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Delivering Primary Care for Non-communicable Diseases:

A Compendium of Service Delivery Models in Low and Middle-income Countries

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An accompanying digest was developed to summarize lessons learned across all case studies and highlight models of care exemplifying these lessons. For readers looking to consult the full case study of a model of care featured in the digest, please refer to the classification lists on pages 15 to 29 of this compendium report using the case study number provided.

Preface

Non-communicable diseases (NCDs) such as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes are the leading causes of mortality worldwide. The impact of NCDs goes beyond individuals, as premature deaths hinder economic growth and perpetuate poverty within communities. Low- and middle-income countries face particularly significant challenges due to the rapid rise of NCDs against the backdrop of persistent high burdens of infectious diseases, including HIV/AIDS and tuberculosis, as well as maternal and child illnesses. Resources, including human capital and infrastructure, are limited to effectively address NCDs amid multiple health priorities.

Primary health care (PHC) centers, universally available at the community level, serve as critical access points for a large portion of the population in need. However, their current capacity remains focused on providing episodic care and symptomatic treatment, highlighting the necessity to restructure PHC systems to meet the evolving demands of chronic care and enhance resilience for the future. By leveraging successful care models implemented in similar settings, restructuring the PHC system presents a significant opportunity to drive meaningful change.

Recognizing the growing interest in the concept of a "model of care" among policymakers and health service planners, this compendium showcases integrated care models implemented in low- and middle-income countries across the world. In this compendium, integrated care refers to coordinated care that responds to the needs of individuals across the care continuum—spanning health promotion, disease prevention, diagnosis, treatment, disease-management, rehabilitation, and palliative care services—and throughout the life course.

Through the publication of this compendium, the World Bank and Boston University aim to support policymakers and stakeholders in undertaking the necessary steps to restructure their PHC systems. The objective is to enable the delivery of high-quality services across the entire NCD continuum, including efforts to mitigate risk factors and ensure the sustainable management of NCDs and their long-term complications.

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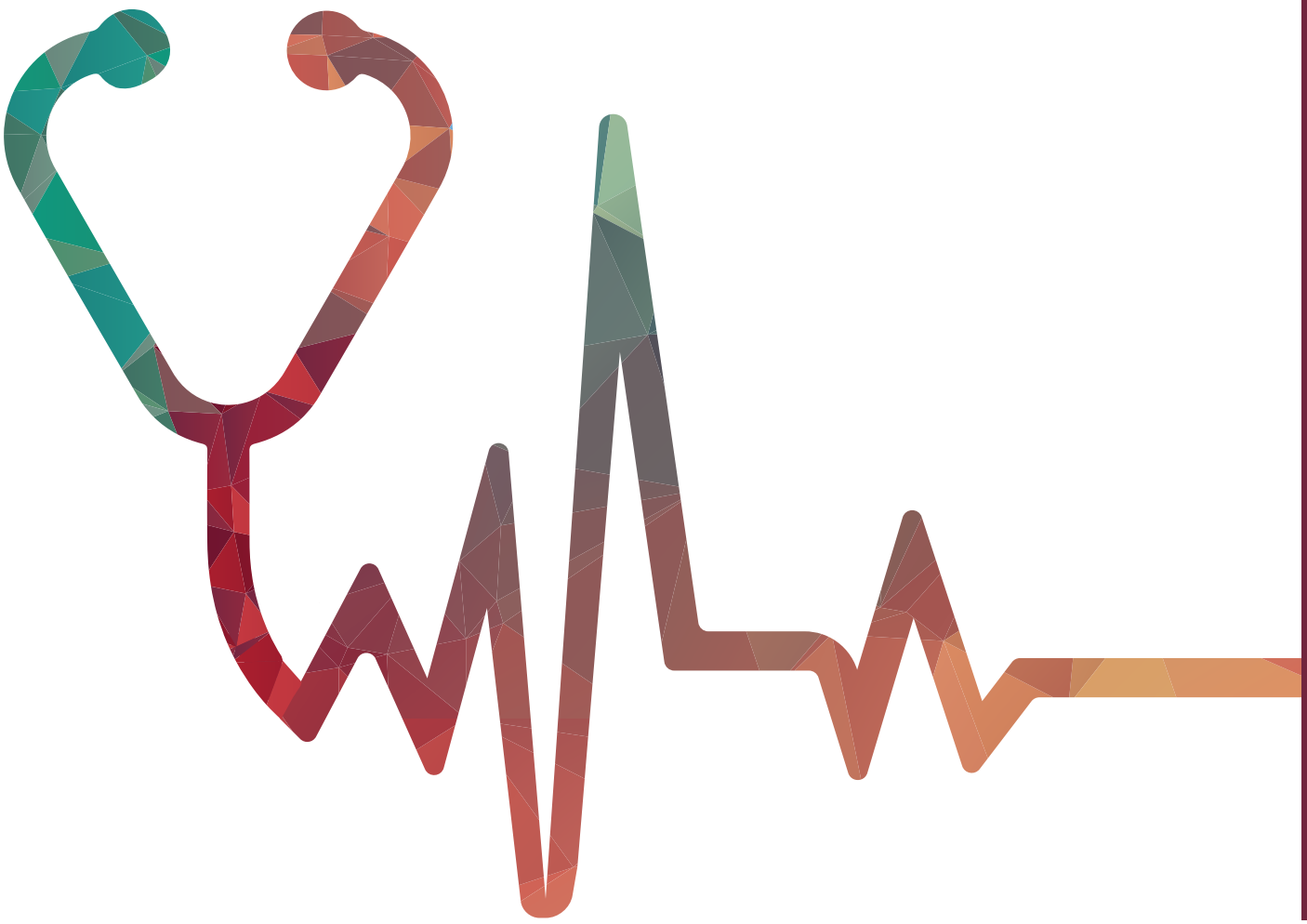


Acronyms and abbreviations

AB-HWC	Ayushman Bharat-Health and Wellness Centre
ACE	angiotensin converting enzyme
ACM	additional case management
AMI	acute myocardial infarction
AMR	age-adjusted mortality rate
ANM	auxiliary nurse midwife
aOR	adjusted odds ratio
APC	Adult Primary Care
ARB	angiotensin receptor blocker
ART	antiretroviral therapy
ASHA	accredited social health activist
AUD	alcohol use disorder
AUDIT	Alcohol Use Disorders Identification Test
AW	auxiliary workers
BHU	basic health unit
BHU-I	grade I basic health unit
BHU-II	grade II basic health unit
BMI	body mass index
BODE	Body mass index, airway Obstruction, Dyspnoea, Exercise capacity
BP	blood pressure
CAP	complementary alternative health provider
CARIMENSA	Caribbean Institute of Mental Health and Substance Abuse
CBR	community-based rehabilitation
CBT	cognitive behavioral therapy
CC	care companion
CCC	Chronic Care Clinic
CCM	Chronic Care Model
CCSS	Costa Rican Social Security Fund / Caja Costarricense de Seguro Social

CDC	Center for Disease Control and Prevention
CDM	Chronic Disease Management
CEMH	Community Engagement Mental Health
CG	control group
CHC	community health center
CHEW	community health extension worker
CHO	community health officer
CHSC	community health service center
CHW	community health worker
CKT	Circle Kubatana Tose
CMD	common mental disorder
CMIS	Client Management Information System
CNAM	National Health Insurance Company / Compania Națională de Asigurări în Medicină
CO	clinical officer
COACH	Chinese Older Adult Collaborations in Health
COMDIS-HSD	Communicable Diseases Health Service Delivery
COPD	chronic obstructive pulmonary disease
CORFIS	Cardiovascular Risk Factors Intervention Strategies
COSIMPO	Collaborative Shared Care to Improve Psychosis Outcomes
CPG	clinical practice guideline
CRD	chronic respiratory disease
CVD	cardiovascular disease
DALY	disability-adjusted life year
DBP	diastolic blood pressure
DCST	district clinical specialist team
DFID	Department for International Development
DHI	digital health intervention
DHIS2	District Health Information System 2
DIABEMPIC	DIAbetes EMPowerment and Improvement of Care
DIADA	Detection and Integrated Care for Depression and Alcohol Use in Primary Care
DIAPREM	DIAbetes Primary Care, Registry, Education, and Management

DKK	Dr. Kenneth Kauda
DOHA	Direction of Healthcare Activities
DOTS	directly observed treatment shortcourse
DRC	Democratic Republic of the Congo
DRF	Drug Revolving Fund
D2B	door-to-balloon
EBAIS	Equipos Basicos de Atencion Integral en Salud
eCAU	enhanced care-as-usual
ECG	echocardiogram
EDS	electronic decision support
EDSS	electronic decision support system
EMR	electronic medical record
ENACT	Enhancing Assessment of Common Therapeutic
ENLIGHTEN	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives
ENPCSOD	National Strategy for the Prevention and Control of Overweight, Obesity, and Diabetes
ER	emergency room
ERIC	Education Resources Information Center
EUC	enhanced usual care
FAMD	fully adjusted mean difference
FAOR	fully adjusted odds ratio
FBS	fasting blood sugar
FCS	Carlos Slim Foundation / Fundación Carlos Slim
FiLDCare	First Line Diabetes Care
FMS	family medicine specialist
FPG	fasting plasma glucose
GAD	Generalized Anxiety Disorder questionnaire
GDP	gross domestic product
GP	general practitioner
HA	health assistant
HBPM	home blood pressure monitoring

HC	health center
HCP	health care provider
HDRS	Hamilton Depression Rating Scale
HEARTS	HEARTS Technical Package for Cardiovascular Disease Management in Primary Health Care
HH	health houses
HiAP	Health in All Policies
HIV/AIDS	human immunodeficiency virus / acquired immunodeficiency syndrome
HOPE 4	Heart Outcomes Prevention and Evaluation Program
HPV	human papillomavirus
HRQOL	health-related quality of life
HSS	health system strengthening
HTN	hypertension
ICDM	Integrated Care Disease Management
ICSM	Integrated Clinical Service Management
IC3	Integrated Chronic Care Clinic
IG	intervention group
IMB	Inshuti Mu Buzima
IMSS	Mexican Institute of Social Security / Instituto Mexicano del Seguro Social
IRC	International Rescue Committee
IRR	incidence rate ratio
ISH	International Society of Hypertension
ISSSTE	Institute for Social Security and Services for State Workers / Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado
IVR	interactive voice response
IVRS	interactive voice response system
LATIN	Latin America Telemedicine Infarct Network
LDL	low-density lipoprotein
LHW	lay health workers
LILACS	Latin America and the Caribbean Literature on Health Sciences
LMIC	lower-middle-income country
LPA	local public authority

MAC	Medication Adherence Club
MAPEC	Model for the Care of Individuals with Chronic Diseases
MDD	major depressive disorder
MDSS	mobile phone-based decision support
MDT	multi-disciplinary teams
M&E	monitoring and evaluation
MeHPriC	Mental Health in Primary Care
MH	mental health
MHCP	mental health care plan
MHD	mental health disorders
mhGAP	Mental Health Gap Action Programme
mhGAP-IG	Mental Health Gap Action Programme-Intervention Guide
MHO	mental health officer
MIDE	National Integrated Management of Diabetes in Stages / Manejo Integral de la Diabetes por Etapas
MIDO	Integrated Measurement for Early Detection / Medición Integrada para la Detección Oportuna
MIS	management information system
MMRS	Mosoriot Medical Record System
MNS	Mental, neurological, and substance use
MoH	Ministry of Health
MoHME	Ministry of Health and Medical Education
MO-NCDs	medical officer-non-communicable diseases
MSF	Médecins Sans Frontières
MTRH	Moi Teaching and Referral Hospital
NCC	nurse care coordinator
NCD	non-communicable disease
NGO	non-governmental organization
NHSO	National Health Security Office
NIROGI Lanka	National Initiative to Reinforce and Organize Diabetes Care in Sri Lanka
NPHW	non-physician health worker
NSPP	National Suicide Prevention Program
OECD	Organisation for Economic Co-operation and Development

OOP	out-of-pocket
OPD	outpatient department
OpenMRS	Open Medical Record System
OVE	oral visual examination
PACIC	Patients' Assessment of Chronic Illness Care
PAHO	Pan American Health Organization
PANSS	Positive and Negative Symptom Scale
PCI	pharmaceutical care issue
PCP	primary care provider
PEN	Package of Essential Noncommunicable Disease Interventions for Primary Health Care
PEPFAR	President's Emergency Plan for AIDS Relief
PHC	primary health care
PHCW	primary health care worker
PHQ	Patient Health Questionnaire
PIC4C	Primary Health Integrated Care Project for Chronic Conditions
PIH	Partners In Health
PLSP	Peer Leader-Support Program
PLWD	people living with diabetes
PMCU	primary care medical unit
PRIME	Programme for Improving Mental Health Care
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PRISMA-P	Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols
PST-PC	Problem Solving Therapy
PUCOP	Purdue University College of Pharmacy
Q&A	question and answer
QALY	quality-adjusted life year
QR	Quick References
RDH	Rwinkwavu District Hospital
RE-AIM	Reach, Effectiveness, Adoption, Implementation, and Maintenance
RESHAPE	Reducing Stigma Among Healthcare Providers
RISE	Rehabilitation Intervention for People with Schizophrenia in Ethiopia

SBP	systolic blood pressure
SCCI	Service with Care and Compassion Initiative
SDC	Special Diabetes Clinic
SDS	Social Distance Scale
SEARCH	Sustainable East Africa Research in Community Health
SHPH	sub-district health promoting hospital
SIC	Non-communicable Disease Information System / Sistema Nominal de Información en Crónicas
SINEMA	System-Integrated and Technology-enabled Model of Care China
SKILLD	Spoken Knowledge in Low Literacy Patients with Diabetes
SMART	Systematic Medical Appraisal, Referral, and Treatment
SMART2D	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes
SME/S	self-management education and support
SMS	short message service
SPCO	Suicide Prevention Consultation Office
SSQ	Shona Symptom Questionnaire
STAGED	Somatic Treatment Algorithm for Geriatric Depression
STEMI	ST-segment evaluation myocardial infarction
STEPS	STEPwise Approach to Surveillance
TB	tuberculosis
TFH	traditional faith healers
TIA	transient ischemic attack
TO	Teófilo Otoni
ToC	theory of change
TTR	testing, treating, and recording
TWG	technical working group
T2DM	type 2 diabetes mellitus
UHC	universal health coverage
UM	University of Michigan
UMIC	upper-middle-income country
USAID	United States Agency for International Development
VC	Vitória da Conquista
VHV	village health volunteer

VHW	village health worker
VIA	visual inspection with acetic acid
WBOT	ward-based outreach team
WHO	World Health Organization
WHODAS	World Health Organization Disability Assessment Schedule
YLL	years of life lost

Executive summary

The burden of non-communicable diseases (NCDs) poses a significant global challenge, with cardiovascular diseases (CVDs) being the leading cause of death, followed by cancers, chronic respiratory diseases, and diabetes.[1] This shift from infectious diseases to chronic, non-infectious causes of mortality is driven by demographic changes, urbanization, and lifestyle factors, particularly in less economically developed countries.

Evidence-based interventions, known as "best buys," have been identified by the World Health Organization (WHO) to address NCDs, focusing on population-level efforts to reduce modifiable risk factors.[2] Additionally, the Disease Control Priorities, 3rd edition[3] and the Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion[4] have identified a broader range of cost-effective and equitable interventions, spanning intersectoral policies and various health care interventions. However, the challenge lies in effectively delivering this wide range of interventions, particularly in health systems facing significant constraints in terms of human resources and infrastructure.

Primary health care (PHC) systems in low- and middle-income countries play a crucial role in providing essential health care services to a significant portion of the population. However, these systems face challenges in delivering NCD services due to supply-side constraints, including limited human resources and infrastructure. Nonetheless, research emphasizes the significance of adopting an integrated approach to PHC, actively promoting the prevention and control of NCDs in all health care settings.[5,6] This calls for innovative strategies and interventions to address existing constraints and enhance outcomes across the entire care continuum.

To explore innovative and effective NCD management strategies and develop this compendium, a systematic review was conducted to identify models of care for NCDs. Based on the systematic review, 56 case studies were purposively selected such that they would provide valuable insights into effective models and approaches. These case studies delve into models of care addressing a range of NCDs, including hypertension, diabetes, chronic respiratory conditions, cancer, CVD, and mental health conditions, across diverse settings in low- and middle-income countries.

The case studies on managing NCDs encompass various strategies. Some of these include:

1. Integrating complex conditions into existing PHC programs, optimizing health care professionals' roles, and ensuring specialized care
2. Task-shifting, empowering less specialized cadres to provide NCD screening, referral, education, and management
3. Digital health approaches, such as mobile health and healthy lifestyle support tools
4. Collaboration between hospitals and PHC centers to enhance comprehensive NCD treatment
5. Community-based screening services
6. Strengthening the health system and improving health worker capacity through training and guidelines
7. Supporting patient self-management and establishing peer support groups
8. Standardizing service delivery using protocols

To complement this compendium, a digest was developed to summarize key lessons learned from the case studies and to highlight models of care exemplifying these insights. In particular, the digest highlights that task-shifting to non-specialist health workers helped decentralize services and use higher level cadres more efficiently, and that community engagement improved NCD outcomes and reduced barriers to care. Integrating NCDs and mental health services into PHC systems was particularly important to improve access to care and reduce care demands at higher levels of the health system with few specialized providers. Digital tools and telemedicine were effectively used

to increase access to care in resource-limited settings, with SMS and web-based applications improving patient adherence to treatment and follow-up and clinical decision support systems facilitating task-shifting efforts and strengthening quality of care. Multi-disease screening and integrated care also improved the efficiency and reach of services. Strong partnerships and leadership were essential to support sustainable scale-up efforts.

Addressing the burden of NCDs requires comprehensive and context-specific strategies. By integrating evidence-based interventions into PHC systems and overcoming challenges through innovative approaches, countries can effectively manage NCDs and improve outcomes for their populations.

Introduction

RATIONALE AND PURPOSE

The global prevalence of non-communicable diseases (NCDs) continues to escalate, leading to a substantial burden of disease. NCDs account for 74% of all global deaths, causing approximately 41 million fatalities annually, with cardiovascular diseases (CVDs), cancers, chronic respiratory disease (CRD), and diabetes being the primary contributors.[1] Low- and middle-income countries bear a greater share of this burden, experiencing around 82% of premature NCD-related deaths.[7] Women in these countries now face a triple burden of NCDs, reproductive and maternal health challenges, and infectious diseases such as HIV/AIDS.[8,9]

Moreover, many health systems are inadequately prepared to deliver comprehensive care for major NCDs, including type 2 diabetes, hypertension, CVDs, chronic obstructive pulmonary disease (COPD), obesity, and mental health conditions. Primary health care (PHC) services in low- and middle-income countries, which play a crucial role in preventing and controlling NCDs, mainly focus on the provision of acute and episodic care, leaving gaps in coverage and quality of essential services for the prevention, diagnosis, treatment, and long-term management of NCDs across the care continuum.[10]

The World Health Organization (WHO),[2,11] Disease Control Priorities, 3rd edition,[3] and Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion[4] have identified equitable and cost-effective interventions to address the growing burden of NCDs across different levels of health systems. However, the challenge lies in effectively delivering this wide range of interventions, particularly in health systems facing significant constraints in terms of human resources and infrastructure.

To address these needs, restructuring PHC offers an opportunity to adopt and scale effective models for increasing access to services and delivering care more efficiently (e.g., by moving patient volume into ambulatory clinic, home visit, or virtual visit settings, or targeting effort/support by segmenting patient populations), thereby decreasing direct and indirect costs, strengthening patient-centered care, and improving patient outcomes in the long term.

Despite the current constraints faced by NCD programs and PHC systems, research has shown that an integrated approach to PHC, including active health promotion, prevention, and control of NCDs, is necessary in any setting.[5,6] New strategies and innovative solutions are needed to achieve this approach and improve outcomes across the care continuum, from reducing risk factors to sustainably managing chronic conditions at the PHC level.[12]

OBJECTIVE

In response to the urgent requirement for restructuring PHC systems to effectively meet the demands of chronic care and establish greater resilience for the future, the objective was to create a compendium of well-documented integrated and effective care models at the PHC level in low- and middle-income countries. The concept of a “model of care” can be defined as the way in which specific health services are delivered to a patient population at and across various levels of the health system. These models specifically address chronic conditions, including NCDs, and demonstrate evidence of impact. In this compendium, the term “integrated” refers to coordinated health services that respond to the needs of individuals across the care continuum—spanning health promotion, disease prevention, diagnosis, treatment, disease-management, rehabilitation, and palliative care services—and throughout the life course.

ABOUT THE COMPENDIUM

This compendium of integrated care models at the PHC level is a highly implementation-oriented resource that synthesizes design solutions and digital health approaches that work in diverse ways to improve access, efficiency, effectiveness, and quality of NCD care in low- and middle-income countries.

Target audience: The primary intended audience for this compendium includes ministries of health, implementing partners, and other key stakeholders who are actively involved in developing strategies to manage the growing burden of NCDs in low- and middle-income countries. These stakeholders play a crucial role in shaping policies, implementing programs, and allocating resources to address NCDs and population health in their respective countries.

Use of the compendium: This compendium is designed to provide valuable support to countries as they undergo ongoing transformations and redesign of their PHC systems. Its main objective is to guide countries in shifting their focus from acute, episodic care to integrated and coordinated, PHC-based chronic care services. By adopting an integrated approach to PHC, countries can strengthen their health care systems and improve the prevention, diagnosis, treatment, and long-term management of NCDs.

An accompanying digest was developed to summarize lessons learned across all case studies and highlight models of care exemplifying these lessons.

ORGANIZATION OF THE COMPENDIUM

The compendium is structured as follows:

Methodology: This section provides a detailed explanation of the methodology employed in the development of the compendium. It outlines the systematic review process, which involved a rigorous and comprehensive search for relevant literature and identification of case studies with evidence of impact. The criteria for inclusion and exclusion of studies are described, along with the steps taken to ensure the quality and reliability of the selected studies. The methodology used to create the individual case studies is also discussed, highlighting the key elements considered and the approach taken to gather information and insights.

Summary results: This section offers a concise and informative overview of the findings derived from both the systematic review and the individual case studies. It presents a summary of the key insights, outcomes, and trends identified throughout the research process. The summary results provide readers with a high-level understanding of the diverse models of care included in the compendium and the impact they have had on managing NCDs in low- and middle-income countries. This section serves as a valuable snapshot of the overall findings, encouraging further exploration and analysis of specific models and their potential applicability in different contexts.

Case studies: The compendium includes a collection of 56 case studies that illustrate diverse, impactful models of care implemented in different countries, highlighting key strategies, outcomes, and lessons learned. The case studies serve as valuable resources for policymakers and program managers looking for detailed documentation of care models and inspiration to inform their own initiatives.

Methods

OVERVIEW OF METHODS

To develop this compendium, a rigorous and systematic approach was followed. The process involved conducting a comprehensive systematic review to identify relevant, impactful models of care from both peer-reviewed literature and gray literature sources. The key evaluation components of each identified model were carefully extracted. Based on the findings from the systematic review, a thoughtful selection process was undertaken to curate a collection of 56 models that represent a diverse range of successful approaches. The methods employed for the systematic review and the development of the case studies are described in detail below, providing transparency and clarity regarding the approach undertaken to identify and showcase the included models of care.

PART I. SYSTEMATIC REVIEW

A comprehensive search was conducted, encompassing a wide range of academic and gray literature sources. Academic sources, such as PubMed, Web of Science, ERIC (Education Resources Information Center) on EBSCOhost, Sage Research Methods, Cochrane Library, Embase, LILACS (Latin America and the Caribbean Literature on Health Sciences), Trip Pro, JSTOR, AnthroSource, and Social Sciences Full Text, were systematically explored to gather scholarly articles and research papers. In addition, gray literature sources, including OPENGREY, Grey Literature Report - New York Academy of Medicine, WHO literature, WHO Regional Indexes Medici, UN literature, and the USAID (United States Agency for International Development Development) Experience Clearinghouse, were included to capture relevant non-peer-reviewed publications.

To ensure the exhaustiveness of the search, a snowballing process technique[13] was implemented, whereby the reference lists of the included articles and literature were scrutinized to identify any additional sources that may have been inadvertently missed during the initial search. Implementers also provided additional references in some cases. To enhance transparency and adherence to established research practices, the search protocol was registered with PROSPERO (registration number: 405754). This review followed the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist,[14] a recognized guideline for systematic reviews, to ensure accurate and comprehensive reporting of the search methodology and relevant details.

Search strategy: The search strategy employed for this study involved an extensive and thorough list of search terms and MeSH terms to ensure comprehensive coverage of relevant literature. An example of the search terms used for the PubMed database can be found in Appendix 1 of this compendium. The search strategy was adapted and applied to other academic and gray literature databases mentioned earlier to ensure consistency and inclusivity across different sources. To focus on recent and up-to-date information, the search was limited to publications within the past 10 years. Additionally, the search was restricted to English language publications to maintain consistency in language and facilitate analysis and synthesis of the findings.

Data management: Covidence systematic review software was utilized to ensure efficient data management and organization.[15] This software facilitated the compilation and management of all titles, abstracts, and summaries of the search results. Employing Covidence streamlined the screening process, enabled more effective collaboration among team members, and allowed for a systematic approach to data management throughout the entire review processes. This enhanced the accuracy, transparency, and traceability of data management procedures.

Selection process: A rigorous screening process was implemented to identify relevant sources for inclusion in the review. Initially, all titles and abstracts were independently screened by a reviewer. In cases where there were discrepancies or uncertainties regarding the eligibility of a source, a senior reviewer was consulted to resolve any disagreements and ensure consistent and accurate selection of sources. This rigorous approach minimized the risk of bias and ensured that sources with potentially relevant information were selected for full-text review.

Definition of integrated health services: The effective management and delivery of health services require a comprehensive approach that encompasses a continuum of care. Integrated health services are services that are managed and delivered in a way that allows individuals to receive a continuum of health promotion, disease prevention, diagnosis, treatment, long-term disease management, rehabilitation, and palliative care. These services are delivered across various levels and care sites within and beyond the health system, ensuring that individuals receive coordinated care throughout their journey.[16] By incorporating these functions and activities, the health system can provide holistic and comprehensive care to individuals, addressing their health care needs at every stage of their condition.

Definition of a "model of care": The conceptualization of service delivery involves the careful consideration of care processes, provider organization, and service management. A "model of care" can be defined as the way in which specific health services are delivered to a patient population at and across various levels of the health system. As the health aims and priorities of the population evolve, models of care also adapt to meet these changing needs and enhance the performance of the health system. In the included studies, a clear distinction was made between models of care and specific interventions. Additionally, the compendium captured linkages and referral mechanisms between PHC and other health care facilities. This allowed for the inclusion of models that involved the stepdown or decentralization of care from the primary care level, ensuring a comprehensive representation of different care delivery approaches within the health care system.

Source inclusion criteria:

- Geographic range: Low- and middle-income countries
- Topic: Models of care for NCDs at the PHC level
- Study design: Case control, case series, cross-sectional, cohort, clinical trials, mixed methods (including quantitative methods (note: systematic reviews/meta-analyses were reviewed separately for inclusion)
- Population: Adults (>18 years)
- Publication period: Last 10 years
- Source must describe a model of care for one or more NCDs (e.g., diabetes, CVD, hypertension, CRD, and mental health)
- The model of care must include the PHC level and report quantitatively on one or more of the desired outcomes (listed in Table 1 below)

Source exclusion criteria:

- Population: The included studies do not primarily focus on children and adolescents; however, models of care in certain settings (e.g., fragile, conflict-affected, and vulnerable settings) provide access to care for NCDs across all age ranges, including children, adolescents, and adults
- Study design: Excluded studies consists of modelling studies, studies that do not use primary data, and purely qualitative studies

Data collection process: A data extraction matrix (the "model matrix") was developed to gather comprehensive bibliographic, geographic, and substantive data on care models. As the literature search process progressed, the matrix was continuously refined to ensure it effectively captured relevant information obtained from the literature. This iterative approach allowed for enhanced accuracy and completeness of the data extraction process. Table 4 in the Appendix 2 details the data fields that were, when possible, extracted from each source reviewed. The model matrix is a supplementary document that can be made available upon request.

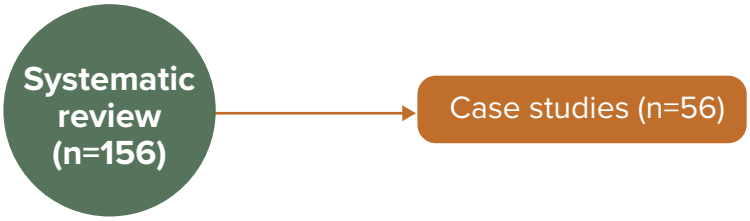
Outcomes: Table 1 details the range of outcomes that were collected from models to demonstrate evidence of impact. To organize the outcomes and capture the key implementation science domains, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework[17] was adapted (see Table 1).

Table 1. Quantitative outputs and outcomes captured in the compendium

RE-AIM domain	Application to this compendium
Reach (R)	Coverage outcomes: screening, treatment initiation, equity (e.g., geographic accessibility, biological sex, socioeconomic status)
Effectiveness (E)	Health behavior outcomes: treatment adherence, decrease in cigarette smoking, decrease in alcohol use, decrease in physical inactivity, improved diet Health outcomes: glucose/glycemic/ABC (HbA1c, blood pressure, low-density lipoprotein or LDL cholesterol) control for diabetes, blood pressure control for hypertension, improved cardiovascular health for stroke and heart attack, improved pulmonary health for respiratory diseases, improved mental health (indication/therapeutic-specific outcomes), retention in care, life-years gained, quality-adjusted life-years gained, disability-adjusted life years averted, decline in mortality
Adoption (A)	Outputs: guideline compliance (range of results that showed health care providers performing their jobs according to established protocols or guidelines, such as the frequency of providers measuring blood pressure at each clinic visit or documenting body mass index)
Implementation (I)	Quality of care outcomes: costs to patients, referral process, enrollment barriers, time to treatment, patient satisfaction (self-reported), staff retention, patient experience, human resource experience
Maintenance (M)	Economic outcomes: costs, cost-effectiveness, cost-benefit ratios, affordability (within existing or expected budgets)

PART II. CASE STUDIES

Figure 1. Relationship of case studies to systematic review



Case selection: A multi-site, mixed-method collective case study approach was used to examine the implementation processes and outcomes of a selection of models.[15,16] All case studies were purposively selected from the models that were identified in the systematic review. An accompanying digest was developed to summarize lessons learned across all case studies and highlight models of care exemplifying these lessons.

Selection of all case studies was based on objective criteria, including country/region of implementation, disease focus, scale, and effectiveness, as well as relevance to World Bank operations. Ongoing discussions were held to ensure variation in geographies/regions, socioeconomic settings, contexts (e.g., rural/urban, fragile and conflict-affected, refugee etc.), target populations, scale (e.g., subnational, national), and strategies adopted. Sources that only had abstracts available and no further detail were not considered for a case study.

Case study development: All case studies include the following sections: 1) a title with the model name; 2) a summary byline explaining the model; 3) a header with the geographic locale, program setting, target disease(s), target population, and partners/stakeholders; 4) a background and overview of the model; 5) notable features of the model; 6) model strategy, 7) model funding; 8) human resources; 9) laboratory, diagnostic, and pharmacy services; 10) digital solutions; 11) impact of the model; and 12) relevant resources.

To the degree possible, sources were standardized to report the burden of disease as follows:

- Source 1: Diabetes Atlas[18] to report on diabetes prevalence
- Source 2: Lancet NCD Risk Factor Collaboration[19] for hypertension estimates
- Source 3: World Bank Open Data[20] for country-level population estimates
- Source 4: WHO global health estimates for prevalence of depression and other common mental disorders[21]
- Source 5: Institute for Health Metrics and Evaluation Global Burden of Disease to report on other NCDs, such as CVD[22]

All case studies summarize information provided by the sources identified in the systematic review, as well as standard sources for disease burden information. Some case studies were supplemented with additional references from peer-reviewed and grey literature and relevant implementer websites. In an effort to ensure the accuracy of the case study descriptions, engagement was actively sought with implementers of the models of care or lead authors of source publications. Implementers and authors were contacted via email and, in some cases, interviewed via video to further inform model descriptions and logic models and gather more nuanced insights.

All case studies underwent a rigorous review process by World Bank staff to help ensure quality and accuracy. To facilitate easy access to relevant data sources, each case study was indexed with a unique "case study number" data field in the model matrix. However, when presented in the compendium, the case studies are arranged by region to allow for convenient navigation and referencing.

Logic model development: All case studies are accompanied by a standardized logic model, which serves two purposes: providing a visual overview of the model and enabling comparability across different models. The team collectively agreed upon a standard template (Appendix 3) to ensure consistency in presenting the logic models.

The logic models for each case study were populated with relevant information to the extent possible, based on details provided in the respective sources, and validated by implementers when possible. These logic models contain essential information, including on the following sections:

Inputs: Each model of care relies on various resources for its implementation, including human, financial, and technical resources. These inputs are essential to support and sustain the model's activities and interventions effectively.

Program activities: Implementation of the model involves a range of primary activities that are categorized into five broad areas, as agreed upon by the team: 1) facility-based activities, 2) community-based activities, 3) training and capacity building, 4) integration and coordination, and 5) technology and digital solutions. These five broad areas capture the key areas of focus in implementing the model and guiding the delivery of care and related services.

Outputs: The outputs represent the direct results of the implementation activities. These outputs are mapped to the domains of the RE-AIM framework, which encompasses Reach, Effectiveness, Adoption, Implementation, and Maintenance. The mapping is based on the data extracted for the systematic review (as presented in Table 1). In instances where there were no corresponding implementation activities, the outputs were omitted. It is important to note that all outputs converge to contribute to the achievement of desired outcomes. Note that the output "guideline compliance" captured a range of indicators including but not limited to provider adherence to national guidelines, protocol compliance, and treatment algorithms. Outputs from all relevant studies cited in the case study were included, not solely from the primary study; outputs are cited accordingly.

Outcomes: The outcomes reflect the changes observed in the target population, which comprises the patients receiving care under the model. The outcomes are categorized into proximal, intermediary, and distal outcomes. Proximal outcomes capture changes in patient satisfaction, awareness, and knowledge. Intermediary outcomes encompass changes related to patient behavior, such as adherence to treatment, adoption of healthy lifestyles, and retention in care. Distal outcomes encompass changes in patients' health outcomes and, when available, include cost-effectiveness results. The outcomes are also mapped to the domains of the RE-AIM framework, denoted as (I) for Implementation, (E) for Effectiveness, or (M) for Maintenance, based on the data extracted for the systematic review (as presented in Table 1). If there were no reported outcomes in a specific area, it is indicated, but the corresponding box remains in the template to illustrate the flow of outcomes. The logic model includes outcomes from all relevant sources cited for each case study, not solely from the primary study. The source(s) for each listed outcome is (are) cited accordingly.

Results

PART I. SYSTEMATIC REVIEW

Figure 2 below is the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[14] flow chart that depicts the flow of information through the different phases of the review. The initial search of academic and gray literature yielded 9,318 results, 21 of which were duplicates, leaving a total of 9,297 studies to be screened. Of those 9,297, 8,428 did not meet the inclusion criteria for the review and were excluded, leaving 869 studies eligible for full text review. After review of the 869, a final set of 156 studies remained for data extraction.

Figure 2. PRISMA flow chart

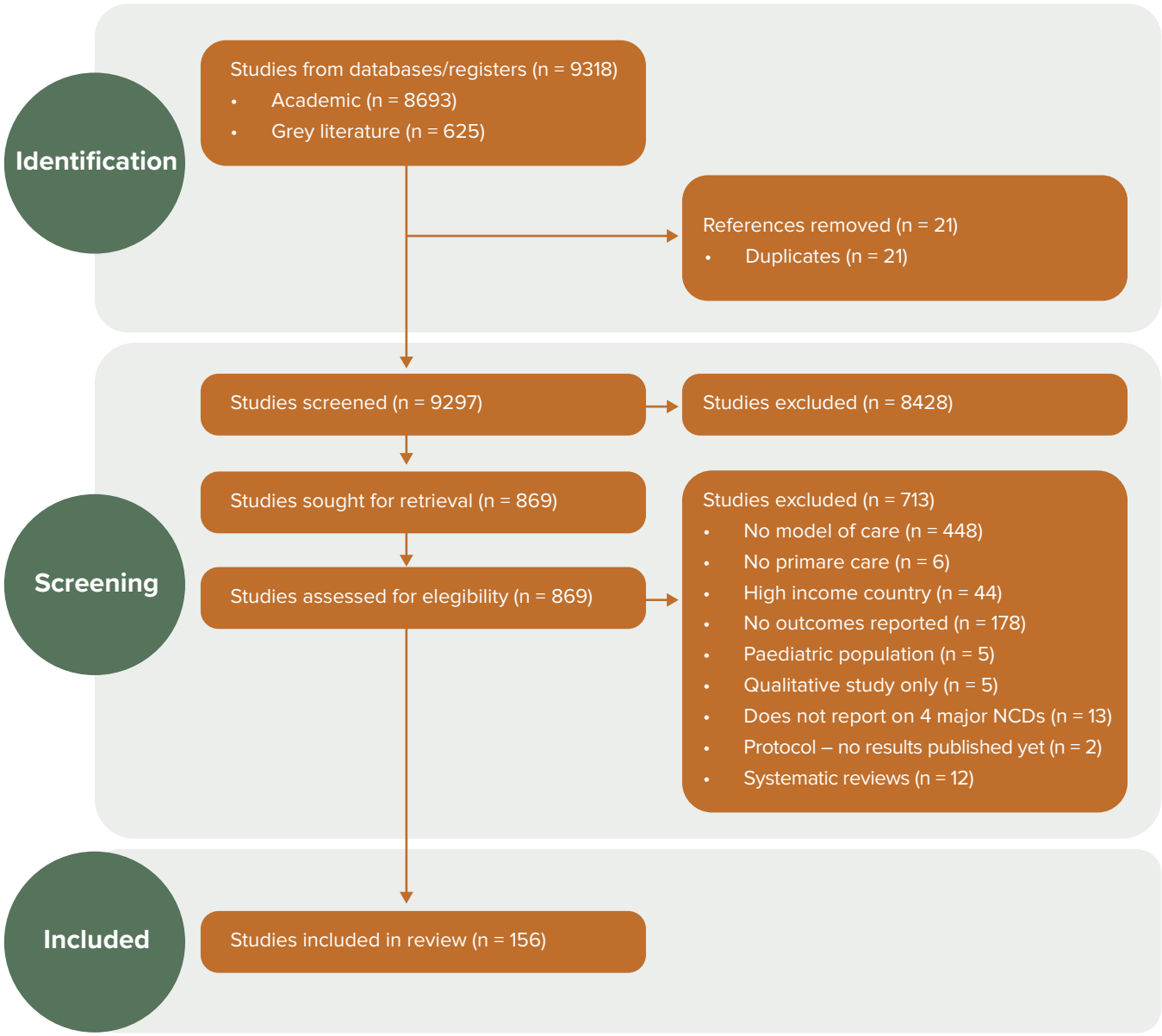


Table 2 below provides a comprehensive overview of the distribution of various characteristics of the 156 models identified by the systematic review. The analysis reveals that Sub-Saharan Africa has the highest representation (26.9%), followed by East Asia and Pacific (22.4%) and South Asia (20.5%). Upper-middle-income countries (UMICs) account for most selected models (44.9%), with lower-middle-income countries (LMICs) close behind (42.9%). Diabetes is the most targeted NCD (50.0%), followed by hypertension (42.3%) and mental health disorders (38.5%). Task-shifting/task-sharing is the most common model mechanism (40.4%), along with new services/conditions integration (35.9%) and education/training (33.3%). Mixed areas serve as the most common delivery location (41.7%), followed by rural areas (25.0%) and urban areas (21.8%). Small- to medium-scale implementations dominate (55.1%), with significant representations of large-scale (19.9%), national (10.3%), and multi-country (9.6%) implementations.

Table 2. Summary characteristics of studies included in the systematic review (n=156)

Characteristic	Sub-characteristic	N (%)
Region	Sub-Saharan Africa	42 (26.9)
	East Asia and Pacific	35 (22.4)
	South Asia	32 (20.5)
	Latin America and the Caribbean	30 (19.2)
	Multi-regional	10 (6.4)
	Europe and Central Asia	5 (3.2)
	Middle East and North Africa	2 (1.3)
Economy	Low income	9 (5.8)
	Lower-middle income	67 (42.9)
	Upper-middle income	70 (44.9)
	Combination (multi-country/multi-income level)	10 (6.4)
Target NCD*	Hypertension	66 (42.3)
	Cardiovascular disease	21 (13.5)
	Mental health disorders	60 (38.5)
	Type 2 diabetes mellitus	78 (50.0)
	Chronic respiratory disease	13 (8.3)
	Epilepsy	11 (7.1)
	Cancer	6 (3.8)
	Sickle cell anemia	1 (0.6)
Model mechanism*	Task-shifting/task-sharing	63 (40.4)
	New services/conditions integrated into existing delivery model	56 (35.9)
	Education/training	52 (33.3)
	Integrated care teams	21 (13.5)
	Mobile health	20 (12.8)
	Community-based services	27 (17.3)
Geographical setting	Urban	34 (21.8)
	Peri-urban	2 (1.3)
	Sub-urban	1 (0.6)
	Rural	39 (25.0)
	Mixed	65 (41.7)
	Not specified	15 (9.6)

Characteristic	Sub-characteristic	N (%)
Scale	Multi-country	15 (9.6)
	National	16 (10.3)
	Large-scale	31 (19.9)
	Small- to medium- scale	86 (55.1)
	Single center	8 (5.1)

* Many models included care for multiple target NCDs and model mechanisms.

PART II. CASE STUDIES

Table 3 below provides key statistics on various characteristics of the models chosen for the case studies (n=56). Notably, the distribution of models is relatively balanced across regions, with Sub-Saharan Africa, East Asia and Pacific, Latin America and the Caribbean, and South Asia each accounting for 18-25% of the total. In terms of the economy, the majority of models are implemented in UMICs (44.6%), followed by LMICs (37.5%). Among target NCDs, type 2 diabetes mellitus is the most commonly addressed (51.8%), followed by hypertension (48.2%) and mental health disorders (30.4%), with many models addressing more than one NCD. Regarding model mechanisms, task-shifting/task sharing and new services/conditions integrated into existing delivery model are the most common at 41.1% and 37.5%, respectively, followed by education/training (32.1%). As with target NCDs, many models used more than one mechanism. Geographical settings vary, with mixed settings (48.2%) having the highest representation, followed by rural (25.0%) and urban (17.9%) areas.

Table 3. Summary characteristics of case studies (n=56)

Characteristic	Sub-characteristic	N (%)
Region	East Asia and Pacific	13 (23.2)
	Europe and Central Asia	1 (1.8)
	Latin America and the Caribbean	13 (23.2)
	Middle East and North Africa	1 (1.8)
	South Asia	10 (17.9)
	Sub-Saharan Africa	14 (25.0)
	Multi-regional	4 (7.1)
Economy	Low income	4 (7.1)
	Lower-middle income	21 (37.5)
	Upper-middle income	25 (44.6)
	Combination (multi-country/multi-income level)	6 (10.7)
Target NCD*	Type 2 diabetes mellitus	29 (51.8)
	Hypertension	27 (48.2)
	Mental health disorders	17 (30.4)
	Cardiovascular disease	10 (17.9)
	Chronic respiratory disease	7 (12.5)
	Epilepsy	4 (7.1)
	Cancer	2 (3.6)
	Sickle cell anemia	1 (1.8)

Characteristic	Sub-characteristic	N (%)
Model mechanism*	Task-shifting/task-sharing	23 (41.1)
	Mobile health	9 (16.1)
	Education/training	18 (32.1)
	Integrated care teams	10 (17.9)
	Community-based services	6 (10.7)
	New services/conditions integrated into existing delivery model	21 (37.5)
Geographical setting	Urban	10 (17.9)
	Peri-urban	2 (3.6)
	Sub-urban	1 (1.8)
	Rural	14 (25.0)
	Mixed	27 (48.2)
	Not specified	2 (3.6)

* Many models included care for multiple target NCDs and model mechanisms.

Case studies

HOW TO NAVIGATE THE CASE STUDIES

The case studies in this compendium are arranged by region to allow for convenient navigation and referencing. Case studies can also be searched by the parameters below using the classification lists in the following section.

Region

- East Asia and Pacific
- Europe and Central Asia
- Latin America and the Caribbean
- Middle East and North Africa
- South Asia
- Sub-Saharan Africa

Use of digital health interventions

- Interventions for clients
- Interventions for health care providers
- Data services interventions

Targeted disease

- Type 2 diabetes mellitus
- Chronic respiratory disease
- Cardiovascular disease
- Hypertension
- Mental health
- Multi-disease

Geographical setting

- Rural
- Urban
- Mixed urban/rural
- Peri-urban
- Sub-urban

Model mechanism

- Task-shifting/task-sharing
- Mobile health
- Education/training
- Integrated care teams
- Community-based services
- New services or conditions integrated into existing model

Country income level

- Low income
- Lower-middle income
- Upper-middle income

CLASSIFICATION LISTS

Region

All case studies are classified below by World Bank region, including East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa, or as multi-regional.

Country	#	Model
East Asia and Pacific		
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
	2	Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China
	3	Chinese Older Adult Collaborations in Health (COACH) Model
Indonesia	4	Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
	6	Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia
Philippines	7	First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines
	8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
Samoa	9	PEN Fa'a Samoa: A Customized and Expanded PEN Program Model
Thailand	10	Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand
	11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
	12	VICHAI's 7 Color Balls Model for Diabetes Care in Thailand
Viet Nam	13	Communities for Healthy Viet Nam Model
Europe and Central Asia		
Moldova	14	Interprofessional Management of NCDs Model in the Republic of Moldova
Latin America and the Caribbean		
Argentina	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
	16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
Brazil	17	Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
Jamaica	20	Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica
Mexico	21	Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico
	22	National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico
	23	DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico
	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Peru	25	Diabetic Retinopathy Referral Network Model in Peru
St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia

Country		#	Model
Multi-country	Brazil, Colombia, Mexico, Argentina	27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
Middle East and North Africa			
I. R. of Iran		28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
South Asia			
Bhutan		29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan
India		30	mWellcare Model for Integrated Management of NCDs in India
		31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
		32	Home-based Service Delivery Model for NCDs in Udaipur, India
		33	Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India
		34	mPower Heart Model in India
Nepal		35	Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal
Pakistan		36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
		37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan
Sri Lanka		38	Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka
Sub-Saharan Africa			
Democratic Republic of Congo		39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
Eswatini		40	Decentralized Model of NCD Care in Eswatini
Ethiopia		41	Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model
Kenya		42	Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya
		43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
		44	Mental Health and Development Model in Kenya
Malawi		45	Integrated Chronic Care Clinic (IC^3) Model for HIV and NCDs in Malawi
Nigeria		46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
Rwanda		47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
South Africa		48	Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa
		49	Integrated Care Disease Management (ICDM) Model in South Africa
Zimbabwe		50	Friendship Bench Model for Mental Health Care in Zimbabwe
Multi-country	Ghana, Nigeria	51	Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana
	Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda
Multi-region			
Brazil, India, South Africa, and the United States		53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Colombia, Malaysia		54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
Ethiopia, India, Nepal, South Africa, Uganda		55	Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda
Uganda, South Africa, Sweden		56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden

Targeted disease

All models are classified below by targeted disease(s), including type 2 diabetes mellitus (T2DM), CRD, CVD, hypertension (HTN), and mental health (MH), or as multi-disease.

Country		#	Model
Type 2 diabetes mellitus and complications			
Argentina		15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
China		2	Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China
Mexico		22	National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico
		23	DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico
Peru		25	Diabetic Retinopathy Referral Network Model in Peru
Philippines		7	First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines
Thailand		12	VICHAI's 7 Color Balls Model for Diabetes Care in Thailand
Multi-country	Uganda, South Africa, Sweden	56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden
Chronic respiratory disease			
Pakistan		37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan
Cardiovascular disease			
China		1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
Malaysia		6	Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia
Sri Lanka		38	Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka
Brazil, Colombia, Mexico, Argentina		27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
Hypertension			
Argentina		16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
Pakistan		36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
Philippines		8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
St. Lucia		26	HEARTS Initiative Model for Hypertension Care in St. Lucia
Multi-country	Colombia, Malaysia	54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
	Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda
Mental health			
Colombia		18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Ethiopia		41	Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model
India		31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
Indonesia		4	Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia
I. R. of Iran		28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
Jamaica		20	Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica
Kenya		44	Mental Health and Development Model in Kenya
Nepal		35	Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal

Country		#	Model
Nigeria		46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
South Africa		48	Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa
Zimbabwe		50	Friendship Bench Model for Mental Health Care in Zimbabwe
Multi-country	Ghana, Nigeria	51	Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana

Targeted disease								
HTN	T2DM	CVD	CRD	MH	Other	Country	#	Model
Multi-disease								
•	•	•				Bhutan	29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan
						Brazil	17	Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil
•				•		China	3	Chinese Older Adult Collaborations in Health (COACH) Model
	•	•	•		Cancer	Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
•	•					Democratic Republic of Congo	39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
•	•					Eswatini	40	Decentralized Model of NCD Care in Eswatini
•	•					India	34	mPower Heart Model in India
•	•				Cancer		32	Home-based Service Delivery Model for NCDs in Udaipur, India
•	•			•			30	mWellcare Model for Integrated Management of NCDs in India
		•			Stroke		33	Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India
•	•		•		Epilepsy, sickle cell anemia	Kenya	42	Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya
•	•				HIV/AIDS		43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
•	•		•		Epilepsy, HIV	Malawi	45	Integrated Chronic Care Clinic (IC3) Model for HIV and NCDs in Malawi
•	•				Hyperlipidemia	Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
•	•					Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
•	•						21	Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico
•	•	•				Moldova	14	Interprofessional Management of NCDs Model in the Republic of Moldova
•	•	•	•		Cancer	Rwanda	47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
•	•	•				Samoa	9	PEN Fa'a Samoa: A Customized and Expanded PEN Program Model
•	•		•	•	HIV/AIDS, COPD, asthma, epilepsy	South Africa	49	Integrated Care Disease Management (ICDM) Model in South Africa

Targeted disease								
HTN	T2DM	CVD	CRD	MH	Other	Country	#	Model
•						St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia
•	•					Thailand	10	Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand
•	•						11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
•	•					Viet Nam	13	Communities for Healthy Viet Nam Model
•	•					Brazil, India, South Africa, United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
				•	Epilepsy	Ethiopia, India, Nepal, South Africa, Uganda	55	Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda

Model mechanism

All models are classified below by the main mechanism(s) used, including:

- **Task-shifting/task-sharing:** the reorganization of processes whereby specific tasks are redistributed from care teams to lower cadre providers with shorter training and fewer qualifications, to make more efficient use of the available human resources for health
- **Mobile health:** the use of mobile wireless technologies for health service delivery
- **Education/training:** the provision of education and/or in-service training for health workers
- **Integrated care teams:** the use of multi-disciplinary groups of health care professionals who collaborate to provide coordinated, comprehensive, and patient-centered care. Their aim is to reduce fragmentation by addressing both physical and mental health needs, particularly for patients with complex conditions
- **Community-based services:** the delivery of NCD services at the community level
- **New services or conditions integrated into existing delivery model:** the integration of new NCD services or conditions into existing health service delivery models for PHC, HIV, and TB

Mechanism									
Task-shifting/ task-sharing	Mobile health	Education/ training	Integrated care teams	Community-based services	New services integration	New conditions integration	Country	#	Model
		•	•				Argentina	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
		•			•			16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
					•		Bhutan	29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan
•			•				Brazil	17	Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil
	•	•					China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
•		•						2	Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China
		•	•					3	Chinese Older Adult Collaborations in Health (COACH) Model
	•						Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
			•				Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
						•	Democratic Republic of Congo	39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
•							Eswatini	40	Decentralized Model of NCD Care in Eswatini
		•			•		Ethiopia	41	Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model

Mechanism									
Task-shifting/ task-sharing	Mobile health	Education/ training	Integrated care teams	Community-based services	New services integration	New conditions integration	Country	#	Model
•	•						India	30	mWellcare Model for Integrated Management of NCDs in India
•	•							31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
•		•						33	Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India
•				•				32	Home-based Service Delivery Model for NCDs in Udaipur, India
•	•							34	mPower Heart Model in India
						•	Indonesia	4	Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia
		•			•		I. R. of Iran	28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
•							Jamaica	20	Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica
•							Kenya	42	Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya
			•					43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
•				•				44	Mental Health and Development Model in Kenya
•					•	•	Malawi	45	Integrated Chronic Care Clinic (IC^3) Model for HIV and NCDs in Malawi
			•		•		Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
					•			6	Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia
			•		•		Mexico	21	Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico
		•						22	National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico
•			•					23	DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico
	•							24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
		•					Nepal	35	Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal
					•		Nigeria	46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
		•					Pakistan	36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
		•						37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan

Mechanism									
Task-shifting/ task-sharing	Mobile health	Education/ training	Integrated care teams	Community-based services	New services integration	New conditions integration	Country	#	Model
		•			•		Peru	25	Diabetic Retinopathy Referral Network Model in Peru
•							Philippines	7	First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines
		•						8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
		•					Moldova	14	Interprofessional Management of NCDs Model in the Republic of Moldova
					•		Rwanda	47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
•							Samoa	9	PEN Fa'a Samoa: A Customized and Expanded PEN Program Model
•			•				South Africa	48	Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa
					•			49	Integrated Care Disease Management (ICDM) Model in South Africa
					•		Sri Lanka	38	Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka
		•					St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia
•							Thailand	10	Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand
•	•							11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
				•	•			12	VICHAI's 7 Color Balls Model for Diabetes Care in Thailand
				•	•		Viet Nam	13	Communities for Healthy Viet Nam Model
•							Zimbabwe	50	Friendship Bench Model for Mental Health Care in Zimbabwe
•			•				Colombia, Malaysia	54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
•	•						Brazil, Colombia, Mexico, Argentina	27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
	•	•					Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
•		•					Ghana, Nigeria	51	Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana

Mechanism									
Task-shifting/ task-sharing	Mobile health	Education/ training	Integrated care teams	Community-based services	New services integration	New conditions integration	Country	#	Model
				•	•	•	Ethiopia, India, Nepal, South Africa, Uganda	55	Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda
				•		•	Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda
•							Uganda, South Africa, Sweden	56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden

* Only the primary and secondary mechanisms for each model are included in the table. Some models may employ additional mechanisms that are not captured here.

Use of digital health interventions

Case studies with digital components are classified below following the WHO Classification of Digital Health Interventions v1.0, which categorizes the different ways in which digital technologies are being used to support health system needs. The classifications are organized by the targeted primary user and include interventions for 1) "clients," or patients; 2) health care providers; and 3) data services. For each of the models below, a summary of the digital components can be found in Appendix 4.

Country	#	Model
Clients		
Targeted client communication		
Argentina	16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
India	30	mWellcare Model for Integrated Management of NCDs in India
	31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
Kenya	43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Nigeria	46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
Pakistan	36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
	37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan
Peru	25	Diabetic Retinopathy Referral Network Model in Peru
Philippines	8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
South Africa	49	Integrated Care Disease Management (ICDM) Model in South Africa
Thailand	11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
Viet Nam	13	Communities for Healthy Viet Nam Model
Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda

Country	#	Model
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Uganda, South Africa, Sweden	56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden
Personal health tracking		
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Viet Nam	13	Communities for Healthy Viet Nam Model
On-demand information services to clients		
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Viet Nam	13	Communities for Healthy Viet Nam Model
Zimbabwe	50	Friendship Bench Model for Mental Health Care in Zimbabwe
Health care providers		
Client health records		
Argentina	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
India	30	mWellcare Model for Integrated Management of NCDs in India
	31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
	34	mPower Heart Model in India
Kenya	43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
Malawi	45	Integrated Chronic Care Clinic (IC3) Model for HIV and NCDs in Malawi
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Peru	25	Diabetic Retinopathy Referral Network Model in Peru
Rwanda	47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
South Africa	49	Integrated Care Disease Management (ICDM) Model in South Africa
St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia
Thailand	11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
Viet Nam	13	Communities for Healthy Viet Nam Model
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Health care provider decision support		
Argentina	16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
India	30	mWellcare Model for Integrated Management of NCDs in India
	31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
	34	mPower Heart Model in India
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Peru	25	Diabetic Retinopathy Referral Network Model in Peru

Country	#	Model
St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Colombia, Malaysia	54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
Telemedicine		
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Peru	25	Diabetic Retinopathy Referral Network Model in Peru
Zimbabwe	50	Friendship Bench Model for Mental Health Care in Zimbabwe
Brazil, Colombia, Mexico, Argentina	27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
Health care provider communication		
Bhutan	29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
India	31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Referral coordination		
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Viet Nam	13	Communities for Healthy Viet Nam Model
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Health worker activity planning and scheduling		
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Health care provider training		
Argentina	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
Data services		
Data collection, management, and use		
Democratic Republic of Congo	39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
I. R. of Iran	28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
Malawi	45	Integrated Chronic Care Clinic (IC3) Model for HIV and NCDs in Malawi
Mexico	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Viet Nam	13	Communities for Healthy Viet Nam Model

Geographical setting

All case studies are classified below by primary geographical setting for service delivery, including rural, urban, mixed urban/rural, peri-urban, sub-urban, or not specified.

Country		#	Model
Rural			
China		1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
		3	Chinese Older Adult Collaborations in Health (COACH) Model
Eswatini		40	Decentralized Model of NCD Care in Eswatini
Ethiopia		41	Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model
India		30	mWellcare Model for Integrated Management of NCDs in India
		31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
		32	Home-based Service Delivery Model for NCDs in Udaipur, India
		33	Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India
Kenya		44	Mental Health and Development Model in Kenya
Malawi		45	Integrated Chronic Care Clinic (IC3) Model for HIV and NCDs in Malawi
Rwanda		47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
Samoa		9	PEN Fa'a Samoa: A Customized and Expanded PEN Program Model
Multi-country	Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda
	Brazil, Colombia, Mexico, Argentina	27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
Urban			
Argentina		16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
Kenya		42	Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya
		43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
Mexico		21	Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico
		23	DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico
Pakistan		36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
Philippines		7	First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines
		8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
Viet Nam		13	Communities for Healthy Viet Nam Model
Multi-country	Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Mixed urban/rural			
Argentina		15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
Bhutan		29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan

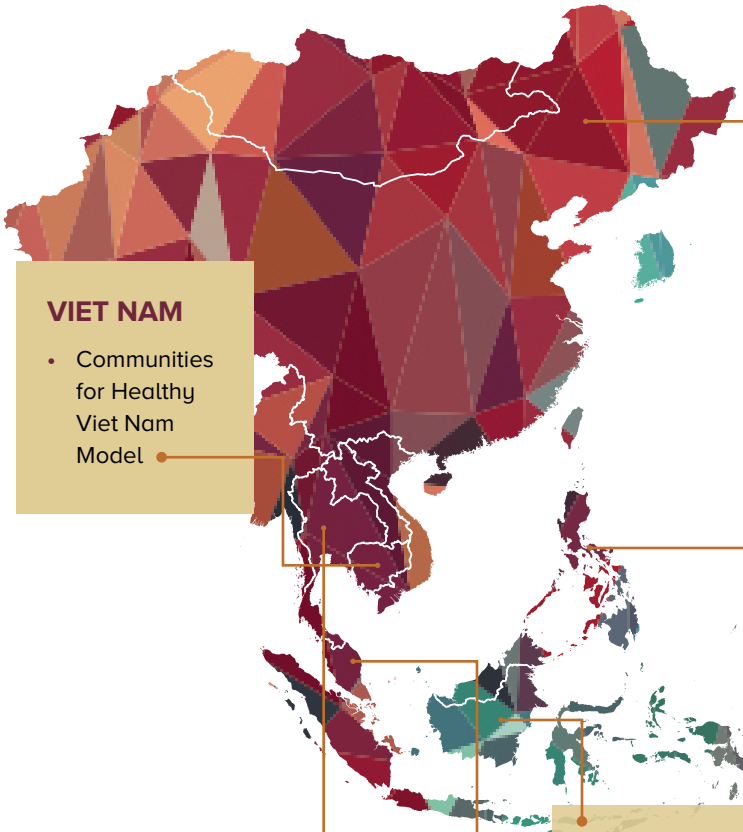
Country		#	Model
Brazil		17	Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil
China		2	Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China
Colombia		18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Costa Rica		19	Community-oriented PHC Model for NCD Care in Costa Rica
Democratic Republic of Congo		39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
I. R. of Iran		28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
Jamaica		20	Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica
Malaysia		5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
		6	Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia
Mexico		22	National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico
		24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Nepal		35	Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal
Nigeria		46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
Pakistan		37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan
Peru		25	Diabetic Retinopathy Referral Network Model in Peru
South Africa		48	Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa
		49	Integrated Care Disease Management (ICDM) Model in South Africa
Sri Lanka		38	Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka
St. Lucia		26	HEARTS Initiative Model for Hypertension Care in St. Lucia
Thailand		10	Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand
Zimbabwe		50	Friendship Bench Model for Mental Health Care in Zimbabwe
Multi-country	Colombia, Malaysia	54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
	Ghana, Nigeria	51	Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana
	Ethiopia, India, Nepal, South Africa, Uganda	55	Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda
	Uganda, South Africa, Sweden	56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden
Peri-urban			
India		34	mPower Heart Model in India
Indonesia		4	Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia
Sub-urban			
Thailand		11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
Not Specified			
Moldova		14	Interprofessional Management of NCDs Model in the Republic of Moldova
Thailand		12	VICHAI's 7 Color Balls Model for Diabetes Care in Thailand

Country income level

All case studies are classified below by World Bank country income level, including low income, lower-middle income, and upper-middle income, or as multi-country/income level.

Country	#	Model
Low income (gross national income per capita of US$1,135 or less)		
Democratic Republic of Congo	39	Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC
Ethiopia	41	Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model
Malawi	45	Integrated Chronic Care Clinic (IC3) Model for HIV and NCDs in Malawi
Rwanda	47	Nurse-led Model for Integrated NCD Care in Rural Rwanda
Lower-middle income (gross national income per capita between US$1,136 and US$4,465)		
Bhutan	29	Service with Care and Compassion Initiative (SCCI) Model in Bhutan
Eswatini	40	Decentralized Model of NCD Care in Eswatini
India	30	mWellcare Model for Integrated Management of NCDs in India
	31	Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India
	32	Home-based Service Delivery Model for NCDs in Udaipur, India
	33	Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India
	34	mPower Heart Model in India
I. R. of Iran	28	Model for the Integration of Suicide Prevention into PHC in I. R. of Iran
Kenya	42	Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya
	43	Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya
	44	Mental Health and Development Model in Kenya
Nepal	35	Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal
Nigeria	46	Mental Health in Primary Care (MeHPriC) Model in Nigeria
Pakistan	36	Public-private Partnership Model for Hypertension Care in Urban Pakistan
	37	Integrated Model for COPD and Asthma Care in Punjab, Pakistan
Philippines	7	First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines
	8	EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines
Samoa	9	PEN Fa'a Samoa: A Customized and Expanded PEN Program Model
Sri Lanka	38	Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka
Viet Nam	13	Communities for Healthy Viet Nam Model
Zimbabwe	50	Friendship Bench Model for Mental Health Care in Zimbabwe
Upper-middle income (gross national income per capita between US$4,466 and US$13,845)		
Argentina	15	DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina
	16	Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina
Brazil	17	Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil
China	1	System-integrated and Technology-enabled Model of Care (SINEMA) in China
	2	Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China
	3	Chinese Older Adult Collaborations in Health (COACH) Model
Colombia	18	Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia
Costa Rica	19	Community-oriented PHC Model for NCD Care in Costa Rica
Indonesia	4	Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia

Country	#	Model
Jamaica	20	Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica
Malaysia	5	Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia
	6	Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia
Mexico	21	Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico
	22	National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico
	23	DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico
	24	Integrated Measurement for Early Detection (MIDO) Model in Mexico
Peru	25	Diabetic Retinopathy Referral Network Model in Peru
Moldova	14	Interprofessional Management of NCDs Model in the Republic of Moldova
South Africa	48	Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa
	49	Integrated Care Disease Management (ICDM) Model in South Africa
St. Lucia	26	HEARTS Initiative Model for Hypertension Care in St. Lucia
Thailand	10	Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand
	11	WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand
	12	VICHAI's 7 Color Balls Model for Diabetes Care in Thailand
Multi-country/income level		
Brazil, Colombia, Mexico, Argentina	27	Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina
Brazil, India, South Africa, and the United States	53	HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States
Columbia, Malaysia	54	Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia
Ethiopia, India, Nepal, South Africa, Uganda	55	Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda
Ghana, Nigeria	51	Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana
Kenya, Uganda	52	Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda
Uganda, South Africa, Sweden	56	Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden



VIET NAM

- Communities for Healthy Viet Nam Model

PHILIPPINES

- First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management
- HyperTENsives of Lifestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model

CHINA

- System-integrated and Technology-enabled Model of Care (SINEMA)
- Peer Leader-support Program (PLSP) Model for Diabetes Self-management
- Chinese Older Adult Collaborations in Health (COACH) Model

INDONESIA

- Task-shifting Model for Management of Mental Health by General Practitioners

THAILAND

- Chronic Diseases Clinic Model: Integrating NCDs into PHC
- WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with NCDS
- Seamless Hypertensive Care Model
- VICHAI's 7 Color Balls Model for Diabetes Care

MALAYSIA

- EMPOWER Participatory Action Research (PAR) Model
- Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model
- Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model

SAMOA

- PEN Fa'a Samoa: A Customized and Expanded PEN Program Model

East Asia and Pacific: Models of care

System-integrated and Technology-enabled Model of Care (SINEMA) in China

USING MOBILE HEALTH TO SUPPORT VILLAGE DOCTORS IN IMPROVING CARE AND OUTCOMES FOR PATIENTS WITH A HISTORY OF STROKE

1

Geographic locale	Nanhe County, Hebei Province, China
Program setting	Village clinics or township health care centers in 50 villages
Target disease(s)	Stroke
Target population	Clinically stable adults (>18 years) with history of stroke capable of basic communication
Partners/Stakeholders	Nanhe County and Ren County Centers for Disease Prevention and Control, Nanhe County Health and Family Planning Commission

Background: China is an upper-middle-income country with a population of 1.4 billion.[1] In 2019, China had an estimated age-adjusted prevalence of 1.6%[2] for stroke, with estimated age-adjusted years of life lost of 2,097.7[2] per 100,000 population from stroke.

Model Overview: The System-integrated and Technology-enabled Model of Care (SINEMA) aimed to deliver a primary care-based integrated mobile health intervention through village doctors to improve stroke management in rural China.[3]

Model Strategy: SINEMA involved village doctors at the PHC level conducting monthly follow-up visits supported by the Android-based SINEMA application to collect, record, and retrieve patient information and send daily education on stroke risk and prevention to patients through an automated voice messaging system. Based on the information received through the app and its clinical algorithms, village doctors assessed patient health status at the monthly follow up visits (e.g., measured blood pressure (BP), reviewed stroke symptoms, and assessed medication use) and provided health education with a focus on patients' medication adherence and physical activity.[3,4,5]

Notable Features of the Model: SINEMA sought to improve care for a unique population of patients in rural China with a history of stroke by enabling village doctors to provide post-stroke management care and secondary prevention of stroke using a mobile health intervention.[3,4,5]

Model Funding: A cluster-randomized controlled trial of this model was funded by the United Kingdom Medical Research Council, the Economic and Social Research Council, the Department for International Development, Wellcome Trust, local governments, and Duke Kunshan University.[3]

Key Messages

- Village doctors conducted monthly follow-up visits at village clinics or patient homes and used the SINEMA app to capture patient data and send daily educational information on stroke risk and prevention.
- The SINEMA model resulted in a modest, but statistically significant, reduction in mean systolic BP and an increase in the proportion of patients reaching BP control targets.

Human Resources: This model used existing human resources within the health system, including village doctors, physicians from township hospitals, and a county manager. Village doctors were provided with quarterly performance-based payment and provided with ongoing review and support by township physicians and the county manager.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: Using the SINEMA app in Android phones, village doctors collected, recorded, and retrieved patient information and follow-up history. The digital health system was linked with a third party dispatching platform and a message bank loaded with over 175 messages designed in partnership with clinical experts and local health care providers. These messages were recorded in the local dialect and were sent daily to patients to provide education and instructional information around stroke risk and prevention. The SINEMA app was consistent with China's clinical guidelines for stroke prevention in a primary care setting and had been tailored to the local context.[3,4,5]

Impact of the Model: A cluster-randomized controlled trial designed to evaluate the effectiveness of SINEMA was implemented in a total of 50 villages, with 25 villages assigned to the intervention arm and 25 villages assigned to the control arm.[6] There was a modest but statistically significant reduction in mean systolic BP when comparing those enrolled in the SINEMA model (-7.1 mmHg) with standard of care (−4.3 mmHg), corresponding to an adjusted mean difference of −2.8 mmHg (95% confidence interval [CI] −4.8, 0.0). Additional analysis on the primary outcome of BP control revealed that SINEMA resulted in a 19% (95% CI 8%, 30%) relative increase in the proportion of patients reaching the target of BP control (systolic BP <140 mmHg and diastolic BP <90 mmHg). Significant and meaningful beneficial effects were also observed in six of the seven prespecified secondary outcomes with a reduction in diastolic BP, improvement in health-related quality of life, performance in the "timed up and go" test, physical activity level, and medication adherence to statin and antihypertensives. Notably, there was a significantly reduced risk of stroke recurrence in the intervention group as compared to controls (4.4% vs. 9.3%, risk ratio [RR] = 0.46, $p<0.001$), as well as a reduced risk of hospitalization in the past year (RR = 0.44, $p<0.001$). (4.4% versus 9.3%; risk ratio [RR] = 0.46, 95% CI 0.32, 0.66). The annual per capita cost to deliver the program was US$24.30.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
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INPUTS

- Existing cadres of human resources for health.
- Financial and/or technical resources from Nanhe County and Ren County Centers for Disease Prevention and Control, and Nanhe County Health and Family Planning Commission.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Village doctors utilized SINEMA app to collect, record, and retrieve patient information.
- Village doctors sent educational information and instructions back to patients using the SINEMA app.
- Village doctors performed follow-up visits to assess patient's health status and provided health education at village clinics.

2 COMMUNITY-BASED ACTIVITIES

- Village doctors performed follow-up visits to assess patient's health status and provided health education at patient's homes.
- Patients received educational and instructional information messages on stroke risk reduction and prevention in their local language through the SINEMA app.

3 TRAINING & CAPACITY BUILDING

- Village doctors were trained on the use of the SINEMA app for stroke risk reduction, prevention, and management.

4 INTEGRATION & COORDINATION

- Physicians from township hospitals and a county manager provided ongoing support and monitored the performance of village doctors.
- Educational and instructional messages were developed in partnership with clinical experts and local health care providers.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Development of SINEMA app which adhered to China's clinical guidelines for stroke prevention in a primary care setting and had been tailored to the local context.
- Pre-loading of over 175 educational and instructional messages to third party dispatching platform.

OUTPUTS

- **Providers trained (A):** 25 village doctors (one per village) were trained in use of the SINEMA app.[6]

EQUITY (A)

- **Geographic reach:** 25 rural villages were included in the SINEMA intervention study.[6]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E):** increased adherence to statins (OR = 1.23, *p=0.003*) and antihypertensives (OR = 1.11, *p=0.039*).[6]
- **Patient health behaviors (physical activity, diet) (E):** increased physical activity compared to control patients (1,203.9 vs. 750.9 minutes/week, *p<0.001*).[6]

DISTAL

- **Patient health outcomes (E):**
  - Compared to the control group, the SINEMA intervention group had: decreased systolic BP (adjusted mean difference of −3.3 mmHg, *p=0.001*), decreased diastolic BP (adjusted mean difference of −2.3 mmHg, *p<0.001*), and a 19% (95% CI 8%, 30%) relative increase in the proportion of patients achieving BP control.
  - SINEMA patients also had decreased stroke recurrence (risk ratio = 0.46, *p<0.001*) and hospitalization in the past year (risk ratio = 0.44, *p<0.001*) compared to control patients.[6]

Peer Leader-support Program (PLSP) Model for Diabetes Self-management in China

EMPOWERING INDIVIDUALS WITH TYPE 2 DIABETES THROUGH PEER SUPPORT AND SELF-MANAGEMENT

2

Geographic locale	China
Program setting	Primary care within communities in Anhui Province, China
Target diseases	Type 2 diabetes mellitus
Target population	Adults (≥15 years) with type 2 diabetes
Partners/Stakeholders	Hefei City Health Bureau, Hefei City Center for Disease Control and Prevention (CDC), Shu-shan District CDC, Heyidi CHSS, Tongling City Health Bureau, Tongling City CDC, Tong guan-shan District CDC, Yangguan CHSS, Rendong CHSS, Bangbu City Health Bureau, Bangbu City CDC, Yuhui District CDC, Daqing CHSS

Background: China is an upper-middle-income country with a population of 1.4 billion.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 10.6%,[2] with estimated age-adjusted years of life lost of 167.4[3] per 100,000 population for type 2 diabetes in 2019.

Model Overview: The Peer Leader-Support Program (PLSP) for diabetes self-management in China is a structured initiative aimed at empowering individuals with diabetes to take control of their condition through peer support. The program focuses on providing education, guidance, and encouragement to enhance self-management skills among participants.[4]

Model Strategy: Key components of the PLSP strategy include: 1) *recruitment and training of peer leaders:* the program identifies and trains individuals living with diabetes who are willing to serve as peer leaders. These leaders undergo comprehensive training to enhance their knowledge of diabetes management, communication skills, and mentoring techniques; 2) *peer support groups*: small peer support groups comprised of 10-15 individuals with diabetes are facilitated by the trained peer leaders. These groups meet regularly to discuss various aspects of diabetes management, share challenges and successes, and provide mutual support, and informal activities such as walking and tai chi groups are also encouraged; 3) *educational workshops:* the PLSP in conjunction with Community Health Service Stations (CHSSs) organizes educational workshops for patients on diabetes management and lifestyle adjustments; 4) *individualized support:* peer leaders offer individualized support to participants. They serve as mentors and role models, providing ongoing encouragement and motivation to help participants achieve their self-management goals.[4]

Notable Features of the Model: The PLSP is notable for its emphasis on peer support, which recognizes the value of individuals with diabetes supporting each other through shared experiences.[4] By leveraging the power of empathy and shared understanding, the program creates a supportive community where participants can learn from each other, exchange practical tips, and provide emotional support.

Key Messages

- Model emphasizes peer-led support for diabetes self-management, including peer leaders and peer support groups.
- Model improved diabetes knowledge, self-efficacy, BMI, BP, and blood glucose.

Model Funding: Funding for the evaluation of this model was provided by the American Academy of Family Physicians Foundation through the Peers for Progress program with support from the Eli Lilly and Company Foundation and the Anhui Provincial Health Bureau.[4]

Human Resources: The key human resources are: 1) program coordinators to oversee the overall implementation of the PLSP, including recruitment, training, and coordination of peer leaders and support groups; 2) peer leaders who are trained individuals with diabetes who serve as mentors and facilitators in the program, guiding support group discussions and providing individual support to participants; and 3) health care professionals, including doctors, nurses, dietitians, and psychologists, who contribute their expertise through workshops and consultations with peer leaders and patients.[4] Peer leaders were provided with a three day training on basic peer support skills and diabetes self-management, including providing daily diabetes management, social and emotional support and linking with community resources and primary care at CHSS's.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A recent mixed-methods study assessed the impact of the PLSP model in two sub-communities within three cities of Anhui province.[4] The qualitative evaluation deemed the model to be acceptable and feasible among local neighborhood committees, CHSS staff, peer leaders, and patients. The health authorities in the three study cities agreed to provide policy, technical, and some financial support for the model. Implementation was successful in two out of three communities and poor in the third community, which failed to recruit any participants in the control group due to lack of staffing. Of the 365 recruited participants in the PLSP group and 361 in the control group, 53% and 74% were lost to follow-up, respectively. Of the intended 12 biweekly educational meetings co-led by CHSS staff and peer leaders according to the study protocol, the average number of meetings was 8.78 (site 1), 7.73 (site 2), and 4.24 (site 3). Of the intended 12 biweekly discussion meetings led by peer leaders, the average number of meetings was 11.63 (site 1), 9.35 (site 2) and 6.47 (site 3). More than three-quarters (76.4%) of the 365 individuals in the PLSP intervention group attended at least six meetings and activities. PLSP was found to be effective with significant improvements in diabetes knowledge ($p<0.001$), self-efficacy ($p=0.002$), body mass index (BMI) ($p<0.001$), systolic blood pressure (BP) ($p<0.001$), diastolic BP ($p=0.02$), and both fasting ($p<0.001$) and two-hour post-prandial ($p=0.02$) blood glucose in the intervention group compared to control. In terms of implementation scale-up, the Anhui Provincial Health Bureau has extended the PLSP model to other communities and to cardiovascular disease prevention and management.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
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3. GBD Results (database). Institute for Health Metrics and Evaluation (IHME), Seattle, WA. https://vizhub.healthdata.org/gbd-results/. Accessed September 1, 2023.
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INPUTS

- Peer leaders chosen from among diabetic patients at CHSSs
- Existing human resources at CHSSs
- Financial and/or technical support from Hefei City Health Bureau, Hefei City CDC, Shu-shan District CDC, Heyidi CHSS, Tongling City Health Bureau, Tongling City CDC, Tong guan-shan District CDC, Yangguan CHSS, Rendong CHSS, Bangbu City Health Bureau, Bangbu City CDC, Yuhui District CDC, Daqing CHSS

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- None reported.

2 COMMUNITY-BASED ACTIVITIES

- Peer leaders led twice monthly group meetings with diabetic patients and discussed disease management, shared challenges and successes, and provided mutual support.
- Peer leaders and Community Health Service Stations co-led twice monthly educational meetings for peer support groups.

3 TRAINING & CAPACITY BUILDING

- PLSP identified peer leaders who had been diagnosed with type 2 diabetes more than 1 year prior, were willing to volunteer, and generally adhered to both medication and behavioral management regimens.
- PLSP trained peer leaders in diabetes management, communication skills, and mentoring techniques.

4 INTEGRATION & COORDINATION

- Peer leaders offered individualized mentorship and support to diabetes patients.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Peer group members are enrolled in WhatsApp groups, where primary care nurse trainees led discussions on diabetes management, such as medication management and side-effects.
- PLSP used social media platforms (e.g. Facebook, Instagram, and Twitter) to raise mental health awareness and disseminate information about the project.

OUTPUTS

- None reported

OUTCOMES

PROXIMAL

- **Patient knowledge (I):** increase in patient knowledge about glucose, complications, diet, and insulin among PLSP participants compared to control group participants ($p<0.001$).
- **Patient self-efficacy (I):** increase in patient self-efficacy among PLSP participants compared to control group participants ($p=0.002$).

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** decrease in PLSP participant BMI ($p<0.001$), systolic BP ($p<0.001$), diastolic BP ($p=0.02$), fasting glucose ($p<0.001$), and 2-hour post-prandial glucose ($p=0.02$) compared to control group participants.[4]

Chinese Older Adult Collaborations in Health (COACH) Model

MANAGING COMORBID DEPRESSION AND HYPERTENSION IN OLDER ADULTS THROUGH A COLLABORATIVE CARE INTERVENTION

3

Geographic locale	Zhejiang province, China
Program setting	Primary care clinics and communities
Target diseases	Depression and hypertension
Target population	Adults ≥ 60 years with depression and hypertension
Partners/Stakeholders	University of Rochester, Zhejiang University, National Institute of Mental Health, United States National Institutes of Health

Background: China is an upper-middle-income country with a population of 1.4 billion.[1] In 2019, China had an estimated age-adjusted prevalence of hypertension of 30.2%[2] for males and 24.1%[2] for females, with an estimated age-adjusted years of life lost due to hypertensive heart disease of 277.7[3] per 100,000 population. The estimated age-adjusted prevalence of mental health disorders in China in 2019 was 11.3%,[3] with an estimated disability-adjusted life years of 1,248.2[3] per 100,000 population.

Model Overview: The Chinese Older Adult Collaborations in Health (COACH) model, implemented from January 12, 2014 through September 30, 2018, focused on addressing the comorbidity of depression and hypertension in older adults through a collaborative care intervention. The intervention provided algorithm-driven treatment of depression and hypertension by village primary care doctors supported by auxiliary workers (AWs), as well as by telephone consultations with centrally located psychiatrists. COACH aimed to ensure comprehensive and coordinated care by bringing together primary care providers (PCPs), aging workers, and psychiatric consultants. This collaborative approach allowed for close monitoring of patient progress and aimed to improve outcomes and enhance the quality of care for older adults with comorbid depression and hypertension.[4]

Model Strategy: The COACH model involved collaboration between PCPs, AWs, and psychiatrists to optimize outcomes and improve the overall well-being of older adults with comorbid depression and hypertension. PCPs used decision support tools, prescribed antidepressants, and facilitated psychiatric consultations, while AWs supported patient self-management, behavioral activation, and created social opportunities for patients. COACH PCPs received training in depression assessment, case management using a toolkit adapted from the MacArthur Initiative on Depression in Primary Care, and antidepressant treatment guidelines adapted from the Duke Somatic Treatment Algorithm for Geriatric Depression (STAGED).[5,6] PCPs saw patients at baseline and again at monthly follow-ups for depression screening and blood pressure (BP) monitoring. Prior to implementing the model, PCPs did not receive any training or guidelines regarding the diagnosis and treatment of affective disorders. Instead, when PCPs suspected mental illness in their patients, they typically advised them to seek treatment at the County Mental Hospital. PCPs were not authorized to initiate antidepressant treatment themselves, but they could renew prescriptions that had been initiated by psychiatrists at the County Mental Hospital. The role of AWs included educating patients, and setting goals during their monthly home visits. Initially, the AW, PCP, and psychiatrist collectively examined the patient assessment data and devised a comprehensive care plan. The psychiatrist provided initial consultation, prescribed antidepressants, and held monthly meetings by telephone. PCPs and AWs met with participants monthly to monitor BP, medication use, and provide support. Weekly meetings between PCPs and AWs and monthly telephone consultations with the psychiatrist were conducted to review progress and update the treatment plan.[4]

Notable Features of the Model: A unique aspect of the COACH model was the collaboration between village AWs, PCPs, and psychiatrists to prepare individual treatment plans based on recent progress. It is also notable that this intervention specifically targeted comorbid depression and hypertension, which is common among older adults, rather than trying to treat each separately.[4]

Key Messages

- COACH participants had a significantly greater reduction in depressive symptom severity and a higher likelihood of achieving hypertension control compared to the enhanced care-as-ususal group.
- The model demonstrates that integrated care management can be effective for treating comorbid depression and hypertension in older adults in primary care settings with limited access to mental health services.

Model Funding: The COACH model was supported by a grant from the National Institute of Mental Health of the United States National Institutes of Health.[4]

Human Resources: Existing PCPs were linked to village-based AWs and psychiatrists based at the County Mental Hospital to implement COACH. In each village, there was one PCP and one AW employed part-time by the village leaders. The majority of AWs were women with a middle-school education. They received training from the Bureau of Civil Affairs to address the social needs of the villagers. AWs were trained on depression, hypertension, and their relationship; principles of disease management; psychosocial assessment and care planning; psychoeducation with older adults and their families; and ethical standards, including confidentiality. The COACH intervention connected the PCP and AW of each village through telephone communication with a psychiatrist at the County Mental Hospital. This remote linkage allowed for collaboration and support in addressing mental health issues in the villages.[4]

Laboratory, Diagnostic, or Pharmacy Services: Regular laboratory, diagnostic, and pharmacy services were available at the village clinic. As part of the COACH model, depression assessment and antidepressant guidelines were provided for diagnosis.[4]

Digital Solutions: Centrally located psychiatrists held remote monthly consultations by telephone with PCPs and AWs to review cases. Scaling this model in areas with few mental health resources would likely require the use of telehealth technologies.[4]

Impact of the Model: A cluster randomized controlled trial conducted in ten townships of Zhejiang province, China from January 2014 through September 2018 evaluated the impact of the COACH model as compared to enhanced care-as-usual (eCAU).[4] Over a 12-month period, COACH participants demonstrated a significantly greater reduction in depressive symptoms as measured by their Hamilton Depression Rating Scale (HDRS) scores compared to patients who received eCAU. The effect size, as measured by Cohen's d, was -1.43 (SD -1.71 to -1.15) ($p<0.001$). The COACH participants also had a higher likelihood of achieving hypertension control when compared to those receiving eCAU (adjusted odds ratio (aOR): 18.24; 95% CI 8.40, 39.63) ($p<0.001$). HDRS scores steadily decreased for COACH participants from a baseline of 22.1 (SD 4.5) to 12.7 (SD 4.2) at 12 months, which is still considered moderately symptomatic. eCAU participants showed a smaller reduction in their HDRS scores over the same 12-month period, with scores decreasing from a baseline average of 21.8 (SD 3.6) to 18.8 (SD 4.7). The group x time interaction was found to be significant with a large effect size, indicating that the COACH participants also had a higher likelihood of achieving hypertension control when compared to those receiving eCAU (aOR 18.24; 95% CI 8.40, 39.63) ($p<0.001$). The authors concluded that integrated care appeared to be effective for the management of comorbid depression and hypertension in Chinese older adults in primary care settings with limited access to mental health care.[4]

Resources

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INPUTS

- Existing human resources at PHC centers, including PCPs, AWs, and psychiatric consultants based at county mental hospitals.
- Financial resources from the National Institute of Mental Health, United States National Institutes of Health.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Psychiatrists conducted initial consultations with patients utilizing decision support tools and prescribed antidepressants.
- AWs provided self-management support to patients and promoted adherence.
- PCPs and AWs met with participants monthly at home or in the clinic to monitor BP, assess medication use and side effects, and provide support. The health care team regularly reviewed and adapted patient treatment plans based on patient progress to optimize outcomes.

2 COMMUNITY-BASED ACTIVITIES

- AWs conducted monthly home visits to provide patient education, review progress and educate participants, set goals, and modify the care plan.

3 TRAINING & CAPACITY BUILDING

- PCPs were trained in depression assessment, case management and STAGED antidepressant treatment guidelines.
- AWs were trained on depression and hypertension, principles of disease management, psychosocial assessment and care planning, psychoeducation with older adults and their families, and ethical standards including confidentiality.
- PCPs were provided decision support tools, depression assessments for diagnosis, and antidepressant guidelines.

4 INTEGRATION & COORDINATION

- Access to antidepressants and psychiatric consultation was facilitated.
- PCPs and AWs held weekly meetings and monthly telephone consultations with the psychiatrist to review patient progress and update treatment plans.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Centrally located psychiatrists held remote monthly consultations by telephone with PCPs and AWs to review cases.

OUTPUTS

COVERAGE (R)

- Average number of times PCPs met with COACH participants over a 12 month period: 11.6.[4]
- Average number of times AWs met with COACH participants over a 12 month period: 8.3.[4]

COVERAGE (R)

- Community activities organized by AWs over 12 months: 9.8 out of 12 planned.[4]

- **Compliance with guidelines (A):**
  - Average number of meetings between PCP and AW in each COACH clinic over 12 months to coordinate care: 56.6 times.[4]
  - Average number of telephone-based meetings between COACH team and consulting psychiatrist over 12 months: 7.9 out of 12 planned.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** at 12 months, compared to eCAU patients, COACH patients had:
  - significantly greater reduction in depressive symptoms (Cohen's d: -1.43 (SD: -1.71 to -1.15), *p<0.001*).[4]
  - faster reduction in depressive symptom severity based on group x time interaction (F=217.38, *p<0.001*)[4]
  - higher likelihood of achieving hypertension control (aOR 18.2; 95% CI 8.40, 39.6; *p<0.001*).[4]

Task-shifting Model for Management of Mental Health by General Practitioners in Indonesia

SHIFTING CARE FROM CLINICAL PSYCHOLOGISTS TO GENERAL PRACTITIONERS

4

Geographic locale	Indonesia
Program setting	PHC centers, Puskesmas
Target diseases	Mental health disorders
Target population	Adults ≥ 18 years
Partners/Stakeholders	Indonesia Ministry of Health, Centre for Public Mental Health, Health Authorities

Background: Indonesia is an upper-middle-income country with a population of 275.5 million.[1] In 2019, Indonesia had an estimated age-adjusted prevalence of 10.7%[2] for mental health disorders (MHDs) and estimated disability-adjusted life years of 1,241.4[2] per 100,000 population due to MHDs.[2]

Model Overview: The main objective of the model was to task-shift the responsibility of treating patients with MHDs from clinical psychologists providing specialist care co-located in a primary care setting to general practitioners (GPs) working in primary care. This integrated care model was implemented within Indonesia's broader effort, beginning in 2015, to systematically introduce the World Health Organization (WHO) Mental Health Gap Action Programme (mhGAP) to its 10,000 primary care clinics as an add-on mental health training for GPs and nurses. The Ministry of Health (MoH) modified the WHO mhGAP framework with the aim of improving providers' knowledge and enhancing the treatment and care of mental disorders in the population.[3]

Model Strategy: The MoH aligned the WHO mhGAP framework with the existing skills and abilities of primary care GPs and nurses, enabling them to effectively identify and manage a wide range of psychiatric conditions. In a partially-randomized, pragmatic cluster trial comparing WHO mhGAP trained versus specialist care, the WHO mhGAP arm of GPs at Puskesmas (government-owned clinics funded and managed by district governments), supported by nurses, provided pharmacological therapy and/or psychosocial interventions based on the WHO mhGAP Intervention Guide. They also had the discretion to refer patients to specialist care as necessary.

Notable Features of the Model: The adaptation of the WHO mhGAP training by a team of experts from the MoH contributed to the training's external validity. The strong dedication of the Indonesian government to this model further facilitated the successful adaptation of the WHO mhGAP training.[3]

Key Messages

- Mental health care provided by GPs using the WHO mhGAP approach was comparable to care delivered by clinical psychologists in reducing symptoms, improving quality of life, and reducing disability.
- GPs had higher patient follow-up rates compared to clinical psychologists, indicating patient preference for primary care.
- Clinical psychologists were more cost-effective in the long term based on HoNOS scores, suggesting a clearer need for specialist care in patients with greater impairment.

Model Funding: Implementation of this model and adaptation of the WHO mhGAP program were financed primarily by the MoH.[3]

Human Resources: Key personnel of this model were GPs and nurses, in addition to the existing model of clinical psychologists providing specialist care within the primary care clinics. Since the beginning of 2016, the Directorate of Mental Health organized training sessions that encompassed all modules of WHO mhGAP, along with a dedicated day for role-playing and observing real-world scenarios.[3] The Directorate aimed to eventually train all 10,000 Puskesmas.

Laboratory, Diagnostic, or Pharmacy Services: GPs administered pharmacological therapy in accordance with the guidelines outlined in the WHO mhGAP. Additionally, they referred patients to specialist care when necessary. However, the availability of psychotropic medications varied across different Puskesmas, and the recording of prescriptions by providers in this setting was inconsistent. There were no notable alterations made to existing laboratory or diagnostic services during this period.[3]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A partially randomized pragmatic cluster trial was conducted in Yogyakarta province in Java to evaluate patient outcomes among those provided with mental health care by GPs who underwent additional training in WHO mhGAP (intervention group) as compared to those treated by clinical psychologists in primary care (standard of care group).[3] Study recruitment took place in December 2016. As the trial aimed to replicate real-world practices, the choice of treatment by GPs was not documented, and their utilization of the adapted WHO mhGAP modules was not mandatory. The study demonstrated that primary mental health care provided by GPs using the WHO mhGAP approach was non-inferior (or in other words, comparable) to the standard care delivered by clinical psychologists in reducing symptoms related to social and physical impairments, reducing disability, and improving health-related quality of life. In both study arms, a large proportion of patients went into remission, but a higher percentage of patients treated by GPs or nurses returned for follow-up care (82.4%) compared to patients treated by clinical psychologists (68.8%). The primary cost-effectiveness analysis using Health of the Nation Outcome Scales (HoNOS), a set of scales measuring behavior, impairment, symptoms and social functioning, had lower costs and better outcomes in the clinical psychologist arm, generating an incremental cost-effectiveness ratio of Rp 4,843 per unit improvement in HoNOS score. These trial findings suggest that GPs were able to manage mental health care in a primary care setting as effectively as clinical psychologists, and were likely preferred by patients, although clinical psychologists were shown to be a more cost-effective strategy in the long-term. The study authors hypothesized this may be due to referred patients having a clearer need for specialist care due to greater recognized levels of impairment.

Resources

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2. GBD Results (database). Institute for Health Metrics and Evaluation (IHME), Seattle, WA. https://vizhub.healthdata.org/gbd-results/. Accessed September 1, 2023.
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INPUTS

- Existing cadres of GPs, nurses and clinical psychologists.
- Financial support from the MoH.
- WHO mhGAP framework adapted by the Indonesia MoH.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- GPs provided pharmacological therapy and/or psychosocial interventions based on the WHO mhGAP Intervention Guide.
- Nurses supported GPs in provision of care.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- GPs and nurses working in primary care underwent training in the WHO mhGAP.
- Directorate of Mental Health organized trainings that encompassed all the modules of the WHO mhGAP, along with a dedicated day for role-playing and observing real-world scenarios.

4 INTEGRATION & COORDINATION

- GPs referred patients to specialist care as necessary.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Providers trained (A):** Providers were trained in the principles of the WHO MhGAP approach.[3]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Retention in care (E):** a higher percentage of patients sought follow-up care with the WHO mhGAP group (82.4%) compared to the typical care group (68.8%).[3]

DISTAL

- **Patient health outcomes (E):**
- 152 of 173 patients in the WHO mhGAP arm went into remission.[3]
- Reduction in mental and social health problems as measured by HoNOS.[3]
- Improvement in quality of life as measured by EQ-5D-3L.[3]

Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia

DELIVERY SYSTEM REDESIGN, TELEMONITORING, AND PATIENT EMPOWERMENT TO MANAGE HYPERTENSION, DIABETES MELLITUS, AND HYPERLIPIDEMIA

5

Geographic locale	Malaysia
Program setting	Private primary care clinics
Target diseases	Hypertension, diabetes mellitus, hyperlipidemia
Target population	Adults ≥18 years of age with hypertension with or without diabetes mellitus or hyperlipidemia and currently on medication for one or more of those conditions
Partners/Stakeholders	National Institute of Health, Ministry of Health Malaysia, Sanofi-Aventis (Malaysia), AstraZeneca (Malaysia)

Background: Malaysia is an upper-middle-income country with a population of 33.9 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Malaysia was 19.0%.[2] In 2019, the age-adjusted prevalence was of hypertension was 40.5%[3] for males and 41.0%[3] for females. The estimated age-adjusted years of life lost was 274.6[4] and 49.6[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in 2019.

Model Overview: The Cardiovascular Risk Factors Intervention Strategies (CORFIS) model was a collaborative intervention by private primary care professionals, including general practitioners (GPs), pharmacists, dietitians, and nurses, to provide care for hypertensive patients.[5] The model was based on five elements of the Chronic Care Model (CCM) adapted by the World Health Organization, including delivery system redesign, decision support, clinical information system, patient empowerment and self-management support, and community resources.

Model Strategy: The five elements of the CORFIS model adapted from the CCM included: 1) *Delivery system redesign*—establishment of an allied health care team consisting of a pharmacist, dietitian, and nurse educator to support GPs in delivering patient education, counseling, and self-monitoring guidance. Trained nurse advisors provided telemonitoring for self-care reinforcement. Regular assessments led to customized care plans and follow-up visits. During the intervention individuals would receive one-on-one counseling from each health care professional (e.g., GPs, pharmacists, dietitians, and nurse), spending approximately 30 to 60 minutes with each one. Over a period of six months, the pharmacist reviewed medications, counseled participants regularly, addressed any pharmaceutical care issues (PCIs) encountered, and collaborated with the GP if necessary to resolve PCIs. Dietitians provided dietary advice, while nurses offered guidance on general health care, including foot care; 2) *Decision support*—management protocols were based on clinical practice guidelines. Evidence-based guidelines informed medical nutrition therapy. Clinical specialists provided remote screening and feedback; 3) *Clinical information system*—an online application collected patient data, coordinated care, and sent reminders. Patients securely accessed medical records, resources, and self-monitored blood pressure (BP) and blood glucose; 4) *Patient empowerment and self-management support*—individualized care from allied health professionals was provided through monthly counselling at GP clinic visits. Continuity of care and positive relationships were emphasized, along with provision of home monitoring devices; and 5) *Community resources*—patients were informed about local support resources and participated in focus group sessions to foster mutual support and self-care motivation.[5]

Notable Features of the Model: The CORFIS model was unique in that it focused on collaboration across multi-disciplinary teams of health care providers to improve outcomes for hypertension patients.

Key Messages

- CORFIS model adapted the CCM model and focused on providing individualized care through multi-disciplinary provider teams
- Model was associated with significantly improved BP control and reductions in systolic and diastolic BP

Model Funding: The National Institute of Health, Ministry of Health Malaysia, Sanofi-Aventis (Malaysia), and AstraZeneca (Malaysia) supported the CORFIS trial.[5]

Human Resources: The allied health care team, which consisted of a pharmacist, dietitian, and nurse educator, was designed to support individual GPs and provide multi-disciplinary care to patients.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.[5]

Digital Solutions: Telemonitoring services offered by trained nurse advisors played a crucial role in strengthening self-care practices, ensuring treatment adherence, and providing essential care support. Additionally, a secure web-based application was used to collect patient data, coordinate care among health care providers, and transmit laboratory results. It also served as a reminder system for appointments, blood sampling, and home monitoring. Patients accessed their medical records, educational materials, and self-monitored readings securely through a dedicated web portal at www.corfis.gov.my.[5]

Impact of the Model: A non-randomized controlled trial of the CORFIS trial found that among patients who had uncontrolled BP at baseline, the proportion who achieved target BP at six months was significantly higher in the intervention group (IG) (56.6%) compared to the control group (CG) (34.1%) ($p<0.0001$).[5] There was no difference among patients who had already achieved BP control at baseline. There were significant reductions in systolic blood pressure (SBP) in the IG compared to the CG, with a median reduction of 9.0mmHg (ranging from –60 to 50) versus a reduction of 2mmHg (ranging from –50 to 48), respectively ($p=0.003$). Similarly, there were significant reductions in diastolic blood pressure (DBP) in the IG, with a median reduction of 6.0mmHg (ranging from –53 to 30), compared to a median change of 0.0 mmHg (ranging from –42 to 30) in the CG ($p<0.001$). Another study which focused on the pharmaceutical care issues (PCIs) in the CORFIS trial found that among the 477 participants, 53.7% experienced at least one PCI, with the most common being non-adherence to medications. Of the 338 PCIs resulting changes recommended by pharmacists, 87.3% were implemented as advised.[6]

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. *IDF Diabetes Atlas 2021: 10th edition*. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
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INPUTS

- Existing human resources at private primary care clinics, including GPs, pharmacists, dietitians, and nurses
- Financial resources from National Institute of Health, Ministry of Health Malaysia, Sanofi-Aventis (Malaysia), AstraZeneca (Malaysia)
- Technical support from Ministry of Health Malaysia
- Chronic Care Model

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- An allied health care team provided patients with education, counseling, and self-monitoring guidance.
- Patients received one-on-one counseling from each health care provider from each discipline, spending approximately 30-60 minutes with each.
- Pharmacists reviewed medications, counseled patients regularly, and addressed any pharmaceutical care issues encountered.
- Dietitians provided dietary advice.
- Nurses offered guidance on general health care, including foot care.
- Health care providers informed patients about local support resources.

2 COMMUNITY-BASED ACTIVITIES

- Patients participated in focus group sessions to foster mutual support and self-care motivation.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- Health care professionals were assembled into teams including GPs, pharmacists, dietitians, and nurses.
- Provider decision-making was supported through management protocols based on clinical practice guidelines. Evidence-based guidelines informed medical nutrition therapy.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Nurse advisors provided telemonitoring visits with patients for self-care reinforcement, including treatment adherence.
- Clinical specialists provided remote screening and feedback.
- An online application collected patient data, coordinated care among health care providers, transmitted laboratory results. The application also sent reminders to patients for appointments, blood sampling, and home monitoring.
- Patients accessed their medical records, educational materials, and self-monitored readings securely through a dedicated web portal.

OUTPUTS

COVERAGE (R)

- **Treatment:** Out of the 338 pharmaceutical care issues where changes were recommended by pharmacists, 87.3% were implemented as advised.[6]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** Compared to the CG, the IG experienced:
  - Reduced SBP (median reduction of: IG: −9.0mmHg, vs. CG: −2.0mmHg *(p=0.003)*).[5]
  - Reduced DBP (median reduction of: IG: −6.0mmHg vs. CG: 0.0mmHg *(p<0.001)*).[5]
  - Among patients with uncontrolled BP at baseline, the proportion who achieved target BP at 6 months was significantly higher in the IG (56.6%) compared to the CG (34.1%) (*p<0.0001*).[5]

Integrated Care Pathway for Post Stroke Patients (iCaPPS©) Model in Malaysia

COORDINATED AND COMPREHENSIVE POST-STROKE CARE FOR PATIENTS RECOVERING AT HOME

6

Geographic locale	Malaysia
Program setting	Public PHC centers
Target diseases	Stroke
Target population	Post-stroke patients, aged ≥40 years
Partners/Stakeholders	Malaysia Ministry of Health, Faculty of Medicine, Universiti Kebangsaan Malaysia, Hospital Canselor Tuanku Muhriz, International Medical University

Background: Malaysia is an upper-middle-income country with a population of 33.9 million.[1] In 2019, Malaysia had an estimated stroke prevalence of 1.7%,[2] with an estimated 1,633.4[2] average years of life lost per 100,000 population.

Model Overview: Integrated Care Pathway for Post Stroke patients (iCaPPS©) is a model that helps to align multiple providers to offer coordinated and comprehensive post-stroke care delivery for patients who are discharged from hospital after an acute stroke. These patients are managed in primary care or community public health care centers during subacute to later stages of stroke recovery. The iCaPPS© model aims to serve as a catalyst that will improve the quality of post-stroke care along the continuum from the acute phase, through rehabilitation, to long-term management for low-and middle-income countries with resource-constrained public health systems.[3]

Model Strategy: The iCaPPS© protocol was designed by an expert panel of specialist stroke care providers and family medicine specialists (FMSs) from the Malaysian Ministry of Health and academic institutions based at tertiary university hospitals. This expert panel convened to create iCaPPS© using non-standardized protocols from places of practice, evidence-based knowledge, and recommendations for improvements within existing public health care services. Using a shared care strategy, the iCaPPS© protocol links the acute management phase with managing physical and psychosocial patient needs during rehabilitation and long-term management at home. First, iCaPPS© ensures continuous review of the patient by specialists in tertiary hospitals and by teams at the PHC center. A clinical team at the secondary or tertiary hospital (where acute care was managed) discharges patients and organizes the transfer to PHC centers and rehabilitation. Teams of clinicians and mental health officers work at PHC centers to provide supportive services. PHC centers offer pharmacies, lab services, and physiotherapy/occupational therapy. In the PHC centers, the iCaPPS© protocol ensures ten elements of care are addressed within the PHC center at every patient interaction post-discharge. This protocol covers the initial assessment by a FMS or medical officer, as well as the monitoring of stroke risk factors, mood, cognition, medical investigations, nursing, the evaluation of swallowing disorders, physiotherapy, occupational therapy, and the list of medications used.[3]

Notable Features of the Model: In designing the iCaPPS© model, the expert panel primarily focused on stroke care providers' perspectives, but did use the perspectives of stroke patients and their caregivers' as a basis for discussion. iCaPPS© is the first detailed guide to create a shared care approach between primary care and specialist stroke care providers in Malaysia for patients that recover at home in the community setting.[3]

Key Messages

- iCaPPS© increased staff involvement and improved post-stroke care by emphasizing assessments and screening for complications often overlooked in conventional care.
- The model was highly cost-effective and cost-saving with with a 12.7% lower cost per QALY after 6 months, compared to conventional care.
- The study recommends nationwide implementation of the iCaPPS© model in public PHC centers, given the positive outcomes.

Model Funding: This study received funding from The National University of Malaysia Research University Grant.[3]

Human Resources: The model utilized FMSs, community-based therapists, and nurses based at PHC centers to conduct screenings and monitoring. Evaluations of swallowing disorders must be completed by speech and language therapists, occupational therapists, or medical officers.[3]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. Health centers can provide standard medical laboratory services, and on-site dispensing pharmacy services to patients as needed.[3]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A cost-effectiveness analysis of the iCaPPS© model found that the cost of post-stroke monitoring with iCaPPS© was approximately 50% higher than the cost of conventional care (MYR790.24 vs. MYR527.22, respectively), primarily due to the cost of staff salaries and drugs.[4] However, after six months of implementation, iCaPPS© had a 12.7% lower cost per quality-adjusted life year (QALY) than conventional care (MYR1,436.98 vs MYR1,647.56). The study reported an incremental cost-effectiveness ratio (ICER) of MYR1,144—in other words, the iCaPPS© post-stroke care resulted in MYR1,144 per QALY gained compared to conventional care. Since the ICER is less than one times the gross domestic product per QALY averted for Malaysia, this intervention is considered to be highly cost-effective using WHO thresholds.[3] The iCaPPS© model also increased involvement of health center staff, and kept them engaged in assessments and screening for stroke-related complications, which are often overlooked in the conventional care model. Based on these findings, the study authors' report that managing post-stroke patients in the community using the iCaPPS© protocol is highly cost-effective, particularly for patients accessing longer-term care at public primary care health centers, and should be considered for nationwide implementation in public primary care health centers.[4] An updated version of the iCAPPs protocol© includes a reminder to regularly conduct an oral health assessment as well; however, this newer version has not yet undergone an economic evaluation.

Resources

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INPUTS

- Existing human resources based at PHC centers, including FMSs, community-based therapists and nurses.
- Technical support from Malaysia Ministry of Health, expert panel group, Faculty of Medicine, Universiti Kebangsaan Malaysia, Hospital Canselor Tuanku Muhriz, and International Medical University.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- A clinical team at the secondary or tertiary hospital discharges patients after an acute stroke and organizes transfers to PHCs and rehabilitation.
- Specialists in tertiary hospitals and teams at the PHC center provide continuous review of the patient.
- Teams of clinicians (FMSs, medical officers, speech and language therapists, occupational therapists) and mental health officers at PHCs offer supportive services to stroke patients through their subacute to later stages of recovery, including monitoring of stroke risk factors, mood, cognition, medical investigations, nursing, the evaluation of swallowing disorders, physiotherapy, occupational therapy, and the list of medications used.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- iCaPPS© protocol was designed through conversations with an expert panel of specialist stroke care providers and FMSs from the Malaysian Ministry of Health and academic institutions based at tertiary university hospitals.
- PHCs offer integrated services, including pharmacies and laboratory services.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Compliance with guidelines (A):** iCaPPS© increased involvement of staff at PHC centers and kept them engaged in assessments and screening for stroke-related complications.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Neutral or improved cost-benefit (M):** after 6 months, iCaPPS© had a 12.7% lower cost per QALYs than conventional care (MYR 1436.98 vs. MYR 1647.56).[4]

First Line Diabetes Care (FiLDCare) Model: Enhancing Diabetes Management in the Northern Philippines

STRENGTHENING DELIVERY OF DIABETES PRIMARY CARE AND SELF-MANAGEMENT SUPPORT AND EDUCATION

7

Geographic locale	Batac City and Pagudpud, Northern Philippines
Program setting	Government PHC units
Target diseases	Type 2 diabetes mellitus
Target population	Adults with diabetes
Partners/Stakeholders	Institute of Tropical Medicine, Antwerp

Background: The Philippines is a lower-middle-income country with a population of 115.6 million.[1] In 2019, the Philippines had an estimated age-adjusted prevalence of 7.1%[2] for type 2 diabetes mellitus, with an estimated 800.0[3] average years of life lost per 100,000 population due to type 2 diabetes.

Model Overview: The primary aim of the First Line Diabetes Care (FiLDCARE) project, implemented in two local government health units (LGHU) from May 2011 to February 2013, was to integrate care for diabetes into PHC activities. The FiLDCare Project was based on a context-adapted chronic care model[4] in an attempt to make delivery of primary care and self-management education and support (SME/S) for chronic conditions, like diabetes, possible in an already overburdened health care system. Type 2 diabetes mellitus was the initial focus of the model, with the expectation that it would be expanded to other conditions at a later date.[5]

Model Strategy: The FiLDCare model was developed by adapting existing models and programs for chronic care delivery to suit the local context in the northern Philippines. The foundation of the model was built upon established frameworks such as the Chronic Care Model (CCM) and the Innovative Care for Chronic Conditions (ICCC) framework developed by the World Health Organization (WHO). Within the health system, the FiLDCare model implemented chronic care elements of (1) *healthcare reorganization* to create a chronic care team comprised of the municipal or city health officer (MHO/CHO), nurse, midwives, and barangay health workers (BHW); (2) *health service redesign* to redistribute specific chronic care tasks, with clinical consultations retained as a task for the MHO/CHO and SME/S activities re-assigned from either the MHO/CHO or the nurse to the midwives and BHW; and (3) *decision support for health workers* through training. Chronic care teams were responsible for providing comprehensive care to a specific group of people with diabetes who actively participated in the FiLDCARE Project. The focus of the care provided by these teams was to empower people with diabetes through one-on-one diabetes SME/S, ensuring that they had the knowledge and skills to effectively manage their condition.

SME/S sessions focused on blood glucose monitoring, medication management, healthy eating, physical activity, and coping with the emotional aspects of living with diabetes. Sessions ranged from 20 to 30 minutes initially, with subsequent sessions lasting 5 to 15 minutes. Community-based SME/S was also provided by BHWs and midwives who provided information on diabetes during informal home visits and during SME/S sessions held for people with diabetes in barangay health stations two to four times per month.

Notable Features of the Model: Trained health care staff were organized into chronic care teams to provide primary diabetes care, with SME/S activities led by BHWs and midwives. This model strongly emphasized SME/S for people with diabetes, a potentially cost-effective way to help control chronic conditions and prevent complications in settings with a high burden of disease.[5]

Key Messages

- FiLDCare model created chronic care teams of health officers, nurses, midwives, and BHWs, with task-shifting of SME/S to BHWs and midwives
- Strong emphasis on SME/S to provide people with diabetes with the knowledge and skills to effectively manage the condition
- Improved glycemic control and adherence to medications and exercise regimes was seen over time among participants in the FiLDCare model

Model Funding: This project was funded by the Belgian Directorate for Development Cooperation through the Institute of Tropical Medicine, Antwerp.[5]

Human Resources: Pre-existing health personnel at local governmental health units were trained to provide care to people with diabetes via the FiLDCare model.[5] Personnel included BHWs, health officers, health unit nurses, and midwives. Health care staff attended a 32-hour training workshop comprised of lectures and hands-on training on diabetes care and development of psychosocial skills, including provision of diabetes SME/S.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: The FiLDCare model was evaluated on various outcomes related to provider knowledge and patient self-management practices and clinical outcomes.[5-7] Training improved diabetes knowledge and self-assessed skills of health care staff.[6] A prospective, quasi-experimental before-after study conducted over the duration of the project from May 2011 to February 2013 assessed changes in knowledge, attitudes and self-management practices, body mass index (BMI), and glycemia (measured by glycated hemoglobin or HbA1c) in people with diabetes.[5] After one year of project implementation, the average HbA1c reduction among participants was 1.3 percentage points (−14.2 mmol/mol) and the proportion with optimal glycemic control increased significantly from 41.5% to 50.6% ($p<0.001$). Reductions in HbA1c were documented in 60.4% of participants. Median waist circumference decreased from 85.0 cm to 83.0 ($p=0.007$). Knowledge and the proportion of participants adherent to medication and exercise regimens also improved. No significant changes were seen in BMI, and diet adherence decreased over time. Median Patients' Assessment of Chronic Illness Care (PACIC) scores—reflecting a set of 20 questions about patient activation, delivery system design, goal-setting, problem-solving, and follow-up activities of a health service providing chronic care—increased from 3.2 to 3.5 before and after project implementation ($p=0.009$).[7]

Resources

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INPUTS

- Existing human resources at the local government health units providing both facility- and community-based services.
- Financial resources from Belgian Directorate for Development Cooperation through the Institute of Tropical Medicine, Antwerp.
- Chronic Care Model and the WHO's ICCC framework informed an adapted approach.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Patients accessed routine primary diabetes care at local government health units.
- Within routine clinical counseling sessions occurring at least once every three months, providers conducted one-on-one diabetes self-management education sessions with patients. These 5- to 30-minute sessions were conversational and interactive and included information on diabetes and diabetes medications, adoption of self-care behavior, gaining control over the condition through problem solving skills and goal setting.
- Patients were provided with written materials on healthy eating, exercise and glycemic goals during the diabetes self-management education sessions.

2 COMMUNITY-BASED ACTIVITIES

- Midwives and village health workers provided community-based diabetes self-management support, including taking medications, diet, exercise and foot care and problem solving, through informal home visits.
- Midwives and village health workers held weekly or biweekly open diabetes self-management support sessions where diabetic patients could ask questions or speak with them.

3 TRAINING & CAPACITY BUILDING

- Health care providers were trained to provide the care to diabetic patients according to the adapted chronic care model, including providing diabetes self-management education and support and being active listeners during education and counseling sessions.

4 INTEGRATION & COORDINATION

- Existing health care providers were organized into chronic care teams for primary diabetes care. Specific tasks for primary diabetes care and self-management education and support were assigned to different team members.
- Health care providers were given decision support tools.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Providers trained (A):** 110 health care workers were trained (1 health officer, 6 nurses, 16 midwives, and 87 barangay health workers).[6]

OUTCOMES

PROXIMAL

- **Patient motivation (I):** median PACIC score increased from 3.2 to 3.5 (*p=0.009*)[7]
- **Four subsets of PACIC significantly improved:** patient activation (*p=0.026*), goal setting (*p=0.017*), problem solving (*p<0.001*), and follow-up (*p<0.001*)[7]
- **Patient knowledge (I):** increased knowledge (*p<0.001*).[5]

INTERMEDIATE

- **Treatment adherence (E):** Proportion adherent to medications increased from 65.9% to 81.7% over one year of implementation (*p=0.001*).[5]
- **Patient health behaviors (E):**
  - Proportion adherent to exercise regimen increased from 41.5% to 67.1% (*p<0.001*).[5]
  - Proportion adherent to prescribed diet decreased from 60.4% to 40.2% (*p<0.001*).[5]

DISTAL

- **Patient health outcomes (E):**
  - Proportion of participants with optimal glycemic control increased from 41.5% to 50.6% over one year of implementation (*p<0.001*).[5]
  - Average HbA1c reduction of −1.3 pp (−14.2 mmol/mol).[5]
  - HbA1c reduced in 60.4% of participants.[5]
  - Reduced waist circumference from 85.0 cm to 83.0 cm (*p=0.007*).[5]
  - No significant change in BMI (23.7 to 23.3, *p=0.075*).[5]

EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines

MONTHLY HEALTH EDUCATION IN AN URBAN COMMUNITY SETTING

8

Geographic locale	Manila, Philippines
Program setting	Communities and health facilities
Target diseases	Hypertension
Target population	Pre-hypertensives and individuals with stage 1 hypertension who are not on anti-hypertensives
Partners/Stakeholders	National Institute of Health, National Center for Research Resources and the Quantitative Sciences Unit at Stanford University School of Medicine

Background: The Philippines is a lower-middle-income country with a population of 115.6 million.[1] In 2021, the Philippines had an estimated age-adjusted prevalence of hypertension of 34.7%[2] for males and 32.8%[2] for females, with an estimated age-adjusted years of life lost of 692.5[3] per 100,000 population for hypertensive heart disease in 2019.

Model Overview: EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) was a monthly health education intervention at clinics designed to target prehypertensive and stage 1 hypertensive individuals, focusing on promoting nutritional changes and enhancing physical activity to achieve reductions in blood pressure (BP) as well as selected biochemical and anthropometric parameters. Medical residents were assigned to oversee the health of select individuals in the target community. The aim of the ENLIGHTEN model was to provide individuals with the necessary knowledge and tools to effectively manage their BP and improve their overall health and well-being.[4]

Model Strategy: In the ENLIGHTEN implementation model, the community's baseline cardiovascular risks were determined by administering the World Health Organization STEPwise Approach to Surveillance (STEPS) questionnaire.[4] The intervention group attended monthly educational lectures that specifically covered topics such as hypertension, healthy diet, and physical activity. To ensure adherence to the program, participants were required to attend at least four out of the six monthly group lectures. Individualized diet counseling was provided by a dietitian, and primary care providers were available to offer guidance to patients as needed. To track their progress, participants kept diet and fitness diaries and received reminders to document their activities. Trained barangay health workers (a type of community health worker) were responsible for monitoring participants' attendance at exercise activities. They also received reminders and follow-up messages through text or phone calls, aimed at providing support and encouraging them to make and sustain lifestyle changes.[4]

Notable Features of the Model: The focus on non-pharmacological management of hypertension and the assignment of medical residents to oversee the health of select individuals in the target community were notable features of the ENLIGHTEN model. There was an emphasis on personalized care, education, and the integration of health care professionals in community-based initiatives aimed at improving BP control and overall health.[4]

Key Messages

- The health education intervention targeted prehypertensive and stage 1 hypertensive individuals to improve BP and overall health through nutritional changes and physical activity.
- Baseline risk assessment, monthly educational lectures, individualized diet counseling, and primary care provider guidance were key components of the intervention.
- There were significant reductions in systolic BP, waist circumference, BMI, and total cholesterol.

Model Funding: The model was financed by the US National Institutes of Health, National Center for Research Resources and the Quantitative Sciences Unit at Stanford University School of Medicine.[4]

Human Resources: Existing medical residents, nurses, dieticians, and trained barangay health workers.[4]

Laboratory, Diagnostic, or Pharmacy Services: Participants in both the baseline and follow-up visits of the study underwent physical and biochemical assessments. These evaluations involved the measurement of various factors such as BP, waist circumference, body mass index (BMI), and fasting blood glucose levels. Additionally, laboratory tests were conducted to analyze markers such as fasting glucose, creatinine, serum glutamic-pyruvic transaminase, uric acid, glycated hemoglobin or HbA1c, complete blood count, triglycerides, total cholesterol, low-density lipoprotein, and high-density lipoprotein.[4]

Digital Solutions: Participants were sent notifications for their upcoming appointments, as well as subsequent messages addressing dietary choices, physical activity, and lifestyle adjustments. These messages were conveyed through either short message service (SMS) messages or phone calls, depending on the participant's preferred method of communication.[4]

Impact of the Model: The main objective of the ENLIGHTEN study was to determine the effectiveness of this monthly lifestyle education program on systolic BP, with secondary outcomes of BMI, waist circumference, and various laboratory markers.[4] Participants were residents of two barangays (districts) in Manila, with each barangay assigned to either intervention group (IG) or attention-control group (CG). The IG received monthly lectures on cardiovascular disease and organized classes on diet and exercise, and the attention-CG received monthly lectures on non-cardiovascular topics and verbal advice that healthy diet and exercise are important. Linear mixed effects models were used to analyze the six-month changes in each group, considering the interaction between the IG and time. After six months, the IG exhibited significantly lower systolic BP compared to the CG (IG: -12.7 mmHg, 95% CI -14.5, -10.9 vs. CG: -0.24 mmHg, 95% CI -1.87, 1.43, $p<0.001$). Additionally, the IG showed reductions in waist circumference ($p<0.001$), BMI ($p<0.001$), and total cholesterol ($p=0.049$). However, no significant difference was observed in fasting glucose levels between the IG and CG ($p = 0.740$). The study demonstrated that patients who received the intervention, a low-cost diet and active lifestyle education program, experienced greater improvements in BP, BMI, waist circumference, and total cholesterol compared to the attention-CG.[4]

Resources

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INPUTS

- Existing human resources at the PHC level, including medical residents, nurses, dietician, and trained barangay health workers.
- Financial resources from National Institutes of Health, National Center for Research Resources, and the Quantitative Sciences Unit at Stanford University School of Medicine.

PROGRAM ACTIVITIES

1

FACILITY-BASED ACTIVITIES

- Patients with prehypertension or stage 1 HTN attended monthly educational lectures that specifically covered topics such as HTN, healthy diet, and physical activity.
- Barangay health workers monitored patient's attendance at exercise activities.
- Dieticians provided diet counseling to patients.
- Medical residents oversaw the health of patients in intervention group as required (provided physical activity and diet counseling in absence of dietician).

2

COMMUNITY-BASED ACTIVITIES

- Patients maintained diet and fitness diaries to track their progress.

3

TRAINING & CAPACITY BUILDING

- Barangay health workers were trained on intervention procedures for providing health education and adherence monitoring.

4

INTEGRATION & COORDINATION

- Primary care providers offered guidance to dieticians or barangay health workers as needed.

5

TECHNOLOGY & DIGITAL SOLUTIONS

- Patients were provided support and encouragement through reminders to document their activities and follow-up SMS or phone calls about lifestyle changes.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** After 6 months, intervention patients exhibited:
  - greater reduction in systolic BP compared to control patients (IG: -12.7 mmHg vs. CG: -0.24 mmHg; $p<0.001$).[4]
  - reduction in waist circumference ($p<0.001$).[4]
  - reduction in BMI ($p < 0.001$)[4]
  - reduction in total cholesterol ($p=0.049$).[4]
  - no significant difference in fasting glucose levels ($p=0.740$).[4]

PEN Fa'a Samoa: A Customized and Expanded PEN Program Model

COMMUNITY-BASED PHC MODEL BASED ON WHO PEN INTERVENTION, SUPPORTED BY MULTI-DISCIPLINARY TEAMS

9

Geographic locale	Samoa
Program setting	Primary health facilities and community-level outreach services
Target diseases	All NCDs, with a focus on diabetes, hypertension, and cardiovascular disease
Target population	Adults, particularly high-risk adults
Partners/Stakeholders	Government of Samoa, World Health Organization, World Bank, New Zealand Ministry of Foreign Affairs and Trade, Australia Department of Foreign Affairs and Trade

OVERVIEW

Samoa was one of the first countries to contextualize the World Health Organization (WHO) Package of Essential Noncommunicable Disease Interventions for Primary Health Care (PEN) protocols at the country level. To reinvigorate primary care services in rural areas, discourage by-passing, address the growing need for integrated care for NCDs, and move toward universal health coverage, the Government of Samoa launched the PEN Fa'a Samoa program, which translates to 'Samoan way of life.' Motivated by a high prevalence of NCDs and a lack of systematic NCD management, Samoa collaborated with WHO to develop a practical application of the WHO PEN protocols 1 and 2, focusing initially on cardiovascular disease (CVD) and diabetes.

In 2013, the Government of Samoa laid the groundwork for the PEN Fa'a Samoa program with the vision of adapting the WHO PEN protocols to the Samoan context. A national steering committee led by Ministry of Health officials and comprised of National Health Service representatives and local WHO Country Office staff[1] established national referral criteria for NCDs. Criteria includes symptoms of stroke, hypertension and diabetes; risk factors including smoking, alcohol and inactivity; blood pressure (BP); body mass index (BMI); random glucose; cholesterol (total and high-density lipoprotein for those older than 40 years); and WHO/International Society of Hypertension risk prediction.[1]

In 2015, the Government of Samoa established the PEN Fa'a pilot program, an integrated village outreach service for NCDs, utilizing an existing group of community actors (women's health and hygiene committees or Komiti Tumama).[2] The government trained and supported the Komiti Tumama to identify and refer patients with NCD risk factors within their communities.[2] Continuing to operate today, these community actors increase awareness around NCDs and NCD risk factors, including lifestyle choices, particularly for high-risk individuals.[2] The Komiti Tumama screen community members to detect cases of NCDs early and link them with rural district hospitals for official diagnosis, treatment, and follow-up.[2] They also track NCD patients in their villages and provide follow-up visits and continued support to ensure adherence to medications or treatments and compliance with protocols.[2]

In 2020, this program was expanded to further support the capacity of rural district hospitals through the establishment and deployment of multi-disciplinary teams (MDT).[3] The MDTs include a medical officer/physician, community nutritionist and assistant, data management administration officer, health inspector, nurse manager, public health nurse and midwife.[3] The teams provide primary care and are responsible for health maintenance and disease management

for the citizens in their catchment areas, carrying out core PHC functions, including health promotion, screening, referral, diagnosis, and case management of NCD patients.[3] Additionally, the Government of Samoa provided NCD equipment to hospitals, such as digital monitors needed to improve the quality of hypertension care.[3] Refresher trainings are provided annually to the MDTs and the village women/health committees. These trainings are guided by the Pen Fa'a Samoa Village and Community Health Promotion Manual and Standard Operating Procedures, the Pen Fa'a Samoa School Health Manual and Standard Operating Procedures, and the NCD Clinical Manual for PHC, which are reviewed and updated biannually based on implementation lessons and new evidence.[4]

NOTABLE FEATURES OF THE MODEL

The PEN Fa'a Samoa program has two unique features. First, it utilizes an existing, though under-resourced, community structure to rapidly deploy its program. The Komiti Tumama already hold community trust and their involvement was approved by the local traditional governance structures, enabling the community actors to quickly disseminate information and screen community members.[2] Second, the MDTs at district hospitals ensure sufficient human resource capacity to manage the increased volume of NCD referrals.

BURDEN OF NCDS

Samoa is a lower-middle-income country with a population of 0.2 million.[5] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Samoa was 9.2%.[6] In 2019, the age-adjusted prevalence of hypertension was 38.6%[7] for males and 37.9%[7] for females and the estimated age-adjusted prevalence of CVD was 7.5%.[8] In 2019, the estimated age-adjusted years of life lost were 1,950.1,[8] 550.1,[8] and 8,544.1[8] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

The Government of Samoa seeks to achieve universal health coverage for all its citizens. The Government of Samoa issued its first National NCD Policy 2010-2015, which was updated in 2018 in response to new data and a gap analysis.[9] The National NCD Control Policy 2018-2023 identified NCDs as the leading cause of mortality, morbidity, and disability in Samoa.[9] Through this policy (as well as the prior NCD policy, the Health Sector Plan 2008-2018, and Samoa's Strategy for Development) the government identified NCDs as a priority area of concern for Samoa's continued development and a major challenge to the government achieving its vision of "Health for All."[9]

The policymakers acknowledged the need for communities to promote and encourage healthy behaviors, including reducing smoking and alcohol consumption and improving nutrition and physical activity to ultimately prevent the onset of NCDs.[9] The 2018 policy prioritized the following NCDs for the health system to focus on: type 2 diabetes, hypertension, CVD, cancer, and mental health conditions.[9] The 2018 policy laid out a multi-pronged strategy to reduce the incidence of and increase the screening, diagnosis, treatment, and management of NCDs to reduce the disease burden.[9] The National NCD Control Policy highlighted the following guiding principles for the health system overall and for implementation of this policy: accessibility, accountability, efficiency, affordability, equity, safety, and quality.[9]

Health System Structure

Samoa's health system is primarily publicly owned and operated. Serving a population of just over 200,000 split across two main islands (Upolu and Savai'i) and two smaller islands (Apolima and Manono), the public health system is small, consisting of: two referral hospitals (with the primary national one in Apia, Upolu) and 11 rural health facilities–six rural district hospitals (three on Upolu and three on Savaii) and five community health centers (three on Upolu and two on Savaii).[3] The rural health facilities are strategically placed based on population size and distance.[3,4] The health

system operates in a hierarchical structure, with primary preventive health services (e.g. family planning, antenatal and postnatal care, and immunizations), outpatient, and uncomplicated emergency services provided at community health centers, which operate during regular working hours between two to five days a week.[10] Rural district hospitals operate 24/7 and provide inpatient, outpatient, and emergency services for acute illness and injuries; antenatal, postnatal, and obstetric services; preventive health services such as family planning and immunizations; management of both complicated and uncomplicated chronic conditions; community and school outreach programs; and home care and home visits for directly observed treatment shortcourse, or DOTS.[10] The national referral hospitals are meant to see only the most severe illnesses, injuries, or complicated cases with multiple comorbidities.

Over time, capacity and infrastructure weakened in the rural areas.[10] Rural facilities lacked basic infrastructure, diagnostic and laboratory equipment, and human resource competencies to diagnose and manage chronic NCDs.[10] In response, many patients bypassed the PHC level and sought care at national referral hospitals, where the country's few doctors were concentrated.[10] Furthermore, lack of human resources severely limited the ability of rural district hospitals to identify NCD cases among their patients, provide consultation and treatment for the patients, and provide health education services necessary for prevention.[10]

Historically, community-based health promotion, advocacy, and assistance in accessing services was led by women's health and hygiene committees (Komiti Tumama).[2] Though the role of these committees diminished over time, they remained in operation when the PEN Fa'a program began in 2015.[2]

Model Strategy

The overall goal of the scaled-up model is to strengthen linkages between health services and the community and achieve a target of at least 50% of eligible people receiving drug therapy and counselling through NCD early detection and management.[1]

The model operates through three pillars: 1) *NCD early detection* – to provide comprehensive population screening for NCDs and increase the detection rate of people with risk factors for NCDs; 2) *NCD management* – to increase the percentage of people with risk factors for NCDs who obtain appropriate treatment and/or management strategies and to increase compliance with NCD treatment and management protocols; 3) *NCD awareness in the community* – to build capacity among district health professionals and community representatives on prevention and treatment of NCDs at the community level and to increase health literacy and raise community awareness of NCD-related lifestyle factors.[1]

The model was initially tested in two districts. The Government has since developed a phased scaling process, with the intention of scaling to 34 of 37 districts by 2027. To date (April 2025), the model has been scaled in approximately 10-12 districts. Critical to its success, the model strategy aligns with the Government's national NCD policy. Currently, the MDTs are working on the longer-term vision to broaden PEN Fa'a Samoa to PEN Fa'a Samoa+ to also address the prevention and treatment of communicable diseases, public health, reproductive health services, and health security. While there is a focus on NCDs in the current programming, the intention and design of the program is health systems strengthening across the board. For example, the equipment and infrastructural investments cover all essential needs for PHC function, while ensuring reliable, uninterrupted, and affordable essential drug supply.

Model Financing

The initial pilot of PEN Fa'a Samoa in two districts was a collaboration between the Government of Samoa and WHO. For scale up, the Government engages with the World Bank and WHO for technical support, along with the New Zealand Ministry of Foreign Affairs and Trade and the Australia Department of Foreign Affairs and Trade as funding and technical partners.

Financing to scale to a national level by 2027 comes from multiple sources. The model is part of the national NCD control strategy to which the Government of Samoa has allocated US$55 million through 2027; additionally, the World Bank contributes US$9.3 million and the Ministries of Foreign Affairs of New Zealand and Australia contribute US$7.8 million.

Human Resources

This model of care primarily built the capacity of human resources at the PHC level to identify high-risk groups and screen, diagnose, treat, and manage NCD patients over time. This was accomplished by training existing community-based actors (Komiti Tumama) on four risk factors for NCDs—smoking, nutrition, alcohol consumption, and physical activity—as well as early signs and symptoms of NCDs and ways to address unhealthy behavior.[2] The Komiti Tumama were also trained in how to record key information (e.g. key patient demographics and contact details, weight, and height), calculate BMI, and measure blood sugar and BP levels to detect high-risk individuals.[1,2] Additional human resources with a range of expertise have been deployed to rural district hospitals to increase their staffing and capacity to screen for, diagnose, and treat NCDs. There is ongoing recruitment of MDTs for all rural district hospitals, adding around seven new personnel per district hospital.

Laboratory, Diagnostic, or Pharmacy Services

As part of the strategy to capacitate rural district hospitals to manage the influx of referred patients, additional equipment and tools are provided to them for essential health service delivery, including the diagnosis and management of NCDs.[4] Equipment includes digital BP monitors, medical equipment and instruments, information communication technology, and transport to access communities.[4] The Ministry of Health is currently developing a standardized list of essential technologies that should be available at the rural district hospitals.[4]

Digital Solutions

An electronic health system was developed and implemented during the COVID-19 pandemic. This e-health system now includes pathways for NCD care management in half of the health facilities with a plan for national roll-out by 2027 to the rest of the facilities.

IMPACT OF THE MODEL

An evaluation of the initial two districts showed positive screening results among PEN Fa'a Samoa village residents.[1] Nearly half of the population screened was found to have NCD risk factors, the majority having no prior knowledge of their risk factors.[1] A 2018 evaluation found that PEN villages had significantly better hypertension screening coverage than non PEN villages (70.0% vs. 62.4%), primarily driven by higher coverage among men in PEN villages compared to men in non-PEN villages.[11] During the prior 12 months, more PEN Fa'a Samoa residents had their BP screened three or more times (38% vs. 30%), potentially indicating better linkage to care in the PEN villages among those who were screened and referred.[11] Additionally, PEN Fa'a Samoa villagers had significantly better follow-up with a health care provider after being referred compared to non-PEN Fa'a Samoa villagers (69% vs. 50% followed referral successfully, $p=0.033$) and failed referrals were lower for PEN (5% vs. 18%, $p=0.016$).[11] This suggests PEN Fa'a Samoa respondents may have better understood the the importance of accessing care for their hypertension.[11]

PEN Fa'a Samoa village men had lower rates of obesity compared to non-PEN Fa'a Samoa men, with a smaller average waist circumference by about 3 cm ($p=0.03$). While 91% of survey respondents in PEN villages recalled learning about causes of hypertension, particularly foods high in sugar, fat, and salt, these weight differences cannot be directly attributed to PEN.[11]

PEN Fa'a Samoa is being scaled nationally through 2027, though progress has been slower than expected due to the COVID-19 pandemic. A mid-program review will be available in 2025, and program outcomes will be evaluated at the end of the implementation period.[4]

COSTING

A cost-benefit analysis was conducted examining the full operational and recurrent costs of the Government of Samoa's NCD Program over the five-year period 2022-2027 (US$72.02 million). The analysis focused on the health gains from improved access, quality, and efficiency of NCD prevention and treatment services and estimated projected benefits to 2035. A return-on-investment analysis showed that for every dollar spent on the project, the investment is expected to yield US$1.70 in returns.[4]

The estimated additional cost for one year of implementation was approximately US$40,000/site (health facility and village).[4] Training for local facilitators and health care workers cost US$500 per session.[1] To date, there are no available data on costs to the patients.

LESSONS LEARNED

Recent articles on the implementation of the PEN Fa'a program cited the following lessons learned:

1. A community health workforce, such as the Komiti Tumama, can be mobilized to work on priority health conditions such as NCDs, but should not be limited to only those. It could also be a stepping stone to other important health issues where a community approach is needed to reach the most vulnerable groups.[2] Consider sustainability and compensation of a community health workforce.
2. Coordination and accountability mechanisms at the national and local levels proved critical for the success of the program.[2]
3. Komiti Tumama overcame the cultural belief that illness is only present when a person feels ill when educating community members about NCD risk factors and early disease, before symptoms arise, through adequate training based on context and cultural sensitivity.[1]
4. Donor alignment is critical: all funding needs to be aligned with the broader government priorities. In this case, the government requires all formal support coming into the country to be aligned with existing NCD policy and reforms in an effort to reduce fragmentation and support transformation of the health care system.[4]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Remember that this process takes time. Don't focus on quick wins, focus on transformation and reorienting to family- and community-facing care.[4]

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INPUTS

- Existing human resources within the health system.
- Existing community actors known as Women's Village Groups (Komiti Tumama) within local traditional governance structures.
- Financial and/or technical support from the Ministry of Health, World Bank, WHO, Ministries of Foreign Affairs of New Zealand and Australia.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- An MDT (including a primary care physician, nurses, a nutrition assistant, allied health workers, and member of the Komiti Tumama) is stationed at rural district hospitals with expertise in NCDs.
- The MDT screens adults, diagnoses NCDs, assigns a treatment regimen, and manages NCDs over time.

2 COMMUNITY-BASED ACTIVITIES

- Komiti Tumama educate community members on NCDs and risk factors.
- Komiti Tumama screen community members in their villages for NCD risk factors and early symptoms of NCDs.

3 TRAINING & CAPACITY BUILDING

- Trained Komiti Tumama on 4 risk factors for NCDs—smoking, nutrition, alcohol consumption, and physical activity—as well as early signs and symptoms of NCDs and ways to address unhealthy behavior.
- Trained Komiti Tumama in recording key information (e.g. key patient demographics and contact details, weight, and height), calculating BMI, and measuring blood sugar and BP levels to detect high-risk individuals.
- Additional equipment provided to rural district hospitals to improve quality of NCD care, such as digital BP monitors.

4 INTEGRATION & COORDINATION

- Komiti Tumama refer suspected NCD cases to rural district hospitals for official diagnoses, management, and follow-up.
- MDTs coordinate care across health system levels.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- An electronic health record incorporating NCD care pathways

OUTPUTS

EQUITY (R)

- **Geographic reach –** NCD diagnosis, treatment, and management services brought to rural areas when previously concentrated in the capital.[1,2]

COVERAGE (R)

- **Screening –** increased for hypertension (70% PEN village residents vs. 62% non-PEN village residents).[11]
- **Diagnosis –** close to half of the population screened in PEN villages were found to have an NCD risk factor, the majority having no prior knowledge of their risk factors.[2]

EQUITY (R)

- **Geographic reach –** NCD education and screening services brought to communities in rural areas when previously concentrated in the capital.[1,2]

- **Sites equipped (A) –** rural district hospitals equipped with screening and diagnostic equipment.
- **Providers trained (A) –** Komiti Tumama community actors trained.

- **Functioning referral mechanisms (I)**
  - **Successful referrals –** PEN village residents had significantly better follow-up with a health care provider after being referred compared to non-PEN villagers (69% vs. 50% followed referral successfully, *p=0.033*).[11]
  - **Unsuccessful referrals –** A significantly lower proportion of PEN village residents had failed referrals compared to non-PEN village residents (5% vs. 18%, *p=0.016*).[11]

OUTCOMES

PROXIMAL

- **Patient knowledge (I) –** 91% of PEN village residents surveyed recalled learning about causes of hypertension, especially foods high in sugar, fat and salt.[11]

INTERMEDIATE

- **Risk factors (E) –** lower rates of obesity among PEN village residents, with a smaller average waist circumference by ~3 cm (*p=0.03*) compared to non-PEN village residents.[11]

DISTAL

- No distal outcomes reported.

Chronic Diseases Clinic Model: Integrating NCDs into PHC in Thailand

SHIFTING THE CARE OF CHRONIC DISEASE PATIENTS FROM DISTRICT HOSPITALS TO THE PHC LEVEL

10

Geographic locale	Thailand
Program setting	PHC infrastructure in all sub-districts and district hospitals; network of village health volunteers
Target diseases	NCDs, primarily diabetes and hypertension
Target population	Adults over 35 years of age
Partners/Stakeholders	Ministry of Public Health, Provincial and District Health Offices, District Health Systems, National Health Security Office, Local Health Promotion Fund

Background: Thailand is an upper-middle-income country with a population of 71.7 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.7%.[2] In 2019, the age-adjusted prevalence of hypertension was 29.1%[3] for males and 29.2%[3] for females. The estimated age-adjusted years of life lost was 390.7[4] and 38.3[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in 2019.

Model Overview: The Chronic Diseases Clinic model employs a task-shifting approach within the district health system—Thailand's extensive network of district hospitals, PHC centers, and village health volunteers (VHVs), which serves as the contracted provider for outpatient services under its financial risk protection scheme.[5] The aim is to shift the ongoing care of NCD patients from district hospitals to PHC centers at the sub-district level to decongest district hospitals and reduce transportation time and cost for patients.[5]

Model Strategy: The model uses a multi-level strategy with a bi-directional referral system to decongest district hospitals.[5] First, physicians at district hospitals diagnose and prescribe medication for NCDs, primarily diabetes and hypertension. Stable patients are then referred down to PHC centers if their symptoms are under control. PHC nurses are tasked with monitoring treatment adherence and patient outcomes and refilling medications. Patients with poorly controlled disease are referred back to the district hospitals. District doctors rotate through select PHC centers when patient volume is high or additional support is needed. Medications are distributed to PHC centers by district hospital pharmacists. Lastly, acting as an extension of the PHC center, the VHVs play a critical role in supporting NCD management at the population level. They are equipped to screen for diabetes using blood strip tests and for hypertension using electronic blood pressure (BP) cuffs and refer when needed. VHVs provide health literature and assist with monitoring patients in their home environments. They also delivered NCD medications at home during the COVID-19 pandemic.[5]

Notable Features of the Model: Thailand has a robust PHC infrastructure that took three decades to build. In 2002, the country achieved universal health coverage through financial risk protection schemes which include a full range of NCD interventions free at the point of care.[5] While other World Health Organization Southeast Asian countries have integrated NCD management at the PHC level, most programs are small in scale. Only Bhutan and Thailand have integrated NCD management at the PHC level nationally.[5]

Key Messages

- Robust PHC infrastructure and universal health coverage play a vital role in supporting integration of NCD control and prevention at the PHC level.
- Model uses a bi-directional referral system to decongest district hospitals, with stable patients referred from district hospitals to PHC centers and patients with poorly controlled disease referred back to the district hospitals.
- VHVs screen, refer, and monitor diabetes and hypertension, providing a key link between the PHC center and the community.

Model Funding: District health systems for outpatient services are funded by the National Health Security Office (NHSO), based on an annual capitation fee for Universal Coverage Scheme members.[5] District health systems cover the cost of referring outpatients to the provincial level. Inpatient costs are financed by the NHSO. Additionally, the NHSO funds a small amount to the Local Health Promotion Funds at sub-district levels based on the project budget. This is an additional financial resource that can be drawn upon to support PHC programs or other health-related efforts.

Human Resources: Existing human resources for health (i.e. physicians, nurses, pharmacists, public health officers, and VHVs) work closely within the district health system. Specifically, VHVs play a significant role in supporting the functions of PHC centers.[5] They are the closest contact to patients within communities and conduct most of the monitoring and continuation of care. Mandatory monthly meetings between VHVs and PHC centers provide VHVs with updates on standards of care, policies, and guidelines, as well as knowledge refreshers. VHVs receive a monthly stipend of approximately US$35.[5]

Laboratory, Diagnostic, or Pharmacy Services: Medications are first prescribed to patients by district hospital providers; refills are requested by nurses at the PHC level. Medications are distributed to PHC centers and managed by district hospital pharmacists.[5] VHVs are provided with screening equipment including blood strip tests and electronic BP cuffs.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A 2021 mixed-methods evaluation of two provinces (one wealthier, one poorer) implementing the model found promising results.[5] All of the PHC centers evaluated (n=56) were implementing NCD care, and VHVs were instrumental in implementing community-based screening for hypertension and diabetes. Among adults over 35 years in the wealthier province, 41% and 84% had been screened for hypertension in urban and rural areas, respectively; 39% and 82% were screened for diabetes. In the poorer province, over 95% of over 35s were screened for hypertension and diabetes in both rural and urban areas. There were no stock-outs of essential medicines for hypertension and diabetes at the surveyed PHC centers. However, certain medicines were not widely available in PHC centers because they require a doctor's prescription, and no PHC center in this study had a full-time doctor—for example, only 33% of PHC centers had insulin and only 20% had spironolactone in stock.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. *IDF Diabetes Atlas 2021: 10th edition*. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
3. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 Million Participants." *Lancet 398* (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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INPUTS

- Existing human resources within the health system at the secondary, primary, and community levels.
- Previously trained and engaged VHVs.
- Financial and/or technical support from the Ministry of Public Health, Provincial and District Health Offices, District Health Systems, National Health Security Office, and Local Health Promotion Fund.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- District hospital providers diagnose diabetic or hypertensive patients and prescribe medication.
- PHC nurses monitor patient treatment adherence and patient outcomes and prescribe medication refills.

2 COMMUNITY-BASED ACTIVITIES

- VHVs screen community members and monitor patients at home for NCD management using blood strip tests and electronic BP cuffs for type 2 diabetes mellitus and hypertension, respectively.
- VHVs provide health education to their communities.
- VHVs delivered medication to NCD patients at home during the COVID-19 pandemic.

3 TRAINING & CAPACITY BUILDING

- During mandatory monthly meetings, PHC providers inform their associated VHVs of updates in standards of care, policies, and guidelines as well as provide knowledge refreshers.

4 INTEGRATION & COORDINATION

- District hospitals refer stable patients to PHC centers for continued monitoring and management.
- Patients with poorly controlled disease are referred back to district hospitals.
- District doctors rotate through select PHCs when patient volume is high or additional support is needed.
- Medications are distributed to PHCs and managed by district hospital pharmacists.
- VHVs refer patients to the PHC or district hospital when found with poorly controlled disease.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Not reported.

OUTPUTS

EQUITY (R)

- **Geographic reach:** 56 health facilities across 2 provinces provide NCD care and were implementing this bi-directional referral system in both urban and rural areas.[5]

COVERAGE (R)

- **Screening:** in the wealthier of 2 study provinces, screening for hypertension ranged from 41% to 84% of all adults 35+ in urban and rural areas, respectively; screening for hypertension ranged from 41% to 84%.[5] In the poorer province, over 95% of over 35s were screened for hypertension and diabetes in both rural and urban areas.[5]

EQUITY (R)

- **Socioeconomic Equity:** in the poorer study province, over 95% of over 35s were screened for hypertension and diabetes in both rural and urban areas, meaning more screening was occurring in socioeconomically disadvantaged areas.[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

WinCare Model: A Network of Homecare Providers Using the WinCare App to Support Elderly Patients with Type 2 Diabetes and Hypertension in Thailand

NON-MEDICAL PERSONNEL PROVIDING WEEKLY AT-HOME CARE USING AN APP TO CAPTURE PATIENT DATA AND SEND REMINDERS FOR MEDICATIONS AND APPOINTMENTS

11

Geographic locale	Nong-Hi Community, Mueng Chiang Mai District, Chiang Mai Province
Program setting	Home health care
Target diseases	Hypertension; type 2 diabetes mellitus
Target population	Adults ≥60 years of age
Partners/Stakeholders	Department of Military and Community Medicine; Phramongkutklao College of Medicine; Nong-Hoi Health Promoting Hospital (primary care unit)

Key Messages

- Model uses a network of non-medical homecare providers to conduct weekly home visits with elderly patients with NCDs.
- Wincare mobile application allows homecare providers to capture patient data and send reminders for medications and appointments.
- Model associated with improved BP control status at six months.

Background: Thailand is an upper-middle-income country with a population of 71.7 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Thailand was 9.7%.[2] In 2019, the age-adjusted prevalence of hypertension was 29.1%[3] for males and 29.2%[3] for females. In 2019, the estimated age-adjusted years of life lost was 390.7[4] and 38.3[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively.

Model Overview: The Wincare model deploys a new cadre of non-medical personnel to provide home-based care to elderly patients (≥60 years) with NCDs, including type 2 diabetes and hypertension. Wincare personnel are trained on the mobile Wincare application to capture patient data and send reminders for medications and appointments.[3]

Model Strategy: WinCare aims to provide convenient services to a vulnerable population group experiencing high rates of NCDs by shifting key disease monitoring and lifestyle support tasks to a network of trained non-medical homecare providers. WinCare providers conduct check-in visits of elderly patients at least once a week to measure blood pressure (BP) and body weight for six months and assist patients with medication reminders, exercise routines, grocery shopping and meal preparation, transportation, and companionship. They also provide respite care, giving

full-time family caregivers a break. The WinCare mobile application serves as an electronic medical record for each elderly patient, linking providers, patients and primacy level clinical personnel.

Notable Features of the Model: The WinCare model utilizes task-shifting by training non-medical personnel to provide necessary services to the elderly using an innovative digital health component, the WinCare application. This community-based care is an important source of social support for elderly patients and their caregivers, in addition to supporting NCD care.

Model Funding: The Health Systems Research Institute in Thailand provided financing for the study of this model.

Human Resources: WinCare providers are non-medical personnel who were not village health volunteers on duty formerly and: (1) live in the area of the program; (2) are at least 20 years old; (3) have at least a primary school education; (4) have a motorcycle for transportation; (5) are proficient communicators; (6) are health certified by a physician; (7) are able to use a smartphone and mobile application; (8) have no criminal history; and (9) have no history of illicit drug use in the previous six months. WinCare providers are trained on NCDs, behavioral risk factors, and general care for the elderly with NCDs including diabetes and hypertension based on the 2019 Thai Treatment Guidelines. WinCare providers are also trained on a digital BP machine and a digital scale and independently evaluated and certified by a physician to confirm correct use of the equipment. Once trained, providers are given the equipment and grouped into teams of two to three providers per community.

Laboratory, Diagnostic, or Pharmacy Services: BP and weight are measured by the homecare providers; however, they do not provide laboratory or pharmacy services.

Digital Solutions: The WinCare mobile application (Android & iOS) captures five key areas of patient data: (1) patient demographic data; (2) contact information for relatives; (3) all medications and administration instructions; (4) a reminder system for medications and medical appointments; and (5) monitoring data (e.g. BP, pulse rate, body weight and body mass index). WinCare providers utilize the information held in the app for patient care and enter their weekly measurements for patient monitoring. The app also contains information on lifestyle modifications, exercise, and dietary behaviors for the population the providers are serving.

Impact of the Model: Results of a prospective cohort study aimed to evaluate the effectiveness of WinCare (vs. standard of care) to improve BP control, as well as health-related quality of life (HRQOL) among elderly patients with NCDs.[5] At six-month follow-up, controlled BP among patients in the intervention group was 84.0%, which was significantly higher than in the control group (65.9%) (*p=0.042*) (adjusted OR 3.03; 95% CI 1.02–9.01; *p=0.046*). Diastolic BP of Wincare patients was significantly lower compared to control group patients (74.2 ± 6.8 mmHg vs. 79.4 ± 7.8 mmHg, *p=0.007*); however, there was no significant difference in systolic BP.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. *IDF Diabetes Atlas 2021: 10th edition*. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
3. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 million Participants." *Lancet 398* (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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INPUTS

- Newly selected non-medical individuals serve as homecare providers.
- Financial and/or technical support from the Department of Military and Community Medicine; Phramong-kutklao College of Medicine; and the Nong-Hoi Health Promoting Hospital (primary care unit).

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- None reported.

2 COMMUNITY-BASED ACTIVITIES

- WinCare homecare providers visit elderly patients weekly at their homes and measure BP and weight for 6 months. They assist patients with medication reminders, exercise, meal preparation, groceries, transportation, companionship, and respite care.

3 TRAINING & CAPACITY BUILDING

- WinCare providers are trained on NCDs, behavioral risk factors, and general care for the elderly with NCDs including diabetes and hypertension based on the 2019 Thai Treatment Guidelines.
- WinCare providers are trained on a digital BP machine and a digital scale and independently evaluated and certified by a physician to confirm correct use of the equipment.

4 INTEGRATION & COORDINATION

- The elderly patient, their WinCare provider, and their medical personnel, are able to view their health information on the WinCare app.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- WinCare mobile app developed on iOS/Android to serve as electronic medical record for elderly patients seen by WinCare providers.
- Wincare mobile app was used to link patients, WinCare providers, health promoting hospital and investigators to monitor and enhance effective home care.
- WinCare mobile app's knowledge bank is continuously updated with best available information on lifestyle modifications, exercise, and dietary behaviors for patients and providers to utilize.

OUTPUTS

- **Sites equipped (A):** WinCare provider teams equipped with digital BP machines and digital scales.
- **Providers trained (A):** WinCare non-medical homecare providers trained in diabetes and hypertension care for the elderly.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):**
  - At 6 months, average diastolic BP of WinCare patients was significantly lower compared to control patients (74.2±6.8 mmHg vs. 79.4±7.8 mmHg, *p=0.007*) and controlled BP was significantly higher (84.0% vs. 65.9%, *p=0.042*).[5]
  - At 6 months, there was no difference in average systolic BP between WinCare and control patients.[5]

VICHAI's 7 Color Balls Model for Diabetes Care in Thailand

RISK-STRATIFYING PATIENTS TO BETTER ADDRESS AND MANAGE DIABETES IN PRIMARY CARE SETTINGS

12

Geographic locale	Thailand
Program setting	Sub-district health promoting hospital
Target diseases	Type 2 diabetes mellitus
Target population	Adults ≥ 18 years
Partners/Stakeholders	Thailand Ministry of Public Health

Background: Thailand is an upper-middle-income country with a population of 71.7 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.7%[2], with an estimated age-adjusted years of life lost of 390.7[4] per 100,000 population for type 2 diabetes in 2019.

Model Overview: VICHAI's 7 Color Ball Model was used at the sub-district health promoting hospital (SHPH) level in Thailand to risk-stratify patients into seven groups, each assigned a color, based on clinical indicators to better address and manage diabetes in PHC settings.[5] The model has also been adapted for use among hypertension patients in Thailand.[6]

Model Strategy: This model involved collaboration between hospital providers and primary care providers at associated SHPHs. Patients were screened at SHPHs for several indicators, including Hb1Ac, given necessary medication, and categorized into seven groups based on their clinical outcomes.[5] Patients with normal fasting blood sugar (FBS) ≤ 100 were categorized as the white group. Patients at risk of developing diabetes (FBS 100-125) were categorized as the light green group. Patients with well-controlled diabetes were placed in the dark green (FBS <125) and yellow (FBS 125-154 and HbA1c <7) groups and given bimonthly follow-up appointments. Patients with poorly controlled diabetes were placed in the orange (FBS 155-182 and HbA1c 7-7.9) and red (FBS ≥183 and HbA1c >8) groups, with monthly follow-up appointments. Monitoring frequency increased to every two weeks if no improvement was seen. These patients were also assigned activities including exercise and meditation. If red group patients had poorly controlled diabetes at two consecutive appointments or experienced an adverse event such as hypoglycemia, they were referred to hospital care. Patients with diabetes complications were categorized into the black group for severe diabetes. Home visits by a primary care team member were primarily made to patients in this group with diabetic complications. All patients underwent an annual laboratory examination at the hospital.

Notable Features of the Model: The color-coded categorization of patients according to level of risk to guide clinical follow-up and counseling decisions was a notable feature of this model. This visual representation helped providers to easily communicate about risk and patients to better understand their risk status at a glance.[5]

Key Messages

- Patients were risk-stratified into seven color-coded groups according to clinical indicators and their monitoring frequency was set based on their risk group.
- Nearly three-quarters of patients achieved BP control, but fewer achieved controlled LDL cholesterol, FBS, and HbA1c.

Model Funding: Diabetic care services at SHPH were funded through multiple sources. The National Health Insurance Organization provided funding for medicines and supplies, while two separate government budgets were provided for health promotion and prevention activities and screening for medical complications and behavior change among patients, respectively. The Sub-District Administration Organization supported the provision of screening test kits, and donations from local entrepreneurs and the public covered the cost of meals or snacks during follow-up appointments.

Human Resources: This model was implemented with existing staff who received additional training. At SHPHs, diabetes care was delivered by an interdisciplinary team which consisted of nurses, public health technical officers, and health assistants, typically comprised of four to six providers. This team was responsible for providing medical treatment, health prevention, promotion, and medication dispensation. Additionally, village health volunteers (VHVs) played a crucial role in measuring blood glucose, monitoring vital signs, and offering basic health education to patients at home.[5]

Laboratory, Diagnostic, or Pharmacy Services: Laboratory and diagnostic services at SHPHs included various tests such as HbA1c levels, microalbuminuria, FBS, retinal examination, and foot examination.[5] No significant changes to existing pharmacy services were reported.[5]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A mixed-methods study assessing the process, quality, and challenges of diabetes care was conducted at primary level in one district health network in northeast Thailand using semi-structured interviews and focus groups with primary care providers and descriptive analysis of diabetic patients.[5] More than 80% of the patients received four essential services (HbA1c monitoring, microalbuminuria monitoring, retinopathy screening, and foot examination). Among patients with microalbuminuria, approximately one-third (34.2%) received an angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB). The percentage of patients who achieved controlled levels of low-density lipoprotein (LDL) cholesterol, FBS, and HbA1c (<7%) was relatively low at 34.8%, 34.5%, and 28.9%, respectively. Nearly three-quarters (72.2%) of patients achieved blood pressure (BP) control. Reported diabetic complications included foot ulcer (3.4%), diabetic retinopathy (8.8%), and diabetic nephropathy (16.6%).[5] The authors reported that additional support for the primary care system, including support for SHPHs in the areas of workforce, finance, medical device procurement, and patient information systems, is required to support the provision of diabetes care in primary care in Thailand.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. *IDF Diabetes Atlas 2021: 10th edition*. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
3. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 Million Participants." *Lancet* 398 (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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INPUTS

- Existing human resources at SHPHs, including nurses, public health technical officers, health assistants, and VHVs.
- Financial resources from The National Health Insurance Organization and the Sub-District Administration Organization.
- Technical support.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- At SHPH, teams consisting of nurses, public health technical officers, and health assistants screened and treated patients with diabetes and performed annual laboratory examinations.
- Based on laboratory and diagnostic test results, patients were classified into seven different risk category groups.
- Yellow group patients (fasting blood glucose 125-154 mg/dL; HbA1c <7%) attended appointments every 2 months.
- Orange (fasting blood glucose 155-182 mg/dL; HbA1c 7-7.9%) and red group patients (fasting blood glucose >=183 mg/dL; HbA1c >8%) with poorly controlled diabetes attended monthly appointments. Monitoring frequency increased to every two weeks if no improvement was seen.
- Red or black group patients experiencing uncontrolled symptoms or adverse events were referred to the hospital.

2 COMMUNITY-BASED ACTIVITIES

- Patients with poorly controlled diabetes were encouraged to engaged in activities like exercise, meditation, and games to promote physical activity.
- Health care providers conducted home visits, primarily with patients with diabetic complications.
- VHVs measured blood glucose, monitored vital signs, and offered basic health education to patients at home.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- Interdisciplinary teams of health care providers including nurses, public health technical officers, and health assistants, typically comprising 4 to 6 providers, provided care for diabetes patients.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Compliance with guidelines (A):** >80% of patients received 4 essential services (HbA1c monitoring, microalbuminuria monitoring, retinopathy screening, and foot examinations).[5]
- 34.2% of patients with microalbuminuria received an ACE inhibitor or ARB.[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E)**
  - 72.2% of patients had controlled BP.[5]
  - 34.8% of patients had controlled LDL cholesterol.[5]
  - 34.5% of patients had controlled FBS.[5]
  - 28.9% of patients had controlled HbA1c (<7%).[5]

Communities for Healthy Viet Nam Model

COMMUNITY-BASED, DIGITALLY-ENABLED PHC MODEL

13

Geographic locale	Viet Nam
Program setting	Community screening checkpoints, PHC
Target diseases	Hypertension
Target population	Adults 40+ years in low-income areas; all patient types
Partners/Stakeholders	Viet Nam Ministry of Health, Novartis Foundation (2016-2019), PATH, Access Accelerated (2019-present)

OVERVIEW

Operated as a partnership between the Ministry of Health, Access Accelerated, and PATH, Communities for Healthy Viet Nam, is a broad, multi-pronged service delivery model aimed initially at improving hypertension and later diabetes, awareness, screening, diagnosis, treatment, and case management among adults over 40 in Viet Nam.[1,2] Utilizing new and existing community health workers (CHWs), newly trained and provided with supportive job aids and mentorship, Communities for Healthy Viet Nam offers frequent NCD screenings in convenient community locations and directly refers individuals found at high risk of hypertension or diabetes to partnering health facilities.[3] The model includes an extensive digital solutions component facing both inwards (for health service providers to increase patient tracking, management, and continuity of care) and outwards (for patient use to affect behavior change and facilitate disease self-management).[3–6]

The successful pilot, Communities for Healthy Hearts, focused on reducing hypertension in underserved communities of Viet Nam from 2016-2018. In 2019, it expanded to include diabetes screening and was rebranded as Communities for Healthy Viet Nam.[4,7] The promising pilot results led the government to endorse national scale-up of the delivery model with the goal of increasing the availability and continuity of hypertension and diabetes care in Viet Nam.[2,3] As scale-up of the model continues, the Ministry of Health and its partners aim to collect outcome data and generate evidence of the model's impact to advocate for replication and scale-up of similar approaches, to integrate mental health, cancers, and other NCDs into the service delivery model, and to inform policies that would lead to improved and comprehensive NCD management in Viet Nam.[4] The model has been expanded to a pilot project in Kenya and Ghana. In Kenya, the project started small, in one county, but has since been scaled up.[8]

NOTABLE FEATURES OF THE MODEL

The model provides community-based, people-centered hypertension and diabetes management and uses partnerships between government agencies and non-governmental organizations (NGOs) to bring NCD screening to convenient, hyper-local locations such as grocery stores, coffee shops, salons, and pharmacies.[2-3, 6] This is followed by linkage to diagnosis, treatment, and management at health facilities. The model also provides capacity strengthening and digital communication interventions to drive behavior change and uptake of these services, enhance both availability and quality of services, and generate demand.[3,4]

BURDEN OF NCDS

Viet Nam is a lower-middle-income country with a population of 98.2 million.[9] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Viet Nam was 6.1%.[10] In 2019, the estimated age-adjusted prevalence of hypertension was 32.9%[11] for males and 26.4%[11] for females. The estimated age-adjusted years of life lost were 637.4[12] and 354.7[12] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in 2019.

IMPLEMENTATION CONTEXT

Health Policy Environment

The current National NCD Strategy (2015-2025) outlines ambitious targets, including the goal to provide all PHC facilities and half of workplace health facilities with access to essential NCD equipment and drugs.[13–15] Since implementation of this model, the Government of Viet Nam approved an updated national plan for the prevention and control of NCDs and mental health (2022-2025), signaling continued support for NCD programming.[16]

The Ministry of Health in Viet Nam has managed health care provision through a system known as the Direction of Healthcare Activities (DOHA) since 1961.[17] This system requires health facilities at higher administrative levels to support those at lower levels to enable them to deliver medical services for local communities in primary care settings.[17] DOHA currently focuses on reducing the burden on higher level hospitals, particularly central hospitals, which remain overburdened.[17]

Social health insurance is the primary method of public financing for health care. The government uses tax revenues to subsidize insurance partially or fully for vulnerable groups (i.e., the poor, children under six, the elderly above 80).[18] In 2018, 87% of the population was covered by social health insurance. Uninsured patients pay for all prescribed medicines, including those for NCDs, as an out-of-pocket expense, either at the health facility or from the private sector.[18]

Health System Structure

The public health system has three levels of services: primary, with district hospitals and commune health centers; secondary, with provincial referral hospitals; and tertiary, with the national referral hospitals. The primary care structure in Viet Nam includes a network of more than 11,000 commune health centers that provide basic and essential health services to individuals in every commune.[19] Services provided include child immunization, medication dispensing, referrals, and intrapartum services, as necessary.[20] A commune health center is typically staffed with a general doctor, a midwife, nurse, assistant doctor of traditional medicine and/or a pharmacist. Village health workers play crucial roles in delivering health services and linking patients to commune health centers.[21] They are volunteers that live in the villages where they work and provide basic services and counselling to patients.[21] This is especially impactful in remote areas with limited access to medical care.[21]

Viet Nam has a limited PHC workforce, and many patients lack access to screening, prevention, and adherence counselling. In 2016, World Health Organization (WHO) Global Workforce Statistics data reported that there was less than one doctor and 1.4 nurses for every 1,000 individuals, one of the lowest in Southeast Asia.[22,23]

People with public health insurance may seek care at their registered primary health facility (typically their local commune health center).[19] They can then be referred to a higher level of care if needed, such as a district, provincial or central hospital. Although those with public health insurance generally have free or low-cost access to primary care services through the commune health centers, many people believe the quality of care is poor, leading them to bypass primary care and instead self-pay for services directly at private clinics or hospitals.[19]

Model Strategy

This integrated care model incorporates hypertension and diabetes screening and care into PHC at the community level, targeting people over the age of 40. This model uses a three-pronged approach:

- **Strengthen the capacity of the health system** to identify, track, and manage hypertension. CHW capacity to identify NCDs is strengthened through trainings, job aids, and mentoring. They are linked with commune health centers which can provide official diagnosis and utilize the national electronic registry to track and manage hypertensive patients.
- **Establish community-based screening and referral services** in convenient locations with the aim to relieve the burden on commune health centers and bring services closer to patients. CHWs–community collaborators–provide hypertension and diabetes screening and referral services at community checkpoints such as coffee shops, salons, grocery stores, and pharmacies. Using a list provided by the local commune health center, community collaborators also conduct household visits to screen and refer those needing diagnostic confirmation and/or care. They also provide home-based follow-up and management for diagnosed clients for continuity of care.[3,4] By making services accessible at the community-level, the model aims to improve blood pressure (BP) screening and eventually control among at risk adults.
- **Implement communication interventions with the target population** to increase awareness of NCDs, risk factors, and prevention measures. Local commune health center staff work with community collaborators to host NCD awareness events and screening campaigns, with follow-up provided by community collaborators. Awareness of hypertension and diabetes prevention is also promoted through media (e.g., TV, mobile apps, social media) and direct communication.[3,4] Some of these media and communication methods include banners on streets, mobile loudspeaker broadcasts, leaflets distributed by community collaborators, and a social media campaign in Ho Chi Minh City.[4] These communication activities help in changing individuals' perceptions that screening is only available as a lengthy and expensive health check at a hospital.[6]

Model Funding

In addition to its own funding, the Ministry of Health sourced funding for this model from several sources. Pilot funding was sourced from Novartis from 2016-2018,[22] with financial support from Access Accelerated beginning in 2019 and primarily financing the scale-up.[8,24] While there is nationwide coverage, financing for the model varies across provinces, in part because the decentralized health system results in each province receiving different levels and types of support.

Human Resources

The convenient community checkpoints are staffed with trained CHWs who are either newly selected for this role from non-traditional community actors (e.g., local shopkeepers) or from the existing cadre of village health workers operating within the health system. They were nominated for this NCD role by their associated commune health centers and local councils based on their reputation in their communities and their support with past social initiatives. The CHWs were trained in line with the Ministry of Health and WHO guidelines to provide standardized, quality NCD screening, education, and referral services and provided with job aids.[3]

All trained CHWs provide community screenings and referral services; CHWs who had previously served as village health workers also provide home-based screenings and follow-up services, and help to raise awareness within their communities. Health staff at commune health centers provide confirmatory diagnosis, treatment, and counseling services for referred clients with hypertension and/or diabetes.

CHWs were not paid monthly salaries. They were provided with a performance-based stipend of about VND 200,000 (roughly US$10) per month or higher and provided with screening equipment.[3]

Laboratory, Diagnostic, or Pharmacy Services

Efforts to strengthen availability of NCD medicines and health products are currently being implemented by the Ministry of Health.[7, 13] There are no additional laboratory diagnostic, or pharmacy service components integral to this model.

Digital Solutions

Communities for Healthy Viet Nam includes both provider-focused and patient-focused digital solutions. In 2019, the Ministry of Health with its partners developed and deployed eHypertensionTracker, a searchable, online registry of hypertensive patients for use by health care providers to improve patient tracking, referrals, management, and continuity of care.[3,22] Data on hypertension screening, diagnosis, care, and treatment are entered into the eHypertensionTracker by CHWs and clinicians at any partner facilities. A unique patient ID enables screened clients to be tracked over time and across facility levels.[3] It also allows for the Ministry of Health and WHO to integrate indicators for reporting at the national level.

Additionally, a mobile application called Healthy App that aims to improve patient knowledge, motivate users to identify potential risk factors and engage in early screening, influence behaviors toward healthier lifestyles, increase appointments and treatment, and facilitate disease self-management.[3] It provides information on NCDs, risk factors, screening centers and screening processes, diagnosis, and treatment. The app allows patients to receive support and referrals and input appointments and treatment information (e.g. medication dose schedule). It can also provide patients with appointment and adherence short message service (SMS) text reminders and has a diary function that allows patients to enter and track BP measurements over time. Additionally, the app provides users with healthy lifestyle guidance.[3]

IMPACT OF THE MODEL

The Communities for Healthy Hearts pilot established a community-based network of over 70 health providers, 132 CHWs, and 358 community-based BP checkpoints.[6] A mixed methods study reported on the reach of the pilot: among the 121,273 adults aged 40+ screened between September 2016 and January 2018, more than half (55%) were diagnosed with hypertension. Of these, 57% were treated, and 57% of those treated reached target BP.[3] In addition, nearly 670,000 individuals in Viet Nam were reached with hypertension messaging during the pilot period.[6]

Another study conducted between October 2017 and September 2019 randomly sampled 2,701 hypertensive adults split between Communities for Healthy Hearts intervention and control districts in Ho Chi Minh City, Viet Nam.[25] During four follow-up rounds over two years, the Communities for Healthy Hearts intervention showed improved self-management of BP among hypertensive adults with the utilization of BP self-management tools.[25] While both groups improved after the study, the intervention group adults who self-managed BP increased 8.5% higher than the control group.[25]

After the addition of diabetes screening, 93,425 adults over 40 were screened for diabetes and hypertension from October 2019 to March 2021.[7] Of those who were screened during this time, 32.7% had elevated BP and/or were considered at risk for diabetes. If at risk, they were referred to health facilities, where 51.3% were diagnosed with hypertension and 0.6% with diabetes.[7] Of those diagnosed, 93.8% were treated.[7] Of those treated, 80.5% achieved BP control and 77.1% achieved blood glucose control, which is an improvement from past programs.[7]

COSTING

There have been costing activities conducted, but no cost data has been analyzed or are publicly available.[8]

LESSONS LEARNED

While there is some overlap with previous lessons learned from the pilot phase presented in another case,[6] several key lessons can be drawn from the scale-up of Communities for Healthy Viet Nam.

It is critical to recognize the value of the village-level community health workforce in implementing and extending the reach of the program. They act as an 'extended hand' from the health sector to the community, detecting high-risk, at-risk, and early stage disease or people that might otherwise not present at the health system until their disease has progressed much further.

Ministries of health should be heavily engaged in the development of digital solutions. This will improve stakeholder buy-in and adoption and allow for easier integration of the solution into the routine health management system. The eHypertensionTracker was co-developed, ensuring indicators were harmonized with the national reporting system.

Ministries of health should anticipate and respond to a change in supply chain when implementing interventions that generate demand. In this case, the Ministry of Health worked with partners to understand the root causes of supply chain issues and develop an improvement plan to ensure affordability and availability of medicines for hypertension.

To the degree possible, ministries of health should harmonize and streamline behavior change communication materials among implementing partners across all provinces.

Prioritize NCDs and find creative solutions to increase resources. In this case, the burden of disease is huge and far outpaces the available financial and human resource capacity, as government investments in NCD are still limited compared to HIV and tuberculosis. Implementing partners have invested in online programs and training materials as one strategy to overcome resource constraints.

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Consider digital tools as they provide better opportunities to access information if implemented correctly. Additionally, advocate at national and international levels to ensure better investment in NCDs can keep pace with the growing burden.[8]

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INPUTS

- Existing cadre of village health workers operating within the health system.
- Group of community collaborators interested in being trained as CHWs.
- Financial resources from multiple partners and the Ministry of Health.
- Technical support from multiple partner and the Ministry of Health.
- Ministry of Health and WHO guidelines.
- Partner and stakeholder support.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Commune health centers create lists of adults 40+ who require home-based screenings and provide these to CHWs.
- Commune health centers host NCD awareness events and screening campaigns.
- Commune health centers receive referrals from CHWs and diagnose, treat, and manage the previously screened patients as appropriate.

2 COMMUNITY-BASED ACTIVITIES

- CHWs are newly selected for this role from non-traditional community actors (e.g., local shopkeepers) or are selected from the existing cadre of village health workers operating withing the health system.
- CHWs conduct household visits with adults 40+ to offer HTN and T2DM risk screening from lists provided by commune health centers. CHWs offer opportunistic HTN and T2DM risk screenings at convenient community locations, such as grocery stores, coffee shops, salons, and pharmacies.
- CHWs host screening events.
- CHWs provide home-based follow-up and HTN and T2DM management support for diagnosed clients.
- CHWs provide health education to communities to raise awareness about NCDs and risk factors. CHWs distribute educational leaflets on NCDs.

3 TRAINING & CAPACITY BUILDING

- CHWs are trained in line with Ministry of Health and WHO guidelines to provide standardized, quality NCD screening, education, and referral services.
- CHWs are provided with supportive job-aids and mentoring to improve capacity to provide health education and conduct NCD risk screenings.

4 INTEGRATION & COORDINATION

- CHWs directly refer individuals found at high risk of HTN or T2DM to partnering health facilities.
- Providers at commune health centers use the eHypertensionTracker to track patient referrals and manage diagnoses and treatments.
- Healthy App users are helped to monitor and self-manage their disease through a and receive SMS reminders for appointments and treatment.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- eHypertensionTracker, a searchable online registry of hypertension patients, was developed an deployed.
- Healthy App provides users with educational information on NCDs, risks, screening centers, processes, diagnosis and treatment.
- Healthy App users are helped to monitor and self-manage their disease through input of monitoring information (e.g. blood glucose levels), appointments, and treatment regimens; users receive SMS reminders for appointments and treatments.
- HTN and T2DM prevention is promoted through TV, social media, street banners, and loudspeaker broadcasts.

OUTPUTS

COVERAGE (R

- **Diagnosis –** 51% of patients identified at risk of NCDs were later diagnosed with HTN; 0.6% with T2DM.
- **Treatment –** 57% of patients diagnosed with HTN between 2016-2018 were treated; 94% of those diagnosed between 2019-2021 were treated.[3,7]

COVERAGE (R

- **Screening –** 121,273 adults over 40 were screened for HTN between 2016-2018; 93,425 adults over 40 were screened for HTN and T2DM between 2019-2021.[7]

EQUITY (R)

- **Geographic reach –** 358 community-based HTN checkpoints were created.[6]

- **Sites equipped (A) –** 358 community-based HTN checkpoints were created.[6]
- **Providers trained (A) –** over 70 providers and 132 CHWs were trained.[6]

- **Compliance with guidelines (A) –** eHypertensionTracker was developed with national guidelines; reports harmonized indicators into the national health information system.
- **Awareness Campaigns –** nearly 670,000 individuals in Viet Nam were reached with hypertension messaging during the Communities for Healthy Hearts pilot.[6]

OUTCOMES

PROXIMAL

- **Patient knowledge**
  - 92% of pilot patients had adequate knowledge on modifiable HTN risk factors.
  - 64% identified normal BP ranges.
  - 86% could identify symptoms of HTN. Participant knowledge increased from before involvement in the pilot.[4]

INTERMEDIATE

- **Treatment adherence (E) –** HTN pilot patients had 9% higher treatment compliance and utilized self-management tools, compared to control patients.[24]

DISTAL

- **Patient health outcomes (E)**
  - Of adults aged 40+ screened for hypertension from Sept. 2016 to Jan 2018, 57% of those diagnosed with hypertension were treated and 57% of those treated reached target BP.[3]
  - Of adults aged 40+ diagnosed with hypertension and diabetes from Oct. 2019 to Mar. 2021, 93.8% were treated, with 80.5% achieving BP control and 77.1% achieving blood glucose control.[7]

Europe and Central Asia: Models of care

Interprofessional Management of NCDs Model in the Republic of Moldova

ADAPTATION AND IMPLEMENTATION OF THE WHO PEN PROTOCOLS USING A PARTICIPATORY, MULTI-SECTORAL APPROACH

14

Geographic locale	Republic of Moldova
Program setting	PHC clinics
Target diseases	NCDs, primarily hypertension, cardiovascular diseases, type 2 diabetes
Target population	Adult patients 18 years or older
Partners/Stakeholders	Government of the Republic of Moldova, Ministry of Health, Labour and Social Protection, the Swiss Agency for Development and Cooperation, World Health Organization Regional Office for Europe, the Nicolae Testemitanu State University of Medicine and Pharmacy, and the National Public Health Agency

OVERVIEW

The Package of Essential Non-Communicable Disease Interventions for Primary Health Care (PEN) was developed by the World Health Organization (WHO) to help strengthen the equity and efficiency of primary health care (PHC) in low-income settings.[1,2] Ministries of health can then adapt these clinical protocols to their specific contexts and population needs.[1,2] Moldova adapted and piloted the WHO PEN approach in 10 PHC clinics to understand its impact on cardiovascular disease (CVD) prevention and hypertension management at the PHC level, and to generate recommendations for national scale-up.[1] Adaptations were made to the PEN protocol by a national team of experts, including representatives from the Ministry of Health, Labour, and Social Protection of Moldova, the Nicolae Testemitanu State University of Medicine and Pharmacy, and the National Public Health Agency, with guidance from WHO and other international stakeholders, to ensure that the protocol was responsive to the context and national disease-specific guidelines.[1,3] The model had three key components: 1) integrate NCDs into the broader PHC system; 2) build the capacity of PHC staff, and 3) promote healthy living.[1]

NOTABLE FEATURES OF THE MODEL

This model is notable for several reasons. First, the PEN protocols on integrating the management of hypertension and diabetes were adapted using a participatory, multi-sectoral approach.[1,3] Second, the training of professionals and the provision of supportive materials and tools were accompanied by intensive in-service support and mentorship visits from national experts to ensure quality implementation.[1,3]

BURDEN OF NCDS

Moldova is a upper-middle-income country with a population of 2.5 million.[4] In 2021, the estimated age-adjusted prevalence of type 2 diabetes mellitus in Moldova was 5.6%.[5] In 2019, the estimated age-adjusted prevalence of hypertension was 49.3%[6] for males and 46.9%[6] for females, and the estimated age-adjusted prevalence of CVD was 7.2%.[7] In 2019, the estimated age-adjusted years of life lost were 105.9,[7] 424.8,[7] and 6,940.8[7] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

In 2016, the Moldovan government committed to strengthening the PHC system in the Action Programme of the Government of the Republic of Moldova for 2016-2018.[9] The following year, the Moldovan Government established the National Agency for Public Health to increase the focus on the prevention and control of NCDs.[2]

Other policies have focused on addressing NCD risk factors. In 2016, the Ministry of Health endorsed guidelines to enforce compliance with the Tobacco Control Law, aimed to protect the population from tobacco smoke exposure.[2] Further regulations on the use of health warnings and messages for tobacco products were approved by the government in 2017.[2] In 2018, the use of health warnings on tobacco became mandatory.[2] In 2017, Parliament made a policy decision to ban alcohol advertising in the country, along with reclassifying brewery products as alcohol beverages (as opposed to their previous classification as food).[2] It is within this supportive policy environment that this model was implemented.

Health System Structure

In Moldova, the health system is comprised of public and private medical facilities: in 2022, there were 17 republican public hospitals, 34 district-level public hospitals, nine municipal-level public hospitals, and 17 private hospitals (with the number of private hospitals increasing over the last decade).[10] In 2021, there were 293 public primary care facilities, with an increasing emphasis being placed on primary care.[10] The Ministry of Health has the primary responsibility for developing health policy and legislation that regulates health services.[10] The National Agency for Public Health is responsible for managing public health services.[10] Medicines and medical devices are regulated and managed by the Agency for Medicines and Medical Devices.[10] Finally, the Centre for Centralized Public Procurement in Health plans and conducts any procurement of medical and protective equipment at the request of any public provider.[10] Local Public Authorities (LPAs) are responsible for developing and maintaining the medical infrastructure within their respective territories. The LPAs own the infrastructure, but they do not finance any health services.[10]

Moldova has a publicly financed mandatory health insurance system that started in 2004 and includes a defined benefits package.[10] This insurance system is managed by the National Health Insurance Company (Compania Națională de Asigurări în Medicină, CNAM), which serves as the single purchasing agency in the country.[10] Regardless of insurance status, a basic package of essential health care, including emergency care, primary care, and medication and inpatient care for selected diseases (including COVID-19) is available to the citizens of Moldova free of charge at the point of service.[3,10]

Model Strategy

The model implementation strategy focused on the adaptation, adoption, and implementation of the WHO PEN protocols, which provide simple clinical protocols for managing NCDs in a cost-effective manner. In 2016, the model was rolled out at 10 PHC centers strategically selected across different regions of the country.[1] The model aimed to enhance the quality of care while improving the organization of care, using three overarching aims: integrate NCDs into the broader system, build the capacity of PHC staff, and promote healthy living. Activities related to integrating NCDs into the broader system (component 1) included the assessment and adaptation of national protocols by a multi-disciplinary steering group. The steering group was comprised of representatives from the Ministry of Health, Labour and Social Protection, the Nicolae Testemitanu State University of Medicine and Pharmacy, and the National Public Health Agency, and was supported by an international team of experts. The committee adapted PEN protocols to the Moldovan context and integrated them into the existing health system organization and resources. Activities

related to building the capacity of the PHC staff (component 2) included a three-day in-service training course, which was provided to 183 clinic managers, physicians and nurses (participation from clinics varied between 80% and 100%),[1] and was also integrated into the curriculum of the Moldova State University of Medicine and Pharmacy.[2] PHC staff were also provided with supportive tools and job aids. Bi-monthly mentorship visits were conducted to support clinical teams for the first 12 months of implementation, as well as periodical meetings with clinic representatives to discuss implementation challenges and good practices.[1] To promote healthy living (component 3), the program implemented a mass communication campaign to educate the population about CVD and diabetes risk factors, while concurrently promoting the recent Tobacco Control Law.[2] Public service announcements (radio and video) were produced in the Romanian and Russian languages and distributed to all media providers to raise awareness about the ban on smoking in public places and the benefits of following the Tobacco Control Law.[2]

Model Financing

The Swiss Agency for Development and Cooperation and the WHO Regional Office for Europe provided funding for the pilot project and the evaluation in Moldova.[1]

Human Resources

Key personnel for this model included existing clinical staff, such as physicians, nurses, and clinic managers.[1]

Laboratory, Diagnostic, or Pharmacy Services

There were no significant changes to existing laboratory, diagnostic, or pharmacy services. While essential anti-hypertensive medications are typically available in Moldova, it was noted that the pilot was unable to influence the availability of statins.[1] Collection of data on serum lipid levels was not included in the pilot because such diagnostics are not available in all clinics across the country.[1]

Digital Solutions

No digital solutions were integral to this model's implementation.

IMPACT OF THE MODEL

A feasibility study conducted after one year of implementation found significantly greater improvements in diabetes detection (20% improvement from baseline to follow-up (p=0.004)), recording of smoking status, proportion of patients with blood pressure at normal level, and hypertension control (from 22% at baseline to 62% at follow-up) suggesting that it is feasible to implement and evaluate the PEN protocol for prevention of CVD using routine clinical and that improvements in risk factor identification and management can be achieved in a relatively short period of time.[1]

After two years of implementation, a follow-up evaluation was conducted in response to key stakeholder interest in the long-term impact and sustainability of the intervention in Moldova.[11] Intervention clinics had nearly twice the odds (OR 1.96, 95% CI 1.67, 2.31) of recording patient smoking status and more than twice the odds (OR 2.16, 95% CI 1.49, 2.87) of documenting high-risk patients compared to control clinics. Intervention clinics were also significantly more likely to prescribe statins for patients with CVD (OR 2.07, 95% CI 1.49, 2.87) and for high-risk diabetes patients (aged 40 years or older) (OR 1.87, 95% CI 1.14, 3.06). However, not all indicators were significantly better in intervention clinics. For example, by the 24-month mark, both the intervention and control clinics had improved their measurement of hemoglobin A1c (HbA1c) among patients with diabetes mellitus, but the control clinics improved significantly more (OR 14.54, 95% CI 8.20, 25.78) than the intervention clinics (OR 6.03, 95% CI 3.90, 9.35).[11] Overall, the follow-up evaluation found that in intervention clinics, process indicators either significantly improved or remained the same, whereas

four of the control clinic process indicators worsened over the two-year time frame. Furthermore, the evaluation also found that the odds of a patient with hypertension achieving BP control were approximately ten-fold higher in the intervention clinics after two years of implementation compared to the baseline (OR 9.94, 95% CI 7.74, 12.77, p<0.001), double the odds ratio of the control clinics over the same period (OR 4.94, 95% CI 3.83, 6.27, p<0.001). The intervention clinics also had a significantly greater relative reduction in raised blood pressure compared to control clinics (79% and 52% relative reduction, respectively).[11]

COSTING

The adaptation of the PEN project in Moldova has not been assessed for cost-effectiveness; however, the WHO PEN model more broadly is based on cost-effective interventions and is a well-established "best-buy" model.[11]

LESSONS LEARNED

Early implementation generated several lessons learned. First, the feasibility study[1] found that capacity building of professionals to implement evidence-based guidelines and support patient self-management, as well as further changes in organizational processes, are needed to strengthen NCD management. Findings from the follow-up evaluation show that and adapting existing resources, such as the WHO PEN protocols and the health system's human resource infrastructure, supplemented by focused training and support for healthcare professionals can lead to sustainable improvements in NCD risk factor control in PHC in low resource settings.[11]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Implementer feedback was not available.

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INPUTS

- Existing human resources within the health system.
- Financial resources from the Swiss Agency for Development and Cooperation and the WHO Regional Office for Europe.
- Technical support from the Ministry of Health, Labour, and Social Protection of Moldova, the Nicolae Testemitanu State University of Medicine and Pharmacy, and the National Public Health Agency, with guidance from WHO and other international stakeholders.
- WHO PEN protocols.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Doctors, nurses and clinic managers provide NCD services to patients at PHC centers.

2 COMMUNITY-BASED ACTIVITIES

- Public service announcements over the radio and in video format are distributed in the Romanian and Russian languages through all media providers to raise awareness about the ban on smoking in public places, the benefits of following the Tobacco Control Law, and risk factors for CVD and T2DM.

3 TRAINING & CAPACITY BUILDING

- Health care providers are provided with a 3-day in-service training course, which was also integrated into the curriculum at the Nicolae Testemitanu State University of Medicine and Pharmacy.
- Health care providers are given supportive tools and job aids.
- Bi-monthly mentorship visits from national experts are conducted during 12 months to support health care providers.

4 INTEGRATION & COORDINATION

- A national multi-disciplinary steering group assessed and adapted the WHO PEN interventions to the local context and national guidelines.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Diagnosis –** 20% improvement for patients with diabetes observed in intervention clinics from baseline to 1-year follow-up (p = 0.004 after controlling for patient age and sex).[1]

- **Sites equipped (A) –** Roll-out at 10 PHC centers that were strategically selected throughout different regions of the country.[1]
- **Providers trained (A) –** Doctors, nurses and clinic managers were trained at 10 PHC centers.[1]

- **Compliance with guidelines (A)**
  - Regular BP monitoring increased in intervention clinics[1]
  - Intervention centers were: 1.96 times more likely (95% CI 1.67, 2.31) to document patient smoking status; 2.16 more likely (95% CI 1.49, 3.14) to document high-risk patients; 2.07 times more likely (95% CI 1.49, 2.87) to prescribe statins for patients with CVD; 1.87 times more likely (95% CI 1.14, 3.06) to prescribe statins for high-risk patients with diabetes.[11]

OUTCOMES

PROXIMAL

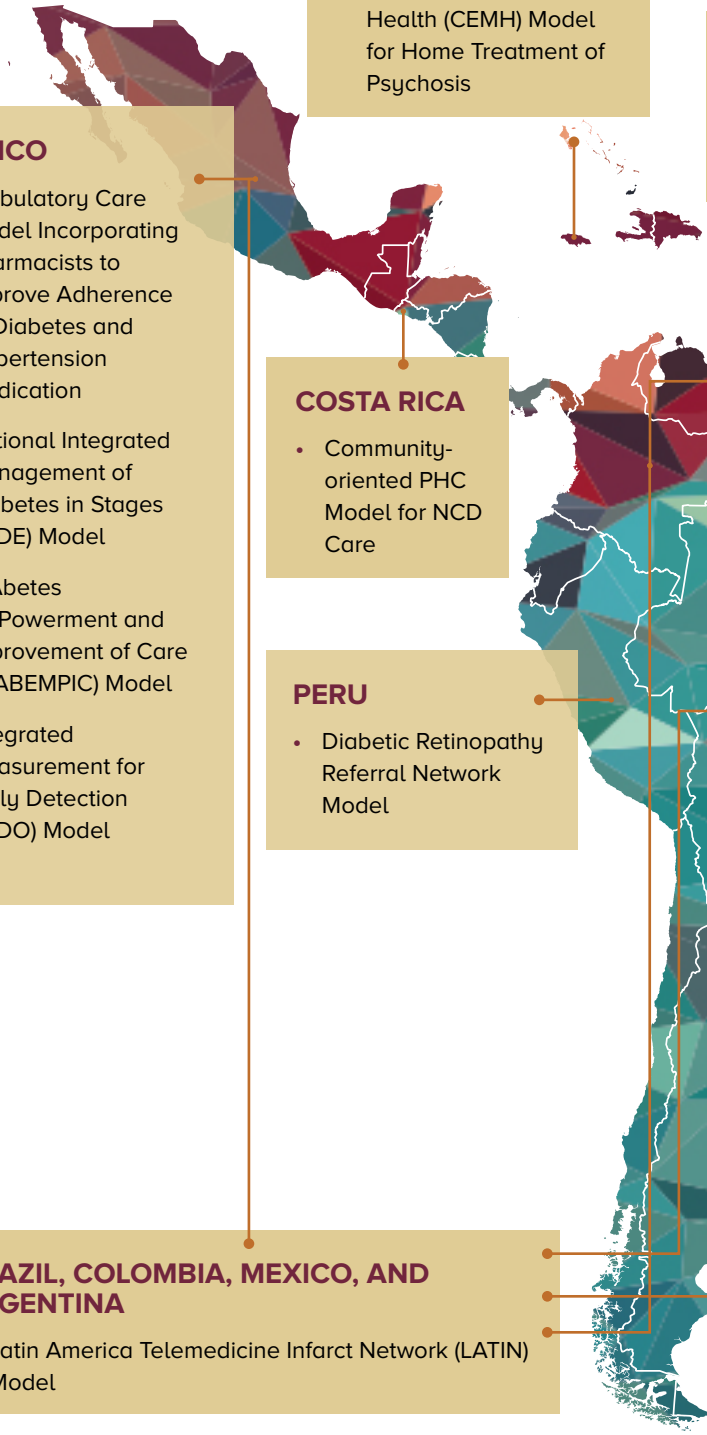
- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E)**
  - HTN control increased from 22% to 62% in intervention clinics at 1-year follow up.[1]
  - The odds of BP control was 10 times higher after two years compared to baseline (OR 9.94, 95% CI 7.74, 12.77, p<0.001).[11]



JAMAICA

- Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis

ST LUCIA

- HEARTS Initiative Model for Hypertension Care

COLOMBIA

- Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model

MEXICO

- Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication
- National Integrated Management of Diabetes in Stages (MIDE) Model
- DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model
- Integrated Measurement for Early Detection (MIDO) Model

COSTA RICA

- Community-oriented PHC Model for NCD Care

BRAZIL

- Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders

PERU

- Diabetic Retinopathy Referral Network Model

ARGENTINA

- DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model
- Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta

BRAZIL, COLOMBIA, MEXICO, AND ARGENTINA

- Latin America Telemedicine Infarct Network (LATIN) Model

Latin America and the Caribbean: Models of care

DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina

IMPROVING THE QUALITY OF DIABETES CARE AT PUBLIC PHC CENTERS

15

Geographic locale	La Matanza County, Buenos Aires, Argentina
Program setting	40 primary care clinics
Target diseases	Type 2 diabetes mellitus
Target population	Adults ≥18 years of age
Partners/Stakeholders	Ministry of Health of the Province of Buenos Aires, Health Secretariat of Municipalidad de La Matanza, Universidad Nacional de La Plata

Background: Argentina is an upper-middle-income country with a population of 46.2 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Argentina was 5.4%,[2] with an estimated age-adjusted years of life lost due to type 2 diabetes of 362.8[3] per 100,000 population in 2019.

Model Overview: In Argentina, the DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) model of care aimed to improve the quality of diabetes care at PHC centers within the public health care system. DIAPREM used a strategic approach, aimed at systems change, establishing a consistent patient registry containing clinical, metabolic, and therapeutic indicators, improving the quality of clinical care, and providing patient education. The model has been shown to improve patient adherence and quality of care which was motivating for providers and local health authorities.[4]

Model Strategy: The different components of this multi-pronged strategy worked to collectively enhance the capacity of primary care providers to effectively manage diabetes. First, a diabetes training course was provided for both physicians and nurses who worked as a combined physician-nurse team to manage care. The use of a physician-nurse team increased the amount of time devoted to each patient without reducing the number of patients attendance, optimizing use of time and improving care outcomes.[4] Second, patient follow-up and call center activities were implemented to remind patients of their next appointment and set up an annual appointment for cardiovascular and ophthalmological controls. Third, there was a structured patient registry to collect patients' clinical, biochemical, educational, and therapeutic data to track patient progress and prompt clinicians on best clinical care practices if patients were not meeting their treatment.[4]

Notable Features of the Model: DIAPREM is an innovative health care model in which physicians and nurses worked together in PHC centers to provide coordinated care for patients with diabetes. The training of physicians and nurses was an important component of the program and included for example training for nurses to promote empathy for patients with type 2 diabetes, with modules such as "living as a person with diabetes." The model leveraged simple and low cost interventions which led to significant improvements in care outcomes by optimizing resources available at the primary care level. DIAPREM aimed to deliver comprehensive and patient-centered diabetes care through teamwork, empathy-building training, and accessible resources.[5]

Key Messages

- The DIAPREM model in Argentina aimed to improve diabetes care at PHC centers through a multistrategic diabetes care programme including a patient registry and enhanced clinical care and education.
- Physician-nurse teams received comprehensive training to effectively manage diabetes, with a focus on understanding patient complexities, which enabled collaborative and patient-centered care.
- Fewer intervention patients dropped out of care and key indicators such as HbA1c, BP, and higher achievement of treatment targets were improved compared to patients receiving to standard of care.

Model Funding: DIAPREM implementation was partially supported by a grant provided by the World Diabetes Foundation. The model leverages the resources of the PHC system within the public health sector, which is primarily financed by the government, through taxes, and is utilized for free by mostly low-income people and unemployed populations not insured by social security or the private sector.[4]

Human Resources: The model used existing clinicians who were staffing PHC centers. There was a physician-nurse team at each PHC center who were provided with training and worked collaboratively to manage the diabetes patients.[4] The physician training was conducted online and consisted of both mandatory and optional modules, as well as an in-person practical training at a reference center. Physicians were given a comprehensive manual with all treatment algorithms for diagnosis, control, and treatment of type 2 diabetes. Nurses attended an in-person theoretical and practical training, with modules to foster empathy (e.g. living as a person with diabetes) and to help understand the complexities of caring for patients with diabetes.[4]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. Primary care units in Argentina typically provide disease management programmes for chronic diseases such as diabetes which include a free supply of selected drugs and a limited number of blood glucose test strips. An evaluation study of the model found no significant changes in drug prescriptions except a decrease in oral monotherapy.[4]

Digital Solutions: The training course for clinicians was offered in modules through an online platform hosted by the Universidad Nacional de La Plata. Additionally, the DIAPREM model's structured registry contributed to the advancement of knowledge in diabetes care by providing a comprehensive and standardized dataset for research and analysis. The structured registry form collected patient data and was filled in by physicians and nurses. There was also a built-in feedback mechanism that compared a patient's current values to treatment targets and if a patient was not reaching their targets, the form highlighted areas that should be focused on.[4]

Impact of the Model: To evaluate the effectiveness of the DIAPREM program, 30 physicians and 30 nurses were randomly selected among the 40 primary care units of La Matanza Health Secretariat. Of these, 15 physicians and 15 nurses were randomly selected to be trained as part of the intervention group, and another group of 15 physicians and 15 nurses served as controls providing standard of care.[4] Each physician-nurse team took care of and followed up with 10 patients with type 2 diabetes for one year, with both groups using structured medical data registry forms to collect patients' data. Significantly fewer patients in the intervention group dropped out of care (28%) compared to the control group (48%) ($p<0.0003$) after one year.[4] There were also significant improvements in the intervention group in HbA1c, diastolic blood pressure (DBP), and lipid fractions at six months, with either sustained or further improvements at 12 months, compared with no significant improvement over the same time periods in the control group. At 12 months, a higher proportion of intervention patients compared to control patients achieved treatment target values for HbA1c (57% vs. 36%, *p=0.004*) and for blood pressure (BP) (73% vs. 59%, *p=0.04*). In addition, both groups showed an increase in the proportion of patients achieving treatment target values for systolic blood pressure and total cholesterol, but this increase was larger in the intervention group.[4]

Resources

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INPUTS

- Existing human resources at PHC centers.
- Financial resources from the government, through taxes for the public health care.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Physicians and nurses provided health services to patients with T2DM.
- Patients accessed care for free, including supplies like insulin, medications, and monitoring tools.
- Patients at risk were given educational material on life-style adaptations.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Nurses underwent an in-person training with theoretical and practical lessons. Modules were designed to foster empathy (e.g. living as a person with T2DM) and to help nurses understand the complexities of caring for patients with T2DM.
- Physicians participated in online training as well as in person practical training.

4 INTEGRATION & COORDINATION

- Physicians and nurses worked together in PHC centers to provide coordinated care for T2DM patients.
- Physicians were given a comprehensive manual with all treatment algorithms.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Training course for providers was offered in a modular fashion through an online platform hosted by Universidad Nacional de La Plata.
- Health care providers used a structured registry both for tracking patient progress and for prompting providers on quality care practices.

OUTPUTS

- **Providers trained (A):** 15 nurse and 15 primary care physicians trained in the modules.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Retention in care (E):** significantly fewer DIAPREM patients dropped out of care (28%) compared to standard of care (48%; *p<0.001*).[4]

DISTAL

- **Patient health outcomes (E):** significant improvements were seen in T2DM patients for HbA1c, DBP, and lipid fractions at 6 months, many of which were sustained or improved by 12 months.[4] At 12 months, 57% of DIAPREM patients had achieved HbA1c treatment targets as compared to 36% of standard of care patients (*p*=0.004). 73% of DIAPREM patients achieved BP treatment targets compared to 59% of standard of care patients.

Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina

A CHRONIC CARE MODEL (CCM)-ADAPTED APPROACH FOR HYPERTENSION CARE IN PRIMARY HEALTH CARE CLINICS

16

Geographic locale	City of Salta Northwestern Argentina
Program setting	PHC clinics
Target disease(s)	Hypertension
Target population	Adults ≥ 18
Partners/Stakeholders	Government Health Secretariat through Health Research Directorate

Background: Argentina is an upper-middle-income country with a population of 46.2 million.[1] In 2019, the age-adjusted prevalence of hypertension was 54.0%[2] for males and 41.2%[2] for females, with an estimated age-adjusted years of life lost of 208.5[3] per 100,000 population for hypertensive heart disease.

Model Overview: In 2016, the Argentine Ministry of Health developed a new model of care for people with chronic non-communicable diseases (NCDs) called "Model for the Care of People with Chronic Diseases" (MAPEC). This model was based on the Chronic Care Model (CCM). It was introduced for the care of people with hypertension and evaluated in three primary health care centers (PHCC) in the city of Salta.

Model Strategy: MAPEC implementation in Salta integrated actions within each of the six components of the CCM:[4,5]

- **Health care organization:** Patients were given "self-monitoring" forms to record their monthly blood pressure (BP) measurements, results of health care inter-consultations, and attendance at educational workshops and physical activities. Patients were actively contacted to attend appointments by telephone or Whatsapp messages.
- **Care provision system:** patients were treated by an interdisciplinary team. Patient BP was monitored monthly by providers using digital sphygmomanometers, with measurements recorded on a follow-up form and medications adjusted as needed.
- **Clinical information system:** complete patient clinical histories were kept in line with clinical practice guidelines (CPG), including requests for inter-consultations and laboratory results.
- **Support for decision-making:** Hypertension CPGs were updated monthly for the entire health care team in a digital format on office computers.
- **Self-management support:** PHC clinic staff offered patients monthly workshops and a weekly physical activity to promote self-management of hypertension. Patients requested appointments and tracked their health parameters on the self-monitoring form. Brochures and posters were displayed in PHC center waiting rooms. A Whatsapp group was created to inform patients of activities.
- **Community resources:** community leaders from the PHC clinic catchment areas were invited to participate in health education workshops on hypertension to discuss shared goals and community needs.

Notable Features of the Model: A unique feature of the MAPEC-SALTA model was its emphasis on improving people-centered care for individuals with hypertension using already available resources and without significant additional expenditures.

Key Messages

- MAPEC aimed to improve hypertension care in several PHC clinics with an interdisciplinary team of already available health care professionals implementing an adapted version of the Chronic Care Model.
- MAPEC promoted patient-centered and proactive care by health care providers, together with patient self-management.
- Systolic and diastolic blood pressure, cardiovascular risk, and diet improved over time among MAPEC patients.

Model Funding: Implementation of the model was financed primarily through the Ministry of Health. Evaluations were funded through Investiga Salud "Dr. Abraam Sonis" scholarships granted by the Government Health Secretariat.[5]

Human Resources: Key personnel for MAPEC were physicians, nurses, nutritionists, and a dentist.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: WhatsApp groups were used to provide patients with updates, reminders, and information regarding workshops, events, and other relevant activities. By utilizing the WhatsApp group, patients could receive timely updates and stay engaged in the program, enhancing their knowledge and involvement in managing their chronic condition. Digital versions of hypertensive CPGs were updated monthly on office computers to enhance decision support for providers.[5]

Impact of the Model: A quasi-experimental, prospective longitudinal study of 232 patients was conducted between June 2018 and January 2019 in the three PHC clinics where MAPEC was implemented in Salta.[5] Patients were evaluated before, during, and after the intervention to assess MAPEC's impact on BP control, dietary measures, knowledge of hypertension, and treatment adherence. Comparing MAPEC patients before and after the intervention, the proportion with controlled BP rose from 46.1% to 76.7% ($p<0.000$). Mean systolic BP (SBP) and diastolic BP (DBP) decreased by 13.0 mmHg and 6.9 mmHg, respectively ($p<0.000$). Likely due to the decrease in SBP, the proportion of MAPEC patients with the lowest level of global cardiovascular risk (GCR<10%) increased from 69.4% to 82.0% ($p=0.017$) over the course of the study. Clinical outcomes that did not significantly improve over time in MAPEC patients were the proportion of patients with abnormal fasting blood glucose, hypercholesterolemia, and hypertriglyceridemia. Treatment adherence (52.2% to 79.7%, $p<0.000$) and knowledge of hypertension (40.5% to 90.5%, $p<0.000$) improved among MAPEC patients over time. Other lifestyle behaviors such as high vegetable and fruit intake, low sodium diets, and sedentariness also significantly improved over time among MAPEC patients, while obesity did not.

Resources

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INPUTS

- Existing human resources for health in PHC centers.
- Financial and/or technical support from the Government Health Secretariat through Health Research Directorate.
- CCM guidelines.
- CPGs for hypertension.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Hypertension patients attended monthly scheduled appointments at PHC centers to have their BP checked; health care providers made medication adjustments as necessary.
- Health care providers held monthly hypertension self-management workshops with patients, as well as weekly physical activity sessions.
- Brochures and posters were displayed in PHC center waiting rooms.

2 COMMUNITY-BASED ACTIVITIES

- MAPEC invited community leaders from the areas surrounding the PHC centers to participate in health education workshops on hypertension, providing an opportunity for community discussion of shared goals and specific needs.

3 TRAINING & CAPACITY BUILDING

- MAPEC distributed hypertension clinical practice and implementation guidelines to PHC centers.

4 INTEGRATION & COORDINATION

- Updates of CPGs for hypertension were made available monthly for health care providers.
- Providers including physicians, nurses, nutritionists, and a dentist were organized into multi-disciplinary teams for patients with hypertension.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Comprehensive patient clinical histories were maintained on a clinical information system and included records of inter-consultations and laboratory analyses.
- WhatsApp was used to create patient groups to provide patients with updates, reminders, and information regarding workshops, events, and other relevant activities.
- CPGs were made available in digital format on office computers.

OUTPUTS

- **Sites equipped (A):** PHC centers provided with hypertension clinical and implementation guidelines.[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E):** Increase of 27.59pp ($p<0.0001$) in adherence among MAPEC patients before and after the intervention.[5]
- **Patient health behaviors (E):**
  - Proportion of MAPEC patients with high vegetable intake (64.2% to 83.2%, $p<0.000$), high fruit intake (57.8% to 71.1%, $p<0.03$), low sodium diets (47.4% to 75.9%, $p<0.000$) increased before and after the study. Sedentarism decreased from 63.4% to 36.2% ($p<0.000$).[5]
  - Proportion of MAPEC patients who were overweight/obese did not decrease (94.4% to 91.4%, $p=0.2$).[5]

DISTAL

- **Patient health outcomes (E):**
  - Proportion of MAPEC patients with controlled BP increased from 46.1% to 76.7% ($p<0.000$) before and after the study.[5]
  - Among MAPEC patients, mean SBP decreased by 12.97mmHg ($p<0.000$) and mean DBP decreased by 6.93mmHg ($p<0.000$).[5]
  - Proportion of MAPEC patients with a global cardiovascular risk of <10% rose from 69.4% to 82.0% ($p=0.017$).[5]
  - Proportion of MAPEC patients with abnormal blood fasting glucose (44.3% to 38.3%, $p=0.13$), hypercholesterolemia (46.8% to 38.8%, $p=0.07$, and hypertriglyceridemia (51.7% vs. 42.8%, $p=0.16$) did not significantly improve.[5]

INPUTS

- Existing primary care clinicians.
- Financed by a Fulbright Scholarship, a grant from the United States National Institute of Health, UM School of Public Health, UM Global REACH, and UM International Institute.
- Developers of IVR, Bolivian health professions to design scripts and translate.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Providers screened patients for depression using PHQ-8 scores.
- Providers screened patients for HTN and DM using standard of care protocol.
- Patients with depression, HTN or DM invited to enroll in IVR.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Primary care teams were trained and oriented to the IVR system.

4 INTEGRATION & COORDINATION

- None reported.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Developed and deployed automated IVR calling system that used the patients' touch tone responses to deliver pre-recorded feedback and tailored advice for self-management.[5,6]

OUTPUTS

- **Coverage (R):** Nearly 200 patients enrolled in IVR studies (32 with depression, 165 with HTN and/or DM).[5,6]
- **Equity (R):** For depression, there were no significant differences observed in PHQ-8 scores or IVR call completion rates based on ethnicity, education level, self-reported depression diagnosis, self-reported overall health, number of chronic conditions, or health literacy.[6]
- Among HTN/DM enrollees, patients with more than 12 years of education had a 2.4 times higher odds of call completion (95% CI 1.2, 4.6, $p<0.001$).[5]

- **Providers trained (A):** PHC teams oriented to IVR at primary care clinics located at 3 hospitals in La Paz and one in El Alto.[5,6]

- **Functioning IVR system (I):** IVR system that auto-called all enrollees multiple times per week; 51-54% completion rates based on condition.[5,6]
- Functioning referral mechanisms (I): IVR system sent alerts to the patient's primary care teams for follow-up at the subsequent visit.[5]

OUTCOMES

PROXIMAL

- **Patient satisfaction (I):**
  - Of the 20 HTN/DM IVR patients who were interviewed, nearly all (19/20, 95%) reported that they would recommend the program to a friend. Most (14/20, 70%) reported that they were very satisfied with the amount of assistance they received through the IVR program.[5]
  - Of the 32 IVR depression patients, 97% reported they were "mostly" or "very" satisfied with intervention. Patients qualitatively reported liking aspects related to self-care, adherence, education, and having someone to ask about their health.[6]

INTERMEDIARY

- No intermediary outcomes reported.

DISTAL

- **Patient health outcomes (E):** HTN/DM patients were more likely to report excellent, very good, or good health via IVR as program progressed, from 64% in week 1 to 88% in week 2.[5]

Matrix Support Model for Chronic Respiratory Conditions and Mental Health Disorders in Brazil

COLLABORATIVE CARE APPROACH DESIGNED TO SHIFT CARE FROM SPECIALIZED SETTINGS TO PRIMARY CARE

17

Geographic locale	Sao Bernardo do Campo city (for COPD and asthma) and Florianópolis (for mental health disorders), Brazil
Program setting	11 primary care basic health units and 49 municipal primary care clinics
Target diseases	Asthma, chronic obstructive pulmonary disorder (COPD) mental health disorders (MHDs)
Target population	Patients > 18 years
Partners/Stakeholders	International Primary Care Respiratory Group and the Municipality of Sao Bernardo do Campo

Background: Brazil is an upper-middle-income country with a population of 215.3 million.[1] In 2019, Brazil had an estimated age-adjusted prevalence of 5.1%[2] for asthma and 2.8%[2] for chronic obstructive pulmonary disease (COPD), with an estimated 33.5[2] and 543.3[2] years of life lost, respectively, per 100,000 population in the same year. In addition, Brazil had an age-adjusted prevalence of mental health disorders (MHDs) of 16.7%[2] in 2019, with estimated 2,118.4 disability adjusted years of life lost per 100,000 population due to MHDs in the same year.

Model Overview: The Matrix Support model was a collaborative care approach that improved communication between primary and specialized care, to support patient-centered care in the community. The model aimed to shift care from specialized settings to primary care, building on principles of academic detailing and educational outreach to improve identification, diagnosis and treatment in community settings and enhance health care delivery. It also included interventions to strengthen primary care workforce skills and knowledge, and to improve the appropriateness of referrals to specialists. Overall, it promoted shared care and strengthened the partnership between primary and specialized health care providers to improve patient outcomes.[3]

Model Strategy: With regards to COPD and asthma, the implementation of the matrix support model focused on reducing respiratory-related referrals and improve primary care management in an area where there was limited access to specialist services. Implementation of the model first involved securing the commitment of the basic health unit (BHU) manager through discussions and information sharing, which ensured their active support throughout the process. Second, the strategy prioritized patients who were referred to pulmonologists but had not yet been consulted, referring them back to their respective BHUs. Consultations were re-scheduled at the BHUs through telephone contact and home visits by community health workers (CHWs). Third, standardized workshops led by pulmonologists and a primary care physician expert on matrix support were conducted for BHU family doctors, nurses, and managers, focusing on asthma and COPD management and including clinical case discussions to enhance skills and knowledge. Training sessions emphasized the importance of strengthening the role of nurses and of collaborating across traditional boundaries to implement effective and efficient protocols for accessing pulmonology care.[3] Fourth, the joint consultations were facilitated between primary care physicians and pulmonologists during patients' initial visits, to promote collaboration and knowledge exchange. These were followed by individual case discussions and/or roundtable note-based case discussions, which further contributed to ongoing learning and improvement in asthma and COPD management.[3]

With regards to mental health disorders, the Matrix Support model aimed to integrate clinical and administrative procedures between primary care and mental health teams during the initial stage between 2005 and 2010. The outpatient referral system was replaced by regular meetings between the two teams, during which they conducted collaborative activities like case discussions, joint visits, on-site training, and agreed on and monitored treatment plans. Ongoing communication between meetings was encouraged. In the second stage between 2010 and 2015, the model was expanded to other health areas, and mental health professionals were integrated in the broader Family Health support teams as part of the federally-funded Núcleo de Apoio à Saúde da Família (NASF) program. Programme management shifted to middle managers who supported a broader range of professionals (e.g. physiotherapists and dietitians), which meant that fewer resources were available to support the integration between primary care and mental health professionals.[4]

Notable Features of the Model: The Matrix Support model incorporated personalized training and support for healthcare staff, structured follow-ups, and promoted collaboration and communication across primary and specialist care as well, as multi-professional care, to support patient-centeredness. Its focus on improving the appropriateness of referrals is an effective strategy to optimize the use of

Key Messages

- The Matrix Support model aims to shift care from specialized settings to primary care and support patient-centeredness, by promoting communication and collaborative, multi-professional care.
- The implementation of the Matrix Support model had a positive impact on the management of asthma and COPD, with reduced referrals, improved medication dispensing, increased knowledge, and high acceptance among primary care professionals.
- When implemented with sufficient on-site support to facilitate the clinical and administrative integration of primary care and mental health teams, the Matrix Support model was associated with improved diagnosis and treatment of mental disorders by GPs.

scarce specialist resources. In addition, it also aimed to foster community-based integration, which facilitates convenient access to health services and timely and appropriate care within the local community. More broadly, the matrix support model was also expanded to other areas like rehabilitation and nutritional care and scaled-up as part of the federally funded NASF (Family Health Support Teams) programme, which covered over 4000 teams in 2016.[4]

Model Funding: The implementation of the Matrix Support model for asthma and COPD was made possible through an educational grant from the International Primary Care Respiratory Group and an unrestricted grant from the Municipality of Sao Bernardo do Campo.[3]

Human Resources: In both instances, the implementation of personnel for the BHU team were family physicians, nurses, nursing assistants, and community health workers, as well as hospital-based pulmonologists.[3] General practitioners (GPs) and mental health professionals were responsible for the diagnosis and treatment of MHDs, and in the first phase, the support to the clinical and administrative integration was provided by one full-time mental health worker for 50 primary care practices. In the second phase, program management was shifted to middle managers who were responsible for overseeing a wider range of multi-professional care programs that needed to converge to support patient-centered care.[4]

Laboratory, Diagnostic, or Pharmacy Services: For asthma and COPD, there were no significant changes to existing laboratory or pharmacy services, although increased dispensing of beclomethasone propionate inhalers was mentioned, indicating that patients with asthma were not properly treated before.[3]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: An observational study conducted from 2013 to 2014 piloted the implementation of the Matrix Support model in three health territories in the city of Sao Bernardo do Campo to reduce respiratory-related referrals.[3] Nearly all PHC providers in the three areas were trained on the model (132 of 157, 87%). The primary outcome was that referrals for asthma and COPD declined from 13.4 to 5.4 cases per month ($p=0.09$). Similarly, referrals for other lung diseases decreased from 10.8 to 5.3 cases per month ($p<0.05$). Additionally, there was a 43% increase (from 804 canisters to 1,150) in the dispensing of beclomethasone propionate inhaler canisters (MDI 250 mcg or DPI 50 mcg) in the five months following the start of the matrix program. Knowledge scores among providers showed significant improvements following implementation of the model ($p<0.001$). Overall, the study's findings indicate that the implementation of the Matrix Support model had a positive impact on the management of asthma and COPD, with reduced referrals, improved medication dispensing, increased knowledge, and high acceptance among primary care professionals.

A retrospective cohort study assessed trends in the diagnosis and treatment of MHDs in 49 primary care clinics in Florianópolis, after a matrix support model was introduced in two stages.[4] The model was applied to MHDs only in stage 1 (2005-2009) and then expanded to other health areas in stage 2 (from 2010) as part of the NASF program. Among 322,100 patients included in the analysis, 58,179 (18%) ever had a mental disorder recorded. While the odds of receiving a mental disorder diagnosis during a visit with a general practitioner (GP) initially increased by 13% per year during stage 1 (OR 1.13, 95% CI 1.11 to 1.14, $p<0.001$), these odds decreased by 5% per year thereafter during stage 2 (OR 0.95, 95% CI 0.94 to 0.95, $p<0.001$), and the odds of diagnosing incident MHDs decreased slightly in both stage 1 and 2. Nevertheless, between 2005 and 2015, the number of visits with MHDs recorded over a year increased from 3,964 to 25,618, and the number of patients with MHDs recorded over a year increased from 2,545 to 12,689.[4] The odds of prescribing an antidepressant to patients with a mental disorder diagnosis increased by 7% per year during stage 1 (OR 1.07, 95% CI 1.05 to 1.20, $p<0.001$) and by 9% during stage 2 (OR 1.09, 95% CI 1.08 to 1.10, $p<0.001$); however, the odds of antidepressant prescriptions did not increase during stage 1 (OR 1.00, 95% CI 0.97 to 1.02, $p=0.665$) and increased only slightly during stage 2 (OR 1.03, 95% CI 1.00 to 1.04, $p<0.001$), potentially reflecting increased treatment at the primary care level of previously diagnosed patients. Changes per year were all significantly greater during stage 1 than stage 2 (except for antidepressant prescriptions during visits) which study authors suggest might be due to the decreased on site management support provided in stage 2, with more competing demands placed on the primary care teams.[4]

Resources

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INPUTS

- For asthma and COPD, existing human resources at BHUs, including family physicians, nurses, nursing assistants, and CHWs, and pulmonologists at specialty facilities.
- For MHDs, primary care and mental health professionals assigned to the 150 teams working across 49 municipal primary care clinics as part of the Family Health Strategy.
- For asthma and COPD, financial resources from International Primary Care Respiratory Group and the Municipality of Sao Bernardo do Campo.

PROGRAM ACTIVITIES

1

FACILITY-BASED ACTIVITIES

- Patients were diagnosed by primary care physicians in collaboration with pulmonologists or mental health professionals.
- Patients who were referred to pulmonologists but had not yet been consulted were referred back to their respective BHUs for further management.

2

COMMUNITY-BASED ACTIVITIES

- Consultations at BHUs were re-scheduled through telephone contact and home visits by CHWs.

3

TRAINING & CAPACITY BUILDING

- Standardized workshops were conducted for BHU family physicians, nurses, and managers, focusing on asthma and COPD management and clinical case discussions to enhance skills and knowledge.
- On site training was provided during regular meetings between primary care and mental health teams through discussion of diagnostic criteria, screening during routine consultations and feedback about GP referrals to mental health professionals.

4

INTEGRATION & COORDINATION

- For asthma and COPD: joint consultations were held between primary care physicians and pulmonologists for patients' initial visits to facilitate collaboration and knowledge exchange. They subsequently held individual case discussions and roundtable note-based case discussions to support ongoing learning and improvement in asthma and COPD management.
- For MHDs: regular meetings between primary care and mental health teams replaced the outpatients' referral system. Teams used these meetings to jointly agree on and monitor treatment plans, conduct case discussions or joint visits. Additional support to facilitate integration was provided by a dedicated programme manager in stage 1, and by middle managers in stage 2.

5

TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Coverage (R)**
  - While the odds of receiving a mental disorder diagnosis during a GP visit initially increased by 13% per year during stage 1, these odds decreased by 5% per year during stage 2. Nevertheless, between 2005-2015, the number of visits with MHDs recorded during a year increased from 3,964 to 25,618.[4]
  - Number of patients with MHDs recorded during a year increased from 2,454 to 12,689.[4]
  - **Treatment (R):** Between 2005-2015, the number of patients with any antidepressant prescribed during a year increased by 5716, and by 992 for patients with first time prescriptions.[4]

- **Providers trained (A)**
  - For asthma and COPD, 132 of 157 (87%) health care providers were trained in all 3 territories, and primary care providers showed significant improvement in knowledge scores ($p<0.001$).[3]

- **Compliance with guidelines (A):** Dispensing of beclomethasone propionate inhaler canisters (MDI 250 mcg or DPI 50 mcg) increased by 43% from 804 to 1,150 within 5 months of trainings.[3]
- **Functioning referral mechanisms (I)**
  - Referrals dropped by 50% from 290 in the year before matrix support to 134 the year after.
  - Monthly referral rate for asthma and COPD decreased from 13.4 to to 5.4 cases ($p=0.09$), and from 10.8 to 5.3 cases ($p<0.05$) for other lung diseases.[3]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia

LEVERAGING TECHNOLOGY TO IDENTIFY AND CARE FOR PEOPLE WITH DEPRESSION AND ALCOHOL USE DISORDERS

18

Geographic locale	Urban and rural regions of Colombia
Program setting	PHC centers (both urban and rural)
Target disease(s)	Depression, alcohol use disorder
Target population	Adults >18 screened for depression and alcohol use disorder
Partners/Stakeholders	Research Partnerships for Scaling Up Mental Health Interventions in Low- and Middle-Income Countries (Scale-Up Hubs) program of the United States National Institute of Mental Health, the Detection and Integrated Care for Depression and Alcohol Use in Primary Care Project

Background: Colombia is an upper-middle-income country with a population of 51.9 million.[1] In 2019, Columbia had an estimated age-adjusted mental health disorder (MHD) prevalence of 12.1%[2], and an estimated disability-adjusted life years of 1,461.2[2] per 100,000 population due to MHDs.

Model Overview: The DIADA (Detection and Integrated Care for Depression and Alcohol Use in Primary Care) model, launched in February 2018, aimed to leverage technology to identify and care for people with depression and alcohol use disorders (AUD) within urban and rural primary care settings. The core components of the model included: (1) *a one-day training,* (2) *waiting room kiosks for patient screening,* (3) *a tablet-based clinical decision support tool to support diagnosis and initiate treatment,* and (4) *a digital therapeutic software tool for patients with depression and AUD*. The implementation targeted six primary care clinics (urban, small, and large town) in Colombia.[3]

A 2022 paper focused on the implementation science and scale-up of the DIADA model reported plans to launch this mental health service delivery model at multiple primary care sites in Colombia to inform scale-up in other Latin American countries, including Chile and Peru.[9]

Model Strategy: Implementation of the DIADA model involved several components: (1) a one-day *training* on-site led by a DIADA psychiatrist for primary care providers, focusing on the assessment and care of individuals with depression and AUD and integration of the waiting room screening tool into the current patient workflow; (2) *patient screening* for which patients were directed to dedicated kiosks in clinic waiting rooms, where they completed screening using the Whooley test for depression[4] and the AUDIT-C[5] for unhealthy alcohol use. Positive results prompted patients to complete the full Patient Health Questionnaire (PHQ-9)[6] or Alcohol Use Disorders Identification Test (AUDIT) questionnaire;[7] (3) *clinical decision support* involved use of a tablet-based clinical decision support tool to guide doctors in making a diagnosis and when indicated, initiating treatment based on Colombian clinical guidelines; and (4) *digital therapeutic software* offering evidence-based behavioral therapy, provided to patients diagnosed with depression or AUD.[3]

Notable Features of the Model: Three notable features of DIADA model included: (a) waiting room screening which invited depression and alcohol use as a health topic for discussion in the primary care visit, (b) change in routine flow of patient care, and (c) utilization of technology to support various aspects of care, which included screening, clinical decision-making support for providers via tablet applications, and the provision of software offering behavioral therapy for depression and AUD to diagnosed patients.[3]

Key Messages

- DIADA implementation increased screening and diagnosis rates for depression and AUD in primary care clinics.
- The PHQ-9 scoring predicted a diagnosis of depression well (73%) but the AUDIT scoring performed less well (38% subsequently diagnosed with AUD).
- Technology-enhanced screening and clinical decision support in DIADA proved feasible and significantly improved diagnoses of depression.

Model Funding: Implementation of the DIADA project is financed by the Research Partnerships for Scaling Up Mental Health Interventions in Low- and Middle-Income Countries (Scale-Up Hubs) program of the United States National Institute of Mental Health.[3]

Human Resources: Key personnel for the DIADA model were existing primary care providers and DIADA psychiatrists, with the latter providing training for primary care providers and back-up telephone consultation for primary care doctors if they had questions.[3]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: Digital solutions for the DIADA project included a waiting room kiosk for screening depression and AUD, a tablet-based clinical decision support tool for physicians to support diagnosis and treatment, and a software tool for patients with depression and AUD. The software called Laddr (available as a smartphone application or as a web-based version compatible with desktop or laptop computers) provided evidence-based behavioral therapy. Waiting room kiosks printed paper-based results for patients to hand to the doctor and also electronically sent reports to the doctors to be displayed on their tablet. Tablet and the electronic screening data were not integrated into electronic medical records because of cost constraints.[3]

Impact of the Model: An interim report published after the first year of DIADA implementation in two primary care clinics—one urban and one in a small town—reported that a total of 2,656 individuals were screened for depression and AUD between February 2018 and February 2019.[3] The percentage of patients who were diagnosed with depression and AUD by primary care doctors increased from nearly zero to 17% and 2%, respectively. A significantly higher proportion of women compared to men screened positive for depression (13% vs. 9%, $p<0.01$) and were given a diagnosis (18% vs. 15%, $p=0.04$). In contrast, for AUD, a lower proportion of women as compared to men screened positive (2% vs. 11%, $p<0.01$) and were given a diagnosis (1% vs. 5%, $p<0.01$). Age-related differences revealed no significant disparities in depression screening and diagnosis, but younger individuals (aged 18-44 years) compared to those aged 45 years and older were much more likely to screen positive for AUD (11% vs. 3%, $p<0.01$) and be given a diagnosis (5% vs. 1%, $p<0.01$).

Overall, the DIADA screening and diagnosis rates and distribution of patients by age and sex were aligned with expectations based on a recent nationwide Colombian mental health survey. Considering the use of the PHQ-9 and AUDIT screening tools in primary care, doctors in the study diagnosed depression at an expected prevalence (73% of individuals with a PHQ-9 score of ≥10 were diagnosed as having depression), but diagnosed AUD at a lower-than-expected prevalence (only 38% of patients with an AUDIT score of ≥8 were diagnosed as having AUD). Roughly half of patients diagnosed with depression (55%) or AUD (56%) joined the study, giving them access to the digital therapy software. These early findings indicated that DIADA's technology-supported screening and decision support

for depression and AUD in primary care clinics was feasible and dramatically increased diagnosis of depression and, to a lesser degree, AUD in these primary care settings in Colombia.

Between February 2018 and March 2020, a modified step wedge study of the DIADA model of care was conducted in six urban and rural primary care centers in Colombia.[8] During this study period, 16,188 patients were screened for depression and AUD. The overall prevalence of general practitioner (GP) confirmed depression diagnosis was 10.1% and GP-confirmed AUD diagnosis was 1.3%. Patients with a depression diagnosis were primarily middle-aged women, and patients with unhealthy alcohol use tended to be young adult men. Compared to the general population, the prevalence of depression in this study was higher and the prevalence of AUD was lower, which may be due to the demographics of the study population, who were primarily women and patients seeking medical care.

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INPUTS

- Existing primary care doctors; psychiatrists (for training primary care doctors).
- Financial support from by Research Partnerships for Scaling Up Mental Health Interventions in Low- and Middle-Income Countries (Scale-Up Hubs) program of the United States National Institute of Mental Health.
- Tablets for digital screening and decision support tools.
- Screening tests (AUDIT-C, AUDIT, PHQ-9, Wholly test).
- Waiting room kiosk.
- Laddr software.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Training for primary care providers.
- Patient screening.
- Decision-supported diagnosis.
- Use of "Laddr" software to provide evidence-based behavioral therapy.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Primary care doctors underwent a 1-day on-site training by a DIADA psychiatrist, focusing on the assessment and care of individuals with depression and AUD, including integration of the waiting room kiosk screening tool into the current workflow.

4 INTEGRATION & COORDINATION

- None reported.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Patients were directed to kiosks in clinic waiting rooms, where they completed screenings for depression and unhealthy alcohol use.
- Primary care doctors received the results of the screening tests through both kiosk printouts and electronic results sent to tablets equipped with a clinical decision support tool; this decision support tool guided doctors through diagnosis and, when required, treatment initiation based on Colombian clinical guidelines.
- Evidence-based behavioral therapy software (Laddr application) was offered to patients. Laddr is available as a smartphone application or as a web-based version compatible with desktop or laptop computers.

OUTPUTS

COVERAGE (R)

- **Screening:** After 1 year of implementation, 2,656 individuals screened for depression and AUD in the first year of implementation.[3]
- Between February 2018 and March 2020, 16,188 patients were screened for depression and AUD in 6 primary care centers.[8]
- **Diagnosis:** Diagnosis of depression and AUD increased from near 0 to 17% and 2%, respectively.[3]
- GP-confirmed depression diagnosis was 10.1% and AUD diagnosis was 1.3%.[8]
- **Treatment:** 55% of patients diagnosed with depression and 56% of patients diagnosed with AUD enrolled in the study and gained access to digital therapy Laddr software.[3]

- **Providers trained (A):** Providers received training about integrating digital tool into service provision.[3]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

Community-oriented PHC Model for NCD Care in Costa Rica

A LONG-TERM HEALTH SYSTEM REDESIGN BRINGING COMPREHENSIVE CARE TO THE PHC LEVEL

19

Geographic locale	Costa Rica
Program setting	Nationwide network of primary care facilities organized in a community-based clinic model
Target diseases	Initially maternal and child health conditions; later NCDs, including cardiovascular disease, cancer, respiratory conditions, diabetes, and hypertension
Target population	Total population
Partners/Stakeholders	Costa Rican Social Security Fund

OVERVIEW

Costa Rica, a regional leader in health care delivery, has a universal health care system known as the Caja Costarricense de Seguro Social (CCSS) or the Costa Rican Social Security Fund, which assumed full responsibility of the PHC system under the 1995 Costa Rican Health Reform.[1] The reform transferred public health and primary care activities from the Ministry of Health to the CCSS, which was already providing secondary and tertiary care to the country's citizens, making CCSS responsible for all aspects of health care provision.[2] This integration of preventive and curative services facilitated the vertical and horizontal redesign of care, with a focus on NCDs.[2] The PHC model adopted by CCSS is based on the PHC model advocated by the World Health Organization and emphasizes community and family health first.[3]

A robust quality improvement system allows the system to adapt over time to meet population needs.[4] The health system conducts a health needs assessment every two years, which allows it to identify emerging threats and priorities. In the 1997 and 1999 needs assessments, NCDs emerged as priority issues that demanded increased attention.[4] Action items that emerged from the assessments included promoting healthy lifestyles; creating registries for hypertension and diabetes; and assessing risk, lipid profiles, and glycemic control for diabetic patients.[4] As such, the model which initially focused on pediatric care, maternal health, vaccine coverage, and infectious disease, evolved in the late 1990s to focus on NCDs, including diabetes and hypertension.[4]

Within this decentralized model of care, Costa Rica has a network of health clinics and community health centers known as EBAIS (Equipos Básicos de Atención Integral en Salud), which provide primary care services to the population.[2] EBAIS clinics are staffed with multi-disciplinary teams and responsible for managing the health of specific catchment areas.[2] They also coordinate referrals to higher levels of care when necessary and linkages to the community and home visits as needed.

NOTABLE FEATURES OF THE MODEL

The Costa Rican model is a leader in the region for gradually consolidating, improving, and expanding its PHC system.[1] The EBAIS teams are multi-disciplinary and include a physician based at each clinic. The CCSS health system

established new geographical divisions of the country to create a unique and universal PHC system.[1] Creating health sectors, health areas, and health regions allowed for geopolitical division of districts and geographic enrollment of the population, which is critical to providing continuity of care, particularly for NCD patients.[4]

BURDEN OF NCDS

Costa Rica is an upper-middle-income country with a population of 5.2 million.[5] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Costa Rica was 8.8%.[6] In 2019, the estimated age-adjusted prevalence of hypertension was 36.0%[7] for males and 39.4%[7] for females and the estimated age-adjusted prevalence of cardiovascular disease (CVD) was 5.7%.[8] In 2019, the estimated age-adjusted years of life lost were 207.1,[8] 152.8,[8] and 2,284.9[8] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

In Costa Rica, most of the citizens' health care is delivered by one public institution, the CCSS. In 1943, CCSS was established to provide health insurance for salaried workers but moved in 1961 to include workers' dependents.[3] The Ministry of Health and the Social Security expanded their coverage of PHC and both specialized outpatient and inpatient services for those in rural areas and lower-income and vulnerable groups in 1961 after a series of laws, regulations, and agreements were made.[3] In 1978, a voluntary group for independent workers who could receive partial public subsidies was established. In the 1970s, there was the large expansion of the highly skilled PHC providers teams to serve those not covered by the social health insurance.[3] Furthermore, reforms aimed at separating the stewardship function from the purchasing and provision, primary and other health care units were transferred from the Ministry of Health and merged with the health care services already provided by CCSS.[3] This vision was to move progressively to integrate first, second, and third level of care, which would improve the continuum of care.[3] Although there is a private market available with private providers, their market share is small, whereas the CCSS has wide coverage.[1] By 2013, 94% of the population was covered by the CCSS.[1,9]

Health System Structure

Costa Rica's health system is a three-tiered system. The first level of care provides health promotion and prevention services in basic health center units.[3] The second level of care provides specialized consultations with hospitals, and medical and surgical treatments for certain basic specialties.[3] The third level of care provides specialized services, along with complex medical and surgical treatment, primarily found in the capital city.[3]

Costa Rica is organized into health sectors. A health sector is a geopolitical division of a district and covers a specific geographic area in the country with approximately 4,000 individuals in it.[1] Each health sector belongs to a health area, which in turn belongs to a health region.[1] A health area manages five to 15 health sectors, which is approximately 30,000-110,000 individuals.[1] A health region is the largest organizational unit and covers a geographic area of six to 32 health areas. Costa Rica has 105 health areas, spanning seven health regions.[1]

Model Strategy

The model strategy is underpinned by the EBAIS clinics which provide holistic PHC inclusive of NCD management, to their patient population throughout their lives.[1,2] Patients are registered and empaneled by medical clerks at the clinic based on geographic location; they see a physician, nurse, and pharmacist as necessary. The community health worker (CHW), a member of the EBAIS team, conducts educational group sessions at community-based venues (i.e., in a church, schools, town centers), and follows-up with patients in the home when needed.[2]

Empanelment for the EBAIS teams promotes first-contact access to patients in the community, by being the first health professional to see the patient for any non-emergency issue, along with continuity and coordination of care over time between the patient and team.[2] Based on where one lives, all citizens are assigned to an EBAIS team.[2] Each EBAIS team has a panel of approximately 4,500 patients. During at-home visits, EBAIS teams collect data on anthropometric measurements, vital signs, home safety and sanitation, familial behavioral and environmental risk factors from their patients.[2]

A standardized regional referral network provides best practices for patient navigation through the health system. The system mandates that patients must receive referrals from a primary care physician to receive specialty care, a process called gatekeeping. Patients can only bypass referrals to receive care at secondary or tertiary facilities in emergency situations. The system also utilizes dual referrals, in which secondary or tertiary care facilities refer patients back down to lower tiers of the health system when care can be adequately managed there, reducing the burden on higher level care facilities.[10]

Model Funding

By 2003, the Costa Rican government had contributed over US$200 million toward strengthening PHC services, with early support from multiple development banks and bilateral donors.[11,12] The governance and financing of CCSS health insurance follows the traditional tripartite model of Latin American Social Security institutions, with three key stakeholders for financing: employees, employers, and the government.[3] Fiscal resources provided by the central government provide subsidies for all the establishments and its contributions as an employer.[3] All sources of funding are then merged into a single pool managed by the central financial administration unit of CCSS. This large social health insurance pool allows resources to flow to the administrative and health care units. Resources are then allocated through line-item budgets.[3]

Human Resources

The multi-disciplinary EBAIS teams are foundational to this model and responsible for direct PHC delivery.[1] Each EBAIS team cares for a health sector (with a patient base of 4,000-5,000).[10] This team is comprised of four to five primary care workers, typically a physician, a nurse or nursing assistant, a CHW/technical assistant, a medical clerk, and sometimes a pharmacist.[1,10] The staffing of the EBAIS, by design, promotes integration between clinical and preventive care. Clinical care is provided by physicians and pharmacists: physicians see patients in clinics, providing curative and preventive care, through diagnosing, treating, and managing acute and chronic conditions, while pharmacists prescribe necessary medications.[2] Technical assistants primarily provide preventive care including health promotion, disease prevention, and sanitation activities by conducting home and community visits. Technical assistants also collect epidemiological data, assess risk factors, and can provide referrals to physicians or hospitals as necessary. Nurses bridge this gap by providing basic clinical care and health education and counseling in clinics.[2,10] The medical clerk conducts patient intakes and data collection, along with data management and epidemiological population health surveillance.[2] Support staff within these health sectors may include family doctors, social workers, psychologists, nutritionists, dentists, laboratory technicians, and radiology technicians.[1]

Laboratory, Diagnostic, or Pharmacy Services

CCSS funds services that cover all health needs of the country, including the EBAIS teams, medications, and lab tests.[13] If a patient requires a special medication or service not typically offered there, they can submit a claim to the CCSS for this purchase.[13] Each EBAIS clinic has its own pharmacy, managed by a certified pharmacist.[10]

Digital Solutions

Through an electronic medical record (EMR) data system, EBAIS teams collect data on anthropometric measurements, vital signs, home safety and sanitation, and familial behavioral and environmental risk factors from their patients during at-home visits.[2] The data is then sent to the health area and then back to the CCSS.[2] The CCSS compiles the data and feeds that information back to the health areas and to the EBAIS teams, allowing for their performance to be assessed against the targets established through management contracts with the CCSS.[2] If a health area falls short of its goals, it creates an action plan to achieve its target within the following year.[2]

IMPACT OF THE MODEL

The model significantly reduced mortality, improved access to care in Costa Rica, and helped to end a decade of stagnant progress on some indicators, such as life expectancy.[1-3,14,15] Early evaluations done in 2004 using geographic information system-based study methods found that health areas, which are ranked annually for quality of clinical services, improved access to primary care services by decreasing the distance from home to an outpatient care clinic by 15%.[15] Another evaluation in 2004, using a quasi-experimental design with outcome measurements before and after the adoption of the health sector reform in different areas of the country, found that the adoption of the reform significantly reduced mortality in adults due to chronic diseases by 2%.[14] This evaluation estimated that the reform saved approximately 120 childrens' lives and 350 adult lives in the year 2001 alone.[14] Equity in access to PHC improved as a result of the health reform being launched first in the less densely populated and less socioeconomically developed areas.[14]

A more recent 2022 evaluation using a stepped wedge design found that opening a health area is associated with a strong and persistent decline in age-adjusted mortality rate (AMR), with the strongest effect upon NCDs compared to other causes of mortality. AMR decreased by 10% (38 fewer deaths per 100,000) in five years after opening a health area.[1] Nine years after opening a health area, the AMR decreased by 13% (49 fewer deaths per 100,000), primarily due to reduction in deaths among adults over 65 and deaths from NCDs, including heart attack, strokes, and diabetes.[1]

COSTING

The cost of the EBAIS model was a concern for some stakeholders, as it included some expensive components, including posting physicians in all EBAIS teams. However, the reform has been proven to be cost-effective. The return on the initial investment is estimated to be 70%. For each US$1 spent, Costa Rica received US$1.70 back in improved health outcomes, worker productivity, and quality of health services.[10] Total benefits from the model are estimated to be over US$409 million.[11]

LESSONS LEARNED

CCSS was first available as social security insurance in 1941, creating the foundation for a system-wide commitment to expand service coverage. More than 80% of the Costa Rican population was eligible for CCSS by 2000.[16] A team-based model of care provided for a supportive facility infrastructure, in which EBAIS services were delivered in buildings designed for these teams and the delivery of PHC.[16] An increasing burden of NCDs and the aging population in Costa Rica continues to be a challenge for the system, and adapting in response to the national bi-annual needs assessment is critical.[16]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Geographic empanelment of the population was crucial to the success of this model. It was necessary to identify patients, assemble a cadre of providers, and conduct proactive population health management.[4]

Investing in horizontal approaches will be a more durable option to provide primary care over the next 20 to 30 years.[4] Secondary prevention will also be an important consideration for future models. For example, systems should consider, once someone develops hypertension or diabetes, how to delay the potential severe consequences of the disease including myocardial infarction, stroke, etc.[4]

Resources

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INPUTS

- Existing human resources at EBAIS clinics.
- Financial resources from the universal health care system: CCSS.
- Network of health clinics and community health centers: EBAIS.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- EBAIS clinics provide holistic PHC, inclusive of NCD management, to their patients throughout their lives.
- Patients are registered and empaneled by medical clerks at the clinic, and receive the following services as needed:
  - Physicians provide curative and preventive care.
  - Pharmacists prescribe necessary medications for an in-house pharmacy.
  - Technical assistants provide preventive care, health promotion, collect epidemiological data, assess risk factors, and provide referrals to physicians or hospitals as necessary.
  - Nurses provide basic clinical care, health education, and counseling.

2 COMMUNITY-BASED ACTIVITIES

- CHWs conduct educational group sessions at community-based venues (i.e. in a church) and conduct home-based follow-up visits with patients when needed.
- During at-home visits, EBAIS team providers collect data on anthropometric measurements, vital signs, home safety and sanitation, familial behavioral and environmental risk factors from their patients.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- Based on where one lives, all citizens are assigned to an EBAIS team. Each EBAIS team has a "panel" of approximately 4,500 patients.
- EBAIS clinics are staffed with multi-disciplinary teams of providers responsible for managing the health of specific catchment areas, from community-based care through referrals as necessary. Teams are comprised of 4-5 primary care workers.
- Patients must receive referrals from a primary care physician to receive specialty care, except in emergency situations.
- Secondary or tertiary care facilities refer patients back down to lower tiers of the health system when care can be adequately managed there.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- EBAIS teams coordinate care at all levels (including community health surveillance visits) through an electronic data system.
- CCSS compiles data and feeds it back to health areas and EBAIS teams for performance assessments against established targets.

OUTPUTS

EQUITY (R)

- **Geographic reach –** establishment of health areas decreased distances from patient's homes to an outpatient care clinic by 15%, improving access to care.[19]
- **Socio-economic equity –** the health reform was first launched in less densely populated and less socio-economically developed areas, with focus on less developed regions of the country first, increasing equity coverage of services.[18]

- **Functioning referral mechanisms (I) –** each region has an established referral network for easy navigation and to reduce the burden on higher levels care facilities.[10]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E) –** AMR decreased by 10% (38 fewer deaths per 100,000) within 5 years after opening a health area and 13% (49 fewer deaths per 100,000) within 9 years, primarily attributed to reduction in deaths of adults over 65 and deaths from NCDs, including heart attack, strokes, and diabetes, among others.[1]
- **Neutral or Improved cost-benefit (M) –** for each US$1 spent, Costa Rica received US$1.70 back in improved health outcomes, worker productivity, and quality of health services.[10] Total benefits from the model are estimated to be over US$409 million.[12]

Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis in Jamaica

TASK-SHARING TO TREAT ACUTE PSYCHIATRIC DISORDERS AT THE COMMUNITY LEVEL

20

Geographic locale	Jamaica
Program setting	Public primary health clinics, outpatient departments, and health centers
Target diseases	Mental disorders, including psychosis
Target population	Adults ≥18 years
Partners/Stakeholders	Ministry of Health of the Government of Jamaica, Caribbean Institute of Mental Health and Substance Abuse

OVERVIEW

Jamaica, an upper-middle-income Caribbean island country, has gradually decentralized and deinstitutionalized its mental health care system since gaining political independence in 1962.[1] It was the first English-speaking country in the Caribbean to implement mental health policy reform in 1974 by introducing 125 mental health clinics island-wide and fully integrating mental health services in all 375 health centers by 2011.[2-4] Most care for patients with mental health conditions occurs at the primary or secondary levels.

The Community Engagement Mental Health (CEMH) Model for Home Treatment of Psychosis is a fully integrated PHC model that provides innovative community mental health services.[1] The model is implemented in one of four regional health authorities in the country, serving a population of 700,000.[1] Using a task-sharing approach to shift care from psychiatrists to trained mental health officers (MHOs) and mental health nurse practitioners (MHNPs), the CEMH model focuses mainly on social inclusion and collaboration with patients, family, and community members to manage crises, rather than inpatient care.[1] The CEMH model helped to expand the role of the mental health team, making mental health services, previously only available in facilities, more collaborative and accessible.[2]

NOTABLE FEATURES OF THE MODEL

Patient social inclusion and functioning are the primary outcomes of the CEMH model, with symptom relief being secondary, unique from other mental health models of care.[1] The CEMH model employs a task-sharing approach that engages MHOs at a community level and focuses on community-based care, social inclusion, and collaboration with patients as an alternative to hospital-based mental health care.[1] The CEMH service has no psychiatric beds, operating public mental health clinics in outpatient departments and health centers in one of the four regions.[1] The CEMH model has been legally and administratively integrated into the primary care system.[1]

BURDEN OF NCDS

Jamaica is an upper-middle-income country with a population of 2.8 million.[5] In 2015, the estimated prevalence of depression and anxiety in Jamaica was 4.8%[6] and 5.7%,[6] respectively. Depression and anxiety accounted for an estimated 8.5%[6] and 5.2%[6] of total years lived with disability in Jamaica.

IMPLEMENTATION CONTEXT

Health Policy Environment

The Mental Health Act of 2000 is the primary legislation governing mental health services in Jamaica. It outlines the rights of individuals with mental health conditions, the criteria for involuntary admission, and the establishment of mental health facilities.[2,8] Amendments (such as in 2009 and 2013) have been made to strengthen protections and ensure compliance with international standards, including a focus on deinstitutionalizing the mental health system.[2]

Health System Structure

Jamaica's health system is made up of both a public and private sector. The public sector is fully financed by the government through taxes, and all Jamaican citizens have access to free health care.[2] The public sector provides services through 375 health centers and 24 hospitals in the country.[2] The private sector is financed through insurance or patient fees-for-service.[2] Though 95% of the country's hospital beds are in the public sector, approximately 65% of Jamaican doctors work in the private sector through private practices.[2] Almost 90% of the Jamaican population lives within a 10-mile radius to a health center, which creates greater access and equity for the population.[2]

Model Strategy

The CEMH model uses a decentralized, task-shifting approach focused on social inclusion and patient collaboration, while providing acute crisis response and home treatment as an alternative to inpatient care for mental health.[1] Patients are encouraged to maintain self-sufficiency, and care is shifted from hospitals to community-level care, allowing for patients to maintain social networks and inclusion.[1]

Patients are encouraged to maintain their social responsibilities and service providers provide support when this is not possible alone. Patients and families are supported through psychoeducation to develop social support networks for monitoring and delivery of psychosocial care during acute episodes and during maintenance phases.[1]

Task-sharing shifts the delivery of interventions from psychiatrists to MHOs and MHNPs, allowing psychiatrists to serve in a more clinical supervisory and administrative role, overseeing a larger patient base.[1] To accomplish this, a significant portion of implementation is dedicated to training the workforce. Emergency calls and crisis response are directed to mobile crisis teams comprised of MHOs who make home visits with a team including psychiatric aides.[7]

Model Funding

The PHC system is financed primarily by the Ministry of Health of the Government of Jamaica. The CEMH model implementation is part of the PHC system.[1]

Human Resources

The mental health workforce has substantially increased in Jamaica over time. In 2019, the country had 40 psychiatrists, 100 MHOs, 15 psychiatric nurse practitioners, 400 community psychiatric aides, and 108 clinics psychologists for a population of 2.7 million, allowing anyone in the population experiencing an acute mental health episode assessment and treatment within 24 hours. Additionally, more than 2,000 general practitioners have been trained to recognize and manage non-severe illness.[3]

This model requires a significant investment in developing human resource capacity, with the mental health teams at PHC centers and hospital outpatient departments consisting of psychiatrists (often rotating), MHNPs, MHOs, and psychiatric aides. In one regional health authority the staffing in 2020 for CEMH consisted of three psychiatrists, three MHNPs, 12 MHOs, and 25 psychiatric aides.[1] Psychiatric aides are nursing assistants who have been trained through a four-month course in psychiatry.[7] MHOs and MHNPs are registered nurses and registered nurse practitioners, respectively, who have undergone further psychiatric and management training. MHOs are legally mandated to deliver community-based care semi-autonomously, under the supervision of a psychiatrist.[1]

MHOs are one of the most important parts of the CEMH, serving as a link between the primary and secondary care teams, the public health team, and the patient.[8] This linkage allows for full integration of the community mental health service within primary and secondary care services.[8] In addition to working in the community, public health nurses help support MHOs by providing transportation, communications, and information technology as needed.[9] The nurses also attend senior staff meetings to present regular reports on patients in the CEMH.[9]

In 2007, the University of West Indies established a mental health institute devoted to primary prevention, the Caribbean Institute of Mental Health and Substance Abuse (CARIMENSA).[3] Through a public-private partnership, CARIMENSA provides specific training for psychiatry care, along with courses in general nursing, psychology, social work, and medicine and is a leader in mental health research.[3,7] The Ministry of Health also offers courses in general nursing and provides training to become an MHO or psychiatric aide.[7] The MHO training includes courses in general medicine, psychiatry, psychology, social work, psychopharmacology, and patient management.[3,7] Training is geared to allow MHOs to deal with most referrals, initial assessments, advise primary care and hospital physicians on treatments, and offer crisis care, home treatment, outreach, and case management.[7]

Laboratory, Diagnostic, or Pharmacy Services

Second-generation antipsychotic pharmaceutical agents are often used in the CEMH context. These medications are more expensive, but better tolerated than first-generation antipsychotics, improving patient adherence and likely reducing hospital bed occupancy and inpatient costs.[1] Overall, psychotropic drug availability varies by location.[7] Medication availability is better in the private sector, but patients must pay a charge.[7] Psychiatrists and MHNPs are able to prescribe psychotropic drugs, through with some restrictions for MHNPs.[9]

Digital Solutions

No digital solutions were integral to this model's implementation.

IMPACT OF THE MODEL

Preliminary data have shown equivalent clinical improvement over time and relapse rates between the CEMH model and acute hospital inpatient treatment for patients with psychotic disorders.[1] Preliminary data have also shown a significant increase in patient utilization of CEMH in the South Eastern Regional Health Authority compared with other regions.[1] There are no specific publicly available evaluation results.

COSTING

There are no specific costing data available for the CEMH model, though it has been described as a cost-effective model, with outpatient treatment costing less than acute inpatient treatment.[1]

LESSONS LEARNED

There is a need to develop country- or region-specific interventions to be implemented together with a global mental health approach.[1] The CEMH model requires a strong, supportive mental health policy environment. Additionally, any low- or middle-income country seeking to more effectively address the mental health of their populations must consider the high cost of second-generation antipsychotic medications typically used to treat psychiatric disorders.[1]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Implementer feedback was not available.

Resources

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INPUTS

- New cadres of MHNPs, MHOs, and psychiatric aides, who are all trained providers with psychiatric focused training.
- Existing human resources, including psychiatrists and nurses.
- Financial and/or technical support from Ministry of Health of the Government of Jamaica and CARIMENSA.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Mental health care services at PHC centers are primarily delivered by MHNPs, MHOs, and psychiatric aides. This includes referrals, initial assessments, advice for primary care and hospital physicians on treatments, and crisis care and case management.
- Mental health care providers at PHC centers encourage patients to maintain their daily routines and social responsibilities, instead of being admitted to a mental health facility.

2 COMMUNITY-BASED ACTIVITIES

- Patients and families are supported through psychoeducation to develop social support networks for monitoring and delivery of psychosocial care during acute episode and during maintenance phases.
- Mental health care providers deliver community-based care including home treatment, outreach, and case management, under the supervision of a psychiatrist.
- Emergency calls and crisis response are directed to mobile crisis teams of MHOs and psychiatric aides who make home visits.

3 TRAINING & CAPACITY BUILDING

- MHNP, MHOs, and psychiatric aides are trained by the Ministry of Health.
- CARIMENSA provides supplemental training in psychiatry care.

4 INTEGRATION & COORDINATION

- Mental health teams at PHC centers consist of a psychiatrist (often rotating), MHNPs, MHOs, and psychiatric aides.
- MHOs serve as a link between the primary and secondary care teams, the public health team, and the patient with the mental illness.
- Public health nurses help support MHOs by providing transportation, communications, and information technology as needed.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Treatment –** Preliminary data showed a significant increase in patient utilization of mental health services in South Eastern Regional Health Authority compared with other regions.

EQUITY (R)

- **Geographic reach –** Expanded community mental health services.

EQUITY (R)

- **Providers trained (A) –**
  - Cadres of MHNP, MHOs, and psychiatric aides are trained to supplement care for patients with mental health conditions.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Neutral or Improved cost-benefit (M) –** outpatient treatment costs less than acute inpatient treatment.

Ambulatory Care Model Incorporating Pharmacists to Improve Adherence to Diabetes and Hypertension Medication in Mexico

EXTENDING PHARMACEUTICAL SERVICES TO AMBULATORY HEALTH CARE TEAMS

21

Geographic locale	Mexico
Program setting	Family medicine clinics
Target diseases	Type 2 diabetes mellitus, hypertension
Target population	Adults ≥18 years with diabetes and/or hypertension
Partners/Stakeholders	Instituto Mexicano del Seguro Social

Background: Mexico is an upper-middle-income country with a population of 127.5 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 16.9%.[2] In 2019, the age-adjusted prevalence of hypertension was 32.8%[3] for males and 31.4%[3] for females. The estimated age-adjusted years of life lost was 1,343.4[4] and 125.4[4] per 100,000 population for diabetes and hypertensive heart disease, respectively in 2019.

Model Overview: The Instituto Mexicano del Seguro Social (IMSS) provides medical care to one-third of the Mexican population. The IMSS also provides 'prepaid' medical care which includes dispensing medications. However, there were previously no pharmacists who participated in providing care. This model incorporated pharmacists on ambulatory health care teams to increase patient treatment adherence.[5]

Model Strategy: To increase treatment adherence among diabetic or hypertensive patients receiving ambulatory care services, experienced pharmacists were incorporated into existing ambulatory health teams. Pharmacists counselled patients diagnosed with diabetes and/or hypertension on drug dosing regimens, adherence, what to do in the event of a missed dose of their medication, diet, and exercise to help improve treatment adherence and ultimately improve outcomes. As part of the counselling session, the pharmacist used graphics to inform patients about their drug dosing regimen and treatment duration in an understandable format. Nurses followed up with patients on a permanent basis to reinforce adherence strategies.[5]

Notable Features of the Model: The addition of pharmacists to health care teams to counsel and educate patients with diabetes and/or hypertension is notable.[5]

Key Messages

- Improvements in treatment adherence were seen in both the intervention and control group.
- Intervention group patients had a significantly higher odds of achieving hypertension control and a non-statistically significant increase in glycaemic control.

Model Funding: The IMSS is responsible for providing medical care to about 30% of the Mexican population. These services are provided in a prepaid manner and include pharmaceutical dispensing.[5]

Human Resources: Key human resources are pharmacists and nurses.

Laboratory, Diagnostic, or Pharmacy Services: The model extended pharmaceutical services to ambulatory medicine by incorporating pharmacists as support members of the care team. There were no additional significant changes to existing laboratory or diagnostic services.[5]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A non-randomized clinical trial evaluated the effectiveness of incorporating the pharmacist into the ambulatory health care team.[5] Patients at intervention clinics received counselling from the pharmacist, while patients at control clinics received usual care. At baseline, there was no difference in treatment adherence between the intervention and control group patients. A significant increase in the proportion of patients who adhered to treatment (calculated from the remaining pill count compared to what had been originally prescribed) was reported between baseline and endline in both the intervention and control groups. The proportion of patients with good treatment adherence in the intervention group (IG) increased from 71% to 80% ($p=0.006$) and in the control group (CG) from 72% to 87% ($p<0.001$). Among those who were adherent to their medication, there were significant decreases in blood pressure (BP) and blood glucose from baseline to endline in both groups (systolic BP: IG 142 to 124 mmHG; CG 151 to 129 mmHG; diastolic BP: IG 89 to 79 mmHG; CG 94 to 81 mmHG; and blood glucose: IG 197 to 145 mg dL^{1}; CG 184 to 171 mg dL^{1}). The IG had a statistically significant 56% increase (adjusted odds ratio (aOR) 1.56; 95% CI 1.08-2.25; $p=0.017$) in the odds of achieving control of their hypertension disease, independent of adherence and disease duration. The IG also had a 13% increase (aOR 1.13; 95% CI 0.85-1.51, $p=0.383$) in the odds of glycaemic control when compared to the CG, but this was not statistically significant.[5]

Resource

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
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INPUTS

- Existing human resources for health including pharmacists, nurses, and other ambulatory team members.
- Financial and/or technical support from the IMSS.

PROGRAM ACTIVITIES

1

FACILITY-BASED ACTIVITIES

- None reported.

2

COMMUNITY-BASED ACTIVITIES

- Pharmacists counseled diabetic and hypertensive patients on drug schedules, adherence, what to do in the event of a missed dose of their medication, diet, and exercise.
- Pharmacists used graphics to inform patients in an understandable format of drug doses, drug schedules, and duration of each of their treatments.
- Nurses followed up with patients on a permanent basis to reinforce adherence strategies.

3

TRAINING & CAPACITY BUILDING

- None reported.

4

INTEGRATION & COORDINATION

- Pharmacists were added to existing ambulatory health care teams.

5

TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- None reported

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E):** the proportion of patients who adhered to treatment increased from baseline to endline in both the IG and CG (71-80%, *p=0.006* vs. 72-87%, *p<0.001*, respectively).[5]

DISTAL

- **Patient health outcomes (E):**
  - patients who were counseled by a pharmacist had a 56% increase (aOR 1.56; 95% CI: 1.08-2.25; *p=0.017*) in the odds of achieving control of their hypertension.[5]
  - patients who were counseled by a pharmacist had a non-significant 13% increase (a OR1.13; 95% CI 0.85-1.51, *p=0.383*) in the odds of glycaemic control when compared to the control patients.[5]

National Integrated Management of Diabetes in Stages (MIDE) Model in Mexico

EDUCATING PROVIDERS AND EMPOWERING PATIENTS TO MANAGE DIABETES AT STANDARDIZED DIABETES HEALTH CARE UNITS

22

Geographic locale	Mexico
Program setting	PHC units (some modules are located in secondary and tertiary health care units)
Target diseases	Type 2 diabetes mellitus
Target population	Adults >18 years of age with type 2 diabetes mellitus
Partners/Stakeholders	Mexico's Institute for Social Security and Services for State Workers

Background: Mexico is an upper-middle-income country with a population of 127.5 million.[1] In 2021, Mexico had an estimated age-adjusted prevalence of 16.9%[2] for type 2 diabetes mellitus, with an estimated age-adjusted years of life lost of 1,343.4[3] per 100,000 population due to type 2 diabetes in 2019.

Model Overview: The Integrated Management of Diabetes in Stages (Manejo Integral de la Diabetes por Etapas), or MIDE model, was grounded in Mexico's 2007 Institute for Social Security and Services for State Workers (ISSSTE) preventive medicine program. This program worked to develop cognitive-behavioral skills to promote active participation by patients with their families, social networks and health care institutions. The MIDE model established diabetes clinics, known as MIDE modules, that were integrated within the PHC system. MIDE focused on patient and provider education in order to: (1) generate a culture of patient self-care and responsibility and (2) improve the quality of preventative care. The MIDE model had five key components, including: (1) preventive care, (2) empowerment of the patient and family, (3) continuous training for health care personnel, (4) adequate facilities, medicines, medical supplies, and medical equipment in PHC units, and the (5) efficient use of information and communication technologies.[4]

Model Strategy: The model's implementation strategy relied on the establishment of MIDE modules, primarily at PHC centers. Each module was outfitted with the necessary supplies and equipment to operate efficiently, including a computer with internet and appropriate reagents and supplies for screening and diagnostics. At these MIDE modules, patients were seen first by a physician who performed preliminary testing and evaluation. Patients were subsequently seen three more times, during which the physician may have referred patients out to other multi-disciplinary health team programs, depending on their needs, or linked them to other members of the care team or support groups. During each consultation in these units, health care workers provided brief, personalized interventions that educated patients on the basic concepts of diabetes education and health promotion. MIDE program strategies empowered patients and supported joint decision-making through the promotion of self-efficacy and self-confidence, motivational interviewing, patient-physician collaboration, and clear communication. The patient empowerment component of the model consisted of at least two two-hour workshops in self-care behaviors that patients could apply in their daily lives.[4]

Notable Features of the Model: The model encouraged participation of a patient's family and social network. The focus on effective patient-physician communication was critical in this model, allowing for joint decision-making and

a shift in the mindset and behavior of health professionals from medication prescribers to facilitators and agents of change. Patient self-management was a primary focus of this patient-physician collaboration, with motivational interviewing used to understand behaviors or life habits that could affect a patient's health. There was also significant task-sharing in this model, with multi-disciplinary care collaboration involving nursing, nutrition, social work, dental care, psychology, and physical activity.[4]

Key Messages

- MIDE focused on patient empowerment and involvement of health care professionals, promoting shared decision-making and enhancing the quality of care.
- The proportion of MIDE patients with metabolic control increased significantly over a 7-year follow-up period.
- The average number of patient illness days and hospitalizations among MIDE patients substantially decreased over a 12-month period.

Model Funding: MIDE was funded by Mexico's ISSSTE through the Secretaria de Hacienda y Crédito Público.[4]

Human Resources: MIDE utilized a multi-disciplinary team of specialists to deliver care to the population. This team was specialized in nursing, nutrition, social work, dental care, psychology, and physical activity. Continuous training was provided for health personnel through a structured education program called the AMARTE VA. The trainings for health care personnel focused on vocational skills in diabetes. The training curriculum for the multi-disciplinary health team covered continuing education on program development, adherence to program operating criteria, and managerial activities and vocational training. The vocational skills training covered three main categories, including: (1) diabetes education, (2) diabetology, and (3) facilitating organization, development, and group action on diabetes. The AMRATE VA program also helped educate patients by focusing on empowerment and self-care. This was completed via workshops with the patients to acquire new skills applicable in their daily lives to promote positive changes in their health.[4]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. All MIDE modules positioned within PHC clinics had the requisite supplies to screen, diagnose, and monitor diabetes. Each module was given a computer with internet and appropriate reagents and supplies for screening and diagnostics.[4]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A cross-sectional study was conducted using data for nearly 100,000 people with diabetes who participated in the patient empowerment program at MIDE modules at ISSSTE hospital clinics and family medical clinics nationwide between 2007 and 2014.[4] A total of 1,117 diplomas were awarded to 826 health professionals, and 2,613 people with diabetes were accredited as "patient experts in diabetes" as part of the program. Over the seven-year study period, the proportion of patients with metabolic control (defined as HbA1c < 7.0%, triglycerides < 150 mg/dL, and total cholesterol < 200 mg/dL) increased significantly from 35.4% to 60% ($p<0.001$). Average HbA1c, triglycerides, and total cholesterol per person with diabetes dropped by 25%, 31%, and 11%, respectively. Quality of life also improved: the average number of patient illness days and hospitalization episodes over a 12-month period decreased by 38% and 41%, respectively.[4]

Resources

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INPUTS

- Existing human resources at PHC centers.
- Existing PHC centers.
- Financial resources from Mexico's ISSSTE through the Secretaria de Hacienda y Crédito Público.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Establishment of diabetes clinics, known as MIDE modules, at PHC centers. Each module was outfitted with the necessary supplies and equipment to screen, diagnose, and manage diabetic patients.
- Patients were seen a minimum of 4 times for a 30-minute visit; once by a physician and subsequently by a physician or by multi-disciplinary health care teams if needed. During each consultation, health care providers conducted brief, personalized interventions that educated patients on the basic concepts of diabetes education and health promotion.
- Health care providers used motivational interviewing to understand patient behaviors or life habits that can affect a patient's health. Patients and providers participated joint decision-making.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- AMARTE VA, a structured education program, trained health care providers in vocational skills in diabetes, including diabetes education, diabetology, and facilitating organization, development, and group action on diabetes.
- AMARTE VA educated patients by focusing on empowerment and self-care behaviors during two 2-hours workshops.

4 INTEGRATION & COORDINATION

- Health care providers were organized into multi-disciplinary teams of specialists in nursing, nutrition, social work, dental care, psychology, and physical activity to deliver comprehensive diabetes care to patients.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- Nearly 100,000 diabetic patients participated in the MIDE patient empowerment program at MIDE modules between 2007-2014.[4]

- **Providers trained (A):**
  - 1,117 diplomas were awarded to 826 health professionals.[4]
  - 2,613 people with diabetes were accredited as patient experts in diabetes.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E)**
  - % of MIDE patients with metabolic control increased significantly from 35.4% to 60% over the 7-year period *(p<0.001)*.[4]
  - Average levels for metabolic indicators (HbA1c, triglycerides, and total cholesterol) dropped by 25%, 31%, and 11%, respectively.[4]
  - Average number of illness days and hospitalization episodes per patient over a 12-month period decreased by 38% and 41%, respectively.[4]

DIAbetes EMPowerment and Improvement of Care (DIABEMPIC) Model in Mexico

A MULTI-COMPONENT INTEGRATED CARE PROGRAM DESIGNED TO ACHIEVE DIABETES CARE GOALS

23

Geographic locale	Mexico City, Mexico
Program setting	Public PHC, specialist diabetes clinic
Target diseases	Type 2 diabetes mellitus
Target population	Adults >18 diagnosed with type 2 diabetes mellitus
Partners/Stakeholders	Clínica Especializada en Diabetes CDMX/Iztapalapa, World Diabetes Foundation

Background: Mexico is an upper-middle-income country with a population of 127.5 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 16.9%,[2] with an estimated age-adjusted years of life lost of 1,343.4[3] per 100,000 population due to type 2 diabetes in 2019.

Model Overview: The DIABEMPIC (DIABetes EMPowerment and Improvement of Care) program was implemented as a holistic approach to improve clinical outcomes in individuals with type 2 diabetes by promoting patient empowerment and improving quality of care. The program was delivered over five months at a Specialist Diabetes Clinic (SDC) and had a strong focus on optimizing care and enhancing outcomes for diabetes patients. It utilized a combination of individual and group sessions conducted during ambulatory, scheduled, and shared medical appointments, with a special emphasis on multi-disciplinary care and self-management education. Shared medical appointments involved a multi-disciplinary team that collaborated in delivering care. Patients were recruited between January 2017 and July 2018.[4]

Model Strategy: The DIABEMPIC program was implemented with multiple components aimed at improving clinical outcomes in diabetes patients. These components included the establishment of an interdisciplinary case management team in the SDC (e.g. endocrinologists, nurses, nutritionists, psychologists, and podiatrists, among others), the implementation of a diabetes self-management education program, and the provision of sufficient consultation time with patients (30-45 minutes).[4] The program also employed audit and feedback mechanisms to monitor activities and provide guidance. Quality control and assurance measures overseen by a medical coordinator included daily reviews of patients coming into the clinic, compliance verification, and performance audits. Medication supply was ensured by the health care system to support patients in maintaining glycemic control. The program also emphasized the maintenance of high-quality electronic patient records, visit planning, and short-term follow-up to ensure consistent and improved care. Educational sessions were conducted with patients to cover various diabetes-related topics, including setting care goals, risk reduction, planning a healthy diet and physical activity, and dispelling myths associated with diabetes.[4]

Notable Features of the Model: The model integrated quality control and assurance measures to enhance the effectiveness of the program and ensure specialized patient care. Health care professionals were monitored by the research team using quality-of-care indicators, which helped to promote compliance and optimize the overall performance of the program.[4]

Key Messages

- DIABEMPIC participants experienced considerable reductions in HbA1c levels, BP, LDL-cholesterol, weight, and BMI, along with increased diabetes knowledge and engagement in self-care activities.
- DIABEMPIC participants experienced statistically significantly improved health-related quality of life.

Model Funding: World Diabetes Foundation provided partial funding to help with the development of the DIABEMPIC program. Medication was ensured through the Mexican health care system.[4]

Human Resources: Key personnel in the team included a multi-disciplinary case management team with an endocrinologist or diabetologist, nutritionist, nurse trained in diabetes management, psychologist, social worker, podiatrist, and ophthalmologist. There was also a medical coordinator that managed the quality control and assurance components of the program.[4]

Laboratory, Diagnostic, or Pharmacy Services: The health care system ensured guaranteed and free medication supply for glycemic control, including metformin, dipeptidyl peptidase-4 inhibitors, sulfonylureas, human insulin, and insulin analogs. Laboratory tests were also provided to patients for free, including glycated hemoglobin and low-density lipoprotein (LDL) cholesterol.[4]

Digital Solutions: The intervention included high-quality electronic patient records.

Impact of the Model: A pre-test post-test study was conducted in Mexico City with type 2 diabetes patients referred to the SDC from 32 primary outpatient health care centers (n=498) to evaluate the impact of DIABEMPIC on various diabetes care goals.[4] The study found improvements after the intervention compared to baseline in mean HbA1c (reduced by 2.7), blood pressure (BP) (reduced by 9.7 mmHg for systolic and 3.2 mmHg for diastolic), LDL cholesterol (reduced by 18.2 mg/dL), weight (reduced by 1.6 kg), and body mass index (BMI) (reduced by 0.6 kg/m2), indicating moderate but statistically significant reductions. The proportion of patients achieving the triple target goal of HbA1c <7%, BP <130/80 mmHg, and LDL cholesterol <100 mg/dL rose from 1.8% of patients at baseline to 25.9% following the intervention ($p<0.001$). Within each of these goals, the proportion of patients who achieved the HbA1c goal rose from 12.9% at baseline to 62.9% ($p<0.001$); the proportion of patients who achieved BP goals rose from 57.6% at baseline to 73.4% for systolic blood pressure (SBP) ($p<0.001$) and from 72.9% at baseline to 80.1% for diastolic blood pressure (DBP) ($p=0.009$); and the proportion of patients who achieved LDL cholesterol goals rose from 39.4% at baseline to 65.5% ($p<0.001$). Diabetes knowledge as measured by the Spoken Knowledge in Low Literacy Patients with Diabetes (SKILLD) score increased by 5.0, representing a 163.8% increase from baseline ($p<0.001$). Frequency of self-care activities in the past seven days as measured by the Summary of Diabetes Self-Care Activities also improved, with an increase in the number of days per week (d/w) for specific diet (1.5 d/w, 50.5% improvement from baseline), global diet (3.2 d/w, 131.7% improvement from baseline), physical activity (2.2 d/w, 121.2% improvement from baseline), and foot care (3.1 d/w, 88.4% improvement from baseline) ($p<0.001$ for all). Furthermore, there was an increase of 26.4 points (43.5% improvement from baseline) on the EuroQol-5D-5 L visual analog scale measuring health-related quality of life ($p<0.001$).[4]

Resources

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INPUTS

- Existing human resources at the PHC level.
- Financial resources from World Diabetes Foundation, Medication through Mexico's health care system.
- Technical support from Clínica Especializada en Diabetes CDMX/ Iztapalapa.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- T2DM patients participated in individual and group sessions during ambulatory, scheduled, and shared medical appointments.
- T2DM patients participated in diabetes self-management education sessions which covered topics in self-identification of care goals, risk reduction, healthy diet and physical activity planning, and dispelling diabetes-related myths.
- Patients were provided with free medication to maintain their glycemic control and laboratory tests.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- A multi-disciplinary case management team was established, including an endocrinologist or diabetologist, nutritionist, nurse trained in diabetes management, psychologist, social worker, podiatrist, and ophthalmologist in the SDC.
- A medical coordinator conducted daily reviews, compliance verification, and performance audits.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Patient records were maintained electronically.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- **Patient knowledge (I):** significant increase of 5.0 on SKILLED score, representing a 164% improvement from baseline *(p<0.001)*.[4]

INTERMEDIATE

- **Patient health behaviors (E):**
  - Frequency of self-care activities increased in number of days per week (d/w) for specific diet (+1.5 d/w, 51% improvement from baseline), global diet (+3.2 d/w, 132%), physical activity (+2.2 d/w, 121%), and foot care (+3.1 d/w, 88%), (*p<0.001* for all).[4]

DISTAL

- **Patient health outcomes (per (E):**
  - After the intervention compared to baseline, mean reductions in: HbA1c by 2.7, SBP by 9.7 mmHg, DBP by 3.2 mmHg, LDL cholesterol by 18.2 mg/dL, weight by 1.6 kg, and BMI by 0.6 kg/m2.[4]
  - Proportion of patients who achieved triple target goal increased from 1.8% at baseline to 25.9% *(p<0.001)*.[4]
  - Health-related quality of life improved by 26.4 points (43.5% improvement from baseline) on EuroQol-5D-5 L visual analog scale.[4]

Integrated Measurement for Early Detection (MIDO) Model in Mexico

DIGITAL HEALTH SCREENING AND DECISION SUPPORT TOOL INTEGRATED INTO A NATIONAL INFORMATION SYSTEM FOR NCDS

24

Geographic locale	Mexico
Program setting	National health centers: primary, secondary, tertiary
Target diseases	NCDs and risk factors, including obesity, type 2 diabetes mellitus, hypertension, chronic kidney disease, and high cholesterol
Target population	Adults aged 20+ years
Partners/Stakeholders	Ministry of Health, Fundación Carlos Slim

OVERVIEW

To address the growing burden of NCDs in Mexico, the Government of Mexico collaborated with the Fundación Carlos Slim (FCS), a private foundation, to develop multiple strategies to improve the prevention, detection, and continuous management of NCDs among adults.

In 2013, the Government of Mexico asked FCS to develop a national registry of patients with NCDs.[1] After a three-month pilot to improve its functionality, the NCD Information System (known as Sistema Nominal de Información en Crónicas, or SIC) was deployed in 2014 and quickly scaled up nationally to 12,000 public health facilities.[1,2] SIC allows for continuity of care for NCDs across all levels of the public health system. Providers can see each patient's prior diagnoses, biomarker measurements for disease monitoring, and prescribed treatment regimens.[2]

A few years prior to the development and deployment of SIC, FCS began implementing an NCD health delivery model (CASALUD, now known as the Integrated Measurement for Early Detection of NCDs (Medición Integrada para la Detección Oportuna, or MIDO)) to strengthen primary health services for NCDs. Along with referrals and clinical management of NCDs, FCS developed and deployed a digital health tool to increase outreach, screening, early diagnosis, and counseling for NCDs in PHC centers.[3–5] As providers entered data into MIDO, it provided prompts and guidance to support decision making. Additionally, the patient screening information entered into MIDO is integrated into SIC, allowing future providers to access initial screening data. Though integration with MIDO allows for more robust NCD screening and counseling, patient information can be entered directly into SIC by health centers not operating MIDO using the standard paper-based tools and screening protocols.

NOTABLE FEATURES OF THE MODEL

SIC and MIDO utilize unique patient identifiers that are the same across platforms and allow all personal health information for each patient to be easily accessed.[1] These government-created personal unique "keys" allow integration of the registry across all states and levels of the health system, an uncommon and powerful feature.[1]

Additionally, SIC and the MIDO software have both been designed to operate without connectivity, allowing entered data to be uploaded to the online registry when connectivity is available.[1] This allows health centers in rural,

disadvantaged areas, which lack electricity or Internet, to utilize both systems and ensure equal continuity of care for their patients.

Ten years after initial development, FCS continues to host and maintain SIC by request of the Government of Mexico and operates a publicly accessible dashboard for NCDs.[1] This dashboard, updated daily, provides extensive information on the care cascade for multiple NCDs nationally, and at sub-national levels down to the individual facility level, allowing robust monitoring of NCD care and real-time data for decision making across the public health system.

BURDEN OF NCDS

Mexico is an upper-middle-income country with a population of 127.5 million.[6] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Mexico was 16.9%.[7] In 2019, the estimated age-adjusted prevalence of hypertension was 32.8%[8] for males and 31.4%[8] for females and the estimated age-adjusted prevalence of cardiovascular disease (CVD) was 5.3%.[9] In 2019, the estimated age-adjusted years of life lost were 1,343.4,[9] 125.4,[9] and 2,719.5[9] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

Health is considered a human right guaranteed under the Constitution and since 2000, the Government of Mexico has aimed to realize universal health coverage.[10] In 2010, the Ministry of Health and National Institute of Public Health created the National Commission for the Prevention and Control of NCDs to coordinate the prevention and control of NCDs and risk factors among the general population, support prevention programs, improve communication between collaborators, and create a registry of NCDs and treatments.[11] To implement the NCD registry component, the Ministry of Health engaged FCS to develop, deploy, and maintain SIC.[1]

The National Strategy for the Prevention and Control of Overweight, Obesity, and Diabetes (ENPCSOD) was subsequently adopted. The strategy included new policies and laws on taxes for sugar-sweetened beverages and processed foods, standardized nutritional labels, and regulations of food and beverage advertisements to children, amongst others.[5] Additionally, ENPCSOD established the Mexican Observatory of NCDs to support the evaluation of the public policies implemented by ENPCSOD.[5]

Health System Structure

Mexico's health system consists of a diverse set of public and private payers and providers.[10] The National Health System, the public health system within the country, has been operated under the Ministry of Health since 1982.[10] While many have private health insurance, public health care is fully or partially subsidized by the federal government.[10] Out-of-pocket payments remain a significant source of health care expenditure overall.[10] Density of human resources for health are below the average for OECD countries.[10,12] Human resources for health and health facilities are unequally distributed across the country, with resources concentrated in urban areas.[10,12]

Model Strategy

The overall goal of these two digital platforms is to enhance the identification and management of NCDs in Mexico through three main pillars:

- Improve continuity of care and NCD management through a national registry of NCD patients that allows patients and their providers anywhere within Mexico to access their medical history related to NCDs, including their diagnoses, laboratory test results and biomarkers, and treatment regimens, as well as their personal and family medical histories.[2]

- Enhance the robustness of NCD screening in PHC and community outreach settings using the MIDO digital tool programed with clinical algorithms to identify patients who are high risk for NCDs, in pre-disease states, or have already developed NCDs.[3]
- Increase the use of data for decision-making.

Building on the previous pillars, both SIC and MIDO were developed with the aim of increasing the use of data for decision-making at the patient, provider, clinic, and health system levels. Patients and providers have access to patients' individual health data. MIDO assists in decision-making during the screening process through its risk assessment algorithm, while SIC provides data throughout the remainder of the patient's disease progression (diagnosis, management/treatment, and monitoring). Additionally, aggregated SIC data feed an extensive dashboard on NCD service coverage and the care cascade at the national and sub-national levels, down to each unique health facility. The dashboard provides invaluable monitoring data to identify gaps in NCD service coverage and can be used for decision-making by the Mexican NCD National Observatory.[3,5]

Model Financing

The development, operation, and maintenance of SIC and MIDO are financed exclusively by FCS.[1] Operational costs for the screening and management of NCDs are covered by the Ministry of Health under their established protocols using existing health resources and equipment. Additionally, the costs of disease management when medicines are required are covered by the National Health System in part or in full; out-of-pocket costs are potentially incurred by patients.

Human Resources

FCS developed a hybrid online-offline health education platform to enhance the education and develop competencies of PHC providers around NCDs. The platform provides doctors, nurses, nutritionists, psychologists, social workers, health promoters, and community health workers with access to accredited courses on NCD prevention and management. The SIC and MIDO digital platforms utilize existing human resources (primarily nurses) and clinical schedules in PHC centers to increase NCD screening and continuity of care.[3]

Laboratory, Diagnostic, or Pharmacy Services

PHC centers perform systematic risk assessments of adults aged 20+ in each center's catchment area using the MIDO digital tool which supports enhanced detection of patients at risk of developing NCDs and those with undiagnosed NCDs. PHC centers were provided with medical equipment for basic measurements (e.g. weight scale, blood pressure (BP) monitors, blood glucose test strips, etc.) and PHC center pharmacies dispense medications provided by the Ministry of Health.

Digital Solutions

The model uses several digital solutions, including SIC, the NCD Information System. SIC was the first national registry of NCDs in Mexico. SIC allows for continuity of care for NCDs across all levels of the public health system. Patients and their public sector providers can see their prior diagnoses, biomarker measurements for disease monitoring, and prescribed treatment regimens.[2] The registry also includes patient sociodemographic information (e.g. age, sex), as well as their clinical and family histories.[2]

MIDO utilizes proprietary software (SI-MIDO™) on either a computer (MIDO Mobile Cart™) for screening at PHC centers or tablet (MIDO Backpack™) or mobile phones for screening within households during community outreach activities.[3–5] The MIDO digital tool replaced the former paper-based NCD risk assessment questionnaire for NCDs for adults 20 years of age and over.[3,5] Using the MIDO platform, providers (primarily nurses) assess the risk of each patient for current or future NCDs based on body mass index (BMI), waist circumference, BP, capillary glucose,

and lifestyle factors, such as smoking, nutrition, and exercise.[3–5] MIDO identifies not only high-risk individuals and occurrences of NCDs, it also identifies patients in "pre-disease" stages based on BMI, BP, and fasting glucose levels.[3–5] Based on their results, each patient receives personalized health education and counseling for lifestyle alterations and time frames for future testing.[3–5] Patients with an NCD newly diagnosed by MIDO are referred to a primary health center for confirmation and management.[3] Additionally, patients with complications are referred to secondary or tertiary care centers.[3]

Other digital platforms incorporated into the model but not as widely scaled include Índice de Calidad de la Atención de la Diabetes, a diabetes quality of care index; the Índice de Calidad de la Atención de la Hipertensión, a hypertension, a quality of care index; and the online dashboard for the monitoring of the performance of the PHC and other structured reports for health professionals and government.[1]

IMPACT OF THE MODEL

SIC has been fully scaled and is operating in approximately 12,000 health facilities across the 32 states of Mexico.[2] To date, there are no available data on the implementation or impact of SIC. However, studies have used the registry to study NCDs in Mexico, including effective coverage for type 2 diabetes mellitus.[2]

The MIDO digital tool operates in approximately 1,200 PHC centers in Mexico; more than 2.4 million people have been assessed to date.[13] An analysis of the de-identified health records of 743,000 people aged ≥20 years screened by MIDO between 2014 to 2018 found that the MIDO integrated risk assessment was a useful way to detect NCDs and pre-disease.[3] More than half of the adult population screened was pre-diabetic, pre-hypertensive, or overweight and over one-third screened positive for an NCD (diabetes, hypertension, obesity, or high cholesterol).[3] The majority (74%) of those found with disease or pre-disease were unaware of their diagnosis before their MIDO screening.[3] No studies were found on the effectiveness of the MIDO screening algorithm compared to paper-based questionnaires or other methods of screening for NCDs.

During the COVID-19 pandemic, MIDO was adapted to incorporate counseling on the link between NCDs and COVID-19 disease morbidity and mortality.[13] The algorithm also provided additional personal recommendations for preventing or controlling chronic conditions within the context of COVID-19.[13] FCS has also adapted MIDO for the whole life course, developing modules for pregnancy, early childhood development, and child and adolescent health. There are no clear intentions to scale the NCD module further, though FCS is testing a full-life course MIDO clinic incorporating all of its digital modules.[1]

COSTING

According to Tapia-Conyer et al. (2015), MIDO costs under US$4 per screening, which takes approximately five minutes to perform.[4] To date, there are no additional available cost or cost-effectiveness data on MIDO or SIC.

LESSONS LEARNED

An implementer from FCS described multiple lessons learned for both SIC and MIDO. Importantly, NCD screening and management cannot be thought of as two separate processes even if they occur at different physical locations (i.e. community locations or primary health facilities vs. primary/secondary health facilities). They are part of the same longer-term process to identify, monitor, and manage NCDs, which is why the technology for MIDO was integrated into SIC to enhance continuity of care for patients.[1]

Additionally, the functionality and interoperability of SIC across the health system was made possible through the existence of government-assigned unique identifiers for all Mexican citizens and permanent residents which are required by law to be used for any government-provided social services, including at public health facilities.[1]

The ability of SIC and MIDO to operate without internet connection is an important feature that allows it to be widely used across the health system, particularly in low-resource areas.[1] MIDO has not scaled nationally like SIC. At facilities not operating MIDO, providers use paper-based questionnaires and protocols and then input data into the database.[1]

Though intended to improve efficiencies and quality of services, adoption of new digital tools can take time and require capacity strengthening for providers who will be using them and government officials who are hosting and maintaining the platform.[1] While FCS' intention is to pass SIC to government control, government officials have voiced concern over the required technical and financial resources to maintain the system into the future.[1]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

1. Design any digital platform with intended users in mind. This requires a bottom-up creation process; designing a digital platform at a desk will not be useful until it is validated by the intended users.[1]

- There will be cultural, operational, and technological barriers to implementing any change. Give people time to change, especially when deploying a change in the way people do their jobs, such as with these two digital platforms. Be patient and sensitive to their difficulty or resistance to change and learn from the people who are using it.[1]
- Implementing digital platforms like this is a never-ending process. They have to be actively maintained every day. If there are insufficient resources to maintain them they will not be sustained. The platforms also require continuous revisions and updates to be relevant.[1]

Resources

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INPUTS

- Funding for FCS.
- CASALUD PHC model operating at PHC centers.
- Existing human resources at PHC centers.
- Ministry of Health support and request for a national information system on NCDs.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Existing human resources for health at PHC centers utilize MIDO Mobile Cart™ to identify high-risk patients, and patients in pre-disease and disease states for NCDs.

2 COMMUNITY-BASED ACTIVITIES

- Existing human resources for health within communities utilize MIDO Backpack™ for outreach activities to identify high-risk patients, and patients in pre-disease and disease states for NCDs.

3 TRAINING & CAPACITY BUILDING

- PHCs are provided equipment to screen patients: scales and tape measures for weight, height, and waist circumference; calculators for BMI; BP monitors; and glucose blood test kits.
- Health workers participated in hybrid online-offline trainings in NCDs, MIDO digital software, and SIC.

4 INTEGRATION & COORDINATION

- Identified NCDs are referred to PHC centers and higher-level care for official diagnosis, treatment and/or management.
- Patients, and health providers across the country or at different levels of the health system are able to access SIC and use it to guide disease management and/or treatment decisions.
- National health officials in the Ministry of Health and the Mexican Observatory of NCDs can use aggregated SIC data to assess quality of NCD services provided throughout the country, identify gaps, and strategize ways to improve those services.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Development and refinement of digital software to replace paper-based questionnaires. Digital software operated on either a computer (MIDO Mobile Cart) or tablet (MIDO Backpack) in PHC and community outreach settings which uses a clinical algorithm to identify patients as high-risk for NCDs, those in pre-disease states, and those with NCDs.
- Development, refinement, and deployment of national registry of NCDs (SIC) with unique patient identifiers to track their diagnosis, test results, biomarkers, and treatment regimens across 12,000 PHCs.

OUTPUTS

COVERAGE (R)

- **Screening –** more than 2.4 million adults screened at PHCs or in communities.[3,11]
- **Diagnosis –** Among 743,000 adults, more than half were in a pre-NCD state and a third screened positive for an NCD.[3]

EQUITY (R)

- **Geographic reach –** NCD education and screening services brought to approximately 1,200 PHC centers; SIC operates in approximately 12,000 PHC centers across 32 states.[2,3,11]

COVERAGE (R)

- **Screening –** more than 2.4 million adults screened at PHC centers or in communities.[3,11]

EQUITY (R)

- **Geographic reach –** NCD education, counseling, and screening services provided during outreach activities in the catchment areas of approximately 1,200 PHC centers.[11]

- **Equipment (A) –** PHC centers equipped with screening and diagnostic equipment.
- **Training –** providers trained in NCDs, MIDO, and SIC.[1]

- **Access to personal health data –** for patients and providers through SIC.[2]

OUTCOMES

PROXIMAL

- **Patient knowledge –** 74% of screened patients found with disease or pre-disease were unaware of their diagnosis before their MIDO screening.[3]

INTERMEDIATE

- No medium term outcomes reported.

DISTAL

- No long term outcomes reported.

Diabetic Retinopathy Referral Network Model in Peru

STRENGTHENING A NETWORK OF HEALTH CARE FACILITIES DEDICATED TO SCREENING AND TREATMENT

25

Geographic locale	La Libertad region, Peru
Program setting	Three different primary care health networks (12 health care centers total)
Target diseases	Retinopathy from type 2 diabetes mellitus
Target population	Diabetic adults in urban and suburban, low-resource populations
Partners/Stakeholders	Orbis International, the Regional Institute of Ophthalmology, and the Regional Health Directorate of La Libertad

Background: Peru is a upper-middle-income country with a population of 34.0 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 4.8%,[2] with estimated age-adjusted years of life lost at 294.2[3] per 100,000 population.

Model Overview: In Peru, low-resource communities lack access to specialized care for diabetic complications (e.g. retinopathy). Most patients seek care for their diabetes at secondary or tertiary levels of the health system due to late-stage identification or treatment. Orbis International and the Regional Institute of Ophthalmology created a network of health care facilities for diabetic retinopathy screening and treatment with a structured referral system to improve access to specialized care and enhance the management of diabetic retinopathy within the network. The network includes primary care centers, secondary hospitals, and advanced tertiary centers strategically located for widespread coverage. The goal is to identify individuals at risk, offer early detection, and prevent vision loss through screenings, diagnosis, and treatment.[4]

Model Strategy: The model was implemented in three primary care networks (Trujillo, Ascope, and Virú) within La Libertad. These networks consist of 10 primary care centers in Trujillo, one in Ascope, and one in Virú, serving a total of 94 satellite health posts.[3] The included facilities cover a catchment population of 1,530,652, which accounts for 62.8% of the regional population. The referral process follows a structured approach, including identification of individuals with diabetes, assessment by primary care providers, referral to advanced centers if necessary, comprehensive eye examinations, diagnosis, treatment, and ongoing management. Effective coordination and communication between health care providers enable seamless and integrated care. Training across all levels of health care was a core component of the model (further described under the Human Resources section below).

Notable Features of the Model: Key features of the model were implementation of a well-defined referral system and training on advanced diagnostics and treatment, with a focus on improving access to screening at lower levels of the health system and earlier intervention.[4]

Key Messages

- Created an extensive referral network for comprehensive diabetic retinopathy screening and treatment.
- Used advanced digital imaging technologies for screening and diagnosis and laser therapy for treatment.
- Diabetic retinopathy screenings at the primary and secondary levels increased, reducing burden on tertiary facilities

Model Funding: Orbis International and the Regional Institute of Ophthalmology pooled resources to finance the model. The project had a total investment of US$2,344,559, with Orbis International covering 64.3% (US$1,507,551) and the institute covering 35.7% (US$837,007). The investment was allocated to equipment, medical supplies, training, staffing, professional fees, and other expenses.

Human Resources: Key personnel are the head of the Regional Institute of Ophthalmology, training director, retina specialists, ophthalmic nurses and technicians, PHC teams (e.g. general practitioners, nurses, and technical staff), and a nurse coordinator.[4] Training was conducted at all levels of health care: primary, secondary, and tertiary.[4] PHC teams attended interactive workshops once a year for four years, covering topics such as diabetes mellitus, diabetic retinopathy, and referral processes. A manual on diabetic retinopathy screening was provided as a reference guide. Nurses responsible for patient registration received training on referring patients to secondary-level hospitals. At the secondary level, ophthalmic nurses and technicians underwent training in capturing retinal images and performing basic grading using non-mydriatic cameras. The results were triaged and confirmed by trained ophthalmologists. Patients requiring treatment were referred to the tertiary level. A laser for panretinal photocoagulation for diabetic retinopathy treatment was installed at the regional institute of ophthalmology. Retraining was conducted as necessary. At the tertiary level, retina specialists received hands-on training in various diabetic retinopathy treatments, including laser therapy, intravitreal bevacizumab, and vitreoretinal surgery. Orbis International organized five high-level training programs from 2014 to 2016, facilitated by volunteer expert faculty. These programs focused on transferring clinical and surgical skills, advanced diagnostic techniques, and managing complex cases.

Laboratory, Diagnostic, or Pharmacy Services: Advanced digital imaging technologies, such as non-mydriatic cameras, to capture retinal images for screening and diagnosis were installed at participating secondary- and tertiary-level health facilities, respectively.[4] The equipment was donated to the Regional Institute of Ophthalmology.

Digital Solutions: The model incorporates various digital solutions to enhance health care delivery. This includes the use of electronic medical records (EMRs) for efficient data management and coordinated care, telemedicine technology for remote assessment and monitoring of diabetic retinopathy cases, decision support systems to aid health care providers in diagnosis and management, and mobile applications to support patient education, self-management, and treatment adherence.[3] Additionally, a public awareness campaign was conducted through social media, radio, television, and other platforms to raise awareness about diabetes and diabetic retinopathy.[4]

Impact of the Model: According to a recent study, the implementation of the diabetic retinopathy referral network led to significant improvements in screening and treatment.[4] Over four years, 11,849 patients with diabetes were screened, a 138% increase compared to the previous period. Of those screened, 80.1% were first-time screenings and 21.9% were follow-up screenings. PHC facilities identified 6,012 diabetes patients, with 5,632 referred for retinopathy screening at secondary-level hospitals. Of the referred patients, 74.6% had their first screening and 25.4% were follow-up screenings. 4,036 patients directly visited secondary-level hospitals, while 2,181 were referred to the tertiary hospital. Secondary facility screenings increased from 1,026 in 2014 to 3,168 in 2017, while tertiary facility screenings decreased from 638 in 2014 to 88 in 2017, reducing the burden on tertiary hospitals. Among those screened, 2,922 (24.7%) were diagnosed with diabetic retinopathy, and 923 (30.2% of treated cases) received treatment at the institute. Treatments included laser treatment for 508 patients, intravitreal bevacizumab for 345 patients, and vitreoretinal surgery for 70 patients. Public awareness activities reached around 119,153 individuals, potentially contributing to increased screening at primary and secondary health care facilities. Efforts are underway to extend this model to additional municipalities across northern Peru; this expansion was initially planned for 2020, but was delayed due to the COVID-19 pandemic.

Resources

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INPUTS

- Existing human resources for health at the primary, secondary, and tertiary levels of the health system.
- Financial support from the Regional Institute of Ophthalmology and Orbis International.
- Technical support from the Regional Institute of Ophthalmology, Orbis International, and the Regional Health Directorate of La Libertad.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Primary-level health care providers screened and diagnosed diabetes during normal clinical activities.
- Primary-level health care providers referred diabetic patients for retinopathy screenings at secondary-level health facilities.
- Secondary-level health care providers screened diabetic patients for retinopathy and treated patients or referred complicated cases requiring specialist services to tertiary-level health facilities.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Doctors, nurses, and allied health staff from the primary, secondary, and tertiary health care levels were trained on diabetes retinopathy epidemiology, diagnosis, treatment, and prevention. Secondary and tertiary providers covered additional topics, including proper diagnostic imaging techniques, diabetic retinopathy laser therapy and ocular surgeries.
- 4 annual refresher trainings conducted with health care providers at PHC level.
- 5 trainings over 2 years conducted with health care providers at the tertiary level.
- Specialized medical equipment for retinopathy screening and treatment (e.g. mydriatic retinal cameras and lasers) were installed at secondary- and tertiary-level health facilities, respectively.

4 INTEGRATION & COORDINATION

- Referral procedures, guidelines, and means for information sharing were established between primary-, secondary-, and tertiary-level health facilities.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Providers used EMRs for efficient data management and coordinated care.
- Providers used telemedicine technology for remote assessment and monitoring of diabetic retinopathy case.
- Decision support systems aided health care providers in diagnosis and management.
- Patients used mobile applications to support their education, self-management, and treatment adherence.
- A public awareness campaign was conducted through social media, radio, television, and other platforms to raise awareness about diabetes and diabetic retinopathy.

OUTPUTS

- **COVERAGE (R)**
- **Screenings:** screenings for diabetic retinopathy increased at multiple levels:
  - by 138% at primary level (n=11,849 patients with diabetes were screened; 80.1% were first-time screenings and 21.9% were follow-up screenings).[4]
  - secondary level health facility screenings increased from 1,026 to 3,168.[4]
- **Treatment:** among those screened, 2,922 (24.7%) were diagnosed with diabetic retinopathy, and 923 (30.2% of treated cases) received treatment at the institute.[4]

EQUITY (R)

- **Socio-economic reach:** 12 health care facilities in urban and suburban low-resource areas were included in the referral network.[4]

- **Sites equipped (A):** participating secondary- and tertiary-level health facilities equipped with specialized retinopathy screening and treatment equipment.[4]
- **Providers trained (A):** health care providers were trained at 12 primary-level health facilities.[4]

- **Functioning referral mechanisms (I):** of 6,012 diabetes patients identified at primary-level health facilities, 5,632 were referred for retinopathy screening at secondary-level hospitals.[4]

- **Patient care (I):** use of EMR, telemedicine, decision support systems, and mobile application improved coordination of patient care.[4]
- **Educational activities (R):** awareness campaign messaging reached approximately 120,000 individuals.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Reduced burden on hospitals (I):** Retinopathy screenings decreased at the tertiary level from 638 to 88, indicating a shifted burden of screening from the tertiary level to secondary.[3]

DISTAL

- No distal outcomes reported.

HEARTS Initiative Model for Hypertension Care in St. Lucia

EVIDENCE-BASED PRACTICES TO IMPROVE CARDIOVASCULAR DISEASE MANAGEMENT IN PRIMARY CARE

26

Geographic locale	St. Lucia
Program setting	PHC facilities
Target diseases	Hypertension
Target population	Adults >18 years of age visiting PHC facilities for hypertension management
Partners/Stakeholders	St. Lucia's Ministry of Health, Pan American Health Organization

Background: St. Lucia is an upper-middle-income country with a population of 179,857.[1] St. Lucia has an age-adjusted estimated prevalence of hypertension of 38.8%[2] for males and 40.8%[2] for females, with an estimated age-adjusted years of life lost of 399.63[3] per 100,000 population for hypertensive heart disease.

Model Overview: The HEARTS Technical Package for Cardiovascular Disease Management in Primary Health Care (HEARTS) is a strategic approach to improving cardiovascular health developed by the World Health Organization (WHO). HEARTS is comprised of six modules and an implementation guide that provides evidence-based, cost-effective best practices to prevent and manage cardiovascular diseases (CVDs), contributing to the achievement of Sustainable Development Goal 3 by 2030. The package was designed to support ministries of health to strengthen management of CVDs in primary care and is aligned with the WHO Package of Essential Noncommunicable Disease Interventions (PEN).

Model Strategy: The Ministry of Health, in collaboration with the Pan American Health Organization (PAHO)/WHO, officially launched the program in St. Lucia in October 2019 in six PHC facilities. As part of this program, the Community Outreach Programme was revitalized, with community health aides visiting and counseling families and encouraging facility visits. These community health aides also informed the health team if special outreach was needed and identified clients who were out of medication.[4]

Specific interventions undertaken as part of the HEARTS initiative included: adaptation of PAHO/WHO chronic disease passports to healthy lifestyle passports, use of the standardized national treatment protocol, conducting cardiovascular risk assessments, ensuring adequate physical infrastructure for accurate blood pressure (BP) monitoring, and establishing recall mechanisms through a tracking tool. Several policy and operational changes that provided a supportive implementation environment were the revitalization of the Community Outreach Programme, utilization of validated automated machines, weekly audits of BP measurements, and updates to existing registries. The program expanded beyond the six demonstration sites, with partial implementation in 34 facilities in St. Lucia due to some trained health care providers working at both demonstration and non-demonstration sites.[4]

Notable Features of the Model: Capacity building was key to HEARTS implementation in St. Lucia, with training conducted for health workers across the public and private sectors beyond the six demonstration sites. An essential component of the program was inclusion of families and communities, which supported patient self-management within communities. A Community Outreach Programme was implemented using community health aides to engage with patients and families directly and encourage self-management, while also identifying issues such as patients who had run out of medication.[4]

Key Messages

- HEARTS is an evidence-based and cost-effective strategy to improve CVD management by training health care workers and involving families and communities.
- Despite COVID-19 challenges, HEARTS improved BP control and hypertension registry coverage, showing its potential impact on cardiovascular health outcomes.

Model Funding: St. Lucia's Ministry of Health with support from Pan American Health Organization.[4]

Human Resources: Key personnel were existing primary care physicians, public health nurse supervisors, nurse practitioners and registered nurses, health educators, pharmacists, systems analysts, and community health aides.[5] Training included a face-to-face training and enrollment in a virtual course. The virtual course included all six modules of the HEARTS program in the training materials: (1) *healthy lifestyle counselling,* (2) *evidence-based treatment protocols,* (3) *access to essential medicines and technology,* (4) *risk-based cardiovascular management,* (5) *team-based care,* and (6) *systems for monitoring.* The face-to-face training was held for health care professionals island-wide (including primary care physicians, public health nurse supervisors, nurse practitioners, registered nurses, health educators, pharmacists, systems analysts, and community health aides) and focused on four of the HEARTS modules: healthy lifestyle counselling, evidence-based treatment protocols, risk-based cardiovascular management, and team-based care. The training also emphasized the national treatment protocol and accurate BP measurements.

Laboratory, Diagnostic, or Pharmacy Services: As per the HEARTS implementation guide, the treatment protocol for hypertension, equipment for hypertension diagnosis, and medicines for its treatment were partially available in the health care facilities implementing HEARTS.[4]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: HEARTS was initially rolled out in six PHC facilities serving an estimated 33,423 people in St Lucia in 2020.[4] As part of the HEARTS initiative, the proportion of registered patients with controlled BP (systolic blood pressure (SBP) <140 mmHG and diastolic blood pressure (DBP) <90 mmHg) within each six-month period was monitored and reported on every six months for two years.[4] The proportion of patients with controlled BP at baseline (December 2019) was 39.7% and decreased over the first year of implementation to 37.1% at six months and 28.9% at one year. This first year of program implementation coincided with the unprecedented challenge of the COVID-19 pandemic. Disruptions related to the pandemic, including supply chain issues, lockdowns, lack of patient counseling due to clinic closures, and lack of human resources, with many staff deployed to work on COVID-19 prevention, had a significant impact on the program's progress and levels of BP control. Of the 42 health workers enrolled in the program, 16 (38%) completed the virtual training. The proportion of patients with controlled BP increased in the second year of the program to 33.9% at 18 months and 36.5% at two years. Hypertension registry coverage for patients accessing services increased over this two-year period by 17.8% from 1,434 to 1,689 patients.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
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INPUTS

- Existing human resources in health at PHC centers.
- Financial and technical support from St. Lucia's Ministry of Health and PAHO.
- WHO HEARTS Technical Package.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Teams of health care providers screened, diagnosed, treated, and managed HTN patients in accordance with national treatment protocols.
- Health care providers at PHC centers conducted cardiovascular risk assessments on patients and counseled them on healthy-lifestyles.
- PHC centers utilized patient passports and updated patient registries regularly.
- Validated, automated BP machines are made available at PHC centers for accurate measurements.
- Health care providers utilizec tracking tools to recall patients when needed.

2 COMMUNITY-BASED ACTIVITIES

- Government reinvestment and revitalization of Community Outreach Programme.
- CHWs conducted visits with patients, let health facilities know if special outreach was needed and flagged if patients were out of medicine.

3 TRAINING & CAPACITY BUILDING

- Health care providers from various disciplines were trained through face-to-face courses in all 6 modules of HEARTS, including: (1) healthy lifestyle counselling, (2) evidence-based treatment protocols, (3) access to essential medicines and technology, (4) risk-based cardiovascular management, (5) team-based care and (6) systems for monitoring. Virtual training was also conducted on four of the modules.

4 INTEGRATION & COORDINATION

- PHC centers utilizec a team-based care approach, including primary care physicians, public health nurse supervisors, nurse practitioners and registered nurses, health educators, pharmacists, systems analysts and community health aides.
- Implementation of a national treatment protocol and accurate BP measurements in line with WHO HTN pharmacological treatment guidelines.
- Chronic disease passports were adapted to healthy lifestyle passports.
- PHC centers used validated machines and conducted weekly audits to ensure accurate measurements.
- PHC centers had access to essential medicines for treatment of HTN.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Reach (R):** rolled out at facilities serving an estimated 33,423 people in St. Lucia.[4]
- **Treatment:** entries into the hypertension registry increased by 17.8%, from 1,434 to 1,689 individuals, with the highest coverage observed in December 2021, reaching a total of 1,689 individuals.[4]

- **Sites equipped (A):** the program eventually scaled up from 6 full implementation facilities to 34 facilities with varying degrees of implementation.[4]
- **Providers trained (A):** of 42 health workers enrolled in the program at the first 6 sites, 16 (38%) completed the training course.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** the proportion of patients with controlled BP decreased from 39.7% at baseline to 36.5% at two years, possibly due to increased patients with uncontrolled BP being registered.[4]

Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina

USING A SPOKE AND HUB TELEMEDICINE MODEL IN THE INITIAL CARE FOR ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION

27

Geographic locale	Colombia and Brazil, expanded to Mexico and Argentina
Program setting	Small clinics, primary health centers, community hospitals
Target diseases	Cardiovascular disease, acute myocardial infarction, ST-segment elevation myocardial infarction
Target population	Primarily adults
Partners/Stakeholders	Ministries of health, the Lumen Foundation, International Telemedicine Systems, Medtronic

OVERVIEW

The Latin America Telemedicine Infarct Network (LATIN) aims to improve the diagnosis and timely treatment of patients experiencing heart attacks in rural and underserved areas. It provides acute myocardial infarction (AMI) management for patients by connecting small clinics and health centers with limited diagnostic capability (spokes) to higher level facilities with increased capacity (hubs) via telemedicine.[1] Hubs support an average of five spokes, generally located between five to 250 miles away. In spoke facilities, patients presenting with chest pain receive electrocardiograms (ECGs), which are then transmitted to remote diagnostic centers for analysis and diagnosis of a STEMI (ST-segment elevation myocardial infarction), a dangerous type of heart attack in which the coronary artery is completely blocked. Upon diagnosis of a STEMI by an expert cardiologist, the telemedicine team triages patients and refers them to the hub facility to undergo treatment, dispatching ambulances as necessary.

Since 2006, the American College of Cardiology's D2B Alliance for Quality has led a campaign to significantly reduce door-to-balloon (D2B) times (a measure of the time it takes from a patient entering a clinic's doors to the time the patient receives medical intervention) and improve patient outcomes. While such interventions were successful in several developed countries (including the United States, Denmark, Australia, Singapore, and South Korea),[2] lower-resource countries have struggled to meet the target of D2B within 90 minutes.[1] Lack of infrastructure, emergency medical systems, ambulances, cardiac catheterization laboratories, and trained personnel have led to delays in STEMI treatment in multiple countries.[1] Accurate STEMI diagnosis is also a limiting factor and is a leading cause of death in rural settings.[1] Diagnosing STEMI at smaller, community hospitals with limited resources and specialists is especially challenging, often due to varied clinical presentation and organizational obstacles.[1,3]

The LATIN model uses a telemedicine platform to integrate expert ECG interpretation, teleconsultation, and quality assurance practices into comprehensive, population-based AMI management in resource-constrained settings.[1] It has four main components: 1) establishment of a telemedicine infrastructure; 2) education and training of providers; 3) teleconsultations for triage; and 4) mechanisms to coordinate patient transfer.

The LATIN model was initially piloted in Barranquilla, Colombia in 2013. The model was then scaled up: As of 2016, the model covered over 42% of the population of Colombia and has engaged 77 health facilities (11 hubs, 66 spokes). It also expanded to Brazil with 104 LATIN telemedicine sites (21 hubs and 83 spokes). These scale-ups demonstrated

the acceptability of telemedicine as part of a hub-and-spoke model in improving AMI outcomes.[4] It has since scaled throughout Colombia, Brazil, Mexico, and Argentina. Over 100 million people fall within the catchments of LATIN health facilities.[1] This case describes the model and context in Colombia and Brazil and additionally presents evaluation results from the scale-up to Mexico and Argentina.

NOTABLE FEATURES OF THE MODEL

The spoke aspect of the model allows for greater reach into geographic areas that often cannot access care.[1] Remote telemedicine diagnostic centers provide 24/7 ECG interpretation and teleconsultation, emergency medical system activation, and overall supervision of the STEMI activation process.[1]

BURDEN OF NCDS

Colombia is an upper-middle-income country with a population of 59.1 million.[5] In 2019, the estimated age-adjusted prevalence of ischemic heart disease was 1.9%[6] and the estimated age-adjusted years of life lost were 1,293.7[6] per 100,000 population.

Brazil is an upper-middle-income country with a population of 215.3 million.[5] In 2019, the estimated age-adjusted prevalence of ischemic heart disease was 1.8%[6] and the estimated age-adjusted years of life lost were 1,500.6[6] per 100,000 population.

IMPLEMENTATION CONTEXT

Health Policy Environment

In 1993, Colombia introduced a health reform, mandating a mixed-market health insurance environment based on managed competition between private insurance providers. In 2013, a Statutory Law was adopted in Congress, defining the right to health. This established and protected health as a fundamental right in the country.[7] The law states that "the fundamental right to health for Colombians will now be respected, protected and guaranteed, with quality, timeliness, sustainability and equity."[7] By 2017, 94% of the population was insured. Nearly all those insured (90%) were covered by contributory (private) schemes and subsidized (free) schemes for those who couldn't pay. Services provided by these packages are guaranteed, identical between the plans, and include access to medicines, surgical procedures, medical and dental services, among others. A smaller proportion of individuals belonged to schemes for teachers, military personnel, and state oil company employees.[8]

The current Brazilian health system, Sistema Único de Saúde (SUS), was created in 1988 and promises universal health coverage within the country.[9] Since the system's inception, the government has made various attempts to provide universal coverage to its citizens.[9]

Health System Structure

The Colombian health system is governed by the Ministry of Health and Social Protection, which issues regulations to oversee the health system and manages finance and coordination. The territory-level government is responsible for health promotion, financing health activities, and ensuring quality of services. Services are provided by public and private facilities and independent health professionals. Health facilities in Colombia are organized by level of complexity.[8] Low-complexity institutions provide general medicine, nursing, pregnancy care, dentistry, pharmaceutical, and laboratory services. Medium-complexity facilities provide basic specialized services including surgery, orthopedics, and pediatrics. High-complexity institutions include public and private hospitals and provide complex medical and surgical specialties, diagnostic imaging, and special care units.[8]

The Brazilian health system is decentralized, with multi-level government engagement. SUS offers many free services including preventative services, primary care, outpatient care, inpatient care, maternity care, and pharmaceutical services among others.[10] Delivery of care is managed at state and municipal levels. Public and private health sectors both provide services and operate independently of each other.[10] Public facilities offer free care, though patients often experience long waits and overcrowding at these clinics. Most hospitals and physicians are concentrated in urban areas of the country, imposing additional challenges and disparities for rural residents.[10] An estimated 25% of Brazilian citizens have private health insurance to avoid waits and inefficiencies in seeking care.[9]

Model Strategy

Designed as a hub-and-spoke model, LATIN spokes consist of small clinics, primary health centers, and community hospitals that lack existing resources to accurately diagnose or treat patients with STEMI.[1] Several of these spokes are in remote regions and jungles. Hubs consist of more specialized facilities, which are equipped to provide treatment for STEMI 24/7.[1] Telemedicine diagnostic centers link these facilities by receiving and interpreting ECGs conducted by spokes and referring patients to hubs for care.

The implementation strategy has four main components: 1) establishment of a telemedicine infrastructure, 2) education and training of providers, 3) teleconsultations, and 4) mechanisms to coordinate patient transfer to a hub.

To establish the telemedicine infrastructure (component 1), LATIN sites are equipped with ECG devices and a telemedicine platform linked to a remote team of cardiologists. Three remote diagnostic centers were initially established in Uberlandia, Brazil; Sao Paulo, Brazil; and Bogota, Colombia.[11] Each center was staffed with cardiologists, who worked full time for LATIN. The telemedicine device is provided by ITMS Inc., which also provides the wireless software platform, Platform Integrated Telemedicine (PIT).[12] The remote diagnostic centers allow for real-time 24/7 communication, collaboration, decision-making, and referral between primary care providers and trained cardiologists.

For the training and education component (component 2), providers at spoke facilities are trained on STEMI recognition, ECG interpretation, and the telemedicine technology platform.[1]

Activities relating to teleconsultations (component 3) are the primary patient-focused intervention. All patients presenting with chest pain at a spoke site are administered an urgent ECG that wirelessly transmits the reading using telemedicine platforms to the remote cardiologist. The ECGs are processed at the diagnostic centers and analyzed in the context of the patient demographic data and clinical symptoms. The remote cardiologist confirms diagnosis and directs patient triage and care to hubs. ECGs indicative of STEMI are prioritized and referral and treatment pathways (including thrombolysis, pharmaco-invasive, or percutaneous coronary intervention) are advised via a teleconsultation between hub and spoke staff.[4]

Lastly, responsive care for STEMI often involves ambulance dispatch (component 4), one of the biggest challenges for the model. Limited ambulances and paramedics put strain on the system and make it challenging for spoke staff in remote areas to coordinate patient transfer.[1] Most study regions lacked a central ambulance system, so LATIN established ambulance structures between hub and spoke facilities.[1]

Model Funding

In 2015, Colombia spent 6.2% of its gross domestic product on health care. Financing for public insurance primarily comes from payroll and general taxes collected by the government.[13] The Brazil health system is also financed through tax revenue and contributions from the government.[9]

The LATIN network is supported by a grant from the Medtronic Foundation. Medtronic, Inc. provided logistical support for both the pilot and the main phase of LATIN.[12] Lumen Global provides educational training for LATIN sites.[15]

Human Resources

The LATIN model links existing primary health care providers who conduct ECGs at spoke facilities to full-time cardiologists at hub facilities. The cardiologists are employed by LATIN and are responsible for analyzing ECG results via telemedicine for diagnosis and patient triage.

Laboratory, Diagnostic, or Pharmacy Services

Spoke facilities perform 12-lead ECGs connected through the internet to a remote diagnostic center. They then refer and transfer patients to a hub with a catheterization laboratory.[14] If the patient is diagnosed with STEMI and transferred, the telemedicine company sends a phone message to the interventional cardiologist on call communicating the patient's diagnosis, along with a brief clinical summary and the ECG interpretation via email.[14] These expert cardiologists access documents from the telemedicine platform and provide an immediate ECG diagnosis.[15]

Digital Solutions

An ECG device with multiport transmission capabilities and patented telemedicine-integrated platforms that can be used by remote medical professionals is available at every LATIN site.[4] Each ECG is vectorized into a standard format to allow for real-time interpretation by remote cardiologists who can then assist the patient along the entire management pathway for their diagnosis.[4]

IMPACT OF THE MODEL

One evaluation of the pilot phase of this program in Colombia and Brazil found that 104 telemedicine centers were established, 62,000 ECGs were remotely interpreted, 642 STEMIs were diagnosed, and 297 patients with STEMI were urgently reperfused (46%).[11] Accuracy of ECG at detecting STEMI was 98%. Time-to-telemedicine diagnosis was 5.58 minutes. Another study conducted between 2013 and 2014 compared the number of patients treated before and after the implementation of the LATIN protocol. This study reported the D2B time using the LATIN protocol was 32 minutes compared with 85 minutes using the previous protocol ($p<0.05$).[15] The number of patients identified with STEMIs increased from 25 patients in nine months to 25 patients in only three months after implementing the LATIN model.[15]

After the scale-up phase to all four countries (Colombia, Brazil, Argentina, and Mexico), an evaluation of all sites found that LATIN spokes (n=313) screened up to 30,000 patients per month, for a total of 780,234 patients over the evaluation period. Telemedicine experts diagnosed 8,395 patients (1.1%) with STEMI, of which a total of 3,872 (46.1%) were urgently treated at 47 hubs.[1] A total of 3,015 patients (78%) were reperfused with percutaneous coronary intervention at hub facilities. Time-to-telemedicine diagnosis averaged 3.5 min, down from 37 minutes. Average D2B time improved from 120 to 48 minutes during the study period and overall STEMI mortality was 5.2%, much lower than the only comparable data from Mexico which found approximately 28% mortality from AMI.[1]

COSTING

The pilot phase of the program found that the mean cost of diagnosing and managing the STEMI process through the LATIN protocol was US$287.50. In 2015, a cost-effectiveness study of LATIN determined that in a scenario in which the rate of percutaneous coronary intervention (one of the treatment paths for STEMI) increases from 19% to 60%, the savings could be approximately US$13 million due to the decrease in indirect costs of mortality, disabilities, and pharmacologic treatment.[4,16] A 2019 cost-benefit analysis of LATIN (Brazil, Columbia, Mexico, and Argentina) found that with efficient triage, the costs for non-AMI patients were controlled.[17] The analysis showed LATIN telemedicine costs

were US$272 and the costs of transfer and indirect care were US$1,068. This led to a net savings per patient of US$796. Estimated savings, to date, range between US$56.5 million and US$169.6 million.[17]

LESSONS LEARNED

Several lessons have emerged on the feasibility of telemedicine/remote communications from this model. First, establishing these telemedicine networks and using a spoke-and-hub model can improve STEMI detection, rapidly activate STEMI referrals, and reduce symptom-to-treatment times, potentially leading to decreasing mortality in underserved populations.[1]

Second, political stability and context is important to project success. After the pilot in Colombia, there was an immediate challenge of stakeholder buy-in, along with selecting appropriate spoke locations and creating D2B pathways at the hub.[1] During implementation in some of the remote centers in mountainous terrain in Colombia including Medellin, Apartado, and Cucuta, there were safety concerns from intransigent conflict.[1]

Third, an important indirect benefit is that the model of care facilitates and expedites the development of regional STEMI protocols to be implemented at PHC and referral centers.[14]

The availability of the core LATIN model does not address the urgent need for ambulances and other critical infrastructure for patient transfers.[2,14] Countries should prioritize and invest in patient transfer mechanisms for the referral system.

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Implementer feedback was not available.

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INPUTS

- Existing human resources at health centers (spokes and hubs).
- LATIN employees: full-time cardiologists who manage the telemedicine platform.
- Financial resources from the Medtronic Foundation.
- Technical support from Lumen Global.
- Logistic support from Medtronic, Inc.
- Telemedicine device and wireless software platform (Platform Integrated Telemedicine) from ITMS Inc.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- All patients presenting with chest pain at a spoke site (small, low-resource health center) have an urgent ECG.
- ECGs are processed at remote diagnostic centers and analyzed in the context of the patient demographic data and clinical symptoms.
- A remote cardiologist at the remote diagnostic center confirms diagnosis and directs care by patient triage team.
- If indicated, patients are referred to hubs to undergo treatment, dispatching ambulances as necessary.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Health care providers at spoke facilities are trained in STEMI recognition, ECG interpretation, and the telemedicine technology platform.

4 INTEGRATION & COORDINATION

- Hubs support ~5 spokes, generally between 5-250 miles away.
- Remote diagnostic centers provide 24/7 ECG interpretation and teleconsultation, ambulance activation, and overall supervision of STEMI activation process.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Telemedicine infrastructure was established at LATIN sites, including an ECG device and a telemedicine platform (Platform Integrated Telemedicine) linked to a remote team of cardiologists.
- ECGs conducted at spokes are transmitted to remote sites for analysis and diagnosis of a STEMI.
- Telemedicine platform alerts cardiologist on call at diagnostic facility via phone message for evaluation of ECG. Telemedicine platform sends patient's diagnosis, along with a brief clinical summary and ECG interpretation via email.
- Expert cardiologists access documents from telemedicine platform and provide immediate ECG diagnosis, which is then communicated back to the triage team at the hub and spoke facilities.

OUTPUTS

COVERAGE (R)

- **Screening –** LATIN spokes (n=313) in 4 countries screened up to 30,000 patients per month, for a total of 780,234 patients over the evaluation.[2]
- **Treatment –** among 780,234 patients screened, cardiologists diagnosed 8,395 (1.1%) with STEMI, of which 3,872 (46%) were urgently treated at 47 hubs.[2]

EQUITY (R)

- **Geographic reach –** this model specifically reached patients at small rural health facilities, some in remote areas or the jungle; >100 million people fall within the catchments of LATIN health facilities.[2]

- **Sites equipped (A) –** LATIN scaled up in Colombia and expanded to Brazil, Mexico, and Argentina for a total of 355 LATIN spokes.[2] Adapted versions of the model have also expanded globally.[2]

- **Compliance with guidelines (A) –** hubs allow for real-time communication, collaboration, and decision-making between primary care providers and trained cardiologists.

- **Compliance with guidelines (A)**
  - 62,000 ECGs were remotely interpreted during pilot in in Colombia and Brazil. Accuracy of ECG at detecting STEMI was 98% during the pilot.[1]
  - Time from ECG to telemedicine diagnosis was 5.6 minutes during a pilot study[1] and 3.5 minutes during an evaluation of the program scale-up.[2]

OUTCOMES

PROXIMAL

- **Time to treatment (I) –** compared to the prior standard, D2B time improved from:
  - 85 minutes to 32 minutes ($p<0.05$) during an early evaluation.
  - 120 minutes to 48 minutes in an evaluation of the program scale-up.[2]

INTERMEDIATE

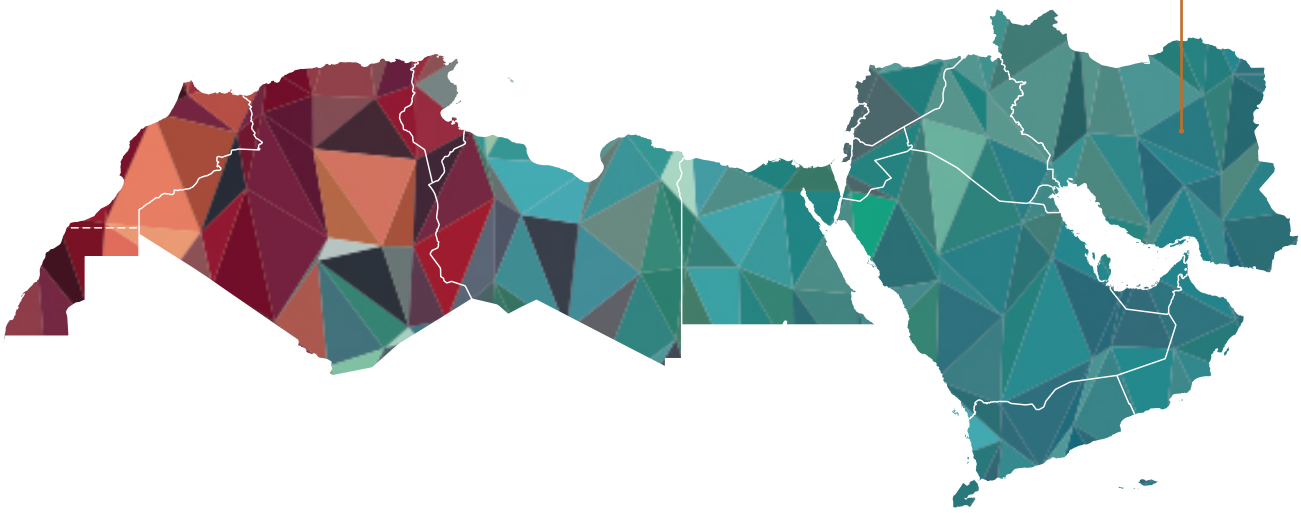
- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E) –** overall STEMI mortality was 5.2%.[2]
- **Neutral or Improved cost-benefit (M) –** LATIN expenses for the telemedicine cost are US$272 per patient, and US$1,068 for the cost of transfer and indirect care. This resulted in a net savings per patient of US$796. Savings through ranged between US$169.6 million and US$56.5 million.

I. R. OF IRAN

- Model for the Integration of Suicide Prevention into PHC



Middle East and North Africa: Models of care

Model for the Integration of Suicide Prevention into PHC in I. R. of Iran

MULTI-LEVEL CARE MODEL FOCUSED ON IMPROVING SCREENING AND MANAGEMENT OF DEPRESSION AND RISK OF SUICIDE

28

Geographic locale	I. R. of Iran, national
Program setting	Primary care network including private clinics; public health care system
Target diseases	Mental health (depression and individuals at risk of suicide)
Target population	People >15 years of age
Partners/Stakeholders:	Ministry of Health and Medical Education of I. R. of Iran, Mental Health Bureau; Lorestan University of Medical Sciences, Department of Health and Treatment and the Department of Mental and Medical Health

OVERVIEW

Suicide is a leading cause of death in I. R. of Iran. Over the last three decades, I. R. of Iran has established a nationwide PHC network to reduce health disparities between rural and urban areas.[1] In an effort to provide timely access to screening, diagnosis, and treatment for mental health disorders and prevent suicide attempts, the Mental Health Bureau of the Ministry of Health and Medical Education (MoHME) integrated their National Suicide Prevention Program (NSPP) into the national PHC network in 2010.[2] Prior to this national scale-up, integration of mental health care into the PHC network was piloted in two counties with high suicide rates in Lorestan province in western I. R. of Iran.[3] In 2009, the program was expanded to Nahavand and Savejbolagh districts and showed promising results.[2] Full national scale-up was implemented through provincial mental health officers (MHOs) with allocated provincial-level mental health budget. It established a referral system and included cascade training and annual re-training for different levels of health care providers at the PHC level; development of educational manuals for district mental health officers and PHC providers; and monitoring of data collected through the national registry.[1] Trainings on identifying and responding to depression and suicide were delivered to health professionals. Other stakeholders, including middle and high school teachers, at-risk groups, and members of the general public, also received training and education on identifying and responding to depression and suicide.[3] A concurrent development of a national web-based suicide registry enhanced the monitoring of the program.[2] The PHC-integrated NSPP enhanced knowledge about suicidal behaviors and management among health personnel, health liaisons, education staff (principals, teachers and counselors), and the general public; offered suicide prevention services at health centers and crisis intervention phones lines; improved the data registry system; improved media reporting of suicide; established a multi-level plan to implement the program from national to community-levels; and reduced access to means of suicide (toxins, drugs, etc.).[1]

NOTABLE FEATURES OF THE MODEL

The MoHME of I. R. of Iran leveraged partnerships across government sectors, including the Ministries of Education and Agriculture, to reduce the rate of suicide.[2] The NSPP is a nationwide integration into PHC, which was grounded in a series of pilot studies. It uses resources at all levels, from the Behvarzes, a well-trained cadre of community health workers in rural areas, to lesser-trained health volunteers in 30% of urban areas to psychiatrists at a Suicide Prevention

Consultation Office. The NSPP model uses the complementary national suicide registration system for monitoring.[3] Implementation required coordination across multiple sectors including health care, emergency services, forensic medicine, police, agriculture, and education.

BURDEN OF NCDS

I. R. of Iran is an upper-middle-income country with a population of 88.5 million.[4] In 2015, the estimated prevalence of depression in I. R. of Iran was 4.9%[5] and depression accounted for an estimated 8.7%[5] of total years lived with disability.

IMPLEMENTATION CONTEXT

Health Policy Environment

A mental health policy and program were first introduced in I. R. of Iran in 1986. Tenets of the program included advocacy, promotion, prevention, treatment, and rehabilitation.[3] Since its establishment, the country has aimed to integrate the mental health program within the PHC system. Several pilots were conducted in the early 1990s to gain evidence about integration of care.[1] The mental health policy and plan were revised in 2004 and included developing community mental health services, building mental health infrastructure, advocacy and promotion, a quality improvement mechanism, and a monitoring system.[1] In 2008 and 2009, respectively, the NSPP was piloted; in 2010 it rolled out nationally.[1]

A set of policy interventions known as the Health Transformation Plan was introduced in May 2014.[6] The primary focus of the plan was to allocate a larger portion of the public budget towards the health sector to decrease reliance on out-of-pocket (OOP) payments and alleviate the financial burden within the public health sector. One of these policies, the Free Universal Health Coverage Fund, extended the scope of basic health insurance to encompass approximately 11 million previously uninsured individuals in I. R. of Iran, primarily those who were self-employed.[6] As a result, the overall population coverage increased to reach 96%.[6] It is within this policy environment the NSPP is operating.[6]

Health System Structure

The health care system in I. R. of Iran is structured into three tiers: primary, secondary, and tertiary facilities. In 2016, I. R. of Iran allocated 8.1% of its gross domestic product (GDP) (equivalent to US$ 415.4 per capita) towards health care, with OOP expenditure decreasing from 80.5% in 1995 to 38.8% in 2016.[3] Multiple funding sources, including government funds, general taxation, health insurance, and individual donations, support health care services. Over the past few decades, I. R. of Iran has implemented significant initiatives to strengthen PHC and achieve universal health coverage.[6] PHC is provided free-of-charge, though with some OOP charges, to all I. R. of Iranian citizens through a public/private partnership and is coordinated and regulated by the MoHME. Secondary health care is delivered through a network of district health clinics, which operate independently under the authority of the MoHME, with coordination and regulation by the treatment deputy of medical universities under MoHME supervision. Tertiary health care services are predominantly provided in major cities by both private and public hospitals and overseen and regulated by the MoHME.[6]

To address gaps in care for rural populations, “health houses” (HHs) deliver PHC services to 1,000-1,500 rural households each. HHs are the first point of contact for patients seeking health care. The HHs are staffed by two Behvarzes who come from villages and receive a two-year training in basic preventive health care; Behvarzes refer patients to the HHs’ affiliated health centers (HCs) when necessary. HCs are staffed by one or two physicians, two health technicians, and sometimes a nurse.[3,6] Each HC has approximately 10-15 affiliated HHs.[3]

In urban areas, primary care is delivered at urban health posts and HCs. These are staffed by Behvarzes as well as lower-trained health volunteers.[3] The volunteers act the link between neighborhood households (conducting home visits) and the district health center. They receive a two-month training in basic health care and play an administrative role, filling out patient information cards for the households they visit and delivering them to health technicians.[3]

The most recently available data on mental health facilities in I. R. of Iran (2006) reports the country had 855 outpatient mental health facilities, 31 day-treatment facilities, 46 community-based inpatient units, 75 residential facilities, and 33 mental hospitals. Most mental health patients received care from outpatient facilities (82%) and mental hospitals (10%).[8] Only physicians are allowed to prescribe psychotropic medications in I. R. of Iran.[3]

Model Strategy

Three key components comprised the implementation of the pilot of the NSPP, which subsequently informed the national scale up.[3] First, the program focused on building the capacity of PHC providers, including general practitioners (GPs) and Behvarzes to diagnose, treat, and refer patients experiencing depression and risk of suicide. Capacity building efforts included a locally appropriate screening checklist to identify cases of depression and training materials and protocols for the treatment and management of depression. The screening checklist assessed patient loneliness, hopelessness, sadness, irritability, anxiety, apathy, and guilt, among other factors. Two psychiatrists and two psychologists reviewed its contents and assured its validity.[3] More details on the trainings are included under the 'human resource' section of this case.

Second, the model included a clearly defined referral pathway between four different levels of the health system (HHs to HCs to outpatient clinics and emergency departments to a psychiatric hospital that hosts a Suicide Prevention Consultation Office (SPCO)).[3] At the HH level, Behvarzes conducted population screenings in their respective regions, filled out patient-related data forms, referred all positive cases to receive care from either rural HH GPs or the local emergency room, and scheduled follow-up appointments. Similar responsibilities were handled by health volunteers in urban areas.[3] At the rural HC level, patients referred from HHs were attended to by health technicians. Subsequently, GPs at these centers delivered suitable physical and mental care to the patients.[3] In the case of complex conditions or individuals at risk of suicide, they were further referred to an outpatient psychiatric clinic located in urban areas. Behvarzes then followed up with the patients to ensure they sought and received the recommended care as appropriate.[3] At the emergency department level, the nurse in charge and the GP referred individuals who had attempted suicide to the SPCO once their medical condition had been stabilized.[3] In cases where the physical condition of the suicide attempters prevented them from leaving the emergency room, the psychologist from the SPCO initiated mental care treatment in the emergency room.[3] At the SPCO level, the licensed psychologists consulted individuals suffering from depression or those who had attempted suicide, as well as their families.[3] The initial five consultation sessions were provided to patients at no cost; no information is available on further costs. The SPCO psychologist conducted follow-up telephone calls with all patients to ensure appropriate support. Additionally, patients and their families received educational brochures on depression and suicide-related topics.[3]

Third, the program developed and leveraged key partnerships. MoHME was the lead actor in rolling out the NSPP, leveraging strategic partnerships with other government bodies—for example, the MoHME worked with the Ministry of Agriculture to reduce access to pesticides (which are often involved in poisonings).[2] At local levels, consultation meetings were held with providers at different levels of the health system. The MoHME also consulted with key stakeholders in suicide prevention and research, including the Department of Health and Substance Abuse, the World Health Organization office, Forensic Medicine, the Police Department, the State Welfare Organization, and the Ministry of Education to design and evaluate the scale up; evaluation results are not publicly available.[2]

Model Funding

In 2012, health financing in I. R. of Iran was based on social insurance with three main sources of funding: the general government budget, health insurance payments, and OOP expenses.[7] From 2013 to 2018, I. R. of Iran increased its health expenditure by 2.6% totaling almost 9% of its total GDP.[3] The NSPP program was implemented and financed by MoHME, Mental Health Bureau.[1]

Human Resources

This model relies primarily on existing PHC providers and community based Behvarzes. To implement the pilot, 49 GPs, 180 health technicians, and 120 Behvarzes were trained using the Waterfall model, which involves progressive phases of work development.[3] The Behvarzes were trained by health technicians. This training model is commonly used in PHC settings. Additionally, 50 GPs in private practice within the study area received similar training. Moreover, training sessions were conducted for 34 nursing staff members in the Emergency, Internal, and Surgical wards. They were also given brochures on depression and suicide prevention.[3]

Laboratory, Diagnostic, or Pharmacy Services

There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions

Concurrent with the NSPP, a pilot and national scale-up of a web-based registration program was implemented. The system spans 42 universities of medical science and covers about 84% of the population.[2] The program provided computers and internet network access, trained health professionals, and established an information system to collect and collate data. Personnel from PHCs, clinics, hospitals, poisoning wards, and the legal medicine organization use the registry to record statistics on suicide attempts and deaths. Data are reported monthly through the routine health information system and are overseen, analyzed, and interpreted by the MHO of the MoHME.[3] After six years of implementing the national program, the MoHME Mental Health Bureau conducted an external evaluation (results not yet publicly available).[1]

IMPACT OF THE MODEL

Results presented here are from the evaluation of the pilot that informed the scale-up.[3] A quasi-experimental community trial evaluating the feasibility of integrating a suicide prevention program within PHC services was conducted in two counties of Lorestan province in western I. R. of Iran from July 2006 to June 2007.[6] Both the intervention and control counties (Khorramabad and Khoohdasht, respectively) were characterized by high rates of suicide and had well-established PHC systems. After one year of implementation, the completed suicide rate in the intervention region was significantly lower compared to the control region ($p<0.005$).[3] The intervention region demonstrated a substantial drop in the rate of completed suicide (from 12.5 persons per 100,000 in 2007 to 6.3 in 2008) compared to a much smaller decline in the control region (from 19.3 persons per 100,000 in 2007 to 18.9 in 2008).[3]

A secondary outcome was the number of suicide attempts. During the study period, there were a total of 1,293 suicide attempts across two cities, with 1,060 cases in Khorramabad and 233 cases in Khoohdasht. This corresponded to a rate of 203 cases per 100,000 population in the intervention county and 110 cases per 100,000 population in the control county ($\chi 2 = 58.4$, $p<0.5$).[3] The ratio of suicide attempts between the intervention and control counties was 0.1% to 0.006%. Suicide attempts were most prevalent among individuals aged 15-24 years, accounting for 60% of the cases. Additionally, urban areas had higher rates of suicide attempts compared to rural areas in both Khorramabad (812 vs. 244) and Khoohdasht (159 vs. 74).[3]

Approximately 60% of rural catchment areas received screening for major depressive disorder (MDD), and almost 50% of the individuals screened attended their scheduled follow-up appointments. Health workers in cities covered around 30% of the urban catchment areas.[3] During the intervention, a total of 538 subjects with depressive disorders were identified, with 525 (97.6%) patients coming from the intervention site and 13 (2.4%) from the control site ($\chi 2 = 14.8$, $p<0.001$).[3] The rural-urban ratios of depressive disorder in the intervention site were 0.18% to 0.06% ($\chi 2 = 29.5$, $p<0.0001$).[3]

The higher number of suicide attempts and patients with depression detected in the intervention county likely reflects improvement in the ability to identify individuals at risk for depression and suicide and capture this surveillance data.[3] Overall, the evaluation of the pilot found that integrating a suicide prevention program within the PHC network increased the depression and suicide surveillance capacity of PHC systems and reduced the number of suicides. However, screening for individuals with depression or at risk of suicide may require increased investment in human resources.

COSTING

No costing study has been conducted and made publicly available.

LESSONS LEARNED

Three key lessons emerged. Using a multi-disciplinary, cross-sectoral workforce (in this case, from health care, emergency services, forensic medicine, police, agriculture, education) was an integral component of implementation; however, lack of official oversight and management posed difficulties for cross-sectoral work.[8] Consistent, clear communication at central governmental, regional, and local levels is vital to program success. Additionally, for a comprehensive evaluation, it is essential to incorporate system-based data collection methods.[6] This should encompass various aspects such as scheduling in primary and mental health care clinics, admissions, referrals, and other contextual information. By including these data, it may be possible to obtain more comprehensive statistics on the outcomes of the implementing approach.[6]

Additionally, in rural areas, the screening rate for MDD was observed to be 0.18%, significantly lower than the expected prevalence of the disease. It is likely that the stigma associated with mental disorders hindered individuals from reporting their symptoms, which consequently limited the ability of the Behvarzes, especially if they were local residents, to identify cases of MDD. Another contributing factor to the low screening outcomes could be the heavy workload of the Behvarzes which has been documented elsewhere,[3,6] making it challenging to conduct screenings for MDD across the entire rural areas within the intervention period.[6]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Implementer feedback was not available.

Resources

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INPUTS

- Existing human resources at community PHC levels, including GPs and Behvarzes (community health workers) in rural areas or health volunteers in urban areas.
- Financial resources from the MoHME to Mental Health Bureau.
- Technical support from the MoHME at national and provincial levels; Lorestan University of Medical Sciences, Department of Health and Treatment, and the Department of Mental and Medical Health.
- Partnerships across government sectors (including the Ministry of Agriculture).
- Provincial budgets for mental health.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- At rural health centers, health technicians process referrals, while GPs provide care to referred patients (referring to the next level as necessary). Complex conditions or individuals at risk of suicide are further referred to an outpatient psychiatric clinic located in urban areas.
- In hospital emergency rooms, nurses and GPs stabilize and refer patients who attempted suicide to the SPCO once their medical condition had been stabilized.
- At SPCO, psychologists consult with patients and families.
- Providers focus on aftercare services for individuals who have previously attempted suicide and presented at emergency departments. Services include a brief psychosocial intervention and follow-up visits via telephone.

2 COMMUNITY-BASED ACTIVITIES

- Behvarzes and health volunteers conduct population-level screenings in their respective regions using a locally appropriate screening checklist which assesses loneliness, hopelessness, sadness, irritability, anxiety, apathy, and guilt, among other factors to identify cases of depression.
- Behvarzes and health volunteers refer all positive cases to PHC GPs or the local emergency room, and schedule follow-up appointments.
- Behvarzes and health volunteers fill out patient data forms.

3 TRAINING & CAPACITY BUILDING

- Health technicians train Behvarzes, health volunteers, and GPs on diagnosis, treatment, pharmacotherapy, and referral for depression and suicide prevention.
- Behvarzes and health volunteers are provided a locally appropriate screening checklist to identify cases of depression.
- Providers receive training materials, brochures, and protocols for treatment and management of depression and suicide prevention.

4 INTEGRATION & COORDINATION

- Establishment of a bi-directional referral system between different levels of the health system, including between Behvarzes or health volunteers and the PHC level.
- Strategic partnerships with other government bodies are leveraged.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Establishment of a national web-based suicide registration program.
- Personnel from PHCs, clinics, hospitals, poisoning wards, and the legal medicine organization use the registry to record statistics on suicide attempts and deaths.
- Data are reported monthly through the health system and are overseen, analyzed, and interpreted by the MHO of the Ministry of Health.

OUTPUTS

COVERAGE (R)

- **Screening –** during a pilot study:
  - 60% of rural catchment areas and 30% of urban catchment areas were screened for MDDs.[3]
  - A total of 538 subjects with MDDs were identified, with 525 (97.6%) patients coming from the intervention county and 13 (2.4%) from the control county ($X^2 = 14.8$, $p<0.001$).[3]

EQUITY (R)

- **Geographic reach –** the program operates in both rural and urban areas.

- **Sites equipped (A) –** piloted in 4 counties, then expanded nationally.
- **Providers trained (A)**
  - During the pilot, 49 GPs, 180 health technicians, and 120 Behvarzes were trained, along with 50 GPs in private practice, and 34 nursing staff members in the Emergency, Internal, and Surgical wards.[3]
  - Training for care providers improved their ability to screen and diagnose patients.[3]

- **Compliance with guidelines (A) –** the national registry spans 42 universities of medical science and covers about 84% of the population.[2]

OUTCOMES

PROXIMAL

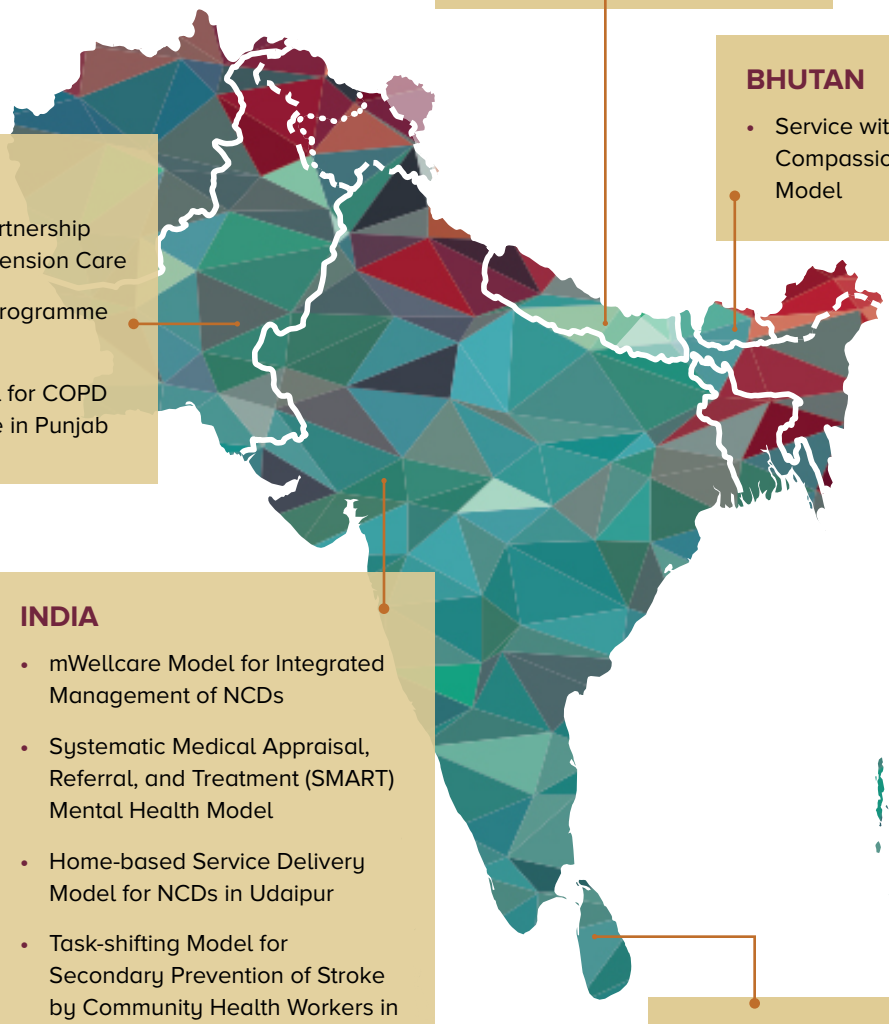
- No proximal outcomes reported.

INTERMEDIATE

- **Retention in care (E) –** during a pilot study, nearly 50% of screened individuals completed scheduled, follow-up appointments.[6]

DISTAL

- **Patient health outcomes (E) –** during a pilot study:
  - The completed suicide rate reduced from 12.5 to 6.3 per 100,000 in the intervention region compared to a decline from 19.3 to 18.9 per 100,000 population in the control region ($p<0.005$).[6]
  - The attempted suicide rate was 203 cases per 100,000 population in the intervention county and 110 per 100,000 population in the control county ($\chi 2 = 58.4$, $p<0.5$).[6]



NEPAL

- Reducing Stigma Among Healthcare Providers (RESHAPE) Model

BHUTAN

- Service with Care and Compassion Initiative (SCCI) Model

PAKISTAN

- Public-private Partnership Model for Hypertension Care
- Provincial NCD Programme Model
- Integrated Model for COPD and Asthma Care in Punjab

INDIA

- mWellcare Model for Integrated Management of NCDs
- Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model
- Home-based Service Delivery Model for NCDs in Udaipur
- Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala
- mPower Heart Model

SRI LANKA

- Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening

South Asia: Models of care

Service with Care and Compassion Initiative (SCCI) Model in Bhutan

FACILITY-BASED PHC MODEL WITH COMMUNITY OUTREACH ADAPTED FROM WHO PEN TECHNICAL PACKAGE

29

Geographic locale	Bhutan
Program setting	Basic health units (PHC level)
Target diseases	All NCDs, with cardiovascular diseases, diabetes, and hypertension as priority diseases
Target population	Adults aged 18+ years, uncomplicated patients, homebound patients
Partners/Stakeholders	The Bhutan Ministry of Health, Khesar Gyalpo University of Medical Sciences of Bhutan, district health authorities

OVERVIEW

To address persistent gaps in the quality of care for hypertension, diabetes, and other NCDs, the Government of Bhutan implemented the Service with Care and Compassion Initiative (SCCI), formerly known as PEN HEARTS based on the World Health Organization's (WHO) Package of Essential Noncommunicable Disease Interventions for Primary Health Care (PEN).[1] In 2009, Bhutan became one of the first countries in the world to pilot WHO's PEN program by integrating the management of chronic diseases such as diabetes and hypertension into primary care.[2] SCCI aims to improve the geographic coverage of NCD programs and the equity of access among the Bhutanese population.[1] Essential NCD services are brought closer to the Bhutanese people through the education and equipping of non-physician health workers (known as health assistants (HAs)) at basic health units (BHUs) with the capacity to screen, diagnose, counsel, follow-up, treat, prescribe, and dispense medication for NCDs.[1,2]

Under the SCCI model, whenever an adult visits a health center for any reason, in addition to receiving medical care, they are also screened for major NCDs and risk factors such as blood pressure (BP) and sugar levels.[2] A protocol directs clinicians on appropriate referral and treatment based on the screening results. If found to be hypertensive, diabetic, or having risk factors for cardiovascular disease (CVD) or other NCDs, the patient is immediately provided with a treatment plan or referred to higher-level care for a confirmatory diagnosis.[2] Patients receive their follow-up care and medications, even specialty medications, from a BHU.[2] Patients who cannot go to the BHU are visited by health workers in their homes.[1] Patients with complicated diagnoses or who require further testing are referred to higher-level care.[2]

After a successful pilot phase in two districts which showed positive effects in increasing patient diagnosis and follow-up visits, as well as improved management of NCDs and lowered risk factors,[2] the Ministry of Health (MoH) initiated a scale-up to four additional districts.[1,3] National scale-up and rebranding of PEN HEARTS to SCCI began in 2019 and was set to be completed in all 20 districts by the end of 2023.[1] SCCI has been implemented and expanded through a three-way partnership between the MoH, Khesar Gyalpo University of Medical Sciences of Bhutan, and district health authorities.

NOTABLE FEATURES OF THE MODEL

SCCI takes a people-centered approach to NCD screening and treatment adherence by making these services as convenient as possible for patients.[1] After initial diagnosis, uncomplicated patients can continue to attend follow-up

visits for routine testing and/or receive NCD medications at their local BHUs or within their homes, aiming to reduce the time and costs for patients to manage their conditions at hospitals, as previously required.[1] Specialized medications that were not previously available at the PHC level are also sent from hospitals to BHUs for specific patients.[1] Additionally, by ensuring health worker visits to homebound patients and emphasizing this population during trainings, SCCI is disability- and elderly-inclusive, priority vulnerable populations for the Bhutanese health sector.[1]

BURDEN OF NCDS

Bhutan is a lower-middle-income country with a population of 0.8 million.[4] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Bhutan was 10.4%.[5] In 2019, the estimated age-adjusted prevalence of hypertension was 43.6%[6] for males and 43.0%[6] for females and the estimated age-adjusted prevalence of CVD was 6.1%.[7] In 2019, the estimated age-adjusted years of life lost were 534.7,[7] 236.6,[7] and 4,583.5[7] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

Universal health care is enshrined in Bhutan's constitution.[8] Health care is primarily financed and managed by the Government of Bhutan.[8] The National Health Policy recognizes NCDs as a public health problem for the country and outlines key policy statements.[9] The country's Five-Year Plan provides inclusive NCD prevention and control by "creating awareness on noncommunicable diseases and initiating programs to promote healthy lifestyles."[9]

Health System Structure

Bhutan's health system is a three-tier structure with primary care (BHUs, sub-posts, and outreach clinics), secondary care (district level hospitals), and tertiary care (regional and national hospitals).[8] Patient pathways through the system are clearly defined, though often circumvented with bypassing to higher levels of care with specialist services.[8] Patients receive free health services, with no registration fees, inpatient fees, or fees for diagnostic tests or drugs.[8] Traditional and allopathic medical services are integrated into the health system.[9]

Grade I BHUs (BHU-Is) offer a wide variety of preventive and curative services, and are staffed by a doctor, dentist, nurse, pharmacist, and drungtsho (doctor of traditional medicine), as well as clinical officers (COs), non-physician HAs, and community health workers (CHWs).[8] Lower-level Grade II BHUs (BHU-IIs) are staffed by two to three HAs who are licensed to perform public health programs and treat minor illnesses within communities.[8] At the community level, village health workers (VHWs), a paid cadre of health worker within the Bhutanese health system, play a key role in health promotion and act as a bridge between health services and the community.[1,8]

Model Strategy

The MoH aims to make SCCI people-centered through three overarching guiding principles (3Cs: comprehensive, collaborative, and continuum of care) and seven implementation strategies (7Rs: robust team building, reach out to homebound services, refill of medicines, recall and reminders, responsive referrals, reliable and people-centered laboratory diagnosis, and real time monitoring and supportive supervision).[10] These strategies can be summarized through three main pillars:

1. **Strengthen the capacity of the health system** to manage NCDs at the primary level through training, ongoing mentorship, and supervision of HAs to screen, manage, and provide continuity of care for NCD patients. While hospitals continue to confirm diagnoses and prescribe specialty medicines, HAs at BHUs are trained to help patients manage their NCDs over the long term, serving as their primary health system contact for NCDs.

2. **Increase the responsiveness of referrals** between the primary and secondary levels of the health system, regardless of whether they are up-referrals (to hospitals for diagnosis) or down-referrals (to BHUs for continued patient management).[1] This was achieved through social media groups, such as WhatsApp, in which all of the health facilities within one district are included in a group to communicate about referrals.
3. **Improve continuity of care and convenience for NCD patients** through NCD management at the PHC level closest to their homes. Uncomplicated patients can continue to attend follow-up visits at BHUs, including receipt of specialized medications for NCDs, which were previously only available at hospitals. This aims to reduce the time and costs patients incur traveling to receive their NCD medicines or for monitoring visits. Additionally, HAs routinely visit homebound patients to monitor their vitals, deliver NCD medications, assess how well the medications are working, and counsel them on further lifestyle modifications if needed.

Model Funding

The MoH funds the existing human resources and essential NCD medicines utilized by this model. The WHO financed the trainings for health workers and provided supplies, such as bags to carry medicines to homebound patients.[1]

Human Resources

Existing HAs at BHUs served as a foundation for SCCI; the initiative invested in them.[1] HAs were trained to provide NCD screening, follow-up, medication prescribing for routine NCD medications, and medication dispensing for specialty medications. HAs were taught how to monitor BP and blood glucose levels over many visits to critically assess whether medications were actually controlling the associated conditions and make treatment decisions based on these assessments.[1] District hospital clinical and non-clinical staff were also trained to ensure they understood the responsibilities of the HAs and would support their work through down-referral of uncomplicated NCD patients for continued monitoring.[1] HAs also receive ongoing mentorship. Small doctor-led teams from district hospitals provide mentorship and supportive supervision to two BHUs at least every six months.[1,11]

Laboratory, Diagnostic, or Pharmacy Services

Through SCCI, BHU-Is and BHU-IIs are equipped with a glucometer and BP machine. Additionally, through SCCI, HAs at BHU-IIs may prescribe and dispense NCD medicines, including ones prescribed for mental health (Diazepam), respiratory disease (Salbutamol), and diabetes (Metformin), among others.[12]

Before SCCI, patients were required to visit a district or regional hospital to initially obtain and renew their NCD medication.[1] Under SCCI, HAs were trained and empowered to prescribe some routine NCD medications. Additionally, renewals for specialty NCD medications initially prescribed at district hospitals are picked up by HAs during their routine bi-weekly or monthly visits to hospitals to pick up vaccines or submit reports.[1,11] Patients can then obtain their medicine refills from the BHUs instead of from the district hospitals.[1] HAs or VHWs also deliver these medications to homebound patients in their communities.[1]

Digital Solutions

District health offices, which manage human resources in district hospitals and BHUs, established social group chats (such as through WhatsApp) to discuss patient cases, medication refills, and referrals.[1]

IMPACT OF THE MODEL

The pilot was conducted in two districts, Paro and Bunthang, and assessed over a three-month period in 2012 as a part of the regular health system assessments.[2] The assessment found increased use of medications for hypertension (87% to 95%) and diabetes (96% to 98%), reduced prevalence of high BP (42% to 22%) and high blood

sugar (68% to 51%).[2] Additionally, prevalence of high 10-year-CVD risk (>20% risk) declined by almost half over three follow-up visits from 13% to 7%.[2]

A 2019 evaluation of the Bhutan PEN HEARTS program assessed patient outcomes and provider knowledge and behavior in early-adopter, late-adopter, and non-adopter districts.[3] A higher proportion of NCD patients in early-adopter districts achieved treatment goals compared to non-adopter districts (44% vs 40%) and had their BP controlled (56% vs. 36%).[3] A lower proportion of patients in early-adopter districts had treatment gaps compared to non-adopter districts (65% vs. 75%); similarly, retention in care was better (52% vs. 30%).[3]

The SCCI has also been reported as motivating for health professionals. The PHC level has experienced improvements in task-sharing and better coordination of care between different levels of the health system. Increased interaction, including home-care visits by HAs or VHWs, has further helped the health-care professionals gain the trust and confidence of patients and the community and increase community-based support and cooperation.[10] More team building, mentoring, and supportive supervision activities were recorded in the early-adopter districts during the 2019 evaluation;[3] additionally, social media groups were used extensively by providers for team-based care. The same study found that health workers in early-adopter SCCI districts also had increased knowledge and improved record keeping.[3]

COSTING

A 2014 economic evaluation modeled the cost-effectiveness of using PEN in Bhutan.[13] The findings suggested that the current screening method, which targets individuals who are overweight, obese, or aged 40 years or older at primary care facilities, is cost-effective when compared to not screening at all. The study also indicated that increasing the coverage of opportunistic screening to reach 70% of the target population or implementing universal screening in which 100% of the target population is screened would be likely to be even more cost-effective.[13] Additionally, from a patient perspective, out-of-pocket expenditure for transportation and opportunity costs may have been reduced as medication renewals and monitoring visits occurred at closer BHUs rather than district hospitals.

LESSONS LEARNED

An official in the Government of Bhutan noted the importance of utilizing existing human resources and established systems, such as set hospital visits to pick up NCD medicines for their patients.[1] Utilizing these systems and structures allowed this initiative to be scaled at relatively low cost.[1] However, leveraging these existing resources also led to an increase in workload for health workers.[10] The focus on NCDs can suffer when health workers have many competing priorities.

SCCI experienced numerous challenges, including standardizing kits for health workers, visiting home-care patients, streamlining vertical reporting of data, utilizing a virtual learning environment, resource mobilization, and integration into the PHC approach.[11] Similarly, increased NCD access to care has led to increased screening, diagnosis, and treatment of diabetes and hypertension, putting a strain on the pharmaceutical supply chain. According to a program evaluator, stockouts of key antihypertensives and antidiabetic medications occurred with increased frequency, and it was difficult to ascertain whether this was due to breakdowns in the system, insufficient supply, or changes in demand.[14]

Home-bound patients are an important vulnerable community requiring care and deserving attention. SCCI reinforced their importance within the health system and revitalized an existing but dormant system to reach them.[1] According to the 2019 evaluation, home-bound reach in rural areas may have been particularly successful due to the existing presence and role of VHWs.[3] A program evaluator noted that government investment in HAs and salaries for VHWs were invaluable drivers of SCCI success, and an asset to the health system at large.[14]

Strong government leadership, the value placed on PHC and each citizen's health as a human right, district and hospital support, and community buy-in were essential to the initiative's success.[1] Due to high rates of turnover within the health system, efforts to integrate SCCI into the education of health workers through university curricula will be critical to ensure its sustainability.[11]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Cooperation and buy-in from hospital management is critical to success of the initiative.[1] Without that support, the initiative cannot be sustained.

Resources

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INPUTS

- Existing human resources at the primary and community health levels including HAs and VHWs.
- Health policy that supports primary health services and NCD prioritization within Bhutan.
- Government financing for health care, including primary care, diagnostics, drugs.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- HAs at BHUs provide health promotion, disease prevention, and screening of HTN and DM. HAs also provide prescription and refill dispensing for stable patients with NCDs.
- Health care providers at BHUs and hospitals provide opportunistic screening, diagnosis, counseling, and treatment for NCDs among patients aged 18+ visiting outpatient departments.
- Hospitals provide confirmatory diagnosis for referrals.
- Physicians and specialists at regional and national referral hospitals provide specialized care for high-risk or unstable patients.

2 COMMUNITY-BASED ACTIVITIES

- VHWs provide NCD outreach services for patients unable to visit facilities including health promotion and education, NCD screenings, and referrals.
- VHWs deliver NCD medication to homebound, previously diagnosed patients.

3 TRAINING & CAPACITY BUILDING

- HAs are trained to provide NCD screening, diagnosis, counselling, follow-up, and medication prescription and dispensing.
- Health care providers at multiple levels are trained on the PEN protocol and the revised PEN HEART protocol.

4 INTEGRATION & COORDINATION

- Patients are referred from BHUs to district hospitals for confirmatory diagnosis.
- Patients are down referred from district hospitals to BHUs for continued care. A structured referral form is used, which contains instructions from the referral facility to the BHU for patient follow-up and medication refills.
- High-risk or unstable patients may be referred by district hospitals to regional referral hospitals for further evaluation and treatment and from regional referral hospitals to national referral hospitals.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- District health offices, who manage human resources in district hospitals and BHUs, have established social group chats with HAs to discuss patient cases, medication refills, and referrals.
- District health officials and hospital physicians conduct phone based coaching sessions with HAs.

OUTPUTS

EQUITY (R)

- **Geographic reach –** piloted in 2 districts in 2009, SCCI is set to be rolled out in all 20 districts of Bhutan by the end of 2023.[1]

- **Compliance with guidelines (A) –** health workers in early-adopter SCCI districts had increased knowledge and improved record keeping.[3]

- **Compliance with guidelines (A) –** more team building, mentoring, and supportive supervision activities were recorded in the early-adopter districts.[3]

- **Functioning referral mechanisms (I) –** social media groups were used extensively by providers for team-based care.[3]

OUTCOMES

PROXIMAL

- **Enrollment barriers (I) –** out-of-pocket expenditure for transportation and opportunity costs may have been reduced.[13]

INTERMEDIATE

- **Retention in care (E) –** lower % of patients in early-adopter SCCI districts had treatment gaps compared to non-adopter districts (65% vs. 75%); similarly, retention in care was better (52% vs. 30%).[3]
- **Patient health behaviors –** prevalence of high 10-year-CVD risk (>20% risk) declined by almost half over three follow-up visits from 13% to 7%.[2]

DISTAL

- **Patient health outcomes (E) –**
  - During pilot, patients with high BP (42% to 22%) or high blood sugar (68% to 51%) decreased.[2]
  - In 2019, more patients in early-adopter districts achieved treatment goals (44% vs 40%) and BP control (56% vs. 36%) compared to non-adopter districts.[3]
  - **Cost-benefit (M) –**
    - the current screening method is cost-effective when compared to not screening at all.[13]

mWellcare Model for Integrated Management of NCDs in India

MOBILE HEALTH-BASED ELECTRONIC DECISION SUPPORT SYSTEM FOR INTEGRATED MANAGEMENT OF CHRONIC CONDITIONS IN PRIMARY CARE

30

Geographic locale	India
Program setting	Primary health center, community health centers in rural India
Target diseases	Hypertension, type 2 diabetes mellitus, tobacco and alcohol use, depression
Target population	Adult patients >30 years with hypertension and/or type 2 diabetes mellitus
Partners/Stakeholders	Department of Health, Government of Karnataka and Haryana; National Program for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke

Background: India is a lower-middle-income country with a population of 1.4 billion.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.6%[3] for males and 30.5%[3] for females. The estimated age-adjusted years of life lost was 499.0[4] and 203.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in the same year.

Model Overview: The development of mWellcare involved a comprehensive approach incorporating needs assessment, multi-disciplinary collaboration, iterative design, pilot testing, and data management. The goal was to create a mobile health intervention that could effectively address the challenges of integrated management of hypertension and diabetes in low-resource settings, ultimately improving patient outcomes and quality of care. The mWellcare system was developed as an Electronic Decision Support (EDS) system to generate tailored recommendations for managing hypertension, diabetes mellitus, depression, and alcohol and tobacco use. It stored health records electronically, enabling ongoing monitoring and follow-up, and was also equipped to send short message service (SMS) messages to patients to take medication and attend follow-up visits.[5]

Model Strategy: The mWellcare application development followed the United Kingdom's Medical Research Council framework, included identifying care gaps, determining intervention components, formulating specific elements, and assessing feasibility through pilot testing. Gaps were identified through previous mobile health project experience, a literature review, and a situation analysis at eight community health centers (CHCs) in Haryana and Karnataka. Semi-structured interviews with health care professionals evaluated patient management practices, guideline adherence, and strategies for improving compliance. For the second stage, clinical algorithms were developed, and a software specification document was created. Dimagi (a software development agency) then built a tablet-computer application using the CommCare platform, designed for rural mobile health services. Internal and external testing ensured the application's accuracy and quality. After iterative refinement, the final version was prepared for real-world piloting.[5]

The intervention was piloted in three phases: (1) setting up the intervention: nurse information was gathered and user profiles were created in the application. Samsung tablets, SIM cards, printers, weighing machines, stadiometers, blood pressure (BP) monitors, glucometers, and strips were obtained for each CHC; (2) training of physicians and nurses; and (3) observation and support by research and Dimagi teams to troubleshoot issues.[5]

The mWellcare mobile application was designed for use in primary care settings to manage NCDs. It offers features such as maintaining health records, providing decision support, managing patient cases, and generating lifestyle advice checklists. The NCD nurses at CHCs play a crucial role in using the mWellcare system for patient assessment and long-term follow-up, thereby sharing some patient management tasks with doctors. The web interface of the system allows for monitoring reports, user and domain management, data viewing, and data extraction.

Patients themselves can also use the system as secondary users, receiving customized SMS messages on their mobile devices after providing consent. The current version of the mWellcare application can be expanded to include diagnostic functionality and to integrate with external diagnostic devices.[5]

Notable Features of the Model: The unique feature of mWellcare lies in its integrated approach to managing multiple chronic conditions and its use of EDS and continuous monitoring to optimize patient care and outcomes. It also emphasized the integration of NCD nurses in CHCs to support physicians in managing hypertension and diabetes. Initially, 10 clinics had NCD nurses, but an additional 30 CHCs implemented this practice, facilitating task sharing and introducing new support in managing these conditions.[5,6]

Key Messages

- mWellcare resulted in better adherence to antihypertensive and antihyperglycemic medications whereas care outcomes were similar between mWellcare and the comparison group.
- Physicians showed high acceptance of decision support recommendation prompts, highlighting the value of nurse support, regular training, and improved medication access.

Model Funding: This work was supported by the Wellcome Trust.[5,6]

Human Resources: Key personnel were nurses and physicians.[5] Initially, nurses underwent a five-day training, while physicians received a one-day onsite training.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. BP readings and HbA1c measures were conducted, and BP monitors, glucometers, and strips were obtained for each CHC.[5]

Digital Solutions: The mWellcare mobile application is an EDS system that generates clinical recommendations, stores health records electronically, and sends patients reminder messages about medication and visit adherence.[5]

Impact of the Model: A recent multicenter, open-label, cluster-randomized controlled trial that evaluated the effectiveness of mWellcare (vs. enhanced usual care (EUC)) among patients with hypertension and diabetes in India found no significant differences between the two groups in systolic BP (Δ=−0.98; 95% CI −4.64, 2.67) and glycated hemoglobin (HbA1c) levels (Δ=0.11; 95% CI −0.24, 0.45), even after adjusting for covariates (adjusted mean difference systolic BP: −0.31; 95% CI −3.91 to 3.29; mean difference in HbA1c: 0.08; 95% CI −0.27, 0.44).[6] Additionally, there were no significant differences between the groups in terms of fasting blood glucose, total cholesterol, body mass index (BMI), and tobacco and alcohol use. Among key process indicators, participants in the mWellcare arm compared to EUC reported higher adherence to antihypertensive (81.1% vs. 57.9%) and antihyperglycemic (82.4% vs. 68.9%) medications. There was no difference in drug availability during the trial period. Physicians showed high acceptance of decision support recommendation prompts for hypertension and diabetes (68% and 69%, respectively). Participants in both the EUC and mWellcare arms reported significant improvements in the quality of care at the CHCs (96.6% and 95.0%, respectively). While there was no incremental benefit of mWellcare over EUC in the management of these chronic conditions, the authors report that this is likely due to the benefits achieved in the EUC arm and emphasize the value of using nurses to support physicians in managing hypertension and diabetes, providing regular health worker training for health workers, and improving access to essential medications.

Resources

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INPUTS

- Existing human resources for health at CHCs.
- Financial resources from the Wellcome Trust.
- Technical support from the Department of Health, Government of Karnataka and Haryana; National Program for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke.
- United Kingdom Medical Research Council framework.

PROGRAM ACTIVITIES

1

FACILITY-BASED ACTIVITIES

- NCD nurses at CHCs used mWellcare decision support system for patient assessment and long-term follow-up.

2

COMMUNITY-BASED ACTIVITIES

- None reported.

3

TRAINING & CAPACITY BUILDING

- Utilizing the mWellcare system and current clinical management guidelines.

4

INTEGRATION & COORDINATION

- Field staff, research team, and software team members supported mWellcare and troubleshooting issues.

5

TECHNOLOGY & DIGITAL SOLUTIONS

- The tablet-computer application (mWellcare) was developed, piloted, and validated by the research team.
- Samsung tablets, SIM cards, printers, weighing machines, stadiometers, BP apparatus, glucometers, and strips were provided for each CHC.
- mWellcare mobile application stored electronic health records, provided decision support, generated lifestyle advice checklists, and enabled ongoing monitoring and follow-up.
- Through the system's web interface, health care providers produced monitoring reports, managed users, viewed and extracted data.
- Patients can used the system as secondary users, receiving customized SMS messages on their mobile devices after providing consent.

OUTPUTS

- **Compliance to guidelines (A):** high acceptance of decision support recommendation prompts for hypertension and diabetes (68% and 69%, respectively) among physicians.[6]

OUTCOMES

PROXIMAL

- **Patient satisfaction (I):** Enhanced usual care (EUC) and mWellcare patients both reported high quality of care at CHCs (96.6% and 95.0%, respectively).[6]

INTERMEDIATE

- **Treatment adherence (E):** mWellcare patients had higher adherence to antihypertensive (81.1% vs. 57.9%) and antihyperglycemic (82.4% vs. 68.9%) medications compared to enhanced usual care.[6]

DISTAL

- **Patient health outcomes (E):** no significant difference was found between mWellcare and EUC patients for:
  - systolic BP or glycated hemoglobin (HbA1c) levels.[6]
  - fasting blood glucose, total cholesterol, BMI, and tobacco and alcohol use.[6]

Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India

TECHNOLOGY-ENABLED, TASK-SHARING APPROACH TO SCREEN AND TREAT COMMON MENTAL DISORDERS

31

Geographic locale	West Godavari District, Andhra Pradesh, India
Program setting	Primary health centers
Target diseases:	Common mental health disorders, including stress, depression, and increased suicide risk
Target population	Adults ≥18 years
Partners/Stakeholders	Government of Andhra Pradesh, DBT India Alliance, Wellcome Trust

Background: India is a lower-middle-income country with a population of 1.4 billion.[1] In 2019, India had an estimated age-adjusted prevalence of mental health disorders of 13.7%[2] and estimated disability-adjusted life years at of 1,561.6[2] per 100,000 population due to mental health disorders.

Model Overview: The Systematic Medical Appraisal, Referral, and Treatment (SMART) mental health project was implemented in 12 villages located in the West Godavari district of Andhra Pradesh, a southern state in India. The primary objective of this project was to address common mental disorders (CMDs) such as stress, anxiety, depression, and increased suicide risk. This was achieved through a task-sharing approach that leveraged the existing primary health workers, including accredited social health activists (ASHAs) and primary care doctors. The project incorporated the use of various technological tools, including an electronic decision support system (EDSS) for care coordination and task sharing, an interactive voice response system (IVRS) to reach individuals who had screened positive for mental health concerns, and a community anti-stigma campaign. This technology-enabled model played a crucial role in facilitating the screening, diagnosis, and management of CMDs within the targeted population.[3]

Model Strategy: The model implemented three key strategies. First, ASHAs and doctors underwent training to screen and manage CMDs, utilizing standardized tools like the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder questionnaire (GAD-7) for ASHAs and the World Health Organization (WHO) Mental Health Gap Action Plan-Intervention Guide (mhGAP-IG) for doctors.[3,4] Screening was done electronically through the Open Medical Record System (OpenMRS) platform, enabling data sharing for better care coordination. Second, individuals who screened positive for a CMD (primarily stress, depression, or suicide risk) received automated voice messages through the IVRS system to encourage adherence to their care plans. Lastly, an anti-stigma campaign was carried out in the community, including video elements, community-based theater, and a door-to-door initiative distributing informative materials. Short videos featuring a local actor and someone with a mental disorder were shown during community meetings to raise awareness and combat stigma.[3]

Notable Features of the Model: A notable feature of this model was the use of an existing network of ASHAs to screen and manage CMDs, supported by digital tools including an EDSS.[3]

Model Funding: The Wellcome Trust/DBT India Alliance Fellowship provided support for this project.[3]

Human Resources: Existing cadres of ASHAs and primary care doctors implemented the SMART project.[3,4] Training sessions for ASHAs, PHC doctors, and field staff focused on the utilization of mobile technology-based applications and effective communication.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Key Messages

- SMART project used a task-sharing approach leveraging existing networks of ASHAs and primary care doctors to improve screening and care for common mental disorders.
- Model was associated with increased service uptake and clinically meaningful reductions in depression and anxiety.

Digital Solutions: The model incorporated technology-driven platforms, including the EDSS and OpenMRS, to streamline the delivery of mental health services and screening.[3,4] The computer application algorithm-based EDSS integrated standardized protocols and included computer-based decision support systems. Furthermore, the IVRS was used to send pre-recorded messages to advise patients who screened positive to continue their care.[3]

Impact of the Model: A process evaluation to evaluate the feasibility and acceptability of the SMART intervention among different stakeholders was conducted between 2014 and 2019.[4] A total of 900 of 22,046 adults (4.08%) screened positive for stress, depression, or suicide risk and were referred to a primary care doctor. Additionally, 14,849 IVRS calls were placed: 13,400 calls to positively screened individuals with a success rate (call received and at least partially heard) of 54.2% and 1,449 calls to ASHAs and doctors with a success rate of 56%. The intervention received positive feedback and was highly valued by participants, leading to an increased understanding of CMDs and an enhancement in mental well-being. Some participants reported that the intervention was particularly beneficial for older patients and women due to a perceived greater need for mental health care in these populations.

A pre-post study evaluating one year of intervention implementation from November 2015 to November 2016 found that the intervention was associated with increased service uptake and clinically meaningful reductions in depression and anxiety.[5] Visiting the doctor for mental health symptoms increased from 3.3% at baseline to 81.2% at follow-up. Mean depression and anxiety scores post-intervention compared to baseline declined from 13.4 to 3.1 ($p<0.001$) and from 12.9 to 1.9 ($p<0.001$). An earlier pre-post evaluation conducted from March to July 2015 in two villages of Andhra Pradesh demonstrated that scores on attitude and behavior related to mental health improved significantly ($p<0.01$) and stigma perceptions related to help-seeking reduced significantly ($p<0.05$) following the anti-stigma campaign;[6] after two years, these effects continued to have a positive trend and knowledge was also improved.[7]

From 2018 to 2022, the SMART Mental Health Project was scaled up across West Godavari district in the state of Andhra Pradesh and Faridabad and Palwal districts in the state of Haryana as a cluster-randomized control trial, screening approximately 165,000 adults in a population of roughly 200,000 (results are being collated).[8] Additionally, there is a cluster-randomized control trial underway as of 2023 to assess the SMART intervention's effectiveness in adolescents (10-19 years) in urban slum communities across two large cities – Vijayawada in Andhra Pradesh and New Delhi in Delhi.[9]

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INPUTS

- Existing human resources, including ASHAs and primary care doctors.
- Financial resources from the Wellcome Trust/DBT India Alliance Fellowship.
- Technical support from Government of Andhra Pradesh.
- WHO mhGAP-IG.
- Standard screening tools: PHQ-9 and GAD7.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Primary care doctors used an EDSS to screen, diagnose, and manage patients with common mental disorders, including stress, depression, and increased suicide risk.
- ASHAs and doctors used an IVRS to reach people who had screened positive.

2 COMMUNITY-BASED ACTIVITIES

- ASHAs identified, screened, and referred patients to primary care doctors. ASHAs used an EDSS to screen patients with CMDs.
- ASHAs encouraged patients to begin treatment and ensure follow-up care.
- Community anti-stigma campaigns for mental health utilized video components, community-based theater, and a door-to-door campaign that shares brochures and pamphlets. A local theatre group put on a drama on domestic violence, mental disorder and needs for treatment.

3 TRAINING & CAPACITY BUILDING

- ASHAs and doctors were trained in screening using standard screening tools, the mobile technology-based application, and managing common mental disorders. The training was grounded in the mhGAP-IG.

4 INTEGRATION & COORDINATION

- Data on the OpenMRS platform was shared between the ASHA and doctor to better coordinate and mange care.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- An algorithm-based EDSS that integrates standardized protocols was developed and used.
- Standardized screening tools were administered electronically through an OpenMRS platform.
- Individuals who screened positive were sent automated, pre-recorded voice messages of advice through the IVRS system to encourage them to follow their care plans.
- Short videos were screened at community meetings and featured a local actor and a person with a mental disorder.

OUTPUTS

COVERAGE (R)

- **Screening:** between 2014-2019, ASHAs screened 22,046 community members for CMDs using the algorithm based EDSS.[4]
- Between 2018-2022, 165,000 adults screened in Andhra Pradesh and Haryana states.[8]

- **Sites equipped (A):** implemented across 12 villages in West Godavari district of the southern Indian state of Andhra Pradesh.[4]
- **Providers trained (A):** 41 ASHAs and 6 doctors were trained on using the mobile technology-based application.[4]

- **Functioning referral mechanisms (I):** between 2014-2019, 900 community members screened positive for a CMD and were referred for treatment.[4]
- Visiting the doctor for mental health symptoms increased from 3.3% at baseline to 81.2% at follow-up.[5]
- **Compliance with guidelines (A):** between 2014-2019, 14,849 IVRS calls were placed: 13,400 to positively screened community members and 1,449 calls were placed to ASHAs and doctors.[4]

OUTCOMES

PROXIMAL

- **Patient satisfaction (I):** patients reported satisfaction with SMART.[4]
- **Patient knowledge (I):** patient attitude and behavior related to mental health improved significantly ($p<0.01$) and stigma perceptions related to help-seeking reduced significantly ($p<0.05$);[6] knowledge also improved after 2 years[7]

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** mean depression and anxiety scores at post-intervention were significantly lower compared to baseline, declining from 13.4 to 3.1 ($p<0.001$) and from 12.9 to 1.9 ($p<0.001$), respectively.[5]

Home-based Service Delivery Model for NCDs in Udaipur, India

COMMUNITY HEALTH WORKER-LED SCREENING FOR HYPERTENSION, DIABETES, AND BREAST, ORAL, AND CERVICAL CANCERS

32

Geographic locale	Udaipur district of Rajasthan, India
Program setting	Community households and primary care health facility
Target diseases	Hypertension; diabetes; breast, cervical, and oral cancers
Target population	Community members between 30-60 years of age
Partners/Stakeholders	GBH Memorial Cancer Hospital, American International Institute of Medical Sciences

Background: India is a lower-middle-income country with a population of 1.4 billion.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.6%[3] for males and 30.5%[3] for females, with an estimated 499.0[4] and 203.[4] age-adjusted years of life lost (YLL) per 100,000 population due to type 2 diabetes and hypertensive heart disease, respectively, in the same year. In addition, in 2019, India had a 0.09%[4] prevalence of breast cancer and 0.03%[4] prevalence of cervical cancer, with an estimated age-adjusted YLL of 205.0[4] and 116.9[4] years per 100,000 population, respectively.

Model Overview: This initiative involved implementing home-based services and referral to appropriate health care facilities for NCDs through community health workers (CHWs) in the Udaipur district of Rajasthan, India from January to December 2017. The primary objective was to offer individuals convenient NCD screening services for hypertension, diabetes, and breast, oral, and cervical cancers in the comfort of their homes, enabling early detection and prevention.[5]

Model Strategy: This model deployed a new cadre of CHWs to conduct home visits for NCD screening and education on healthy lifestyles, the harmful effects of tobacco and alcohol, and the symptoms of common cancers. Community members aged 30-60 years old were eligible for home visits, with the exception of severely ill patients and pregnant women. CHWs recorded weight and blood pressure (BP) and estimated blood glucose level using glucometers. They also performed oral visual examinations (OVE), followed by palpation of abnormal areas for those patients who reported ever using tobacco and/or alcohol, and used a prosthetic breast model to teach women how to detect lumps and encourage self-examination. Additionally, women were offered human papillomavirus (HPV) detection tests using self-collected vaginal samples for cervical cancer screening. The samples were tested for the most oncogenic strains of HPV using the CareHPVTM test. CHWs referred those with high BP (BP ≥140/90 mmHg), high random blood sugar (≥140 mg/dl), and individuals with hypertension and diabetes who were non-adherent to medications to appropriate health care facilities for further evaluation and treatment. Individuals with abnormal OVE, women with breast symptom complaints, and HPV-positive women were also referred to appropriate health care facilities. Hypertension and diabetes were treated at PHC facilities, while some cancers required further referral to specialized hospitals. Based on an evaluation of oral premalignant lesions and breast lesions by the PHC clinician, some patients were referred to GBHMCH for biopsy, ultrasound, or mammography. Among HPV-positive women, PHC gynecologists performed visual inspection of the cervix after application of 5% acetic acid (visual inspection with acetic acid, or VIA); those women who needed further treatment were then either treated at the PHC facility with thermal ablation or referred to GBHMCH for colposcopy if ineligible for thermal ablation.[5]

Notable Features of the Model: The inclusion of HPV screening at household visits—with CHWs providing instructions to individuals on how to self-collect specimens—was a novel feature of this model.[5]

Key Messages

- A new cadre of CHWs conducted home visits for NCD screening, health education, and referral to appropriate health care facilities if needed
- HPV testing was conducted during home visits, with CHWs instructing individuals on self-collection of vaginal samples
- CHW screening identified high BP and high blood sugar in 32.6% and 7.5% of screened individuals, respectively; HPV was detected in 8.6% of women who were screened at home

Model Funding: Implementation of this model was financed by the Indo-American Cancer Association.[5]

Human Resources: A new cadre of CHWs was developed for this model. CHWs were female community members aged 25–45 years with at least a secondary-level education. CHW training was comprised of two weeks of training on common NCDs, followed by a week of conducting counseling and screening at GBH Memorial Cancer Hospital (GBHMCH) outpatient clinics under direct supervision. CHWs were evaluated before their deployment and re-trained after three months. Existing health care professionals at PHC facilities and specialized cancer hospitals provided care to those who were referred.[5]

Laboratory, Diagnostic, or Pharmacy Services: This model utilized glucometers, BP monitors, and CareHPV™ tests for blood glucose, hypertension, and HPV screening, respectively, at the community level. In addition to the regular laboratory services, VIA tests were available at PHC facilities, and mammography, ultrasound, and biopsy services were available at GBHMCH. There were no significant changes to the existing pharmacy services.[5]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A study evaluating the feasibility and efficacy of this model of CHW delivery of NCD screening services at home found that within six months CHWs screened 6,995 participants (1,998 men and 4,997 women), with a refusal rate of <10%.[5] High BP and high blood sugar were detected in 32.6% and 7.5% of participants, respectively; hypertension and diabetes were confirmed in 42.3% and 35% of those undergoing follow-up. Obesity prevalence was 2.4%. Over 50% of men were tobacco chewers. OVE was abnormal in 8.0% of men and 0.4% of women. The HPV test was positive in 8.6% of women, and they were triaged by VIA for treatment either with thermal ablation or loop excision. The VIA was positive in 14% of the HPV-positive women, and 56.5% of these women received same day ablative treatment. No oral or breast cancer was found among study participants.[5]

Resources

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INPUTS

- Existing human resources at PHC centers and specialized cancer hospitals.
- New cadre of CHWs.
- Financial resources from Indo-American Cancer Association.
- Technical support from GBHMCH, American International Institute of Medical Sciences.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Health care providers at PHC facilities evaluated and treated patients referred by CHWs for HTN, T2DM, or relevant cancers.
- PHC providers referred some patients with oral or breast lesions to GBHMCH for biopsy, ultrasound or mammography.
- PHC gynecologists performed VIA for HPV positive women, who were treated at PHC if possible, or referred to GBHMCH.

2 COMMUNITY-BASED ACTIVITIES

- CHWs provided home-based health education to patients about healthy lifestyles, the harmful effects of tobacco and alcohol, and the symptoms of common cancers. CHWs used prosthetic breast models to teach women how to detect lumps and they encourage self-examination.
- CHWs conducted home-based screenings for NCDs, including for HTN, T2DM, and oral, breast, and cervical cancers. CHWs recorded patient weight and BP and estimated blood glucose level using a glucometer. CHWs performed OVE and offered HPV detection tests using patient-collected vaginal samples.
- CHWs referred patients to appropriate PHC facilities for further screening, diagnosis, and treatment based on screening results.

3 TRAINING & CAPACITY BUILDING

- Female local community members aged 25-45 years with education at least up to secondary level were recruited to become CHWs.
- CHWs were trained in providing home-based NCD screening services and to use glucometers, BP instruments, and CareHPV™ tests.
- CHWs conducted counseling sessions and screenings at GBHMCH outpatient clinics under direct supervision. CHWs were evaluated before deploying to home-based services.
- CHWs were reoriented after 3 months.

4 INTEGRATION & COORDINATION

- Referral system was established between CHWs, PHC facilities, and GBHMCH.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Treatment:** HPV tests were positive in 8.6% of women; the VIA was positive in 14% of HPV-positive women and 56.5% of them received same day ablative treatment.[5]

COVERAGE (R)

- **Screening:** within 6 months CHWs screened 6,995 participants (1,988 men and 4,997 women) with a refusal rate of <10%.[5]
- **Detection:** among those screened, CHWs detected:[5]
  - High BP in 32.6%; of those who underwent follow-up, hypertension was confirmed in 42.3%.
  - High blood sugar in 7.5%; of those who underwent follow-up, T2DM was confirmed in 35.0%.
  - OVE was abnormal in 8.0% of men and 0.4% of women.

COVERAGE (R)

- **Training:** 10 CHWs trained to deliver home care screening.[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

Task-shifting Model for Secondary Prevention of Stroke by Community Health Workers in Kerala, India

TASK-SHIFTING TO EMPOWER COMMUNITY HEALTH WORKERS TO PROVIDE SECONDARY PREVENTION FOR CEREBROVASCULAR EVENTS

33

Geographic locale	Kerala, India
Program setting	Rural primary care settings
Target diseases	Cerebrovascular disease: stroke and transient ischemic attack
Target population	Stroke or transient ischemic attack patients aged ≥18 years
Partners/Stakeholders	Department of Health and Family Welfare, Government of Kerala

Background: India is a lower-middle-income country with a population of 1.4 billion.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.6%[3] for males and 30.5%[3] for females. The estimated age-adjusted years of life lost (YLL) was 499.0[4] and 203.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in 2019. The estimated cardiovascular disease prevalence was 6.3%,[4] with an estimated YLL of 5,300.5[4] per 100,000 population, in 2019.

Model Overview: This task-shifting model aimed to empower and provide additional training on stroke management for community health workers (CHWs) operating in rural primary care centers in eight clusters, defined as a geographical region depicting administrative rural "blocks" of the district. The objective was to equip them with the necessary knowledge and skills to provide management for individuals who had experienced strokes or transient ischemic attacks (TIAs). The primary focus of secondary prevention for cerebrovascular disease revolved around monitoring risk factors and promoting a healthy lifestyle. The program aimed to offer patients education and support for secondary stroke prevention, encompassing the monitoring of risk factors and the adoption of healthy lifestyle modifications.[5]

Model Strategy: The model included training rural CHWs on secondary prevention of stroke and TIA, with the aim of improving risk factor control in patients with history of cerebrovascular events. A training program for CHWs was designed and provided by a neurologist, nurse, and physiotherapist working in the Comprehensive Stroke Center. Topics covered included stroke symptoms and management, nursing care for stroke survivors, control of risk factors, including blood pressure (BP), blood sugar and cholesterol levels, tobacco and alcohol use, and caregiver-based rehabilitation. The training was comprised of four sessions, each lasting 45 minutes: Session 1 covered identification of symptoms and management of acute stroke; Session 2 covered the secondary prevention of stroke; Session 3 discussed nursing care of stroke survivors; and Session 4 reviewed aspects of physiotherapy and stroke rehabilitation with a focus on caregiver-based rehabilitation for stroke patients. CHWs were also educated on the importance of home visits for stroke survivors and continued risk factor control, healthy lifestyles, medication adherence, and BP monitoring. Primary care physicians received additional training for their supervisory role in the model. Trained project staff took part in community visits and in-field supportive supervision for CHWs as necessary. Patients received medical care information, were given a list of goals for their clinical condition and were encouraged to record health updates in workbooks.[5]

Notable Features of the Model: A notable feature of this model was the utilization of existing rural CHWs to focus on targeting survivors of stroke or transient ischemic attack after they had received care from a Comprehensive Stroke Center.[5] The aim was to provide quality secondary prevention services at the PHC level. The program aimed to ensure that patients remain engaged in their care in a manner that is manageable both for the patients and the health care system.[5]

Key Messages

- A trial showed that training CHWs to deliver stroke care improved risk factor control in stroke survivors.
- Task-shifting to CHWs was a cost-effective strategy for secondary prevention of stroke in the community.
- Patients in the intervention group received more home visits from CHWs and were more likely to receive information on medication adherence, dietary modifications, rehabilitation, BP control, and blood sugar control.

Model Funding: Funding for the cluster randomized trial was provided by the Department of Health and Family Welfare, Government of Kerala.[5]

Human Resources: CHWs were central to this model, which involved shifting tasks from physicians to CHWs. The CHWs underwent training to learn about care for stroke and TIA, and subsequently provided care, including home-based care, to patients. Physicians played a supervisory role in the model, overseeing CHWs' provision of care. Comprehensive Stroke Centers staff including neurologists, nurses, and physiotherapists provided trainings to CHWs and physicians. Project personnel conducted supervisory visits as requested by CHWs.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A cluster randomized trial conducted from December 2017 to December 2018 demonstrated the viability of training CHWs to deliver care for individuals who have experienced strokes.[5] Systolic blood pressure (SBP) in the intervention group significantly decreased from a mean of 140.79 mm Hg at baseline to 135.15 at three months ($p<0.001$) and 135.71 at six months ($p<0.001$), respectively. SBP also significantly decreased in the control group from 135.59 mm Hg at baseline to 130.28 at three months ($p<0.001$) and 128.66 at six months ($p=0.005$). At baseline, the mean fasting blood sugar (FBS) was 121.3 mg/dl in the intervention group and 122.58 mg/dl in the control group. At three months of follow-up, the mean FBS was significantly lower than baseline in both the intervention and control groups (120.22 mg/dl and 119.92 mg/dl) ($p<0.001$ in both groups). At six months of follow-up, only the control group showed a decline in the mean FBS; however, the difference between mean FBS between the intervention and control groups was not statistically significant ($p=0.426$).

At six months of follow-up, 65.8% of patients in the intervention group had been visited by a CHW in the past three months compared to 13.3% of patients in the control group ($p<0.001$). Additionally, at six months, patients in the intervention group were significantly more likely to have received information on medication adherence (OR 8.75, 95% CI 2.67–28.63, $p<0.001$), dietary modifications (OR 7.95, 95% CI 4.25–25.75, $p<0.001$), BP control (OR 4.08, 95% CI 1.27–13.09, $p=0.013$), and blood sugar control (OR 4.77, 95% CI 1.51–15.03, $p=0.005$).[5]

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. *IDF Diabetes Atlas 2021: 10th edition*. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
3. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 Million Participants." *Lancet 398* (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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INPUTS

- Existing cadres of CHWs and physicians in primary care facilities.
- Existing neurologists, nurses, and physiotherapists from Comprehensive Stroke Centers.
- Financial support from the Department of Health and Family Welfare, Government of Kerala.
- Technical and supervisory support from implementing personnel.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- CHWs provided care and health education to stroke/TIA survivors.

2 COMMUNITY-BASED ACTIVITIES

- CHWs provided home-based care and counseling to stroke survivors and their families.

3 TRAINING & CAPACITY BUILDING

- CHWS underwent a 4-session training, with each session lasting 45 minutes. Topics included stroke symptoms and management, survivor care, control of risk factors, and caregiver-based rehabilitation.
- CHWs were also educated on the importance of home visits for stroke survivors and continued risk factor control, healthy lifestyles, medication adherence, and blood pressure monitoring.
- Primary care physicians received additional training about their supervisory role in the model.

4 INTEGRATION & COORDINATION

- None reported.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Treatment:** CHWs provided secondary prevention focused care and education to survivors who previously sought care at Comprehensive Stroke Centers.[5]

EQUITY (R)

- **Geographic reach:** This task-shifting model was conducted in rural primary health centers, addressing the additional burden placed on survivors in rural areas.[5]

COVERAGE (R)

- **Treatment:** CHWs provided home-based secondary prevention focused care and education to survivors.[5]

EQUITY (R)

- **Geographic reach:** CHWs conducted home visits, addressing the additional burden placed on survivors in rural areas.[5]

- **Providers trained (A):** Training CHWs to deliver secondary prevention care for stroke proved to be feasible.[5]

OUTCOMES

PROXIMAL

- **Patient knowledge (I):** Patients in the intervention group were significantly more likely to receive information about medication adherence (OR 8.75, 95% CI 2.67–28.63, *p<0.001*), dietary modifications (OR 7.95, 95% CI 4.25–25.75, *p<0.001*), BP control (OR 4.08, 95% CI 1.27–13.09, *p=0.013*), and blood sugar control (OR 4.77, 95% CI 1.51–15.03, *p=0.005*).[5]

INTERMEDIATE

- **Retention in care (E):** At 6 months follow up, 65.8% of patients in the intervention group received a home visit by a CHW compared to 13.3% of patients in the control group (*p<0.001*).[5]

DISTAL

- **Patient health outcomes (E):** SBP decreased in the intervention group from a mean of 140.79 mm Hg at baseline to 135.15 and 135.71 at 3 and 6 months, respectively, and in the control group from a mean of 135.59 mm Hg at baseline to 130.28 and 128.66 at 3 and 6 months, respectively; the difference between the study arms was non-significant.[5]

mPower Heart Model in India

A TASK-SHARING AND MOBILE PHONE-BASED CLINICAL DECISION SUPPORT PACKAGE LED BY NURSES AT COMMUNITY HEALTH CENTERS

34

Geographic locale	Himachal Pradesh, India
Program setting	Community health centers
Target diseases	Hypertension, type 2 diabetes mellitus
Target population	Adults >30 years presenting at community health centers with hypertension or diabetes
Partners/Stakeholders	Centre for Chronic Disease Control New Delhi, Center for Control of Chronic Conditions Public Health Foundation of India, London School of Hygiene and Tropical Medicine London, All India Institute of Medical Sciences

Background: India is a lower-middle-income country with a population of 1.4 billion.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 9.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.6%[3] for males and 30.5%[3] for females. The estimated age-adjusted years of life lost was 499.0[4] and 203.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in 2019.

Model Overview: mPower Heart employs task-sharing and integrates a mobile phone-based decision-support (mDSS) tool into community health centers (CHCs). This facility-based intervention was designed with stakeholder input in order to improve clinical care and flow of hypertension and diabetes patients in CHCs. It consisted of two primary pillars: 1) task-shifting of NCD management and duties from physicians to nurses, and 2) provision of job aids, including the digital mDSS tool on mobile devices. The model was integrated into CHCs and is scalable in most primary care settings.[5]

Model Strategy: The model implementation strategy was built around the two primary pillars. First, to *build the capacity of providers*, i.e. nurse care coordinators (NCCs) were trained at facilities and tasked with attending to patients with hypertension and diabetes, as part of a task-sharing approach. Second, NCCs were provided with job aids, including clinical management guidelines for hypertension and diabetes mellitus, as well as the internet-based mDSS. Nurses opportunistically screened all patients over 30 years of age for hypertension and diabetes, checking blood pressure (BP) and fasting glucose (when indicated). The nurses input the clinical parameters into the mDSS to generate an individualized NCD management plan. The plan was printed on a custom card and given to patients who brought it to the medical officer or physician for clinical review during the same appointment. Patients then received health education and lifestyle counselling from the nurses.[5]

Notable Features of the Model: The mDSS tool is a unique and notable digital solution to address staffing challenges in resource constrained settings. Many clinical decision support tools are paper or PDF guides; this digitized tool takes input and generates a management plan tailored to the specific NCD patient.[5]

Key Messages

- Through systematic targeted screening, this model identified a significant number of new cases of hypertension and diabetes, with over half of the hypertension cases and 30% of the diabetes cases being newly detected.
- After 18 months, there were notable reductions in systolic and diastolic BP as well as FPG levels, indicating improved control among patients in treatment.
- The model shows promise for scalability in low-resource settings, with the use of mDSS tools contributing to standardized and personalized care. The observed improvements in health outcomes remained statistically significant after adjusting for demographic factors.

Model Funding: Funding to implement and evaluate the model was supported by Medtronic Foundation and Wellcome Trust Capacity Strengthening Strategic Award to the Public Health Foundation of India and a consortium of United Kingdom universities.[5]

Human Resources: The model relied on existing clinical staff at CHCs, including medical officers and nurses.[5]

Laboratory, Diagnostic, or Pharmacy Services: Diagnostic services included monitoring glucose values and BP, though these were mostly already available at the CHCs. Clinics were provided with necessary supplies as part of the model, if not already present.[5]

Digital Solutions: mDSS was the mobile device clinical decision support tool. The essential features included storing patient records in the device and database, clinical risk scoring for diabetes, generating management plans for both diabetes and hypertension, offering data on continuity of care, quality assurance, and export features for further data analysis.[5]

Impact of the Model: A pre-post evaluation study reported that in the clinics where this model was implemented, there were 132,370 patients from December 2012 to August 2014, including 22,009 who were eligible for opportunistic screening (over 30 years of age).[5] A total of 6,016 individuals were identified as having hypertension, with an average systolic blood pressure (SBP) of 146.1 mmHg (95% CI: 145.7, 146.5) and an average diastolic blood pressure (DBP) of 89.52 mmHg (95% CI 89.33, 89.72). Among them, 3,152 participants (52%) were newly diagnosed. Similarly, there were 1,516 participants with diabetes mellitus, with an average fasting plasma glucose (FPG) level of 177.9 mg/dL (95% CI 175.8, 180.0). Among these individuals, 450 (30%) were newly detected cases. After 18 months of follow-up, significant changes were observed in SBP, DBP, and FPG levels.[5] The changes were as follows: a decrease of 14.6 mmHg (95% CI -15.3, -13.8) in SBP, a decrease of 7.6 mmHg (95% CI -8.0, -7.2) in DBP, and a decrease of 50.0 mg/dL (95% CI -54.6, -45.5) in FPG. These changes remained statistically significant after adjusting for age, sex, and the CHC. The authors noted that this model has the potential for scale-up in low resource settings.[5] Additionally, the mDSS tool was helpful in structuring and standardizing care practices.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 Million Participants." *Lancet 398* (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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INPUTS

- Nurses, medical officers and doctors at CHCs.
- Medtronic Foundation and Wellcome Trust Capacity Strengthening Strategic Award to the Public Health Foundation of India.
- mDSS.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Nurses opportunistically screened patients over 30 years of age for hypertension and diabetes, checked BP and fasting glucose (when indicated) and utilized the mDSS to generate individualized patient management plan.
- Medical officers or doctors reviewed individual patient management plan.
- Nurses counseled and monitored patients.
- CHCs were provided with clinical guidelines and mDSS tool.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Nurses were trained to screen patients for hypertension and diabetes using clinical guidelines, use the mDSS tool, and provide lifestyle counseling.
- Doctors trained on mDSS tool and how to review patient management plan.

4 INTEGRATION & COORDINATION

- Task-shifting of management of NCD patients from doctors, who still provide clinical input to care plans, to nurses.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- mDSS tool generated individualized patient management plans and storage of patient records.

OUTPUTS

COVERAGE (R)

- **Screening:** 22,009 patients screened opportunistically; 52% were newly diagnosed with hypertension, 30% were newly diagnosed with diabetes mellitus.[5]

TRAINING (A)

- 5 CHC sites equipped [5]
- NCCs and clinicians trained at each site[5]

TASK-SHIFTING (I)

- Functioning task-shifting mechanisms at each site.[5]

TECHNOLOGY SOLUTIONS:

- Improved guideline compliance (A).[4]
- Individualized patient management plans (I).[5]
- Standardizing care (I)[5]
- Improving the quality of care (I)[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):**
  - Mean SBP: after 18 months of follow up, mean SBP decreased by 14.6 mmHg (95% CI -15.3, -13.8)[5]
  - Mean DBP: after 18 months of follow up, mean DBP decreased by 7.6 mmHg (95% CI -8.0, -7.2)[5]
  - Mean FPG levels: after 18 months of follow up, mean FPG decreased by 50.0 mg/dL (95% CI -54.6, -45.5)[5]

Reducing Stigma Among Healthcare Providers (RESHAPE) Model in Nepal

INTERACTIONS BETWEEN PCPS AND PEOPLE WITH LIVED EXPERIENCES OF MENTAL ILLNESS TO REDUCE STIGMA

35

Geographic locale	Nepal, Chitwan district
Program setting	Primary care facilities
Target diseases	Mental health disorders
Target population	Adults >21 years
Partners/Stakeholders	Transcultural Psychosocial Organization Nepal, King's College London; Programme for Improving Mental healthcarE Network

Background: Nepal is a lower-middle-income country with a population of 30.5 million.[1] In 2019, Nepal had an estimated mental health disorder (MHD) prevalence of 13.8%,[2] and an estimated disability-adjusted life years rate of 1,773.7[2] per 100,000 population due to MHDs.

Model Overview: Reducing Stigma Among Healthcare Providers (RESHAPE) sought to address stigma among primary care providers (PCPs) regarding individuals with mental illness. In lower-income countries, there is a significant treatment gap for mental health, with mental illness often not prioritized to the same extent as other NCDs. To address care provider stigma against mental illness, the RESHAPE model incorporated elements from the World Health Organization (WHO) Mental Health Gap Action Programme (mhGAP) and trained mental health service users as RESHAPE co-facilitators. These co-facilitators shared their personal experiences, helping to reduce stigma and increase understanding among health care providers, with the aim of improving quality of care. This program recognized the importance of addressing stigma as a barrier to effective mental health care in low-resource settings.[3,4]

Model Strategy: RESHAPE incorporated the foundational framework of Programme for Improving Mental Healthcare (PRIME) training and supervision, which was sponsored by the United Kingdom Department for International Development (DFID). This framework was based on the WHO mhGAP-Intervention Guide, the Healthy Activity Program, and the Counseling for Alcohol Problems intervention. The training of PCPs in PRIME focused on a variety of neuropsychiatric disorders, with a specific emphasis on depression, psychosis, epilepsy, and alcohol use disorder in Nepal. The training program included psychosocial modules that covered communication skills, supportive techniques, and health education. PCPs participated in a 10-day training program led by a psychiatrist and an experienced psychosocial counselor. Following the training, PCPs participated in regular supervision sessions, typically conducted every three months, with a psychiatrist.[3,4]

In RESHAPE, the basic model of PRIME was implemented with the added component of co-facilitators. Co-facilitators were trained mental health service users that achieved recovery through PRIME. A key component of the model was a participatory research approach called PhotoVoice. This was an innovative approach that used photography to harness the power of visual storytelling to give voice to marginalized communities, promote social change, and advance understanding and empathy in various contexts. Co-facilitators developed three-part testimonials that incorporated photographs and personal stories to describe life before, during, and after treatment.[3,4] The co-facilitators in RESHAPE played multiple roles (i.e., provided personal testimonials, maintained ongoing social contact, dispelled myths, and embodied a recovery-oriented perspective).[3,4]

Notable Features of the Model: The RESHAPE model stands out for its focus on stigma reduction, inclusion of people with lived experience, adaptation of mhGAP, empowerment of PCPs, and commitment to evaluation and improvement.[3,4]

Key Messages

- The RESHAPE model aimed to reduce stigma in mental health services through co-facilitator training and was evaluated in a clinical study. PCPs in the RESHAPE group experienced a significant decrease in stigma levels compared to the control group.
- The RESHAPE group demonstrated higher diagnostic accuracy in role-plays and patient evaluations at both four- and 16-month follow-ups, with depression showing the most significant difference between the groups.
- These findings from the RESHAPE model highlight that co-facilitators (i.e., people with lived experience of mental illness) can be effectively engaged and trained to reduce stigma in primary care mental health services.

Model Funding: A cluster randomized trial of this study was funded by the United States National Institute of Mental Health and DFID funding to the PRIME Research Programme Consortium.[3,5]

Human Resources: Key personnel for RESHAPE were psychiatrists, PCPs, psychosocial counselors, and co-facilitators (individuals who have experienced recovery from mental illness through the PRIME program).[3,4]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: Researchers examined the impact of stigma reduction in mental health services in a pilot cluster randomized clinical study of the RESHAPE model.[5] Thirty four facilities were randomized to RESHAPE or the control group, with all eligible PCPs participating (n=43 in the RESHAPE group and n=45 in the control group; n=33 retained at endline in each group). There were 15 co-facilitators trained in PhotoVoice, with 11 retained throughout three months of PCP trainings.

The primary outcome measures of the trial were the Social Distance Scale (SDS), the accuracy of mental illness diagnoses in standardized role-plays using the Enhancing Assessment of Common Therapeutic factors tool (ENACT), and the accuracy of diagnosis with actual patients. Among PCPs in the RESHAPE group, there was a mean SDS change of -10.6 points (95% CI -14.5 to -6.7) compared to -2.8 points (95% CI -8.3 to 2.7) in the control group from pre-training to 16-month follow-up. Diagnoses based on standardized ENACT role-plays were accurate for 78.1% (25/32) of RESHAPE physicians compared to 66.7% (22/33) of physicians in the control group. Patient diagnoses were 72.5% (29/40) accurate among RESHAPE physicians compared to 34.5% (10/29) of control group PCPs. There were no serious adverse events in either group.

Among the four priority disorders—depression, psychosis, alcohol use disorder, and epilepsy—the disorder with the largest absolute difference in diagnostic accuracy between the intervention and control groups was depression in both role-plays and actual patient evaluations. Overall, the pilot cluster RCT findings suggested that it was both feasible and acceptable for PCPs to be trained by people with lived experiences of mental illness.

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
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INPUTS

- Existing human resources for mental health and recovered patients.
- Financial resources from United States National Institute of Mental Health, and DFID funding to the PRIME Research Programme Consortium.
- Technical support from Transcultural Psychosocial Organization Nepal and PRIME.
- mhGAP-Intervention Guide, Healthy Activity Program, Counseling for Alcohol Problems.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Psychiatrists, PCPs, and psychosocial counselors provided care for patients.

2 COMMUNITY-BASED ACTIVITIES

- Co-facilitators (trained mental health service users that achieved recovery through PRIME) used the PhotoVoice approach, developing 3-part testimonials with photographs and personal stories to describe their lives before, during, and after treatment. They worked with PCPs to dispel myths, and embodied a recovery-oriented perspective.

3 TRAINING & CAPACITY BUILDING

- PCPs were trained for 10 days by a psychiatrist and an experienced psychosocial counselor on neuropsychiatric disorders, emphasizing depression, psychosis, epilepsy, and alcohol use disorder. Trainings include modules on communication skills, supportive techniques, and health education.
- PCPs participated in regular supervision sessions every 3 months with a psychiatrist.
- Co-facilitators were trained in mental health services.

4 INTEGRATION & COORDINATION

- None reported.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Providers trained (A)**
  - 43 PCPs were trained for the RESHAPE group and 45 PCPs participated in a cluster RCT as the control group; 33 in each group were retained at 16 month endline.[5]
  - 15 co-facilitators were trained in PhotoVoice; 11 retained throughout 3 months of PCP training.[5]

OUTCOMES

PROXIMAL:

Quality of care (I):

- **Stigma:** RESHAPE PCPs had a mean change of -10.6 points (95% CI -14.5 to -6.7) in SDS vs. -2.8 points (95% CI -8.3 to 2.7) in control group PCPs at 16 months.[5]
- **Role-play-based diagnoses:** 78.1% accurate among RESHAPE PCPs vs. 66.7% among control group PCPs at 16 months.
- **Patient diagnoses:** 72.5% accurate among RESHAPE PCPs vs. 34.5% among control group PCPs.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

Public-private Partnership Model for Hypertension Care in Urban Pakistan

A PUBLIC-PRIVATE PARTNERSHIP TO IMPROVE ACCESS TO HYPERTENSION CARE

36

Geographic locale	Sargodha, Mandi-Bahauddin, and Kasur districts of Punjab, Pakistan
Program setting	Private sector clinics
Target diseases	Hypertension
Target population	Adults with hypertension in low-resource urban settings
Partners/Stakeholders	Communicable Diseases Health Service Delivery, a research consortium funded by UK Aid

Background: Pakistan is a lower-middle income country with a population of 235.8 million.[1] In 2021, Pakistan had an age-adjusted estimated hypertension prevalence of 41.6%[2] for males and 44.8%[2] for females, with an age-adjusted estimated years of life lost of 359.7[3] per 100,000 population due to hypertensive heart disease in 2019.

Model Overview: In urban areas of Pakistan, approximately 70% of basic health care occurs in private facilities. However, private clinics have typically lacked a focus on identifying chronic illnesses and ensuring ongoing long-term medical support. To address this, the Non-Communicable Diseases and Mental Health Programme initiated a district-led public-private partnership to deliver hypertension care to patients who are unwilling or unable to access public facilities. Between January 2015 to September 2016, this model was trialed in 26 private clinics in three districts (Sargodha, Mandi-Bahauddin, and Kasur) of Punjab. It included training care providers and providing NCD management guidelines and essential inputs like blood pressure (BP) monitors and scales to deliver high quality care.[4]

Model Strategy: The clinics where the model was integrated were private care centers in poor urban settings. Their patient populations have limited access to government facility services. Selected clinics were providing comprehensive tuberculosis (TB) care and were willing to engage in a public-private partnership to provide hypertension care. Implementation of the model included signing public-private partnership agreements (district-steered partnership); training clinic staff on standardized hypertension care; and providing a detailed case management desk guide (with comprehensive clinical and pharmaceutical care instructions), essential equipment for hypertension diagnosis and care (e.g., BP cuff, glucometer, glucose test strips, etc.), and monitoring and supervision to ensure quality of care. Providers gave enhanced care to patients using a standardized approach toward hypertension diagnosis and treatment, increased patient education and complementary pictorial tools about healthy lifestyle changes, and active follow-up of patients who missed an appointment via phone calls or messages to improve retention in care. follow-up efforts utilized a three-tray system (i.e., patient's records moved from first to second tray if they attended the clinics) to organize the records of patients who were contacted and, in the third tray, those still needing additional follow-up.[4]

Notable Features of the Model: This program is one of few care models that focuses specifically on urban locations within Pakistan and can be considered for other urban settings. While Pakistan has had success engaging private health facilities in TB and malaria care, private sector integration of care for hypertension has never been evaluated. This model strategically selected private facilities that were already providing TB care.[4]

Key Messages

- The model was feasible and well-received by private clinic staff and patients in poor urban settings.
- The model had higher rates of prescribing preventive medication and better adherence to follow-up visits compared to the control group.
- The model resulted in significant improvements in BP levels, higher hypertension control rates, and better treatment adherence.

Model Funding: Financing for the process evaluation and cluster randomized trial were provided by Communicable Diseases Health Service Delivery, a research consortium funded by UK Aid.[4]

Human Resources: Private health clinics are typically run by at least one physician and allied staff. These staff members underwent training, consisting of modules based on international best practice guidelines with included regional or social context. Nearly all of the invited clinicians (90%) attended the training. These health care personnel then went on to provide hypertension care, educate patients, and make contact about follow-up.[4]

Laboratory, Diagnostic, or Pharmacy Services: Physicians at private clinics began to prescribe (but not dispense, except for thiazide) standardized anti-hypertensive medications as a result of the evaluation of this model.[4]

Digital Solutions: Clinicians engaged in active follow up of patients who missed clinic visits through phone calls and short message service (SMS) messages.[4]

Impact of the Model: A cluster randomized trial—and a mixed-methods process evaluation undertaken as part of the trial—was conducted at 26 private clinics between January 2015 and September 2016 to inform a potential scale-up of the program.[4,5] Both the treatment and control groups implemented enhanced screening and diagnosis of hypertension and related conditions and improved patient data recording processes. The intervention facilities additionally provided a clinical care guide, extra medications for hypertension, a patient lifestyle education flipchart, relevant training, and mobile phone follow-up services. Approximately 90% of invited staff from the selected clinics attended training. The process evaluation demonstrated that delivery of the program was feasible and acceptable for private clinic staff and patients in poor urban settings.[4] While there were significant gaps in the prescription of preventive medication for eligible hypertension patients in both the intervention and control groups, a higher proportion of eligible patients were prescribed preventive medication in the intervention group (59.4%) as compared to the control group (22.6%).[4] Adherence to the first follow-up visit at eight months was also improved in the intervention group (59.1%) as compared to the control group (22.5%).[4]

The cluster randomized trial found significantly greater improvements in systolic blood pressure (SBP) and diastolic blood pressure (DBP) in the intervention group (IG) as compared to the control group (CG) ($p=0.04$).[5] The change in SBP was -25.23 mmHg (-29.86 to -20.61) in the IG and -9.41 mmHg (-21.24 to 2.24) in the CG; the adjusted control-intervention difference was 12.63 (95% CI 0.68, 24.57, $p=0.04$). The change in DBP was -18.18 mmHg (-22.12 to -14.25) in the IG and -8.62 mmHg (-15.00 to -2.24) in the CG; the adjusted control-intervention difference was 7.58 (95% CI 0.61, 14.55, $p=0.04$). The intervention also improved hypertension control, with 70% of the IG achieving hypertension control compared to 36% of the CG ($p=0.02$). Treatment adherence, defined as attending five or more treatment visits, was significantly higher in the IG at 73% compared to 19% in the CG ($p=0.00$).[5]

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INPUTS

- Existing cadres of human resources for health, physicians and allied staff.
- Financial support from Communicable Diseases Health Service Delivery, a consortium funded by UK Aid.
- Provision of essential equipment (BP cuff, scales, glucometer) by model implementers.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Health care providers at private urban clinics:
  - delivered education to patients about hypertension and complementary pictorial tools about healthy lifestyle changes.
  - delivered enhanced hypertension diagnosis and care per international best practice guidelines.
  - actively followed up patients who miss visits via phone calls or messages to improve retention in care.
- Physicians at private urban clinics began to prescribe anti-hypertensive medications.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Private health facility staff members underwent training, consisting of modules based on international best practice guidelines for hypertension care with included regional or social context.
- Administration of a detailed case management desk guide, which provided comprehensive clinical and pharmaceutical care instructions for hypertension.

4 INTEGRATION & COORDINATION

- Districts, government and private health facilities (which had already begun providing TB care) signed cross-sectoral partnership agreements.
- Standardized approach toward diagnosis and pharmaceutical treatment was adopted by providers.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Clinicians engaged in active follow up of patients who missed clinic visits through phone calls and SMS messages.

OUTPUTS

EQUITY (R)

- Geographic reach: urban clinics, which previously were not permitted to provide long term/chronic disease care, offer hypertension care.[4,5]

- **Sites equipped (A):** 26 private health facilities began providing care for hypertension.[4,5]
- **Providers trained (A):** 90% of providers invited to training attended, focusing on clinical guidelines for hypertension diagnosis and treatment.[4,5]
- **Training materials available (A):** desk guides provide step-by-step instructions for hypertension diagnosis, medication, and care.[4,5]
- **Compliance with guidelines (A):** a higher proportion of eligible patients in the IG were prescribed preventive medication (59.4%) as compared to the CG (22.6%).[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Retention in care:**
  - adherence to the first follow-up at 8 months was higher in the IG at 59.1% vs. 22.5% in the CG
  - participants in the IG had increased adherence (attending 5+ treatment visits) (73% compared to 19% in the CG, *p=0.00*)[5]

DISTAL

- **Patient health outcomes (E)**
  - change in SBP was -25.23 mmHg (-29.86 to -20.61) in the IG and -9.41 mmHg (-21.24 to 2.24) in the CG; the change in DBP was -18.18 mmHg (-22.12 to -14.25) in the IG and -8.62 mmHg (-15.00 to -2.24) in the CG (*p=0.04*).[5]
  - IG had a higher proportion of patients with hypertension control (70%) compared to the CG (36%) (*p=0.02*)[5]

Integrated Model for COPD and Asthma Care in Punjab, Pakistan

A PACKAGE OF INTERVENTIONS TO IMPROVE QUALITY OF CARE AND PATIENT HEALTH BEHAVIORS AT PRIMARY AND SECONDARY HEALTH CARE FACILITIES

37

Geographic locale	Punjab, Pakistan
Program setting	15 public health facilities
Target diseases	Chronic obstructive pulmonary disease, asthma
Target population	Adult patients newly diagnosed with chronic obstructive pulmonary disease or asthma
Partners/Stakeholders	Government of the Punjab, Punjab NCD Control Programme, Association for Social Development, Communicable Diseases Health Service Delivery

OVERVIEW

Chronic obstructive pulmonary disease (COPD) and asthma are significant non-communicable diseases (NCDs) in Pakistan. COPD is characterized by progressive lung damage, leading to breathing difficulties and other respiratory symptoms. In 2016, the Government of Punjab developed a set of clinical support tools to integrate chronic lung care at primary and secondary level facilities nationwide, standardize care practices, and improve the quality of care.[1] The Provincial Non-Communicable Disease Programme and its partners developed these contextualized tools by adapting international best practice guidelines, including: a case management desk guide, training for doctors and staff, and an education tool for patients.[1]

The program had three key components, designed to improve asthma and COPD control. The first component aimed to improve providers' ability to manage care. Trained providers would use the desk guide to enhance screening, diagnosis, medication dispensing, counseling, and follow-up care for asthma and COPD. The second component aimed to improve patients' health behaviors (e.g. smoking cessation) as well as adherence to treatment and follow-up visits for asthma and COPD.[1] The last component aimed to ensure the availability of necessary medicines.

The intervention package was initially introduced and piloted in 15 publicly funded primary health care (PHC) centers and sub-district hospitals in three selected districts of Sargodha, Kasur, and Mandi Bahauddin, Pakistan.[2] After the intervention was shown to be effective, the Department of Health of Punjab scaled this model of COPD/asthma care to more than 130 secondary hospitals in all 36 districts of Punjab. The scale-up included adding inhalers to the list of essential drugs for public health facilities in the province.[2,3] Pakistan has also been a leader in integrating other health care interventions into PHC and private clinics. Examples include diabetes, tuberculosis (TB), hepatitis, early childhood development, and malaria, among others.[3]

NOTABLE FEATURES OF THE MODEL

This was the first attempt to formally integrate COPD and asthma care into the public healthcare facilities in Pakistan. The implementation of the integrated COPD care package, which included standardized diagnosis, prescription,

patient education, free drugs, and follow-up adherence support, and its evaluation, generated evidence and showed that the delivery of integrated chronic lung care was feasible for staff and patients in routine PHC settings. By laying the foundation for scaling-up the integration of COPD and asthma care into the wider public healthcare system in Pakistan, it can serve as a model for scaling up chronic disease management services into essential health service packages in lower-middle-income contexts.

BURDEN OF NCDS

Pakistan is a lower-middle-income country with a population of 235.8 million.[4] In 2019, the estimated age-adjusted prevalence of COPD was 2.7%[5] and the estimated age-adjusted prevalence of asthma was 1.8%.[5] In the same year, the estimated age-adjusted years of life lost were 1,311.3[5] and 349.8[5] per 100,000 population for COPD and asthma, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

In 2003, the National Action Plan for the Prevention and Control of Non-Communicable Diseases emphasized the importance of strengthening the delivery of integrated NCD care in the country.[2,6] However, at the time COPD remained relatively neglected by the Action Plan, leading to wide variations in diagnosis and treatment practices and quality of care.[2]

According to the constitution, public health care is the responsibility of the provincial government. “Prevention and Control of Non-Communicable Diseases, Punjab” was established by the Primary & Secondary Healthcare Department of the Government of Punjab in 2016. The primary objective was to mobilize provincial financial resources necessary for implementing NCD screening, awareness-raising, and continuity of care interventions.[7] The strategy emphasized the use of innovative approaches to diagnosis and care, advocacy for increased attention, the integration of NCD prevention and control into the healthcare system, and activities to increase the availability of affordable essential medicines and technologies.[7] The Punjab Non-Communicable Disease Control Programme made integrating COPD care within public healthcare facilities a policy focus and priority.[2,8]

Health System Structure

The public health care system operates in a three-tiered system. Care is delivered at the primary level through basic health units and rural health centers. Secondary-level health care is delivered through sub-district and district-level hospitals.[1,2] The tertiary care level consists of high-level care facilities, including teaching hospitals. The District Health Office is responsible for managing funded care at the primary and secondary levels.[1] Publicly funded health centers and hospitals in Pakistan are staffed with doctors and other allied healthcare professionals and equipped with basic laboratory facilities including blood and urine testing, as well as microscopy.[1] Some services, including those for TB, were already integrated into the public healthcare sector, demonstrating that the integration of priority health conditions is feasible within the existing health system structure.

Model Strategy

The contextualized intervention package was developed to deliver integrated COPD care at primary and secondary level public healthcare facilities. Activities under the first component, which aimed to improve provider ability to manage asthma and COPD care, included the development of contextualized care protocols and training. A two-day training for doctors and healthcare staff was provided by trainers from the provincial NCD program and the Association for Social Development, which detailed the full care regimen for asthmatic and COPD patients. Training materials were developed by the Communicable Diseases Health Service Delivery (COMDIS-HSD) research consortium.[1] In addition,

clinicians at PHC facilities implemented the protocols outlined in the desk guide to screen, diagnose, treat, and refer patients if necessary.[1] Activities to improve patients' health-related behaviors were primarily comprised of counselling: patients were counseled on their pulmonary conditions, preventive measures, treatment adherence, and on healthy lifestyle (e.g. smoking cessation) using visual aids such as pictorial tools. Patients were also scheduled for follow-up care appointments and received ongoing treatment.[1] Doctors and healthcare staff identified and contacted patients who were late for their monthly follow-ups via mobile phones, encouraging them to re-engage in care.[6] To identify patients for follow-up, clinics used a three-tray system for the "chronic disease cards"–the first tray was used for the visits due in the current month, the second tray for visits during the following month, and the third tray for short- and long-delayed visits. All "short delay" cards remaining in the tray at the end of the month were eligible for follow-up via the text messaging system.[3] Lastly, clinic staff managed the supply chain to ensure availability of medicines and supplies, particularly inhalers and peak flow meters, which were distributed at no cost to patients.[2,8]

Model Financing

This model of care was largely financed by the Government of Pakistan. Financing for the initial evaluation was provided by COMDIS-HSD, a research consortium supported by the UK's Department for International Development (DFID), also known as

Human Resources

Interventions were implemented by the existing staff of the participating health centers and hospitals.[1] Staff trainings were conducted jointly by trainers from the provincial NCD program and the Association for Social Development.[1,2]

Laboratory, Diagnostic, or Pharmacy Services

There were no significant changes to existing laboratory or diagnostic services; however, pharmacy services for COPD and asthma were strengthened as part of the program to ensure the availability of key medicines and supplies (for example, peak flow meters). The provision of inhalers free of charge was a specific incentive for patients to visit the healthcare facility and aimed to facilitate treatment adherence.[2]

Digital Solutions

Doctors and allied staff were provided with mobile phones. They identified patients who were late for their monthly follow-up visits and contacted them by phone or text, encouraging them to re-engage in care.[6]

IMPACT OF THE MODEL

A cluster randomized controlled trial was conducted in 30 public health facilities (23 primary and 7 secondary) across three districts of Punjab between October 2014 and December 2016, with 15 health facilities randomized to the intervention arm (n=159 patients) and 15 health facilities randomized to the control arm (n=154 control patients).[2] Both arms received enhanced diagnosis and patient recording processes to facilitate the comparisons of patient outcomes, with intervention facilities also implementing the model of care described above. The primary outcome was the change in BODE (Body mass index, airway Obstruction, Dyspnoea, Exercise capacity) Index from baseline to the final follow-up visit at six months. Over this six-month period, the BODE Index improved in both the intervention and control arm, but there was a statistically and clinically significantly greater reduction in the intervention arm compared with the control arm (adjusted difference -1, 95% CI -1.5 to -0.4, p=0.001). There was also a statistically and clinically significantly higher percentage of COPD control (adjusted difference 29 percentage points, 95% CI 12.4 to 45.6; p=0.001), quit rate among smokers (adjusted difference 32 percentage points, 95% CI 15.4 to 48.5; p=0.001), and level of follow-up adherence (adjusted difference 40.4 percentage points, 95% CI 24.2 to 56.7; p<0.001) among patients in the intervention facilities as compared to control facilities at the 6-month follow-up.[2] The authors concluded

that the integrated care package implemented at the primary and secondary level health facilities was effective in improving COPD and asthma control. Based on these findings, as well as a separate process evaluation study,[1] the Department of Health of Punjab decided to scale up this model of COPD care in all 36 districts and to include inhalers in the list of essential drugs and in the procurement plans for all public healthcare facilities in the province.[2]

COSTING

No costing data was identified.

LESSONS LEARNED

At the 15 publicly funded primary and secondary health facilities that initially adopted this model of care, providers diagnosed <0.04% of outpatient attendees with respiratory disease—markedly lower than the estimated prevalence of asthma (4%) and COPD (1%)[1] in the population during implementation and the 2019 burden reported in the Global Burden of Disease (1.4%).[4] This may indicate low utilization of public health facilities for respiratory care[1] or, potentially, poor quality of care provided at these facilities resulting in missed diagnoses. In addition, patient non-adherence to follow-up visits remained a major challenge, although attrition was lower and slower in the intervention facilities.[1] In-depth interviews with patients seeking care at these facilities revealed that many patients do not seek care due to presumptions of limited or no inhaler stock.

At the time of implementation, inhalers were not classified as an essential drug, so facilities were unable to procure them through public budgets. Inhalers have since been added to the list of essential drugs for PHC facilities.

The researchers' understanding of, and ability to, navigate public sector processes for planning and financing healthcare interventions were essential for scaling-up the evidence-based intervention(s) through public funding.[3] Furthermore, working in parallel on multiple non-communicable conditions (e.g., asthma-COPD, diabetes-hypertension, smoking cessation) has helped in establishing a publicly-funded NCD care program within the public health care system.[9]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

The country-led adaptation of the integrated care package was key to the effectiveness, feasibility, and scalability of the intervention. Public ownership of the piloting and evaluation activities was important for scaling-up the integrated NCD package through a publicly funded program. It is critical to consider access to publicly funded inhalers to facilitate patient uptake and continuity of integrated COPD/asthma care at PHC facilities.[3]

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INPUTS

- Existing human resources at health centers and hospitals, including doctors and allied health staff.
- Financial resources from the government of Pakistan.
- Technical support from the Provincial Non-Communicable Disease Programme and Association for Social Development
- Favorable policy environment.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Clinicians at the PHC facilities use protocols outlined in the desk guide to screen, diagnose, treat, prescribe medication, and refer patients if necessary.
- Clinicians counsel patients using a visual education tool about their pulmonary conditions, treatment adherence and preventive measures including healthy lifestyles (e.g. smoking cessation).
- Patients are scheduled for follow up appointments and treated for continued care.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Doctors and allied health staff are trained on the full care regimen for asthmatic and COPD patients.

4 INTEGRATION & COORDINATION

- Contextualized care protocols were developed.
- Supplement drugs and supplies are provided to ensure availability, particularly of inhalers and peak flow meters, which are distributed to patients free of charge.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Doctors and allied staff are provided with mobile phones and make follow-up calls or send messages to patients who miss their monthly visits encouraging them to re-engage with care.

OUTPUTS

- **Sites equipped (A) –** 15 publicly funded health facilities in 3 selected districts of Sargodha, Kasur, and Mandi Bahauddin, Pakistan, with plans for further scale-up.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E) –** intervention patients showed better adherence compared with control patients (40 percentage points; p<0.001).[5]
- **In risky behaviors (E) –** smokers in the intervention group had a higher quit rate compared to smokers in the control group (32pp; p=0.001).[5]

DISTAL

- **Patient health outcomes (E)**
  - Greater reduction for patients in the intervention group of the BODE Index compared to patients in the control group (-1; p<0.001).[5]
  - Higher percentage of COPD control at 6-month follow-up for patients in the intervention group compared with the control group (29pp; p=0.001).[5]

Healthy Lifestyle Center (HLC) Model for Proactive NCD Screening in Sri Lanka

PREVENTING NCD PROGRESSION BY IDENTIFYING EARLY SIGNS OF CVD RISK FACTORS AND ENHANCED ACCESS TO CARE BASED ON RISK

38

Geographic locale	Sri Lanka
Program setting	Primary medical care units
Target diseases	Cardiovascular disease
Target population	Adults 40-65 years of age
Partners/Stakeholders	Ministry of Health, Sri Lanka; World Health Organization Country office, Sri Lanka

Background: Sri Lanka is a lower-middle-income country with a population of approximately 22.2 million.[1] In 2019, Sri Lanka had an estimated age-adjusted prevalence of 5.6%[2] of cardiovascular disease (CVD), with estimated age-adjusted years of life lost at 3,766.0[2] per 100,000 population due to CVD.

Overview of model: The Ministry of Health in Sri Lanka launched the Healthy Lifestyle Centers (HLCs) in 2011 to address the lack of an NCD screening services provided through PHC institutions in the country. Implementation at launch was within primary medical care units (PMCUs) in at least two HLCs within each of Sri Lanka's 338 medical officer of health areas, which offer only outpatient services and are the lowest level of PHC facilities in Sri Lanka.[3] The primary objective of the HLCs was to prevent NCD progression in individuals aged 40-65 by identifying early signs of behavioral and intermediate risk factors, while also enhancing access to specialized care for those at elevated risk of CVD. This approach emphasized the prevention of advanced-stage diseases and complications in individuals previously undiagnosed with major NCDs.[3]

Model Strategy: The Ministry of Health in Sri Lanka incorporated key elements from three projects to guide the implementation of the HLC model: (1) the World Health Organization (WHO) Package of Essential Noncommunicable Disease Interventions for Primary Health Care (PEN) protocol; (2) the NCD Prevention Project, which was piloted by the Japan International Cooperation Agency; and (3) the community-based health-promotion component of the National Initiative to Reinforce and Organize General Diabetes Care in Sri Lanka (NIROGI Lanka) of the Sri Lanka Medical Association. These elements encompassed the use of risk prediction charts, guidelines for proactive NCD management in PHC, essential medicines lists, health check-up and guidance models, documentation for electronic information systems, health education materials, and strategies to address risk behaviors in families and communities. The HLCs adopted a comprehensive approach to prevent and manage NCDs, employing the total-risk approach for client screening, which assessed the 10-year CVD risk using the WHO/International Society of Hypertension chart adapted for Sri Lanka. Intermediate risk factors assessed for NCDs included fasting capillary blood glucose, blood pressure and body mass index. Behavioral risk factors such as smoking, alcohol consumption, unhealthy diet and physical inactivity were also assessed.[3]

Depending on their risk level, individuals were either referred to specialized clinics or managed through lifestyle modifications and regular re-screening, with findings from the NIROGI Lanka pilot illustrating that knowledge, attitudes and skills-building helped to facilitate diabetes control and prevention through HLCs. HLCs are conducted weekly at the PMCU from 8 am - 12 pm, providing free services for patients who are either self-referred or referred from OPDs. Self-referral is promoted through educational materials like posters and leaflets, and health talks.[4] The HLCs were involved in client screening, patient management, staff training programs, information management, and monitoring and evaluation. Island-wide training focused on implementing HLC protocols, accurately recording information in personal medical records, and ensuring efficient record-keeping and data management were conducted with PHC health care staff, consisting of one medical officer, one health assistant and/ or a dispenser. Service-related data was

gathered via a paper-based information system collated at each HLC and then sent to the medical officer of NCDs (MO-NCDs) on a quarterly basis. Each district MO-NCD would then collate this data and send to the NCD unit of the Ministry of Health, Nutrition and Indigenous Medicine.[3]

Notable Features of the Model: A notable feature of the HLCs model was its proactive approach to case finding. The HLCs actively identified and detected both behavioral and intermediate risk factors for NCDs in individuals aged 40-65 years through patient HLC screening sessions at each PMCU within a PHC institution.[3] The PHC institutions were expected to conduct HLCs on at least one weekday morning, for a minimum of 20 clients. This proactive screening allowed for early intervention and targeted care to reduce the risk of CVD and prevent the progression of advanced-stage diseases.[3]

Key Messages

- 826 HLCs were established, covering 80% of medical officer of health areas in Sri Lanka.
- HLCs actively identified and detected behavioral and risk factors for NCDs in a target population of adults aged 40-65 years.
- Screening rates for previously undiagnosed adults aged 40-65 years met the 25% target.
- Refinement of the model includes extended opening hours for HLCs, workplace outreach, and integration with well woman clinics.

Model Funding: Funding for the model of the study was not explicitly mentioned.

Human Resources: Initially, each HLC had one medical officer and one health assistant. However, to enhance the NCD-related activities and ensure effective implementation of NCD programs and services, additional medical officers known as MO-NCDs were appointed to each district's HLCs. These MO-NCDs served as coordinators, providing oversight and support for NCD-related activities and ensuring the smooth implementation of NCD programs and services within their respective districts.[3]

Laboratory, Diagnostic, or Pharmacy Services: At the HLCs, individuals could undergo screening for intermediate risk factors, which included assessments for fasting blood glucose, blood pressure (BP), body mass index (BMI), as well as inquiries about behavioral risk factors such as smoking, alcohol consumption, unhealthy diet, and physical inactivity.[3]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: In early 2016, there were 826 HLCs established, covering 79.6% of medical officer of health areas.[3] The screening rate for the target population was 25.5%, which met the initial target of 25%. A community-based cross-sectional survey among 1727 adults in two districts determined factors of underutilization of HLCs in 2019.[4] Being a male (OR = 0.18, 95% CI: 0.05–0.52), belonging to an extended family (OR = 0.43, 95% CI: 0.21–0.88), residing within 1–2 km (OR = 0.29, 95% CI: 0.14–0.63) or more than 3 km of the HLC (OR = 0.14, 95% CI: 0.04–0.53), having a higher self-assessed health score (OR = 0.97, 95% CI: 0.95–0.99) and low perceived accessibility to HLCs (OR = 0.12, 95% CI: 0.04–0.36) were significantly associated with underutilization. The Sri Lankan government planned to address model implementation challenges of underutilization, poor service integration and human resource limitations with extended opening hours for HLCs, workplace outreach, and integration with well woman clinics.[3]

Resources

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INPUTS

- Existing staff of one medical officer, one health assistant and/or dispenser at each HLC; MO-NCDs were added.
- Technical support from Ministry of Health in Sri Lanka.
- Key reference projects: WHO PEN protocol, NCD Prevention Project of the Japan International Cooperation Agency, NIROGI Lanka.
- WHO / International Society of Hypertension Risk Prediction Charts.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- At HLCs, within the PMCU facilities, health care providers screened patients aged 40-65 for behavioral and intermediate risk factors for NCDs through assessments for fasting blood glucose, BP, and BMI, as well as inquiries about behavioral risk factors such as smoking, alcohol consumption, unhealthy diet, and physical inactivity.
- HLCs used the total-risk approach for patient screening and assessed their 10-year CVD risk using the WHO/International Society for Hypertension chart.
- Depending on their risk level, patients were either referred to specialized clinics or managed through lifestyle modifications and regular re-screening.
- HLCs provided patients with health education materials.

2 COMMUNITY-BASED ACTIVITIES

- Implementation of strategies to address risk behaviors in families and communities that promote lifestyle-promotional activities of increased exercise and health eating and decreased smoking and alcohol consumption.

3 TRAINING & CAPACITY BUILDING

- Health care providers at HLCs were trained in implementing HLC protocols, accurately recording information in personal medical records, record-keeping, and data management.

4 INTEGRATION & COORDINATION

- HLCs were established within PMCUs.
- Additional medical officers, specifically for NCDs (MO-NCDs), provided oversight and support for NCD-related activities at each HLC.
- Guidelines for NCD management in PHC were established.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Screening:** screening rate of 25.5% for the target population, met the initial 25% target.[3]

EQUITY (R)

- **Geographic reach:** HLCs cover 79.6% of medical officer of health areas in the country.[3]

- **Sites equipped (A):** 826 HLCs were established as of Q1 2016.[3]

OUTCOMES

PROXIMAL

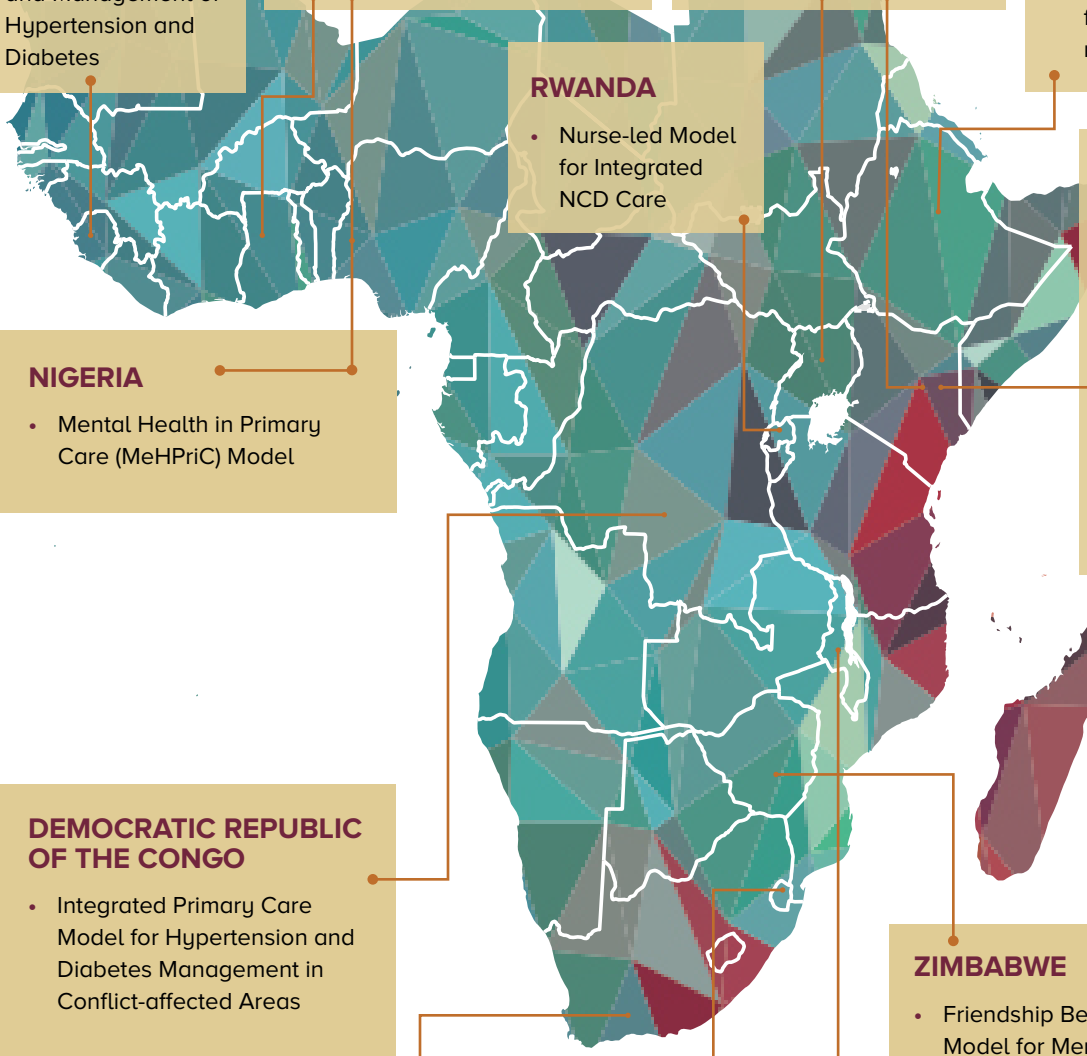
- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.



SIERRA LEONE

- Primary Care-based Model for Diagnosis and Management of Hypertension and Diabetes

GHANA AND NIGERIA

- Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) Model

KENYA AND UGANDA

- Sustainable East Africa Research in Community Health (SEARCH) Model

ETHIOPIA

- Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model

RWANDA

- Nurse-led Model for Integrated NCD Care

KENYA

- Task-shifting Model for Nurse-led Management of NCDs in Kibera
- Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera
- Mental Health and Development Model

NIGERIA

- Mental Health in Primary Care (MeHPriC) Model

DEMOCRATIC REPUBLIC OF THE CONGO

- Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas

ZIMBABWE

- Friendship Bench Model for Mental Health Care

SOUTH AFRICA

- Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions
- Integrated Care Disease Management (ICDM) Model

ESWATINI

- Decentralized Model of NCD Care

MALAWI

- Mental Health Training Model for PHC Workers
- Integrated Chronic Care Clinic (IC^3) Model for HIV and NCDs

Sub-Saharan Africa: Models of care

Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC

INTEGRATING NCD MANAGEMENT INTO PRIMARY CARE IN A CONFLICT-AFFECTED ENVIRONMENT

39

Geographic locale	Democratic Republic of the Congo
Program setting	Beni Region (conflict-affected); emergency PHC centers
Target diseases	Type 1 diabetes mellitus, type 2 diabetes mellitus, hypertension
Target population	Rural and urban; patients ≥ 18 years
Partners/Stakeholders	International Rescue Committee, Ministry of Public Health of the Democratic Republic of the Congo

Background: The Democratic Republic of the Congo (DRC) is a low-income country with a population of 99.0 million.[1] In 2019, the DRC had an estimated age-adjusted type 1 diabetes mellitus prevalence of 0.2%[2] and in 2021, a type 2 diabetes prevalence of 5.8%.[3] In 2019, the age-adjusted hypertension prevalence was 32.7%[4] for males and 35.7%[4] for females in the same year, the age-adjusted estimated years of life lost for type 1 diabetes, type 2 diabetes, and hypertensive heart disease were 66.5, 718.3, and 995.4 per 100,000 population, respectively.[2]

Model Overview: Since 1996, the International Rescue Committee (IRC) has been involved in supporting health care initiatives in the DRC. In 2016, the IRC proposed a pilot project to integrate the management of hypertension and diabetes into its primary care programs in the crisis-affected Beni Region of Nord Kivu. This initiative aimed to address the rising burden of NCDs, specifically hypertension and diabetes, in the region among conflict-affected and, later, Ebola-affected communities. Key components included integrating NCD management into existing primary care programs by developing and training clinical officers on a simplified protocol for diagnosis and management, providing drugs, consumables and equipment, covering referral costs to secondary care, involving community health workers (CHWs) in education and monitoring, implementing a simple cohort monitoring system, and tracking costs. The program aimed to improve access to NCD care and support for patients in a challenging context affected by crises.[5]

Model Strategy: The strategy for integrating NCD management within emergency primary care in the conflict-affected Beni Region involved several key elements: 1) *NCD services were integrated into existing primary care programs* to ensure comprehensive health care delivery; 2) *a simplified protocol was developed for the diagnosis and management of hypertension and diabetes*, allowing for effective and streamlined care in emergency settings; 3) *case management approaches for diabetes and hypertension* were adapted by IRC clinical advisors based on global and national guidelines (including from the World Health Organization, Primary Care International, and the DRC Ministry of Health), and clinical officers and CHWs were trained to ensure that they had the necessary skills and knowledge to manage NCDs; 4) *efforts were made to ensure a reliable supply of medications, consumables and equipment for NCD management, by addressing challenges related to procurement and distribution*; 5) *patients were given cards with information* on their diagnoses, medications, and date of next visit to improve adherence to care, and were monitored by health workers using a simple cohort monitoring approach; and (6) *CHWs were trained to provide community education* on NCDs, counsel on diet and lifestyle, and to make monthly household visits to monitor medication availability and adherence to treatment and clinic visits, as well as to provide referrals for complications.[5] Referral costs to district hospitals for complications not managed by primary care facilities were covered by IRC.

Notable Features of the Model: Overall, the uniqueness of this model lies in its focus on improving NCD management in an active conflict setting, through an adaptive approach, by utilizing a simplified protocol, involving CHWs, and integrating NCD care within emergency primary care services to address the specific health care needs of, and challenges faced by, the population in the Beni Region of the DRC.[5]

Key Messages

- Integration of NCD management into emergency primary care led to significant increases in consultations for hypertension and diabetes in the conflict-affected Beni Region.
- CHWs provided regular contact with NCD patients and facilitated referrals and follow-up care, illustrating their crucial role in ensuring coordination and continuity of NCD care in conflict-affected settings.
- Positive outcomes were reported by patients and health care workers, but challenges remained in the quality and comprehensiveness of care, particularly for diabetes, and in sustaining prevention efforts.

Model Funding: Bureau for Humanitarian Affairs and the United States Agency for International Development.[5]

Human Resources: Key human resources included clinical advisors from the IRC and the Ministry of Health (including an endocrinologist and cardiologist), clinical officers at the health facilities, nurses, administrative personnel, and CHWs.[4] Clinical advisors from the Ministry of Health and IRC trained and evaluated clinical officers. A nurse/research coordinator met with the in-charge clinical officer at each health facility to set up the cohort monitoring system. Supervision visits to observe clinical care and enter data into the cohort monitoring system were conducted twice per month for the first month and once per month after this.[5]

Laboratory, Diagnostic, or Pharmacy Services: Hypertensive and oral diabetes medications, insulin, and equipment (sphygmomanometers, glucometers, glucose strips, weighing scales) and laboratory supplies (blood glucose, urine protein/ketone strips) were provided.[5]

Digital Solutions: Real-time program data was entered into a data entry and visualization program (EpiInfo7) on the research nurse's laptop for cohort monitoring. A dashboard with program metrics was used, producing a report for each health facility on a monthly basis.[5]

Impact of the Model: The program was evaluated using a mixed-methods approach, including a cohort analysis of NCD outcomes and a time-trend analysis of utilization, semi-structured interviews, and costing.[6] More specifically, an evaluation of health care utilization for hypertension and diabetes was conducted over a two-year period from August 2017 to May 2019.[5] The study found a significant increase in consultations for hypertension (incidence rate ratio [IRR] 13.5, 95% CI 5.8–31.5, $p=0.00$) and diabetes (IRR 3.6, 95% CI 1–12.9, $p=0.046$).[5] Consultations declined for hypertension during the onset of Ebola and violence in August 2018 (IRR 0.2, 95% CI 0.1-0.5, $p<0.001$), but there was no significant change for diabetes consultations. Of 833 patients, approximately two-thirds (67%) were women and nearly all were hypertensive (88.7%) and newly diagnosed (95.9%).

During the seven-month cohort analysis study period (April to October 2018), CHWs had regular contact with NCD patients, with a median of 3.5 contacts per month from July to October 2018.[5] They referred a median of 25.5 individuals for diagnosis or care and reported a median of 9.2 contacts with diagnosed patients per month. Adequate treatment adherence (attending at least two visits where counseling, medications, and/or insulin were received) was documented in 45.4% of hypertension patients, 55.3% of diabetes patients, and 82.1% of patients with both conditions. Disease control was achieved in 71% of hypertension patients, 60% of diabetes patients, and 50% of patients with both conditions over the study period, with few complications documented.

Patients and health care workers qualitatively reported positive outcomes of the NCD integration, including linkage of patients with CHWs and program coordination. Enduring challenges mentioned by health care workers related to the quality and comprehensiveness of care available, particularly for diabetes, and difficulties in sustaining prevention. Respondents stated that diabetes care remained fragmented, with insulin and laboratory testing located outside of primary care.

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6. Direct costs of the program, including medications, medical equipment, start-up trainings, and technical support, were an estimated US$67 per person per treatment course. Considering both direct and indirect shared costs, which include shared personnel and equipment used across IRC, the costs increased to US$115 per person per treatment course, which was 50% lower than the costs per patient for hospital-based diabetes care in South Kivu, DRC.

INPUTS

- Existing PHC structure and human resources in the health sector and at the IRC.
- Financial resources from the Bureau for Humanitarian Affairs and the United States Agency for International Development.
- Technical support from the IRC.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- NCD services were integrated into existing PHC programs to ensure comprehensive health care delivery.

2 COMMUNITY-BASED ACTIVITIES

- CHWs educated communities on NCDs, provided counseling on healthy lifestyles, and monitored NCD patients.

3 TRAINING & CAPACITY BUILDING

- Health care providers, including clinical officers and CHWs, were trained and supported to manage NCDs.

4 INTEGRATION & COORDINATION

- A simplified protocol was developed for the diagnosis and management of NCDs.
- Challenges within the NCD medication supply chain were addressed to ensure consistent supply of medications.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Real-time program data were entered into a data entry and visualization program (EpiInfo7) on the research nurse's laptop for cohort monitoring.
- A dashboard with program metrics produced a report for each health facility every month for discussion.

OUTPUTS

COVERAGE (R)

- **Consultations:** a significant increase in consultations was seen for:
  - HTN (incidence rate ratio [IRR]: 13.5, 95% CI 5.8–31.5, p=0.001).[4]
  - T2DM (IRR 3.6, 95% CI 1–12.9, p=0.046).[5]

EQUITY (R)

- **Socio-economic equity:** these services were rolled out in disadvantaged conflict areas.[5]

- **Compliance with guidelines (A):** The simplified NCD management protocol allows for effective and streamlined care in emergency settings.[5]
- **Functioning referral mechanisms (I):** CHWs referred a median of 25.5 individuals for diagnosis or care to PHC centers.[5]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E):** Adequate treatment adherence was observed among:
  - 45.4% of HTN patients[5]
  - 55.3% of T2DM patients[5]
  - 82.1% of patients with both conditions.[5]

DISTAL

- **Patient health outcomes (E):** Patients showed successful disease control rates of 71% for HTN, 60% for T2DM, and 50% for patients with both conditions from April to October 2018.[5]

Decentralized Model of NCD Care in Eswatini

SHIFTING THE CARE OF NCD PATIENTS TO A NURSE-LED MODEL WITHIN THE PHC SYSTEM

40

Geographic locale	Eswatini
Program setting	Community clinics (PHC level)
Target diseases	Diabetes and hypertension
Target population	Adults 18 years and older
Partners/Stakeholders	Eswatini Ministry of Health, Leeds Institute of Health Sciences, European Commission, Clinton Health Access Initiative

OVERVIEW

In 2014, following years of political commitment and attention toward NCDs, the first pilot feasibility study for a decentralized model of NCD care was initiated in Eswatini. This two-year pilot was implemented in 10 facilities in Lubombo region. Using a task-shifting approach, the model aimed to reduce the burden on hospitals (which traditionally provide primary care, as well as more specialized services) by training nurses in community clinics to provide care for diabetes and hypertension.[1] Clinics were provided with necessary medical equipment (including stethoscopes, blood pressure (BP) cuffs, and blood sugar monitors) and patient cards to record health information.[2] Finally, facilities were provided with diabetes and hypertension desk guides and training manuals for reference.[1-2] The feasibility pilot showed promising results. There was a significant reduction in mean BP among hypertensive patients and a non-significant reduction in blood glucose among diabetic patients. Key components of care were completed consistently in accordance with guidelines, suggesting that nurses can safely deliver diabetes and hypertension care in this setting, motivating implementers to scale up.[1] The Eswatini Ministry of Health moved to scale up the decentralization of health services according to the World Health Organization (WHO) Package of Essential Noncommunicable Disease Interventions for Primary Health Care (PEN) guidelines. Alongside the European Commission and the Clinton Health Access Initiative, they aimed to bring 80% of the population within walking distance of lifesaving NCD services.[3]

When the COVID-19 pandemic began in early 2020, the proposed scale-up strategy was reviewed and the country opted to move faster. The Eswatini government initiated an "emergency decentralization" to decongest tertiary care facilities and to protect people living with diabetes and hypertension, who are at high risk of severe outcomes from COVID-19. The emergency decentralization encompassed a nationwide scale-up of the WHO PEN intervention originally envisioned to be implemented only in the two treatment arms of the WHO-PEN@Scale project.[4] This resulted in 179 of Eswatini's 329 health facilities having adopted the model and providing decentralized care.[5]

At the time of writing, a cluster-randomized control trial aimed to evaluate community-based health care service models implemented at the national level, though results were not yet available.[4]

NOTABLE FEATURES OF THE MODEL

This model gives nurses responsibilities and duties that were previously reserved for practitioners at higher level facilities. It allows patients to seek care in their communities, reducing the burden of access and distance. It also decongests higher level hospitals and health centers.

The widespread rapid adoption is also notable. Prior to the COVID-19 pandemic, there were less than 30 facilities using the decentralized care model. Within three years, and under the difficult implementation conditions that the pandemic created, the project reached nearly 150 additional facilities. Implementers trained health personnel rapidly to safeguard the wellbeing of this vulnerable patient base.[5] Eswatini's health system has traditionally focused heavily on HIV and tuberculosis, posing a challenging background to implement NCD care, particularly in regards to data collection.[5]

BURDEN OF NCDS

Eswatini is a lower-middle-income country with a population of 1.2 million.[6] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Eswatini was 4.6%.[7] In 2019, the age-adjusted prevalence of hypertension was 37.4%[8] for males and 47.3%[8] for females and the estimated prevalence of cardiovascular disease (CVD) was 6.7%.[9] In 2019, the estimated age-adjusted years of life lost were 2,782.8,[9] 933.2,[9] and 6,421.2[9] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

In 2011, the Eswatini Ministry of Health developed the National NCD Policy and the National NCD Strategic Plan (2013-2018). The plan outlined the strategic direction to be taken by the health sector in collaboration with other governmental and nongovernmental sectors in contributing to the national collective effort towards reducing NCDs and managing their impact. The goal of the NCD Policy and Strategic Plan was to contribute to the reduction in and combat the incidence of NCDs through the provision of health services for prevention and management in the context of universal access at all levels of care. All in all, the health sector has made progress in its efforts to collaborate with all partners involved.[10]

Despite significant international aid, the health sector is under-resourced. PHC is predominantly free in Eswatini– while the government provides subsidized health services, most people still need to pay out-of-pocket for these services and up to 41.7% of citizens opt to pay for private health care instead.[11]

Health System Structure

The national health system consists of: 14 hospitals, of which six are private hospitals, five government health centers, six public health units, and 215 clinics and outreach sites.[12] This decentralized care model was rolled out in the Lubombo region of Eswatini in the Good Shepherd Hospital and surrounding community clinics.[2] Traditionally, NCD care in Eswatini has been provided using a centralized model, with the majority of care provided by hospitals. Patients have limited access and commonly present late with symptoms of complications. Hospital services are working at full capacity, with little room for expansion. With increasing burden on hospital resources caused by HIV and now the 'double burden' of NCDs, this model of care is no longer sustainable.[1,3] One component of the National NCD strategy has been the development and implementation of a comprehensive integrated NCD service in health centers (called 'community clinics' in southern Africa).[1]

Model Strategy

The goal of the feasibility pilot was to decentralize NCD care by empowering community clinics to offer comprehensive, nurse-led care for diabetes and hypertension. Facilities were given patient-held cards and clinic-held patient cards to record health information. They also implemented improved recording systems and prompts for providers to reference information about NCDs. Implementers provided necessary diagnostic and medical supplies: BP cuffs, stethoscopes, blood glucose monitors, scales, and patient information leaflets.[2]

In the time leading up to this project, there was very little recordkeeping for NCD care. There were no existing paper-based tools to document patient health records for NCDs. In some clinics, nurses had only mobility registers distributed by the ministry, and in other clinics, nurses had only tables inside notebooks to record basic personal information and medications given to the patient.[13] Concurrently, Eswatini has been updating their electronic health management system and rolling out a more comprehensive Client Management Information System (CMIS). Uptake of the CMIS is not yet universal, and the decentralized model was specifically rolled out to facilities that have adopted the new system.[4]

Model Funding

The feasibility pilot was funded by UK Aid.[2] Continued support for the model is provided by the World Bank, Clinton Health Access Initiative, WHO, the Stars Foundation, and the Global Fund.

A recent initiative, the Health Systems Strengthening for Human Capital Development Project, funded by a loan from the World Bank, will help Eswatini improve health service delivery, including services for major NCDs. The project will also support the health care system in providing high quality NCD services and strengthening the capacity of health facilities for PHC. This includes building the capacity of health care workers through training and providing them with digital job aids to enhance decision making, supervision and accountability. Furthermore, it will increase the availability of drugs, equipment, and digitize patient data.[13] In 2019, the Eswatini government allocated 7% of its budget to health care expenditure.[4]

Human Resources

Nurses underwent a 3.5-day training to learn how to provide essential care, screen for NCDs, and identify complications or complex patients for referral to higher level care.[4] Nurses also prescribe essential medications.

Laboratory, Diagnostic, or Pharmacy Services

Unstable medication supply poses challenges to patients and providers. In Eswatini, access to NCD medication has often been a challenge due to inconsistent stock levels.[1] A 2015 study of 300 patients seeking care for diabetes, hypertension, and/or asthma found that 70% of the patients confirmed not receiving all of their prescribed medicines at each visit to the hospital in the previous six months. On average, patients spent 10–50 times more on their medicines at private pharmacies compared to fees at the health facility.[14] In one recent assessment, out-of-pocket expenditure was common for patients with chronic conditions using the study health facility, which can increase the risk of patients defaulting on treatment due to lack of affordable medicines.[14]

The Chief Pharmacist and national pharmaceutical dispensary train and allow nurse-practitioners to distribute anti-hypertensive and anti-diabetic medications. After the COVID-19 emergency scale-up, the types of medications nurses can distribute was expanded. Arrangements were made to increase dispensing of certain classified medications.

For example, with training, nurses at PHCs can perscribe insulin and carvedilol.[5]

Digital Solutions

There is no digital component to this model, though facilities were selected for scale-up based on their uptake of the new national CMIS. Eswatini is attempting to create a simple module of the CMIS for use by community health workers (CHWs), linked to the formal health system.[5]

IMPACT OF THE MODEL

Ten community clinics in the Lubombo Region of Eswatini were randomly selected to be trained to deliver NCD care for an 18-month time period. Observational data on follow-up rates, BP, and glucose were collected and blood pressure and blood glucose measurements between the first and fourth visits were compared. Of the 573 patients in the study who attended at least four visits, there was a significant reduction in mean BP among hypertension patients of 9.9 mmHg systolic and 4.7 mmHg diastolic ($p=0.01$). There was a non-significant reduction in fasting blood glucose among diabetic patients of 1.2 mmol/l ($p=0.2$). Using a target of 140/90 mmHg, the proportion of patients with poor systolic blood pressure (SBP) fell from 57% at baseline to 39% by visit 4; the proportion of patients with poor diastolic blood pressure (DBP) fell from 29% to 18% over the same time period.[1] Key components of NCD care were completed consistently by nurses throughout the intervention period. Patient weight and BP were checked at nearly all patient visits. Blood glucose was measured for 75% of patients at visit 1, falling to 68% of patients at visit 4. At least three-quarters of patients received health education at all visits, but the proportion fell from 90% of hypertension patients and 98% of diabetes patients at baseline to 77% and 75% of patients, respectively. The findings suggest that management of diabetes and hypertension care in a rural district setting can be safely delivered by nurses in community clinics according to a shared care protocol. The study authors posit that improved access will likely lead to improved patient compliance with treatment.

COSTING

Costing has so far focused on scaling up of the WHO-PEN interventions in Eswatini, rather than the nurse-led model in isolation.[15] However, this comprehensive bottom-up costing assessment for 2022-2023 on scaling up primary level NCD care as per PEN approach has provided findings which are relevant to the nurse-led model. The total annual cost of the PEN scale-up to all estimated diabetes and hypertension patients in Eswatini was US$5.25 million, equivalent to 6% of the 2022–23 budget of the Ministry of Health. Expanding standard-of-care coverage would cost 66% more at US$8.73 million compared to the WHO-PEN interventions. The cost per diabetes/hypertension patient visit amounted to US$6.53 with the PEN scale-up and US$10.85 in the control-arm scale-up. Personnel costs represented the most substantial portion of costs of care delivery and were highly sensitive to the patient volume seen by nurses in primary care.

LESSONS LEARNED

Many lessons were learned during the pilot phase of the model's implementation:

- Client access to medications locally was a key part of decentralization, but was not always met.[1] During the pilot, clinics faced medication stock issues. Some clinics reported not having certain drugs for months. As such, they were required to send patients to hospitals or private pharmacies (if available) for routine drug refills.
- Nurses can conduct initial assessments of uncomplicated patients effectively, without the support of doctors. The initial intention was that all patients with a new diagnosis be seen by a doctor at the hospital before receiving nurse-led care in community clinics. However, doctors did not have the capacity to assess the high volume of patients and patients did not want to travel to the hospital.[2]

Additional lessons were learned throughout the scale-up of the model and during implementation research from 2020 to 2022:

1. Eswatini's health system has historically prioritized and invested in HIV and tuberculosis care. Still today, the new CMIS was developed for HIV care, so there is not adequate data regarding NCDs. Data focuses on HIV programs.[5]

- Acknowledging the HIV-focused nature of the system, implementers are working on novel ways to bring NCD care to patients. A one-year project (which has not yet been published or reported upon) attempted to move NCD services into HIV clinics, with the continued goal of following clients with care. Currently, NCD services run parallel with HIV clinics, with no integration of care for clients. They are seen at different entry points. Implementers see value in potentially establishing chronic care clinics to provide one integrated and comprehensive point of service.[5]
- Care and practices should be standard throughout all levels of the health sector.[5] During early implementation, patient management was not standardized, because there were no clear national clinical guidelines in place. Implementers are currently remedying this by conducting seminars for clinicians to inform on the intention and best practices of this decentralized NCD model and to align stakeholders across the health system.
- According to implementation research, the expedited NCD care decentralization as a response to the pandemic was initially uneven due to staggered implementation and incomplete training of health care workers. [16] Shortages in medicines and equipment were common. However, the primary care level increasingly delivered NCD services in an integrated way with consideration for co-morbidities which was reflected in NCD patients' positive opinions. The model implementation led to most NCD clients receiving clear information, and confidential and respectful care. Person-centred integrated care for NCDs and other conditions is valued by clients according to this implementation research.

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Partnership and collaborative relationships with clinicians in the implementing teams are important facilitators of success. Once implementers are organized, it is vital to engage with people on the ground.[5]

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INPUTS

- Existing network of community clinics.
- Existing nurses at community clinics.
- Ministry of Health support to decentralize NCD care and desire to decongest hospitals, especially during the COVID-19 pandemic.
- Financial resources from the Ministry of Health and partner organizations.
- Technical support from the Ministry of Health partner organizations.
- Development and deployment of the CMIS.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Community clinics are provided with medical equipment needed to screen, diagnose, and monitor NCDs, e.g. stethoscopes, scales, BP cuffs, and blood glucose monitors.
- Nurses at community clinics provide patients with NCD education and informational leaflets.
- Nurses at community clinics provide NCD screening, diagnosis, treatment, and on-going education to uncomplicated NCD patients.
- Nurses at community clinics prescribe NCD patients with anti-hypertensive and anti-diabetic medications as appropriate.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Nurses at community clinics are trained to provide NCD education, screening, diagnosis, treatment, and ongoing education.
- The national pharmaceutical dispensary trained nurses to distribute anti-hypertensive and anti-diabetic medications.
- Nurses at community clinics are trained to identify complicated cases and refer them to higher levels of care.
- Nurses at community clinics are provided with of T2DM and HTN desk guides and training manuals for reference.

4 INTEGRATION & COORDINATION

- CHWs directly refer individuals found at high risk of HTN or T2DM to partnering community clinics. Patient health record cards are provided for patients and clinics to each retain.
- Nurses input patient NCD information into CMIS.
- Nurses refer complicated NCD cases to higher levels of care for further management and treatment.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- CMIS is being scaled up nationally to better manage patient information.

OUTPUTS

EQUITY (R)

- **Geographic reach –** 179 of Eswatini's 329 health facilities provide decentralized NCD screening, diagnosis, treatment, and management services.[5]

- **Compliance with guidelines (A)**
  - Patient weight and BP were checked at nearly every monthly patient visit.[1]
  - Blood glucose was measured for 75% of patients at visit 1, falling to 68% of patients by visit 4.[1]
  - At least three-quarters of patients received health education at all visits, but the proportion fell from 90% of hypertension patients and 98% of diabetes patients at visit 1 to 77% and 75% of patients, respectively.[1]

OUTCOMES

PROXIMAL

- **Convenience for patients (I) –** patients able to access care close to homes; patients experience reduced waiting times by accessing care at community clinics instead of at hospitals.[5]

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E)**
  - HTN pilot patients experienced a significant reduction *(p=0.01)* in mean BP of 9.9mmHg systolic and 4.7mmHg diastolic.[1]
  - The proportion of patients with poor SBP fell from 57% at baseline to 39% by visit 4; the proportion of patients with poor DBP fell from 29% to 18% over the same time period.[1]

Rehabilitation Intervention for People with Schizophrenia in Ethiopia (RISE) Model

COMMUNITY-BASED APPROACH FOCUSED ON REDUCING STIGMA AND PROMOTING SOCIAL INTEGRATION FOR INDIVIDUALS WITH SCHIZOPHRENIA

41

Geographic locale	Rural Ethiopia
Program setting	Community-based care
Target diseases	Mental health (schizophrenia)
Target population	Adults >18 years of age
Partners/Stakeholders	RISE funded by Wellcome Trust; Programme for Improving Mental Health Care funded by the United Kingdom Department for International Development (now Foreign, Commonwealth & Development Office)

Background: Ethiopia is a low-income country with a population of 123.4 million.[1] In 2019, Ethiopia had an estimated age-adjusted prevalence of 12.5%[2] for mental health disorders and <1%[2] for schizophrenia with estimated age-adjusted disability-adjusted life years of 1,706[2] and 137[2] per 100,000 population, respectively.

Model Overview: The World Health Organization's (WHO) Mental Health Gap Action Programme (mhGAP) recommends that schizophrenia management include psychosocial interventions where possible, including community-based rehabilitation (CBR), a strategy that aims to reduce disability and improve the quality of life and social inclusion of people with disabilities.[3,4] The Rehabilitation Intervention for people with Schizophrenia in Ethiopia (RISE) project adapted CBR to a rural, low-resource Ethiopian setting with poor mental health care infrastructure. RISE trained lay people to provide CBR, with facility-based care provided as part of the Programme for Improving Mental Health Care (PRIME).[5] It specifically sought to help individuals with schizophrenia who had disabling illness after having had the opportunity to access facility-based care for six months.

Model Strategy: RISE aimed to enhance the management of schizophrenia by providing accessible and supportive rehabilitation services, tailored to the specific needs of individuals with the condition.[4] The RISE intervention occurred alongside routine facility-based care, not as a replacement for it. Facility-based care provided by PRIME was a task-shared model of mental health care integrated within primary care. CBR visits took place at participants' homes and emphasized recovery, human rights, and social inclusion. Various topics were covered during these visits, including psychoeducation, adherence support, family interventions, crisis management, support for a return to livelihood activities, social engagement, and addressing stigma and stress.

The CBR intervention was divided into three phases.[4] Phase 1 focused on engagement and core needs, with home visits occurring every one to two weeks over a period of two to three months. Phase 2, lasting five to six months, involved biweekly home visits and selected modules tailored to individual goals.[4] Phase 3, spanning approximately four months, aimed to maintain progress with monthly home visits. CBR workers actively engaged with the community to mobilize resources, such as financial assistance for treatment and social support. They also facilitated participants' involvement in facility-based care and organized community mobilization activities and family support groups at the subdistrict level. Participants were referred to health centers for specialized care when required.

Notable Features of the Model: RISE adopted a community-based approach, recognizing that individuals with schizophrenia benefit from support and services provided within their own communities.[3,4] This approach helps reduce stigma and promotes social integration. The model also emphasized collaboration among different stakeholders, including health care professionals, CBR workers, people with schizophrenia, and their family members, to provide comprehensive and person-centered support.

Key Messages

- Model provided CBR services delivered by trained lay people alongside facility-based care to improve access to mental health care.
- Focused on promoting social integration and reducing stigma.
- Model of CBR + facility-based care was more effective in reducing disability and improving medication adherence and facility attendance compared to facility-based care alone.

Model Funding: RISE was funded by the Wellcome Trust; it was nested within a broader research project, PRIME, which was funded by the United Kingdom Department for International Development.[4]

Human Resources: Key human resources were lay people recruited and trained to deliver CBR. Comprehensive training in counseling, problem-solving, and other CBR techniques was provided during an initial five-week program, followed by monthly half-day sessions.[4] Two supervisors oversaw the frequency and content of home visits. Nurses, psychiatric nurses, and health officers were involved in the broader research project of PRIME, but not the RISE intervention.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A cluster-randomized controlled trial assessed the effectiveness of CBR at reducing disability, measured with the proxy-rated 36-item WHO Disability Assessment Schedule (WHODAS) score, at 12 months in people with schizophrenia.[4] Intervention group participants received CBR plus facility-based care, while control group participants had access to facility-based care alone. At 12 months of follow-up, the mean WHODAS-36 scores were 46.1 (SD 23.3) in the facility-based care control group and 40.6 (SD 22.5) in the CBR plus facility-based care intervention group, indicating a favorable intervention effect (adjusted mean difference −8.1, 95% CI −15.9, −0.4, *p=0.039*, effect size 0.4). RISE also improved illness severity as measured with the Clinical Global Impression Scale compared to facility-based care alone (fully adjusted odds ratio 0.3, 95% CI 0.01, 0.8, *p=0.02*).

The CBR plus facility-based care intervention participants were less likely to report poor frequency of adherence to antipsychotic medication (OR 0.2, 95% CI 0.1-0.5, *p=0.001*) and less likely to have no attendance at a health facility for mental health in the past three months (OR 0.2, 95% CI 0.1, 0.5, *p=0.002*), suggesting that the intervention improved adherence to prescribed medication and attendance for facility-based care. There was no significant difference in the occurrence of serious adverse events (death, suicide attempt, and hospitalization) in the intervention and control groups.

The RISE workers involved in the program received positive ratings for their competencies. The mean Enhancing Assessment of Common Therapeutic Factors-Ethiopia score, which measures the quality of RISE worker performance, was 2.78 (SD 0.19) at baseline and improved to 2.98 (SD 0.02) at 12 months, indicating that, on average, RISE workers were rated as "done well" across competencies.

Resources

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INPUTS

- Financial support for RISE from the Wellcome Trust. Financial support for the broader PRIME research project from the United Kingdom Department for International Development

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- A task-shared model of facility-based care integrated within primary care was provided by the PRIME project together with the RISE CBR intervention.

2 COMMUNITY-BASED ACTIVITIES

- RISE CBR workers conducted home visits with people with schizophrenia and their families.
- RISE conducted a needs and risk assessment; study participants set goals from a pre-defined list.
- RISE workers supported individuals with schizophrenia to achieve their goals and to prevent relapse. Examples of support included: psychoeducation, adherence support, family interventions, crisis management, support for a return to livelihood activities, social engagement, and addressing stigma and stress.

3 TRAINING & CAPACITY BUILDING

- RISE workers were lay people selected from the local communities and trained in CBR delivery, basic counselling, and problem-solving techniques.
- RISE workers provided information-based care and support to individuals with schizophrenia and their families.
- RISE workers provided community educational programs to increase community awareness of schizophrenia, and increase understanding and empathy towards individuals with schizophrenia, reduce stigma, and increase social acceptance.

4 INTEGRATION & COORDINATION

- None reported.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Providers trained (A):** ENhancing Assessment of Common Therapeutic factors-Ethiopia mean score, which measured the quality of RISE worker performance, was 2.78 (SD 0.19) at baseline and improved to 2.98 (SD 0.02) at 12 months, indicating that, on average, RISE workers were rated as "done well" across the assessed competencies.[4]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Treatment adherence (E):** RISE intervention participants were less likely to report poor frequency of adherence to antipsychotic medication (OR 0.2, 95% CI 0.1-0.5 *p=0.001*).[4]
- **Retention in care (E):** RISE intervention participants were less likely to have no attendance at a health facility for mental health in the past 3 months (OR 0.2, 95% CI 0.1, 0.5, *p=0.002*).[4]

DISTAL

- **Patient health outcomes (E)**
  - Adjusted mean difference on WHODAS was -8.1 (95% CI -15.9, -0.4; *p=0.039*; effect size 0.35), indicating a favorable intervention effect.[4]
  - RISE had a favorable effect on illness severity measured with the Clinical Global Impression scale (FAOR: 0.3; 95% CI 0.1, 0.8; *p=0.02*).[4]

Task-shifting Model for Nurse-led Management of NCDs in Kibera, Kenya

PHC MODEL WITH TASK-SHIFTING TO NURSES TO MANAGE FIVE MAJOR NCDS

42

Geographic locale	Kenya
Program setting	Two PHC facilities within an urban settlement – Kibera, Nairobi
Target diseases	Hypertension, type 2 diabetes mellitus, asthma, sickle cell disease, and epilepsy
Target population	Adults ≥18 years
Partners/Stakeholders	Kenya Ministry of Health and Médecins Sans Frontières

Background: Kenya is a lower-middle-income country with a population of 54.0 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in Kenya was 4.0%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.4%[3] for males and 34.7%[3] for females. The estimated age-adjusted years of life lost were 627.0[4] and 539.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively. In 2019, the estimated age-adjusted prevalence of asthma was 2.8%, while sickle cell disease and epilepsy both had a prevalence of 0.4%.[4]

Model Overview: In 2014, the Kenya Ministry of Health (MoH) and Médecins Sans Frontières (MSF) collaborated to introduce an innovative model that aimed to shift the management of non-complex/stable NCDs from clinical officers to nurses within primary health care (PHC) settings. This model was successfully implemented in two Kibera clinics and targeted five NCDs: hypertension, type 2 diabetes mellitus, asthma, sickle cell disease, and epilepsy. By adopting this task-shifting strategy, the objective was to relieve the workload of clinical officers and enable capable nurses to handle routine visits, addressing a low health care worker to patient ratio and improving access to care.[5]

Model Strategy: Nurses with appropriate qualifications and experience were selected to manage five conditions: hypertension, diabetes mellitus, epilepsy, sickle cell disease, and asthma. They received comprehensive training aligned with guidelines from MSF, the Kenyan MoH, and international standards as of 2013. The training involved theoretical sessions, practical case scenarios, and structured clinical decision support protocols. Specific diagnostic criteria were established for each condition, such as blood pressure (BP) measurements for hypertension and fasting plasma glucose levels for diabetes, and routine follow-up included laboratory testing. Nurses worked under clinical officer supervision in PHC settings and had access to NCD protocols in both paper and electronic formats.[5]

Notable Features of the Model: The collaboration between the Kenya MoH and MSF introduced a unique task-shifting model for managing NCDs in existing primary care services in Kenya. By shifting tasks from clinical officers to nurses, the program addressed the overwhelming NCD patient volume load faced by clinical officers and recognized the nurses' potential in NCD management. Nurses were equipped with NCD protocols to ensure standardized and evidence-based care, even in resource-limited settings. The model's integrated care approach leveraged an existing HIV clinical platform, eliminating the need for additional human resources and optimizing resource utilization. Overall, this collaboration offered an innovative approach to address NCD challenges in primary care settings in resource constrained contexts.[5]

Key Messages

- 55% of non-diabetic hypertensive patients and 28% of diabetic patients with or without hypertension reached their target BP after 24 months.
- Nurses successfully followed protocols managing stable patients with multiple NCDs, including weight measurements, BP readings, and laboratory reviews, suggesting that task-shifting NCD care to nurses may be an effective strategy to address gaps in access to care in resource-constrained settings.
- No deaths were reported among NCD patients seen by task-shifting nurses.

Model Funding: MSF funded the program's implementation.[5]

Human Resources: The model leveraged existing staff and the health care team involved in the task-shifting model included supervising physicians, clinical officers, nurses, counselors, social workers, health promoters, and laboratory staff. Social workers played a crucial role in tracing patients with severe clinical conditions or those who missed appointments, as requested by the clinicians.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. These services were provided free of charge to the individuals.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: In the initial study (2014) assessing the model of care on clinical outcomes, 55% of the 213 non-diabetic patients with hypertension achieved their target BP after 24 months of monitoring.[5] Among the 29 diabetic patients (with or without hypertension) followed for the same period, only 28% reached their target BP. Additionally, 20% of diabetic patients, regardless of hypertension, achieved their target blood glucose levels within three to 12 months of follow-up, with three patients (15%) reaching their target by the 18-month mark.

In a more recent study evaluating the shift of NCD management from clinical officers to nurses, the nurses demonstrated similar adherence to protocols as clinical officers.[6] Weight measurements were completed for 89% of NCD patients, and BP was checked for 98% of hypertension patients and 93% of diabetes patients. Laboratory results were reviewed during the visit for 92% of patients with hypertension and 86% of patients with diabetes. Nurses asked 69% of all patients about adherence, side effects, and complications, ranging from 65% of asthma patients to 86% of sickle cell disease patients. Cholesterol testing was ordered per protocol for 88% of patients with hypertension and 67% of patients with diabetes. During the study, only 2% of consultations (17 cases) were referred back to clinical officers. There were no reported deaths among the NCD patients who were seen by the task-shifting nurses throughout the study period. Nurses were adherent to standardized protocols for managing stable NCD patients, suggesting that task-shifting NCD care to nurses may be an effective strategy to address gaps in access to care.[6]

Resources

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INPUTS

- Existing human resources at PHC centers.
- Existing HIV clinical platform.
- Financial resources from the Kenyan MoH and MSF.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Nurses manage the care for non-complex, stable NCD patients with the following conditions: HTN, T2DM, epilepsy, sickle cell disease, and asthma
- Clinical officers manage more complex or unstable NCD patients.
- Social workers trace patients with severe clinical conditions or those who missed appointments.
- Regular patient follow-up included laboratory tests.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Nurses are trained in NCD guidelines from MSF, the Kenyan MoH, and international standards via theoretical sessions, practical case scenarios, and structured clinical decision support protocols.
- Specific diagnostic criteria were established for each NCD condition, such as BP measurements for HTN and fasting plasma glucose levels for T2DM.

4 INTEGRATION & COORDINATION

- Nurses are equipped with standard, evidence-based NCD protocols for low resource settings in both paper and electronic formats.
- Nurses worked under clinical officer supervision
- A multi-disciplinary health care team provides supervision and support to nurses providing care and patients, including physicians, clinical officers, counselors, social workers, health promoters, and laboratory staff.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- **Sites equipped (A) –** the model of care was rolled out in 2 clinics in Kibera.[5]
- **Providers trained (A) –** nurses at 2 clinics were trained in NCD management.[5]

- **Compliance with guidelines (A) –** nurses demonstrated adherence to protocols for:
  - Weight measurement (89% of patients).[6]
  - BP measurement (98% of HTN patients and 93% of T2DM patients).[6]
  - Review of laboratory results during visit (92% HTN patients and 86% T2DM patients)[6]
  - Asking patients about adherence, side effects, and complications (69% for all patients, ranging from 65% of asthma patients to 86% of sickle cell disease patients).[6]
  - Cholesterol testing ordered per protocol for 88% of HTN patients and 67% of T2DM patients.[6]
- **Functioning referral mechanisms (I) –** 2% of consultations were referred back to clinical officers for uncontrolled disease, medication side effects, or complications associated with NCDs.[6]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.[5]

DISTAL

- **Patient health outcomes (E)**
  - After 24 months of monitoring, 55% of non-diabetic patients with hypertension achieved target BP; 28% of diabetic patients with or without hypertension achieved target BP.[5]
  - 20% of diabetic patients with or without hypertension achieved target blood glucose levels within 3 to 12 months of follow up.[5]
  - There were no reported deaths among nurse-managed NCD patients.[6]

Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya

SHIFTING FOLLOW-UP CARE OF STABLE CHRONIC CONDITIONS FROM CLINICS TO A PEER GROUP TREATMENT MODEL

43

Geographic locale	Informal settlements in Nairobi, Kenya
Program setting	PHC clinics
Target diseases	Hypertension, type 2 diabetes mellitus, HIV
Target population	Adults ≥ 25 diagnosed with hypertension, diabetes mellitus, and/or HIV
Partners/Stakeholders	Kenya Ministry of Health, Mèdecins Sans Frontières, Special Programme for Research and Training in Tropical Diseases at the World Health Organization

Background: Kenya is a lower-middle-income country with a population of 54 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 4.0%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.4%[3] for males and 34.7%[3] for females. The estimated age-adjusted years of life lost was 627.0[4] and 539.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in the same year.

Model Overview: To address the increasing demand for long-term care of NCDs, the Kibera project implemented combined Medication Adherence Clubs (MACs) for hypertension, diabetes mellitus, and HIV patients in 2013. The project adopted the HIV MAC model and tailored it to accommodate patients with multiple chronic conditions. MACs consisted of nurse-facilitated groups of 25-35 stable patients who met quarterly. During these meetings, the patients confirmed their clinical stability, received short health talks, and obtained pre-packed medications. The MAC model aimed to reduce the workload of health care providers in follow-up care, provide simultaneous care for multiple chronic conditions, and improve patient outcomes by minimizing loss to follow-up and wait times. This person-centered approach offered long-term access to integrated care for chronic conditions and demonstrated its potential to scale up chronic care for a substantial number of patients in low-resource settings.[5]

Model Strategy: Communication and dissemination methods, such as daily health talks in waiting rooms, empowerment meetings, and posters in the clinics, were used to inform patients about MACs. MACs were conducted on Wednesday, Thursday, and Saturday afternoons between 3 p.m. and 5 p.m. The meeting schedule was structured to provide maximum flexibility for patients to attend. Groups were facilitated by a nurse and included approximately 25-35 patients who met quarterly. Patients were provided quick clinical assessments and referrals if needed and received information on health and adherence and their pre-packed medications. Clinical officers met and reviewed patients in these groups yearly or when a patient developed complications (i.e., no longer stable).[5]

Notable Features of the Model: The implementation of MACs in Kibera, an informal settlement, brought together patients with hypertension, diabetes mellitus, and HIV in nurse-facilitated groups. This integration of multiple chronic conditions within MACs allowed for comprehensive care and support for patients with diverse health needs. The MAC model aimed to alleviate the burden on health care providers by transferring the responsibility of follow-up care to peer groups. By involving patients in self-management and peer support, health care providers were able to focus on patients with more complex needs, thereby improving overall efficiency and patient care.[5]

Key Messages

- MACs utilized peer groups to provide unique health care support, allowing patients to engage in self-management and benefit from the shared experiences of their peers.
- MACs integrated care for patients with hypertension, diabetes mellitus, and HIV, thereby reducing the burden on health care providers.
- MAC consultations completed 99% of the blood pressure measurements, 98% of the weight checks, and 98-99% of the correct blood test requisitions.

Model Funding: Implementation of this model was funded by the International Union Against Tuberculosis and Lung Disease, Mèdecins Sans Frontières, the United Kingdom Department for International Development, and the World Health Organization.[5]

Human Resources: Key personnel for MACs were nurse-facilitators, clinicians, and clinical officers.[5]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory or diagnostic services. During MACs, nurse-facilitators would deliver pre-packaged medications that were free of cost to the patients.[5]

Digital Solutions: A dedicated MAC database was used to store information from paper-based records on MAC visits. While MAC visits were not included in the clinic-wide electronic medical record (EMR), MAC patients did have EMR data when they were seen for a traditional follow up visit in the clinic. Health promotion staff reached out to MAC participants prior to their group visits by short message service to confirm planned attendance.

Impact of the Model: A retrospective descriptive study assessed the feasibility and early efficacy of MACs to care for stable patients with mixed chronic diseases in this urban, resource-constrained setting of Kenya.[5] There were 47 MACs created that held 109 sessions between August 2013 to 2014, enrolling a total of 1,432 patients. During this time, 2,208 consultations for both HIV and hypertension/type 2 diabetes mellitus were conducted, and MAC nurse-facilitators' adherence to protocols appeared high, with blood pressure measurements completed for 99% of consultations, weight checked for 98% of consultations, and blood tests ordered correctly for 98-99% of consultations. There was a high degree (99%) of compliance with the protocols and only a 3.5% loss to follow-up, suggesting patient satisfaction with this model. Only 2% of consultations required referral for clinical officer review prior to their routine annual appointment. With most MAC group visits lasting less than 2 hours, patient wait time in visits was likely reduced. Based on the results of this study, MAC groups for mixed chronic diseases in a resource-limited setting were shown to be feasible and efficacious, supporting a reduced burden and improved flexibility in clinical care for stable patients.

Resources

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INPUTS

- Existing cadres of nurses in health facilities.
- Financial resources provided by the International Union Against Tuberculosis and Lung Disease, Mèdecins Sans Frontières, the United Kingdom Department for International Development, and the World Health Organization.
- Existing HIV MAC models, from which lessons and structure were adopted.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- MACs were offered 3 times a week during routine clinic times, and typically lasted less than 2 hours.[4]
- Communication and dissemination methods, such as daily health talks in waiting rooms, empowerment meetings, and posters in the clinics, were used to inform patients about MACs.[4]

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- None reported.

4 INTEGRATION & COORDINATION

- Nurse-facilitators conducted MAC meetings quarterly to confirm clinical stability, provide information, and dispense medications.[4]

5 TECHNOLOGY & DIGITAL SOLUTIONS

- EMR data was available for MAC patients when they were seen for traditional clinic follow-up visits.
- Health promotion staff sent messages to MAC participants prior to group visits to confirm attendance.

OUTPUTS

COVERAGE (R):

- 47 MACs formed and held 109 sessions enrolling a total of 1,432 patients between August 2013 to 2014.[5]
- 2,208 consultations for both HIV and hypertension / type 2 diabetes mellitus conducted.[5]

- **Compliance with guidelines (A):** MAC nurse-facilitators' adherence to protocols appeared high, with blood pressure measurements completed for 99% of consultations, weight checked for 98% of consultations, and blood tests ordered correctly for 98-99% of consultations.[5]

OUTCOMES

PROXIMAL

- **Loss to follow-up (I):** low loss to follow-up at 3.5%.[5]
- **Visit length (I):** time variable was not measured, but the model likely reduced patient time at visits.[5]

IINTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- No distal outcomes reported.

Mental Health and Development Model in Kenya

COMMUNITY-BASED CARE MODEL TO IMPROVE PATIENT OUTCOMES AND REDUCE POVERTY AMONG PEOPLE WITH MENTAL DISORDERS

44

Geographic locale	Nyeri and Meru districts, Kenya
Program setting	Outpatient clinics
Target diseases	Severe mental and neurologic disorders (schizophrenic disorders, psychosis, epilepsy, bipolar mood disorder, major depression)
Target population	Adults ≥ 18 years
Partners/Stakeholders	Kenya Ministry of Health, Ministry of Agriculture, Ministry of Gender Children and Social Services, BasicNeeds, CARITAS, Maendeleo ya Wanawako

Background: Kenya is a lower-middle-income country with a population of 54.0 million.[1] In 2019, Kenya had an estimated age-adjusted prevalence of 12.3%[2] for mental health disorders (MHDs), with disability-adjusted life years at 1,709.0[2] per 100,000 population.

Model Overview: In 2005, the Kenyan non-governmental organization (NGO) BasicNeeds launched the model for Mental Health and Development in Kenya. Through a public-private partnership, the model aims to comprehensively address the needs of people living with mental illness, particularly severe mental disorders. The model had five interconnected components that collectively targeted both mental health outcomes and poverty: community mobilization around mental health, capacity-building at the community and clinic levels, sustainable livelihoods interventions, research, and management and collaboration. The model has since expanded to 11 countries. This case focuses on Kenya, which developed the evidence-base and case for expansion.[3]

Model Strategy: Primary care psychiatric clinics within existing facilities were set up by a psychiatric nurse or lead care provider and linked to a trained CHW to collaboratively manage. Primary diagnosis was given by a psychiatric nurse or a primary care provider who had training to recognize and treat mental disorders; patients were then linked to their CHW and support groups. CHWs conducted home visits to identify symptoms of MHDs, support adherence and integration in families and communities, refer to primary care or psychiatry clinics, and facilitate self-help support groups. CHW home visits cost patients US $0.50 per visit.[3]

Community engagement meetings were conducted to increase awareness around mental health and the formation of community-based support groups. Additionally, Mental Health Action Groups comprised of community stakeholders met quarterly in each district to solve user and caregiver issues such as medicine shortages and patient fees. These groups had between seven to 10 participants, including a lawyer, priest, patients, caregiver, youth representative, and the Mental Health and Development coordinator.[3]

Sustainable livelihood activities were community-based and integrated through the CHW-led self-help support groups. Self-help groups gathered monthly and were comprised of about 15-25 members (including care users and caregivers). The groups provided psychosocial support and introduced participants to income-generating activities including training in different crafts, agriculture skills (drought-resistant farming), and business skills. Financial literacy

and livelihood skills training were offered through BasicNeeds and also offered externally. Opportunities for economic empowerment and training were offered through small public-private partnerships in the community.[3]

Notable Features of the Model: This model focused on the mutually reinforcing goals of improving mental health and reducing poverty through sustainable livelihood activities created through public-private partnerships.[3]

Key Messages

- Model used existing cadres of primary care providers and CHWs to conduct home visits, refer patients, and support sustainable livelihood activities
- Quality of life in adults with severe mental health or neurological disorders improved significantly after two years of program implementation
- Proportion of participants who engaged in income-generating activities rose from 45% to 64%

Model Funding: About 80% of the initial expenditures for the Mental Health and Development model were covered by the NGO BasicNeeds via funding given by European/United Kingdom governments. The remainder was funded by the Kenyan government.[4]

Human Resources: This model used existing cadres of primary care providers (nurses and physicians) and CHWs. Nurses and physicians were trained to recognize, diagnose, and treat severe mental health disorders. CHWs were trained to conduct home visits, identify MHD symptoms, refer patients, and facilitate support groups.[3]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: The model showed promising results in a single group cohort study with assessments of mental health, functioning, economic status, and quality of life conducted at baseline, one-year follow-up, and two-year follow-up.[3] After two years of implementation, participants (adults with severe mental or neurological disorder including schizophrenia, epilepsy, bipolar mood disorder, or major depression) improved significantly in mental health and livelihood scores as measured by the General Health Questionnaire (decrease from 21.5 to 6 ($p<0.01$)); the Global Assessment of Functioning scale (increased from 78 to 94 ($p<0.01$)); and the summed World Health Organization Quality of Life Brief scale (increased from 39.5 to 57.2 ($p<0.01$).[3] The proportion of study participants who were engaged in income-generating or work activities increased from 45.3% to 64.0% ($p<0.01$).[3] A primary cost analysis found that from the societal perspective, the model cost Int US$876 per person over two years.[4] The cost per healthy day gained was US$1.03 over two years.[4]

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. GBD Results (database). Institute for Health Metrics and Evaluation (IHME), Seattle, WA. https://vizhub.healthdata.org/gbd-results/. Accessed September 1, 2023.
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INPUTS

HUMAN RESOURCES

- Existing nurses and doctors in outpatient clinics.
- Existing cadre of CHWs.

FINANCIAL RESOURCES

- Model financing through the NGO Basic-Needs, funded by European/United Kingdom governments (80%) and Kenyan government (20%).

TECHNICAL RESOURCES

- Community partners with opportunities for training and employment.

PROGRAM ACTIVITIES

1

FACILITY-BASED ACTIVITIES

- Psychiatric nurse or trained primary care provider gave primary diagnosis; referred to CHWs.
- Psychiatric nurse managed referrals from CHWs.

2

COMMUNITY-BASED ACTIVITIES

- Community engagement meetings were conducted.
- Mental Health Action Groups of community stakeholders were troubleshooting arising issues.
- CHWs facilitated self-help support groups that focused on psychosocial support linking to economic empowerment activities.
- CHWs conducted home visits to support adherence and family/community integration.

3

TRAINING & CAPACITY BUILDING

- CHWs were trained to identify symptoms of MHDs, refer when needed, and facilitate self-help groups.

4

INTEGRATION & COORDINATION

- CHWs referred patients to primary care or psychiatric clinics as indicated.
- PHC providers linked patients with CHWs and support groups.
- Sustainable livelihood activities were integrated in the CHW-led self-help groups (e.g., trainings in crafts, agriculture skills, business skills).
- Partnerships in the communities offered economic empowerment training and employment opportunities.

5

TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- **Patient health behaviors:** The proportion of patients engaged in income-generating activities or work increased from 45.3% to 64.0% (*p<0.01*).[3]

DISTAL

- **Patient health outcomes (E):** Adults with severe mental or neurological disorders improved significantly in mental health and livelihood scores as measured by the General Health Questionnaire (from 21.5 to 6 (*p<0.01*)); the Global Assessment of Functioning scale (from 78 to 94 (*p<0.01*)); and the WHO Quality of Life Brief scale (from 39.5 to 57.2 (*p<0.01*).[3]
- **Neutral or improved cost-benefit (M):** The cost per healthy day gained was US$1.03 over 2 years.[4]

Integrated Chronic Care Clinic (IC^3) Model for HIV and NCDs in Malawi

MAKING USE OF AN ALREADY EFFECTIVE FRAMEWORK TO TRANSFORM THE CASCADE OF CARE FOR NCDS

45

Geographic locale	Neno district, Malawi
Program setting	PHC centers
Target diseases	HIV, NCDs (including hypertension, asthna, epilepsy, and type 2 diabetes mellitus)
Target population	Adults ≥ 18 years of age
Partners/Stakeholders	Partners In Health, Malawi Ministry of Health

Background: Malawi is a low-income country with a population of 20.4 million.[1] In 2021, Malawi had an estimated age-adjusted type 2 diabetes mellitus prevalence of 7.3%,[2] with an estimated age-adjusted years of life lost of 741.9 per 100,000 population due to type 2 diabetes.[3] In 2019, the age-adjusted prevalence of hypertension in Malawi was 26.8%[4] for males and 31.6%[4] for females, with an estimated age-adjusted years of life lost of 629.3[3] per 100,000 population for hypertensive heart disease. The prevalence of asthma in Malawi was 3.8% in 2019, with an estimated age-adjusted years of life lost of 266.3 per 100,000 population.[3] The prevalence of idiopathic epilepsy in Malawi in 2019 was 0.4%,[3] with an estimated age-adjusted years of life lost of 103.0 per 100,000 population.[3]

Model Overview: The Integrated Chronic Care Clinic (IC^3) in the Neno district of Malawi is implemented by the non-governmental organization (NGO) Partners in Health (PIH), in partnership with the Malawi Ministry of Health. This model leverages existing HIV resources to provide longitudinal care for patients with chronic HIV and/or NCDs. Complete integration and decentralization of HIV and chronic disease care were provided through IC^3, allowing for all of a patient's conditions to be treated during the same visit at the nearest health facility. Patients were identified and referred to IC^3 for care through both passive and active NCD screening. The IC^3 model aimed to improve overall health and well-being by optimizing the use of existing health care staff, decentralizing care, improving patient flow, implementing task-shifting, enhancing data management, and strengthening the supply chain.

Model Strategy: The IC^3 model integrated HIV care and the Chronic Care Clinic (CCC) to address challenges and provide comprehensive care for patients with HIV and patients with chronic NCDs (regardless of HIV status). Several strategies were used to screen and refer NCD patients from multiple settings to the IC^3 clinics.[7] Patients were referred from community-based screening events conducted by community health workers (CHWs) and health center staff. Patients were also referred from outpatient clinics and on hospital discharge when chronic conditions were detected. Finally, patients enrolled in IC^3 for one diagnosis were screened for other chronic conditions that may need additional care.

Existing HIV staff, CCC team members, and clinicians trained as clinical officers were (1) *efficiently utilized* to ensure the success of the IC^3 model in health centers within two hospitals. The model emphasized (2) *decentralizing care* by scheduling follow-up appointments for CCC patients at nearby health centers, aligning with the antiretroviral therapy (ART) clinic schedule. Two teams from the base hospitals traveled to the health centers three days a week to deliver IC^3 clinic services, following a similar approach to the existing HIV model. Ensuring (3) *consistent patient flow* was crucial for staff comprehension and quality of services, with integrated care clerks playing a significant role. The implementation prioritized streamlining patient check-in and screening, which presented the greatest challenges and consumed the most time. Task analysis was also crucial for (4) *task-shifting* among health workers. Integrated care clerks became responsible for conducting screenings for chronic conditions, including measuring blood pressure (BP), screening for and recording data for tuberculosis (TB), assessing malnutrition through mid-upper arm circumference and body mass index measurements, and identifiying needs for family planning services. Integrated care clerks were also trained to perform diabetes screenings for high-risk patients and they notified clinicians of positive TB results, updated the TB screening register, guided TB patients for follow-up care, and facilitated enrollment in the national TB program. Electronic (5) *data procedures* were streamlined to improve integration by implementing a new storage system that consolidates patient charts into a single file, incorporating screening records. NCD files were simplified into a unified 'mastercard,' similarly to the HIV system. To (6) *ensure medication availability*, PIH acted as a backup to Central Medical Stores Trust, providing essential medications during stockouts or when additional supplies were needed. They also supplied a limited number of specialty medications to expand the existing formulary in the district.[5]

Notable Features of the Model: This model leveraged an already effective HIV program to improve access to care for NCD screening and treatment, regardless of HIV status, with only nominal increases in resources.[5]

Key Messages

- The IC^3 model successfully integrated HIV and NCD services, providing comprehensive care for patients with HIV and/or chronic NCDs using existing care platforms.
- Care was decentralized, with teams from base hospitals delivering IC^3 services at nearby health centers for convenient access to care.
- Model was associated with a decrease in the average blood pressure (BP), blood glucose, and prevalence of moderate to severe asthma.
- Model was cost-effective, with a lower cost per capita of IC3 services compared to standalone HIV services.

Model Funding: The clinic was funded by the government of Malawi, while PIH contributed extra staff, clinicians, transportation, fuel, and specialized medications for NCD patients. The majority of medications were obtained from the public supply chain or the Global Fund for antiretrovirals.[5]

Human Resources: Key human resources for the IC^3 model included: (1) medical director to oversee the operations; (2) clinic manager to manage staffing, scheduling, resources, ensuring smooth workflow and efficient clinic functioning; (3) nurses to provide direct patient care, management, and follow-up; (4) physicians/clinicians responsible for diagnosing and treating patients with chronic conditions to develop treatment plans, prescribe medications, and monitor patient progress; (5) integrated care clerks to assist in conducting screenings, recording patient data, notifying clinicians of results, and providing support in patient management; (6) pharmacy staff for dispensing, providing medication counseling, and monitoring medication adherence; and (7) administrative and operational staff to assist with appointment scheduling, medical record management, and other logistics.[5]

Laboratory, Diagnostic, or Pharmacy Services: PIH provided essential NCD medications when there were stockouts or changes in demand.[5]

Digital Solutions: PIH supported a comprehensive electronic medical record system using OpenMRS for both HIV and chronic NCD care. A unified NCD "mastercard" was also used, similarly to the HIV system.[5]

Impact of the Model: The IC^3 in the Neno area of Malawi provided convenient and integrated care for patients previously enrolled in HIV or NCD care. Patients were able to receive treatment for all their chronic conditions on a single day at the nearest health center. As of May 2015, the IC^3 had served 6,781 patients on ART and 721 patients with NCDs, including hypertension, asthma, epilepsy, and diabetes.[5] The clinic conducted 6,325 visits for ART and 1,064 visits for NCDs during the March to May 2015 quarter. The HIV prevalence among NCD patients was 15.1%, slightly higher than the district-wide prevalence. In May 2015, the IC^3 collected sputum samples from 47 suspected TB cases, resulting in one positive case. The clinic also conducted malnutrition screenings for 1,673 patients. Ongoing efforts were focused on data quality, integration of family planning, and monthly reporting of key indicators.[5]

A retrospective cohort study demonstrated an increase in access to services for patients with NCDs after decentralizing the IC^3 model from two hospitals to 14 primary care facilities in 2015.[6] Between 2015 and 2017, a total of 6,233 patients were enrolled in IC^3, including 2,990 (48%) diagnosed with chronic NCDs and 3,334 (52%) diagnosed with HIV. One-year retention was 72% for NCDs, with approximately one-quarter (25.5%) of NCD patients defaulting and 1.4% dying. Clinical outcomes for hypertension, diabetes, asthma, and epilepsy were statistically significantly improved on average. Among patients with hypertension, more than half (53.6%) had controlled BP (<140/90 mm Hg) at one year post-enrollment. Of 331 patients with asthma, 21.8% had reported moderate or severe asthma at enrollment compared to 12.6% at their one-year follow-up visit ($p=0.0007$). Among 207 patients with epilepsy, the average number of seizures in the past three months decreased from 2.4 to 1.5 ($p=0.0003$). Finally, of 52 patients with diabetes, average fingerstick blood glucose measurement dropped from 230 (SD=155) to 179 (SD=90) ($p=0.0124$).[6]

An economic evaluation found that the cost of providing integrated HIV and NCD care through the IC^3 model was US$260 per capita as compared to US$327 per capita for standalone HIV services, suggesting that the model is a financially feasible approach to improving clinical outcomes in rural Malawi.[7]

Resources

1. World Bank Open Data (database). World Bank, Washington DC. https://data.worldbank.org/. Accessed September 1, 2023.
2. International Diabetes Federation. 2021. IDF Diabetes Atlas 2021: 10th edition. Brussels, Belgium: International Diabetes Federation. https://diabetesatlas.org/atlas/tenth-edition/.
3. GBD Results (database). Institute for Health Metrics and Evaluation (IHME), Seattle, WA. https://vizhub.healthdata.org/gbd-results/. Accessed September 1, 2023.

INPUTS

- Existing human resources, including medical directors, clinic managers, nurses, physicians/clinicians, integrated care clerks, pharmacy staff, and administrative and operational staff.
- Financial resources from the Ministry of Health and PIH.
- Technical support from PIH.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Integrated care clerks at IC^3 conducted screenings for chronic conditions, including HTN, asthma, epilepsy, T2DM, TB, and malnutrition (IC^3 is free of charge).
- Nurses provided direct patient care, management and follow-up.
- Physicians/clinicians diagnosed and treated patients with chronic conditions, developed treatment plans, prescribed medications, and monitored patient progress.

2 COMMUNITY-BASED ACTIVITIES

- Health care providers provided weekly community outreach events to screen patients for HIV, HTN, and T2DM.

3 TRAINING & CAPACITY BUILDING

- Integrated care clerks were trained to perform diabetes screenings for high-risk patients.

4 INTEGRATION & COORDINATION

- Two hospital teams visited health centers 3 days a week to deliver IC^3 clinic services, following a similar approach to the existing HIV model.
- Integrated care clerks streamlined patient check-in and screening for a consistent patient flow.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- A new storage system was implemented that consolidated patient charts into a single electronic file, including screening records, and simplified NCD files into a unified 'mastercard,' similarly to the HIV system.

OUTPUTS

COVERAGE (R)

- **Screening:**
  - 6,233 patients were enrolled in IC^3, 3,334 diagnosed with HIV and 2,990 diagnosed with various NCDs.[6]
  - The IC^3 conducted malnutrition screenings for 1,673 patients.[3]
- **Treatment:** As of May 2015, the IC^3 served 6,781 patients on ART and 721 patients with NCDs. The clinic conducted 6,325 visits for ART and 1,064 visits for NCDs during the March to May 2015 quarter.[5]

- **Cost effectiveness (M):** The cost per capita of providing IC^3 was US$67 less compared to standalone HIV services (US$260 vs US$327).[7]

OUTCOMES

PROXIMAL

- **Convenience for patients (I):**
  - Patients were able to receive treatment for all their chronic conditions on a single day at the nearest health center.[5]
  - NCD patients experienced better access to services.[6]

INTERMEDIATE

- **Retention in care (E):** One year retention rate was 72% for patients with NCDs.[6]

DISTAL

- **Patient health outcomes (E):**
  - Average BP dropped from 157/94mmHg to 136/83mmHg ($p<0.0001$).[6]
  - Prevalence of persistent moderate or severe asthma decreased from 21.8% to 12.6% ($p=0.0007$).[6]
  - Average fingerstick blood glucose dropped from 230 to 179 ($p=0.0124$).[6]
  - 81% of HIV patients had the virus supressed.[6]

4. NCD Risk Factor Collaboration (NCD-RisC). 2021. "Worldwide Trends in Hypertension Prevalence and Progress in Treatment and Control from 1990 to 2019: A Pooled Analysis of 1201 Population-Representative Studies with 104 Million Participants." *Lancet* 398 (10304): 957-80. https://doi.org/10.1016/S0140-6736(21)01330-1.
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Mental Health in Primary Care (MeHPriC) Model in Nigeria

IMPROVING MENTAL HEALTH THROUGH EVIDENCE-BASED AND CULTURALLY APPROPRIATE INTERVENTIONS AT THE PRIMARY CARE LEVEL

46

Geographic locale	Lagos, Nigeria
Program setting	Primary care level
Target diseases	Mental health disorders
Target population	Adults ≥ 18 years and older
Partners/Stakeholders	Lagos State Ministry of Health, Lagos State University College of Medicine (LASUCOM)

Background: Nigeria is a lower-middle-income country with a population of 218.5 million.[1] In 2019, Nigeria had an estimated age-adjusted prevalence of 10.7%[2] of mental health disorders (MHDs), with an estimated disability-adjusted life years of 1,472.7[2] per 100,000 population in the same year.

Model Overview: The Mental Health in Primary Care (MeHPriC) project in Nigeria aimed to improve mental health care by implementing evidence-based and culturally appropriate interventions at the primary care level in Lagos. The project focused on identifying individuals experiencing depression and providing appropriate support within the primary care setting, following the guidelines of the World Health Organization (WHO) Mental Health Gap Action Programme (mhGAP) project. The intervention was developed based on evidence from low- and middle-income countries, particularly in Sub-Saharan Africa, with the goal of creating a brief and cost-effective intervention that seamlessly integrated into primary care.

Model Strategy: Using the Medical Research Council framework, (1) experts reviewed literature to develop the intervention's theoretical framework, (2) local stakeholders were consulted to assess its practicality and feasibility, and (3) intervention components were pilot-tested for clinical effectiveness and acceptability.[3] The final model components involved: (1) case detection, (2) a four-step intervention to triage patients based on the severity of their depression, (3) clinical supervision, and (4) proactive adherence management.

During the initial case detection stage, the CHEW assessed participants for depression based on three criteria: depressive mood, loss of interest/pleasure, and decreased energy. Those who met the criteria proceeded to the "Further evaluation and decision-making" stage, during which an attending nurse/midwife administered the Patient Health Questionnaire (PHQ-9) to determine the type of intervention to be provided. Under the four-step triage system, those with a PHQ-9 score of >5 were offered psychoeducation with a CHEW (step 1). Patients with a PHQ-9 score >10 to <15 were offered Problem Solving Therapy (PST-PC) administered by a nurse or doctor (step 2.1), in addition to psychoeducation. Those who scored >15 were offered antidepressants administered by a nurse or doctor (step 2.2) and psychoeducation. If patients receiving either PST-PC or antidepressants alone did not experience a reduction in their PHQ-9 scores (mild improvement after three sessions or moderate improvement after six sessions or six weeks of antidepressants), they were offered a combined treatment of PST-PC and antidepressants (step 3). Individuals on the combined treatment who did not improve after three months or experienced worsened symptoms were referred to the district psychiatrist by a mental health specialist (step 4). Patients receiving treatment were sent short message service (SMS) reminders 24 hours before each appointment and received intensive follow-up if they missed appointments through a centralized mobile telephone service through which providers could speak with patients over mobile phones instead of in-person.[3]

Notable Features of the Model: Unique features of the MeHPriC model included the integration of mental health services into primary care, the emphasis on evidence-based and culturally appropriate interventions, and the wide-scale implementation of screening for depression across numerous primary care facilities.[3]

Key Messages

- Model aimed to improve screening, triage, and treatment of depression within the primary care setting using existing primary health care providers working in collaboration with mental health specialists.
- Model resulted in higher clinical recovery rates, improved quality of life, lower rates of disability, and fewer deaths as compared to psychoeducation alone.

Model Funding: This work was supported by Grand Challenges Canada (Grant no. GMH 0084-04).[3,4]

Human Resources: This model was designed to be delivered by existing primary care providers, including doctors, nurses, midwives, community health officers, and CHEWs, in collaboration with mental health specialists, without the need for additional staff. Training was adapted from the mhGAP training guide and conducted over a five-day workshop, followed by a one-day refresher course after five weeks. Training sessions were standardized using video and audiotapes and included lectures, demonstrations, and role play sessions. All PHC providers received monthly in-person supervision visits and ongoing mobile telephone supervision and support from the district mental health team.[3]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory services. A two-stage screening process was used to diagnose mental health conditions. Antidepressants were prescribed by PHC providers.[3]

Digital Solutions: Mobile phones were used by providers in comprehensive PHC centers to support adherence to clinic appointments and medications through a centralized mobile phone service. SMS reminders were sent to patients 24 hours before every scheduled appointment. Additionally, a voice prompt feature was initiated in the event of a missed appointment by a patient. If a patient missed one appointment, a voice prompt was sent. If two appointments were missed by the patient, the system initiated a phone call to the patient.[3]

Impact of the Model: In a 2019 feasibility study of MeHPriC, 71.6% of depressed patients showed improvement after three months of the intervention.[4] The intervention was well-received by health care workers and clients, with over 70% of these groups expressing satisfaction. Expert panels also rated the intervention highly in terms of simplicity, facilitation strategies, and overall quality. A more recent clinical trial that aimed to evaluate the clinical effectiveness of MeHPriC at the 12-month mark found that the intervention group had significantly higher clinical recovery rates (defined as a PHQ-9 score < 6) compared to the enhanced usual care (EUC) group receiving only psychoeducational resources on depression symptoms through CHEWs (60.3% vs 18.2%, adjusted risk ratio (aRR) 3.10; 95% CI 2.15-3.87, $p<0.001$).[5] Additionally, the intervention group experienced better quality of life (aRR: 5.83; 95% CI 4.21–8.45, $p<0.001$), lower rates of disability (aRR 0.41; 95% CI 0.31–0.61, $p<0.001$), fewer deaths (aRR: 0.20; 95% CI 0.07-0.65, $p=0.007$), fewer referrals to the mental health team (aRR 0.44; 95% CI 0.30-0.65, $p<0.001$), less loss to follow-up (aRR: 0.66; 95% CI 0.51-0.90, $p<0.001$) and less deliberate self-harm (aRR 0.28; 95% CI: 0.15-0.55, $p=0.008$) as compared to the EUC group.[4]

Resources

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INPUTS

- Existing human resources at the PHC level, including CHEWs, nurses, and doctors.
- Financial resources from Grand Challenges Canada.
- Technical support.
- WHO mhGAP – Training Guide.
- PHQ-9 screening questionnaire

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Attending nurses or midwives administered the PHQ-9 to screen patients for depression.
- Nurses or doctors conducted PST-PC with patients who scored ≥10 to <15 on the PHQ-9.
- Nurses or doctors prescribed antidepressants to patients who scored ≥ 15 on the PHQ-9.
- Patients not experiencing a reduction in scores were offered combination treatment of PST-PC and antidepressants and referred to a district psychiatrist if no improvement was seen after 3 months.

2 COMMUNITY-BASED ACTIVITIES

- CHEWs screened patients for depression using the PHQ-9.
- CHEWs offered psychoeducation to all patients who screened positive (≥5) on the PHQ-9.

3 TRAINING & CAPACITY BUILDING

- CHEWs, nurses and doctors were trained in screening for depression through lectures, demonstrations, video, audiotapes, and role plays.

4 INTEGRATION & COORDINATION

- All PHC workers received monthly face-to-face supervisor visits.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- A district mental health team provided ongoing mobile telephone supervision and support for providers administering screening or treating patients with depression.
- Patients undergoing treatment were sent SMS reminders 24 hours before each appointment and received intensive follow-up if they missed appointments through a centralized mobile telephone service.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- **Patient satisfaction (I):** over 70% of patients and health workers expressed satisfaction with the intervention.[3]

INTERMEDIATE

- **Retention in care (E):** the intervention group was at a lower risk of loss to follow-up compared to the control group (aRR: 0.66; 95% CI 0.51-0.90, *p<0.001*).[4]

DISTAL

- **Patient health outcomes (E):** at 12 months of follow up, the intervention group demonstrated:
  - Higher clinical recovery rates (defined as a PHQ-9 score<6) (60.3% vs 18.2%, aRR 3.10; *p<0.001*).[4]
  - Better quality of life (aRR: 5.83; *p<0.001*).[4]
  - Lower rates of disability (aRR 0.41; *p<0.001*).[4]
  - Fewer deaths (aRR: 0.20; *p=0.007*).[4]
  - Fewer referrals to the mental health team (aRR 0.44; *p<0.001*)[4]
  - Less deliberate self-harm (aRR 0.28; *p=0.008*).[4]

Nurse-led Model for Integrated NCD Care in Rural Rwanda

INTEGRATED NCD CLINIC FOCUSED ON DECENTRALIZED NURSE-LED CARE AT THE DISTRICT LEVEL

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Geographic locale	Southern Kayonza district in the Eastern province of Rwanda
Program setting	Rwinkwavu District Hospital
Target diseases	Cancer, diabetes (types 1 and 2), cardiovascular disease, chronic respiratory disease, advanced hypertension, end-stage liver and kidney disease
Target population	Patients of all ages
Partners/Stakeholders	Rwanda Ministry of Health, Partners In Health / Inshuti Mu Buzima, Dana-Farber/Brigham & Women's Cancer Center

Background: Rwanda is a low-income country with a population of 13.8 million.[1] In 2019, Rwanda had a prevalence of hypertension of 28.5%[3] for males and 30.9%[3] for females, with an estimated 699.1[4] and 571.0[4] average years of life lost per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively, in the same year.

Model Overview: In 2006, the Rwandan Ministry of Health (MoH) and Partners In Health (PIH) / Inshuti Mu Buzima (IMB) established an integrated district-level program at Rwinkwavu District Hospital (RDH), which aimed to effectively manage both severe and less complex chronic NCDs. This nurse-led clinic provided services for initial diagnosis, long-term follow-up, and patient education. It focused on conditions such as heart failure, advanced hypertension, diabetes, chronic respiratory disease, as well as end-stage liver and kidney disease. The clinic employed evidence-based interventions tailored to the resource-limited setting, optimizing the use of available resources. By integrating the management of multiple chronic NCDs into a single platform, the program sought to deliver comprehensive and accessible care to patients in the Rwinkwavu District hospital catchment area.[6] In 2011, cancer services were added into the model.[5,6]

Model Strategy: The implementation strategy included these activities: i) collective strategic planning and commitment with PIH and the Rwandan Ministry of Health at both central and district levels; ii) development of national clinical and operational protocols and training curricula for heart failure, hypertension, type 1 and 2 diabetes, chronic kidney disease, baseline cancer training, and palliative care; iii) didactic and practical training of health care professionals for two months; iv) procurement of essential medicines and equipment; and v) development of, and training on, disease-specific clinical forms programmed into an electronic medical records (EMR) system. The addition of cancer care led to the development of integrated, decentralized cancer care at the district level with referrals to higher levels of care as needed. This was supported by additional training and referral pathways for both diagnosis and treatment to reflect the unique complexities of cancer care delivery.[6] The nurse-led, integrated NCD clinic operated on a weekly schedule, with each day of the week dedicated to a particular disease; however, patients with multiple NCD diagnoses would be treated for all illnesses during one clinic visit. Clear referral criteria were also established and communicated for complex cases requiring a higher level of care. To ensure continuity and comprehensive care for vulnerable patients, social assistance was provided in the form of subsidies for transportation fees and distribution of food packages.[5,6] Some of the more vulnerable patients were assigned community health workers (CHWs) to support home-based care and monitoring as well as adherence to appointments.[6]

Notable Features of the Model: Notably, the addition of specialized outpatient oncology services, including diagnosis, treatment and referral, and palliative care, was a new addition to the integrated NCD approach and a pioneering example of the integration of chronic care for cancer at a district level hospital in a low-income setting in Sub-Saharan Africa. Access to ongoing technical support was critical to provide high-quality care in a task-shifting model relying largely on non-oncologists. This approach aimed to provide comprehensive care for cancer patients within the integrated NCD framework, optimizing the roles of health care professionals based on their expertise and ensuring that patients received appropriate and specialized care when needed. Also, the cost of care to patients was substantially subsidized (e.g. subsidies for transportation costs and food packages) and the use of such social protection mechanisms played an important role in improving access to the services provided by the clinic.[5,6]

Key Messages

- The program established a nurse-led integrated NCD clinic which aimed to effectively manage both severe and less complex chronic NCDs. Program components included strategic planning, training of health care professionals, and the use of EMR. NCD trained nurses played a central role, with physicians being primarily involved in managing complex cases.
- The model integrated specialized outpatient oncology services, provided comprehensive care for patients with multiple NCD diagnoses, and implemented social protection measures to improve access to care.
- Study findings show that implementation of the model resulted in high short-term (12-months) patient retention, especially for cancer patients.

Model Funding: While initial procurement operations were heavily supported and subsidized by PIH/IMB, these supports and subsidies were substantially reduced over time. In addition, the PIH/IMB, Dana-Farber/Brigham & Women's Cancer Center, and other partners provided support for oncology services and cost subsidies. Advanced medications such as chemotherapy and warfarin were not easily accessible through the public supply chain, therefore PIH/IMB procured these medications to assist the Rwandan MoH until the public sector could independently secure them.[5,6]

Human Resources: The integrated NCD clinic's team consisted of three NCD-trained nurses, a general practitioner, a data officer, and a clerk. The NCD-trained nurses took the lead in most patient encounters, while the GP was primarily involved in managing complex cases. The data officer managed patient data and files, transcribed data from the paper forms into the EMR and monitored form completeness. The clerk facilitated administrative workflow within the clinic and its interactions with the rest of the hospital. In addition, a cardiologist and an endocrinologist visited the clinic on a monthly basis to evaluate complex patients and newly diagnosed patients, and also provided direct mentorship and education to the clinic staff. Social workers assisted in identifying vulnerable patients who needed social assistance, such as subsidies for transportation costs and the distribution of food packages.[5,6]

Laboratory, Diagnostic, or Pharmacy Services: The integrated NCD clinic was equipped with one of each of the following pieces of medical equipment: ultrasound with cardiac probe, stethoscope, sphygmomanometer, peak flow meter, HbA1c point-of-care machine, Internalized Normalized Ratio point-of-care machine, monofilament, glucometer, and a weight scale. Although laboratory and pharmacy services are not explicitly mentioned, there is mention of a limited selection of intravenous chemotherapy and oral hormonal treatment regimens being available.[5,6]

Digital Solutions: To ensure continuity of care and improve the monitoring and evaluation system, disease-specific clinical forms were integrated into the EMR system called OpenMRS. This allowed for comprehensive documentation of patient information, facilitating the management of different diseases, and enhancing efficiency and effectiveness.[5,6]

Impact of the Model: A recent study that set out to describe the early RDH NCD clinic's experience with integration of care for severe chronic NCDs, including cancers, reported that 347 new patients were enrolled during the study period (between July 1, 2012 and June 30, 2014), with the primary diagnosis being: cancers (71.8%), hypertension (10.4%), heart failure (11.0%), diabetes (5.5%), and chronic respiratory disease (1.4%).[6] Only 25.3% of cancer patients resided in the RDH catchment area, in comparison to 71.4% of non-cancer patients, suggesting that the hospital was effectively serving as a regional cancer referral center prior to the strengthening of cancer care at other facilities.[6] The over-representation of cancer patients in the study may be due to the fact that case finding for cancer may be higher compared to other severe NCDs because of the more overt presentation of many cancerous tumors. After 12 months, 76.4% (n=266) of patients were alive and in care, 7.2% (n=25) had died, and 10.1% (n=35) were lost to follow-up. Oncology patients had the highest retention rate in care after 12 months (81.6%), followed by patients with hypertension (75.0%), diabetes (73.7%), chronic respiratory disease (60.0%), and heart failure (47.4%).[6]

Resources

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INPUTS

- Existing human resources at RDH.
- Financial resources from PIH/IMB, and Dana-Farber/ Brigham & Women's Cancer Center.
- Pharmaceutical procurement from PIH.
- Technical support from the Rwandan MoH, PHI/IMB, and Dana-Farber/Brigham & Women's Cancer Center.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Nurse-led integrated NCD clinic provides services for initial diagnosis, long-term follow-up, and patient education, focusing on conditions such as heart failure, advanced hypertension, diabetes, chronic respiratory disease, and end-stage liver and kidney disease. Cancer services were later added to this model.
- Nurses lead most patient encounters, while general practitioners handle complex cases and those at high risk of clinical exacerbations.
- A cardiologist and an endocrinologist visit the clinic on a monthly basis to evaluate complex patients and newly diagnosed patients.
- Social workers assist in identifying vulnerable patients who need social assistance, such as subsidies for transportation costs and distribution of food packages.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Health care providers are trained on clinical and operational protocols for heart failure, hypertension, type 1 and 2 diabetes mellitus, chronic kidney disease, and palliative care through didactic and practical lessons. Oncology training covered inpatient and outpatient content.
- A cardiologist and an endocrinologist provide direct mentorship and education to clinic staff.

4 INTEGRATION & COORDINATION

- National clinical and operational protocols for heart failure, hypertension, type 1 and 2 diabetes mellitus, chronic kidney disease, and palliative care.
- District level oncology services with referrals for higher level care.
- A multi-disciplinary team of 3 NCD-trained nurses, a general practitioner, a data officer and a clerk deliver services. Clerks facilitate administrative workflows within the clinic and its interactions with the rest of the hospital.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Disease-specific clinical forms were integrated into the EMR system called OpenMRS.
- A data officer enters patient information into the EMR.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E) –** After 12 months, 76.4% (n=266) of clinic patients were alive and in care, 7.2% (n=25) had died, and 10.1% (n=35) were lost to follow-up.[6]

Collaborative Care Model for Integrated Primary Care of Depression Comorbid with Chronic Conditions in South Africa

A TASK-SHARING APPROACH INCLUDING THE USE OF NURSE PRACTITIONERS AND LAY PSYCHOSOCIAL COUNSELLORS

48

Geographic locale	Dr. Kenneth Kaunda district, and Bojanala Platinum district, South Africa
Program setting	PHC facilities
Target diseases	Depression in patients with comorbid chronic conditions
Target population	Individuals > 18 years visiting clinic for treatment for chronic illness
Partners/Stakeholders	South African Department of Health

Background: South Africa is a upper-middle-income country with a population of 59.9 million.[1] In 2019, South Africa had an estimated prevalence of 12.0%[2] for mental health disorders, with estimated age-adjusted disability-adjusted years of life lost of 1,640.1[2] per 100,000 population due to mental health disorders in the same year.

Model Overview: The Collaborative Care model implemented through task-sharing in the Dr. Kenneth Kaunda (DKK) district and Bojanala Platinum district of South Africa aimed to address the needs of chronic care patients with depression. The primary focus of the model was to enhance the capabilities of primary care nurse practitioners to identify, diagnose, and manage symptoms of depression in patients with chronic conditions, and to strengthen referral pathways within clinics to include co-located counselling services provided by lay-counsellors. This model is flexible and can be adjusted to suit various contexts, and it has been expanded to the KwaZulu Natal province in South Africa.[3]

Model Strategy: The collaborative care model was implemented in the context of a national roll-out of South Africa's national Integrated Clinical Services Management (ICSM) strategy, which included the reorganization of chronic care services and the introduction of a clinical decision support tool called Adult Primary Care (APC) (or Practical Approach to Care Kit (PACK)), to deliver integrated primary care to patients with any chronic disease. This integrated care approach was rolled out to all pilot districts, including DKK[5]. Against this background, the implementation of the collaborative care model consisted of several key components: (i) nurse practitioners assessed and diagnosed common mental health conditions and served as case managers; (ii) PHC doctors were oriented to the importance of mental health and the collaborative care model, upskilled in prescribing antidepressant medications to patients referred to them by the nurses, and their capacity to manage mental disorders was strengthened; (iii) referral pathways for psychosocial counseling were strengthened with nurses referring patients to clinic-based lay psychosocial counsellors trained in cognitive behavioral therapy techniques; (iv) orientation of district and facility operational managers to the collaborative care model; and (v) introduction of a referral form to monitor referrals from nurses to the counsellors.[6] This comprehensive approach aimed to optimize the roles of various health care providers and improve the overall management of common mental disorders in primary care settings.[3]

Notable Features of the Model: The introduction of clinic-based lay psychosocial counsellors ensured that there were co-located mental health counselling services within clinics for managing depression. This innovative approach involved training and supervision of non-medical personnel to provide counseling based on cognitive and behavioral techniques to address common triggers of depression. By expanding the roles and responsibilities of nurses and lay counsellors, the model aimed to bridge the gap in accessing depression treatment, especially in areas where there is a shortage of doctors and mental health specialists. This approach helps improve the availability and accessibility of evidence-based depression care, and enhances the overall capacity of PHC settings to deliver comprehensive mental health services.[3]

Key Messages

- The Collaborative Care model led to significant improvements in identifying and managing depression, with increased detection rates at 12 months after the intervention, and higher rates of reduced depressive symptoms and remission.
- Findings show that depression care can be successfully integrated within routine PHC services for other conditions in resource-constrained settings, and that non specialist resources can be leveraged to narrow the detection and treatment gap for common mental health conditions.
- Implementation analysis emphasized the importance of co-designing contextualized models and contextual adaptations of innovations for successful scaling-up in health care systems.

Model funding: United Kingdom Department for International Development and National Institute of Mental Health of the National Institutes of Health.[3]

Human Resources: The existing nursing staff and PHC doctors were responsible for delivering services at the PHC center.[3] Nurses received supplementary training in the mental health components of the APC to better equip them to screen for and assess, advise and refer appropriately any patient with a common mental health condition, as well as training in communication skills for person-centered care. In the case of lay counsellors, while existing clinic-based HIV-counsellors were initially identified to participate, it was not feasible to involve them for administrative reasons. The program therefore introduced and trained lay-counsellors, who had a minimum of 12 years of schooling, to provide evidence-based counseling to patients with depressive symptoms. This training included on-site peer to peer mentoring and supervision by a mental health professional.[6]

Laboratory, Diagnostic, or Pharmacy Services: APC guidelines were utilized for assessment and diagnosis of depression.

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: In a repeat cross-sectional facility survey done in four PHC facilities, the detection of depressive symptoms increased from 5.8% to 16.4% (95% CI 2.9, 19.1).[3] As compared to the control group, a significantly higher proportion of intervention patients experienced a more than 50% reduction in their Patient Health Questionnaire-9 (PHQ9) scores at both three months (55.2% vs. 23.4%; RR = 2.10, $p<0.001$) and 12 months (47.9% vs. 30.8%; RR = 1.52, $p=0.006$). Remission at 12 months (PHQ-9 ≤ 5) was higher in the intervention group than the control group (26.9% vs. 16.9%) (RR = 1.72, $p=0.016$). The results of the facility detection survey suggest that the implementation of the integrated collaborative care package led to an improvement in nurse-detection and treatment initiation of depressive symptoms.[3] The intervention was significantly more successful with food secure participants, suggesting the need to combine such interventions with supporting initiatives for people with depressive symptoms from poor socio-economic contexts.[3] The study also indicated that despite these improvements, a significant treatment gap remained, and that additional interventions (such as anti-stigma interventions) might be needed to improve the identification of mental health disorders, including depression, in PHC.[3]

An implementation analysis was conducted of the above-mentioned trial—which was focused on patients with hypertension in DKK district—and a sister trial, which was focused on patients with antiretroviral therapy in the same district, as well as the neighboring Bojanala district.[6] The study found the average nurse practitioner exposure rate to one or more training sessions across the facilities in DKK was 59% (range: 36%-80%). The average rate for completed training across facilities was 39% (range: 0%-80%) in DKK. In Bojanala, the average nurse practitioner exposure rate was 85% (range: 56%-100%); the average completion rate was 78% (range: 43%-100%).[5] Across the 20 intervention facilities from both sites, a total of 4,298 patients were directed to the lay psychosocial counseling service available in both districts during the trial period. Out of these, 2,907 patients were referred for counseling in Bojanala over a period of 18 months, while 1,391 patients were referred in DKK over a period of 17 months. Slightly less than half of the referred patients (n=2,200) attended at least one counseling session. Overall, a total of 6,418 counseling sessions were provided.[5] The adoption rate of counseling sessions was greater in DKK, with referred patients receiving an average of 3.61 counseling sessions, compared to those in Bojanala who received an average of 1.55 sessions. Study authors indicated that more project employed human resources were deployed to support the model's implementation in Bojanala, which could explain the higher number of completed trainings and patient referrals in that site. However, the greater uptake of counselling sessions in DKK was attributed to a higher level of support provided by the system, especially in-vivo supervision and support for lay counsellors.[6] As a result, although a large number of people were referred to the co-located counselling services in both sites, it was found that a one-size-fits-all collaborative care model may not be suitable for different contexts in the country, and co-designing contextualized models and implementing adaptable innovations is crucial for successful scaling-up in health care systems.[6]

From 2019 to 2021, the model to integrate evidence-based depression services within routine primary care was assessed in the KwaZulu Natal province of South Africa using an iterative, observational implementation science approach that incorporated the Reach, Effectiveness, Adoption, Implementation and Maintenance framework. The study found that the establishment of a learning collaborative that included policymakers, researchers, and implementers was key to enable policy changes to institutionalize elements necessary to the success of the care model - in particular a validated, mandated mental health screening tool for nurses, and revisions to health care worker roles and responsibilities.[7]

Resources

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INPUTS

- Existing human resources at the PHC level, including nurse practitioners and doctors.
- New cadre of lay psychosocial counsellors.
- Financial resources from the UK Department for International Development and the National Institute of Mental Health of the National Institutes of Health.
- Technical support from the South African Department of Health.
- ICSM guidelines.
- Validated screening tools: Alcohol Use Disorder Identification Test, PHQ-9.
- APC guidelines.
- Lay psychosocial counselling guidelines.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Nurse practitioners served as case managers for chronic patients with co-existing depressive disorder.
- Nurses assessed chronic patients for depression using APC guidelines.
- Psychosocial lay counsellors provided counselling to referred patients using cognitive behavioral techniques.
- Doctors prescribed antidepressant medications to patients as clinically indicated.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Primary care nurse practitioners received supplementary training in the APM Mental Health Module to better equip them to identify, diagnose, and review symptoms of depression among chronic care patients. They were also trained in clinical communication skills for person-centered care.
- Doctors were oriented to the importance of mental health, the collaborative care model, and upskilled in prescribing antidepressant medications.
- Lay psychosocial counsellors were trained and supervised in evidence-based cognitive behavioural therapy techniques.

4 INTEGRATION & COORDINATION

- Implementation of a stepped-up referral system within each clinic, involving clinic-based nurse practitioners, psychosocial lay counsellors, doctors, and mental health specialists.
- Introduction of a referral form to monitor nurse referrals to psychosocial lay counsellors.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Diagnosis:**
  - Detection of depressive symptoms increased from 5.8% to 16.4% (95% CI 2.9, 19.1) among individuals visiting the intervention clinic.[3]
- **Referrals:** 4,298 patients were directed to the counseling service. Out of these, 2,907 patients received counseling in Bojanala over a period of 18 months, while 1,391 patients sought counseling in DKK over a period of 17 months. Slightly less than half of the referred patients (n=2,200) attended at least one counseling session. The adoption rate of counseling sessions was greater in DKK, with referred patients receiving an average of 3.61 counseling sessions, compared to those in Bojanala who received an average of 1.55 sessions.[6]

- **Providers trained (R)**
  - In DKK, the average nurse practitioner exposure rate to one or more sessions across the facilities was 59%, (range: 36%-80%). The average rate for completed training across facilities was 39% (range: 0%-80%).[6]
  - In Bojanala, the average nurse practitioner exposure rate to one or more sessions across facilities was 85% (range: 56%-100%). The average completion rate was 78% (range: 43%-100%).[6]
  - Training reached 65% and 50% of of PHC doctors in DKK and Bojanala districts.[6]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E): Compared to control group in a quasi-experimental study:**
  - Higher % of intervention patients with a ≥50% reduction in depression symptoms (PHQ-9 scores) at month 3 (55.2% vs. 23.4%; RR=2.10 and *p<0.001*) and month 12 (47.9% vs. 30.8%; RR=1.52 and *p=0.006*).[3]
  - Remission rates (PHQ-9 ≤ 5) were higher in intervention group at month 12 (26.9% vs. 16.9%) (RR=1.72, *p=0.016*).[3]
- **Compared to control group in a cluster RCT study:**
  - Non-significant difference in the % of intervention patients with a ≥50% reduction in depression symptoms (PHQ-9 scores) at month 6 (55.9% vs. 50.9%; *p=0.6*).[5] The study authors concluded that incorporating lay counselling services within collaborative care models does not produce superior nor inferior outcomes to models with specialist only counselling services, and that the use of such models to increase access to care in contexts where specialist resources are scarce, is supported.

Integrated Care Disease Management (ICDM) Model in South Africa

LEVERAGING HIV INFRASTRUCTURE TO DIAGONALLY REORIENT THE HEALTH SYSTEM TO MANAGE A GROWING BURDEN OF NCDS

49

Geographic locale	South Africa, nationwide
Program setting	Primary care facilities
Target diseases	HIV/AIDS, tuberculosis, NCDs (hypertension, diabetes, chronic obstructive pulmonary disease, asthma, epilepsy, mental health illness)
Target population	Adult patients over 15 years old
Partners/Stakeholders	South Africa National Department of Health, United States Agency for International Development

OVERVIEW

The Integrated Chronic Disease Management (ICDM) model reoriented the South African health system to better manage a growing NCD burden. Building upon the country's robust HIV/AIDS care infrastructure, the ICDM model is guided by six principles of the World Health Organization (WHO)-Innovative Care for Chronic Conditions: evidence-based decision making, population focus, prevention focus, quality focus, integration, and flexibility and adaptability.[1]

The overall aim of ICDM is to optimize clinical outcomes for patients with communicable and non-communicable diseases. The ICDM model uses a diagonal approach to health system strengthening, meaning that it focuses heavily on interventions to improve care and empower patients, while concurrently reorganizing and strengthening capacity across various building blocks of the health system.[2] To do so, it targets four inter-connected pillars: 1) facility reorganization to improve efficiency; 2) clinical supportive management to improve quality of care; 3) assisted self-management though outreach teams to empower patients to manage their health and increase community awareness; and 4) cross-cutting support systems outside the facility (human resources, health information, supply chain, equipment, and mobile technology) to improve the responsiveness of the overall system.[2]

The ICDM model is foundational to South Africa's vision of long, healthy lives for all through NCD prevention and control.[1] Building upon its robust HIV infrastructure, the ICDM model was piloted in HIV treatment clinics in 2011 and has since scaled nationwide.

NOTABLE FEATURES OF THE MODEL

This model leveraged elements of the well-established HIV-treatment infrastructure to improve the quality of care for NCDs in South Africa.[2] It uses a diagonal approach to health system strengthening, meaning that it focuses heavily on interventions to improve care and empower patients to manage their health, while concurrently reorganizing and strengthening capacity across the health system.[2]

BURDEN OF NCDS

South Africa is an upper-middle-income country with a population of 59.8 million.[3] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence in South Africa was 10.8%.[4] In 2019, the estimated age-adjusted prevalence of hypertension was 43.8%[5] for males and 44.3%[5] for females and the estimated age-adjusted prevalence of cardiovascular disease (CVD) was 7.0%.[6] In 2019, the estimated age-adjusted years of life lost were 1,296.0,[6] 561.0,[6] and 3,867.7[6] per 100,000 population for type 2 diabetes, hypertensive heart disease, and CVD, respectively.

IMPLEMENTATION CONTEXT

Health Policy Environment

South Africa has been a leader in its policy response to NCD prevention. Several policies focus on mitigating behavioral risk factors including a ban on promoting tobacco and taxing tobacco and sugar-sweetened beverages.[7] It has a policy with strategies to reduce sodium intake through labeling products and encouraging reformulation of snack products and as of 2022 was the only African country to implement national programs promoting physical activity.[7] In 2013, it launched its first Strategic Plan for the Prevention and Control of Non-Communicable Diseases which is routinely updated (current version 2020-2025). Additionally, the constitution in South Africa states that everyone has access to health care, and there is no need for identification to access free antiretroviral treatments for HIV/AIDS.[8]

Health System Structure

The health care system is split into a private and public health care system. The majority of South Africa's population depends on the public system, which is subsidized by the government. However, an estimated 80% of doctors work at least in some capacity in the private system.[9,10] There are over 2,000 PHC clinics that serve as the first point of contact for a patient.[11] These primary level clinics are supported and strengthened by the other care levels, such as acute and specialized referral hospitals.[10,11] District level hospitals, which are smaller hospitals that are managed at the municipal level, are the second step in the referral system.[11] Tertiary hospitals are managed by provincial health departments and are able to handle more specialized care.[11] The HIV-care infrastructure has been heavily invested in, primarily by the President's Emergency Plan for AIDS Relief (PEPFAR), which between 2003 and the beginning of 2022 had contributed over US$8 billion to South Africa's HIV/AIDS response. The resulting vertical HIV/AIDS care platform is well established at all levels of the health system.

Model Strategy

The ICDM implementation strategy employs a package of interventions under each of its four inter-connected pillars. Activities under the facility reorganization pillar aim to improve operational efficiency at the clinic and by extension, across the system. These include process improvement methods to improve patient flow, reduce waiting times, and general cleanliness of the facility.

Activities under clinical supportive management aim to improve the quality of care at the facility-level. These include the introduction of national evidence-based treatment protocols including the ICDM manual, a standardized patient record available in the electronic medical system that can be retrieved in advance of the visit, a health promotion-tool for nurses to reference, and infection prevention measures.

Activities under the assisted self-management pillar aim to empower patients and improve community awareness and rely heavily on community health workers (CHWs) who are part of larger ward-based outreach teams (WBOTs). Additionally, these community-level interventions include health education events to improve knowledge of risk factors and mass NCD screening events to identify at-risk individuals. These mass screening events are strategically organized around key moments (i.e. World AIDS Day, World Diabetes Day etc.) and are most frequently conducted by

the WBOT or integrated school health teams (ISHTs). Additionally, at the community level, social media and marketing tools are used to generate awareness about NCDs and risk factors.[2,12]

At the individual level, the CHWs use point of care screening to identify at-risk people within a household for diabetes, hypertension, and tuberculosis (TB). The CHWs also use point of care testing, refer for diagnosis if needed, monitor blood pressure (BP) and blood sugar of down-referred patients at home, run adherence clubs, and courier medications when needed.[12] They link patients to the health system through formal referral channels or to community-based adherence support including adherence clubs.

Lastly, activities that strengthen cross-cutting support systems focus heavily on improving the supply chain to ensure availability of medicines at the facility-level. District clinical specialist teams (DCST) supervise care provided to the community, undertake clinical audits of professional health care workers' services, and strengthen the referral mechanism between clinics and referral hospital.[12]

Model Funding

In 2011, the total amount spent on health by the Government of South Africa was R248.6-billion, which is 5% above the recommended amount by the World Health Organization.[11] The majority of South Africa's health system is financed by the government through taxation, as well as spending from patients.[10] The South African National Department of Health initially leveraged support from the United States Agency for International Development (USAID) to develop and expand the ICDM model nationally.[13]

Human Resources

The ICDM model uses a task-shifting and task-sharing approach where tasks are shifted from higher trained workers such as medical practitioners to professional nurses and to CHWs who share the responsibility for delivering care for chronic patients. Professional nurses also diagnose disease. Thus, the majority of human resources are at the PHC center level, and the model requires heavy investment in training. WBOTs are deployed in every community ward in the country to ensure continuity of care by interacting directly with the community.[12] WBOTs consist of professional nurses, enrolled nurses, and CHWs.[12] Each PHC facility has a designated ICDM Champion who is tasked with problem solving ICDM, managing ICDM stakeholders, and reporting.[12] The District Management Team has stewardship over monitoring the implementation of the ICDM model.[12]

Laboratory, Diagnostic, or Pharmacy Services

Channels of communication between the essential drug list committees and the professional associations of key NCD conditions were established to ensure that professional clinical guidelines are kept in line with the essential drug list items.[1] This helps to ensure cost-effectiveness and up to date evidence-based medicine for NCDs in South Africa. Since patients with CVDs, diabetes, chronic respiratory conditions, cancer, mental disorder, oral diseases, eye disease, kidney disease, and muscular-skeletal conditions will frequently be referred between levels of care, adequate referral systems and drug distribution systems between these levels of care are critical to ICDM.[1]

The minimal equipment and technologies required at PHC level include BP measurement devices that are regularly serviced and standardized, a height meter and a weighing scale. Blood sugar and blood cholesterol measurement devices with the necessary strips or laboratory services must be available, as well as urine strips to measure urinary albumin.[1] Other essential equipment listed for a ICDM clinic includes: safe, wheelchair, patient trolley, bench, table, bin, chairs, filing cabinet, desk, scale (adult, weight/height), scale (baby), stethoscope, kick about bucket (stainless steel), hemoglobin meter, glucometer, electronic BP machines, mobile with pulse oximetry and temperature, sphygmomanometer cuff (size XL and size PD), urine specimen jar, examination couch, baumanometer (portable), baumanometer (wall mounted), steps, dressing trolley, examination lamp, suture set, diagnostic sets (portable) patella hammer, doctor's torch, and medicine cupboard or trolley.[12]

Digital Solutions

The ICDM model includes several digital solutions. The district health information system, or DHIS2, is the primary data collection site for all facilities, and the patient record has been integrated into this system. This is not a new digital tool and there are no new data elements being collected for this program but it ensures that there is comprehensive data for the ICDM model.[12] Mobile technology is used to improve quality of patient records and help facilitate the continuity of care. This platform for mobile technology can be used to broadcast patient reminders and health promotion messaging directly to the patient.[13] Lastly, patient education materials are disseminated through social media platforms.

IMPACT OF THE MODEL

In 2016, a sustainability assessment was conducted on the ICDM model at the PHC clinics in South Africa.[14] Using the National Health Service Institute for Innovation and Improvement Sustainability Model self-assessment tool, this assessment looked at 37 of the initiating clinics across three districts in three provinces of South Africa.[14] The findings indicated that the "facility reorganization and clinical support component contributed to a high sustainability score for the organization and process component of the Sustainability Model. The perceived poor adaptability, staff behavior towards change, active participation of medical practitioners and infrastructure limitations have a negative impact on the sustainability of the ICDM alignment between all programs of integrated care.[14] Similar challenges persist in a more recent evaluation in 2020.[16]

A 2019 evaluation looked at 16 PHC clinics in two health districts in South Africa: Dr. Kenneth Kaunda and West Rand to assess the implementation fidelity (adherence to guidelines) of the ICDM model.[15] The evaluation found a high level of fidelity of implementation of the ICDM model, with some variability across ICDM model scores on components and on PHC facilities. The highest median scores were on the ICDM model components of facility re-organization and strengthening of support systems.[15]

An evaluation of the 2011 pilot ICDM program published in 2020 found high rates of satisfaction with structural dimensions of quality of care including the accessibility of care (96% of patients, 86% of providers) and supply of critical drugs (93% of patients, 100% of providers). Nearly all patients (97%) were satisfied with availability of equipment, but only 57% of providers were satisfied. Only 17% of patients and 43% of providers were satisfied with wait times. Pilot facilities had a statistically significant ~4% greater chance of controlling patient BP than comparison facilities, during 24 months of ICDM implementation (coef = 0.036; 95% CI 0.029, 0.043; $p<0.001$).[16] The full scale up has yet to be evaluated as it is difficult to isolate the impact of the model from other evolving programs.

COSTING

In 2020, a cost analysis of implementation of the integrated chronic disease model at four clinics was completed to help inform budgeting and economic evaluations.[17] The 2019 analysis from the provider's perspective found that an overall mean annual cost of implementing the ICDM model was US$148,446 (SD: US$65,125) per clinic.[17] The cost of ICDM model activities (those under the four interconnected pillars) in 2019 accounted for 84% (US$124,345) of the annual mean cost, while additional costs of activities to improve implementation fidelity were estimated at 16% (US$24,102). The mean cost per patient per visit was US$6 (SD: US$0.77); US$4.94 (SD: US$0.70) for current cost and US$1.06 (SD: US$0.33) for additional cost to enhance ICDM model fidelity.[17] Costs aggregated consultations for HIV, TB, diabetes and hypertension and are based on number of patients with each disease, not considering multimorbidity. Of the additional costs reported above, 49% were for facility reorganization, 31% for adherence clubs and 20% for training of nursing staff. Sensitivity analyses found that the major cost drivers were the proportion of effort of assisted self-management staff (WBOTs) and the number of patients with chronic diseases receiving care at the clinic, rather than the capital investment of additional infrastructure alone.[17]

LESSONS LEARNED

Several lessons have been identified through the implementation and expansion of this model. First, leveraging the HIV/AIDS program infrastructure has been key to implementing the ICDM model of care. However, the HIV/AIDS program infrastructure itself is a vertical program and therefore is not administratively integrated into the broader health system.

Second, by training and empowering nurses and CHWs, the ICDM model increased the capacity to deliver care and improved access to services, particularly in resource-constrained areas. However, the home-based visits by health workers, an integral part of ICDM, still get associated with HIV/AIDS care and therefore can be stigmatizing in the community, even if the home visit is for other chronic conditions.[16]

Third, clear guidelines, protocols, and standard operating procedures provide a framework for health care workers to deliver consistent and high-quality care. However, they must be adaptable. Each area implements different model elements to different degrees, depending on context and available resources, and therefore requires guidelines to be flexible and adaptable.

Lastly, human and financial resource constraints persist. In terms of human resources, the heavy investment in training for this program and others, pulls staff away from the clinic. Since this model runs concurrently with different programs, health centers, by and large, are consistently understaffed. Malfunctioning machines and procurement challenges make full implementation challenging.[16]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Leveraging the existing HIV/AIDS program infrastructure to roll out the ICDM model was critical. However, even with a strong foundation, implementing new programs requires investment. Do not make the assumption that a program can just be layered on without sufficient and specific human and financial resources allocated to startup and implementation costs. Simplify everything when possible.

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INPUTS

- Existing human resources within the health system at all levels.
- HIV-care infrastructure has previously invested in by PEPFAR.
- Financial resources from the Government of South Africa and USAID.
- Technical support form the Department of Health of South Africa.
- Supportive policy environment.
- DHIS2.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Professional nurses can diagnose NCDs at PHC clinics.
- Establishment of more robust infection prevention measures at PHC clinics.

2 COMMUNITY-BASED ACTIVITIES

- CHWs use point of care screening to identify at-risk people within a household for T2DM, HTN and TB.
- The CHWs use point of care testing, refer for diagnosis if needed, and monitor the down-referred patients (BP and blood sugar screening) at home.
- CHWs run adherence clubs.
- CHWs courier NCD medications to patients when needed.
- CHWs and providers hold health education events to improve knowledge of risk factors.
- WBOTs or ISHTs hold mass NCD screening events are to identify at-risk individuals during national/international health days (i.e. World AIDS Day, World Diabetes Day etc.)

3 TRAINING & CAPACITY BUILDING

- Training of health care providers in ICDM manual.
- Provision of a health promotion-tool for nurses.
- DCSTs supervise care provided to the community, undertake clinical audits of professional health care workers' services.

4 INTEGRATION & COORDINATION

- Implementation of process improvement methods for patient flow, reduce waiting times, and general cleanliness of the facility.
- Increased task shifting and sharing within PHC clinics.
- Provision of clinical supportive management to improve quality of care.
- Introduction of national evidence-based treatment protocols including the ICDM manual.
- CHWs formally refer patients to facilities or community-based adherence support.
- Improvement of supply chain to ensure availability of medicines at facility-level.
- Strengthen of the referral mechanism between clinics and referral hospitals.
- Each PHC facility has a designated ICDM Champion who is tasked with problem solving ICDM, managing ICDM stakeholders and reporting.
- Establishment channels of communication between essential drug list committees and professional associations of key NCD conditions to ensure professional clinical guidelines are kept in line with the essential drug list items.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- A standardized patient record is available in the electronic medical system that can be retrieved in advance of a visit.
- A mobile application is used for entry of patient records and for sending patients appointment reminders or health promotion messaging.
- NCD awareness campaigns are run over social media.

OUTPUTS

- **Sites equipped (A) –** ICDM has been scaled nationwide.

- **Compliance with guidelines (A)**
  - Facility reorganization and clinical support component contributed to a high sustainability score for organization and processes.[14]
  - A high level of fidelity of implementation of the ICDM model guidelines was found, particularly on facility re-organization and strengthening of support systems.[15]

OUTCOMES

PROXIMAL

- **Patient satisfaction (I) –** patients reported satisfaction with quality of care for accessibility of care (96%), supply of critical drugs (93%), and availability of equipment (97%), though not with wait times (17%).[16]

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E) –** ~4% greater chance of controlling patient BP in ICDM clinics compared to control clinics, during 24 months follow-up (coef = 0.036; 95% CI 0.029, 0.043; *p<0.001*).[16]
- **Neutral or Improved cost-benefit (M) –** In 2019, the mean cost per patient per visit was US$ (SD: US$0.77), 49% for facility reorganization, 31% for adherence clubs and 20% for training of nursing staff.

Friendship Bench Model for Mental Health Care in Zimbabwe

COMMUNITY-BASED COGNITIVE BEHAVIORAL THERAPY WITH LAY HEALTH WORKERS

50

Geographic locale	Zimbabwe
Program setting	Community-level outreach settings
Target diseases	Psychological disorders, particularly mood disorders including depression and anxiety
Target population	Adult men and women with mental health disorders such as depression and anxiety; expanded to Youth Friendship Bench for young people
Partners/Stakeholders	(past and current) Ministry of Health and Child Care Zimbabwe, United States Agency for International Development, World Health Organization, OPHID Trust

OVERVIEW

In response to the globally rising rate of mental health disorders (MHDs), the Friendship Bench program in Zimbabwe was designed to use lay health workers (LHWs), known as "community grandmothers," to serve the community and provide psychosocial support and counseling to people suffering from "kufungisisa"—depression and anxiety—without having to visit a clinician.[1] The Friendship Bench clinical team trains the LHWs to provide basic cognitive behavioral therapy (CBT) with an emphasis on problem solving therapy, activity scheduling, and peer-led group support. The program empowers trusted community members to deliver evidence-based therapeutical practices. This task-shifting approach enables the delivery of effective, affordable, and sustainable psychological care at the community level.[1] The Friendship Bench was implemented in 2010, and the project underwent its first major scale-up to 36 primary health clinics in Zimbabwe in 2016. By the end of 2022, the model had been scaled up to 191 PHC facilities in 20 districts in Zimbabwe and a total of 1,290 LHWs had been trained.[2] A total of 239,576 clients had been reached in Zimbabwe by 2022, with more than 94,000 clients reached in 2022 alone (89,350 via face-to-face counseling and 4,819 via Whatsapp counseling). The model has also been replicated in other countries. As of May 2024, the Friendship Bench operates in eight countries: Zimbabwe, Malawi, Zanzibar (a semi-autonomous province of Tanzania), Viet Nam, Kenya, Jordan, the United States (New York City and Washington DC), and the United Kingdom (London).[3,4] The Youth Friendship Bench is an adapted model that reaches youth through peer LHWs. The original Friendship Bench model is described here.

NOTABLE FEATURES OF THE MODEL

This model utilizes LHWs who are trained to provide psychological support and counseling using evidence-based CBT techniques. This approach addresses the shortage of mental health professionals in Zimbabwe and empowers community members to play an active role in mental health care. The model also utilizes public spaces and benches as safe and non-stigmatizing environments where individuals can seek help. By placing these benches in accessible locations, the model aims to reduce barriers to seeking mental health assistance.[5] The Friendship Bench model has

been adapted to meet the needs of young people, with students providing problem solving therapy to adolescents with common mental disorders as part of the Youth Friendship Bench.[6,7] Finally, the Ministry of Health and Child Care, the Friendship Bench, and the World Health Organization (WHO) developed a program called "MH in the workplace" to train and empower employees to conduct screenings in their place of work, and refer peers who are in mental health distress to care through the Friendship Bench.[8]

BURDEN OF NCDS

Zimbabwe is a lower-middle-income country with a population of 16.3 million.[9] In 2015, the estimated prevalence of depression and anxiety in Zimbabwe was 4.0%[10] and 2.8%,[10] respectively. Depression and anxiety accounted for an estimated 8.0%[10] and 2.8%[10] of total years lived with disability in Zimbabwe.

IMPLEMENTATION CONTEXT

Health Policy Environment

In the 1980s, Zimbabwe established a strong PHC system, network of teaching hospitals, and a highly trained cadre of clinicians. Since then, the system has somewhat stagnated, with wavering political will, weakening infrastructure, shortages of medical supplies, and inconsistent government investment in health.[11,12]

The Zimbabwe Constitution outlines citizens' right to basic health care services, basic services for chronic illness, and emergency medical treatment. It also underscores the duty of the government to work to provide these services. The 2021-2025 National Health Strategy outlines 10 key priorities for health, including increased domestic funding for health, reduced morbidity and mortality due to communicable and non-communicable diseases, and improved primary, secondary, tertiary, quaternary, and quinary care.[13] The Zimbabwean government also recognizes the importance of addressing mental health issues and has made efforts to integrate mental health into the overall health care system. The National Strategic Plan for Mental Health Services (2019-2023) provides guidance on mental health services, including the integration of community-based approaches and the adoption of the Friendship Bench as a Ministry of Health and Child Care Program.[14] The Friendship Bench model aligns with the broader policy framework by emphasizing community engagement, collaboration, and decentralized mental health services.

Health System Structure

The health system follows a hierarchical structure built on a referral network and services are provided primarily through the public sector—the Ministries of Health and Child Care and local government among other ministries (Ministries of Education, Defense, Home Affairs, and Prison Services)—at the PHC level.[15] The system is comprised of five tiers: primary care is the lowest and is made up of health centers, clinics, and rural hospitals; the secondary tier is comprised of district hospitals; the tertiary level includes provincial hospitals; the quaternary level includes specialized services and university teaching facilities; and the newly established quinary level includes high-level research and development institutions.[13] In Harare, the capital city, there are no district hospitals, so referrals from primary care must go directly to quaternary institutions.[13] Limited primary care capacity and infrastructure often lead to an excess of referrals to higher levels of care.[13] At the national level, the Ministry of Health and Child Care oversees policy-making, resource allocation, and coordination. Provinces are responsible for planning and coordination, while districts implement and deliver health services. Components of PHC include maternal and child health services, health education, nutrition education, immunization, an essential drug program, and basic and essential preventive and curative health services.[15]

Model Strategy

The Friendship Bench model is integrated into the PHC system and uses a multi-pronged strategy. It operates by selecting and training community members, typically older women (often called "grandmothers"), as LHWs using a train-the-trainer approach.[1,16] These trained LHWs provide basic, quality, culturally-sensitive CBT with an emphasis on problem solving therapy, activity scheduling, and peer-led group support.

Trained LHWs sit with clients outdoors, often under trees on wooden park benches in discreet safe spaces in the community. During training, a referral pathway is established for cases in which a higher level of care is needed. It is recommended that clients seeking support through the Friendship Bench attend three or more sessions with a LHW. The first session is usually the longest, lasting about 50-60 minutes, while subsequent sessions can be anywhere from 20 minutes to 60 minutes. All sessions are free to the client. After the one-on-one talk therapy, Friendship Bench clients are introduced to a peer-led support group known as Circle Kubatana Tose (CKT), which means "holding hands together." In these groups, clients are connected to others in their communities who have received services from LHWs through the Friendship Bench. This safe space to talk in and be heard contributes to clients' sense of belonging and reduces stigma surrounding mental health and sharing of personal issues.

In the CKT groups, clients are also engaged in revenue-generating opportunities, including learning to crochet items such as bags, hats, and mats to sell in the community.[18] Beyond the group serving as a form of ongoing support and behavioral activation, economic opportunities become a vital part of the intervention in low-resource settings. A pilot study documenting the link between poor mental health and economic hardship highlighted the benefit of the CKT income-generating activities.[19] Many participants in the focus group discussion reported poverty as a cause of their depression and valued the opportunity to not only connect with other group members, but participate in the CKT group's income-generating projects.[19]

Model Funding

Public and private sources contribute to the health system in Zimbabwe. Public funds are sourced by the Ministry of Finance and the Municipalities. The government allocated 7.7% of the 2017-2018 national budget to health.[12] Private funding sources include corporations, households, non-profit organizations, and donors. The financing sources' contributions are: 44% from Ministry of Finance and the Muncipalities, 15.8% from corporations, 13.4% from households, and 26.7% from other sources.[20]

The Friendship Bench relies on a combination of funding sources to pay for program implementation and salaries, including salaries for LHWs and LHW supervisors. Funders include government, international donors, and non-governmental organizations. Fixed costs are estimated at US$170,419 per year. An estimated 70-80% of the Friendship Bench program, including scale-up and evaluation, has been funded by non-governmental finance, with the remainder covered by local city health department budgets.[16]

Human Resources

Zimbabwe has a very limited mental health workforce, with 35 psychologists and 19 psychiatrists in 2022.[8] The Friendship Bench model addresses this scarcity of mental health professionals by training LHWs and extending mental health care to the community level. Between 2006 and 2020, the BBC reported that the Friendship Bench program had trained over 400 LHWs to provide mental health counseling.[21] LHWs receive a basic salary for their work.[17] They undergo an eight-day training and, once completed, participants are offered supervision sessions to expand on their skills, learn more about certain mental health topics, and ask for advice on difficult cases. By the end of 2022, the Friendship Bench reported that 1,290 LHWs had been trained in Zimbabwe.[2]

Laboratory, Diagnostic, or Pharmacy Services

There were no laboratory or pharmacy services that were integral to this model. LHWs provide therapy, but do not prescribe medications to treat MHDs. Upon visiting the Friendship Bench, clients are screened for MHDs using the Shona Symptom Questionnaire (SSQ-14), a locally validated tool, and referred for higher-level services when needed.

Digital Solutions

The original Friendship Bench model did not include any digital components. However, in response to the COVID-19 pandemic, the project pivoted and delivered CBT services via WhatsApp and Zimbabwe's standard telecommunication services.[22] In 2022, 4,819 clients received Friendship Bench counselling services through WhatsApp.[2]

The Friendship Bench is currently developing a mobile app called Inuka to provide therapy sessions as well as to allow individuals to access mental health information. The digital component of the model aims to increase accessibility and reduce barriers to mental health care, especially in areas where resources and facilities are limited. A 2022 feasibility study found that the app was feasible and acceptable for delivering mental health services in this context, and the authors recommended that further trials and cost-effectiveness studies should be conducted.[23]

IMPACT OF THE MODEL

Overall, impact evaluation results of the Friendship Bench model indicate that it has been successful in improving mental health outcomes. A randomized clinical trial of 573 participants found that the Friendship Bench intervention group had fewer symptoms of common mental disorders (CMD), as measured by the SSQ-14 ranging from 0 (best) to 14, with a cutpoint of 9 for CMD (3.81, 95% CI 3.28, 4.34) compared to the control group (8.90, 95% CI 8.33, 9.47).[24] The intervention group also had lower risk of symptoms of depression compared to the control group (13.7% vs. 49.9%, adjusted risk ratio 0.28, 95% CI 0.22, 0.34, $p<0.001$).[24] There was no evidence of harm associated with the Friendship Bench intervention; at follow up, there were 32 participants in the control group (12.3%) and 6 participants (2.3%) in the intervention group who were identified as having suicidal ideation.[24] In 2022, the Friendship Bench reported that among a random sample of their clients followed up at six weeks, 78% showed a significant decrease in symptoms of depression on the SSQ-14.[2]

The impact of providing therapy and the potential for vicarious traumatization of the LHWs was also studied. In a sample of 182 female Friendship Bench LHWs, participants indicated having very low rates of post-traumatic stress disorder and common mental disorders compared to PHC seekers in Zimbabwe.[25] The study suggests that these LHWs are highly resilient despite the challenges associated with this care providing role.

COSTING

A 2021 economic threshold analysis determined that the Friendship Bench would need to treat an additional 3,413 clients (10 per active LHW per year) for its scale-up in Zimbabwe since 2016 to be considered cost-effective.[16]

LESSONS LEARNED

Lessons learned can inform similar integrated mental health interventions. First, it is critical to engage the community and be culturally relevant. Leveraging existing trusted relationships and respected community members—trusted "community grandmothers"—has been an effective strategy to expand access to mental health services.[24] Choosing community members as LHWs makes clients feel comfortable, as they have common challenges and life experiences. Interventions should also be designed with scalability and sustainability in mind to have lasting impact.[17]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

It is important to understand the scale strategy. At Friendship Bench the ultimate doer-at-scale is the government, with the team focusing on building government technical capacity to scale and sustain the model by ensuring integration in existing services.[26] It is also important to have clarity on mission, vision, and values and these should underpin the five- to 10-year strategic plan. Bringing all of this together is the theory of change which brings together the mission, vision, and values in a practical step-by-step approach.

Resources (include hyperlink)

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INPUTS

- New cadre of LHWs trained in mental health counseling.
- Evidence -based therapeutical practices such as CBT.
- Locally validated mental health assessment tools such as the SSQ-14.
- Safe public spaces and benches.
- Financial and/ or technical support from a variety of government, international donors, and non-governmental organizations (see main case document for full list).

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- None reported.

2 COMMUNITY-BASED ACTIVITIES

- LHWs provide basic, culturally sensitive CBT with an emphasis on problem-solving therapy, activity scheduling, and peer-led group support. LHWs sit with clients outdoors, often under trees on wooden park benches in discreet safe spaces in the community.
- Clients attend 3+ one-on-one talk therapy sessions with a LHW, ranging from 20 to 60 minutes. Clients are screened for MHDs using the SSQ-14.
- Clients are then introduced to a peer-led support group (known as CKT) meaning "holding hands together." In addition to social support, groups engage in income generating opportunities, including learning to crochet items including bags, hats, and mats to sell in the community.

3 TRAINING & CAPACITY BUILDING

- The Friendship Bench staff selected community members, typically older women (often called "grandmothers"), as LHWs. These LHWs receive a basic salary for their work.
- Using a train-the-trainer approach, the Friendship Bench clinical team trains LHWs to provide basic, culturally sensitive CBT with an emphasis on problem-solving therapy, activity scheduling, and peer-led group support.
- The Friendship Bench staff provide supervision sessions to LHWs to expand on their skills, teach more about certain mental health topics, and give advice on difficult cases.

4 INTEGRATION & COORDINATION

- During LHW training, a local referral pathway is established.
- Based on the SSQ-14 results, clients are referred to higher level services when needed.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- In response to the COVID-19 pandemic, the project pivoted and delivered CBT services via WhatsApp and Zimbabwe's standard telecommunication services.
- The Friendship Bench is currently developing a mobile application (called Inuka) to provide therapy sessions and allow individuals to access mental health information.

OUTPUTS

- **Sites equipped (A) –** the Friendship Bench had been scaled to 191 primary health centers in Zimbabwe by the end of 2022.[2]
- **Providers trained (A) –** 1,292 LHWs[2] in Zimbabwe had been trained to provide mental health counseling by the end of 2022.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** intervention group patients had:
  - Fewer symptoms of common mental disorders on SSQ-14 (3.81, 95% CI 3.28, 4.34) compared to control group (8.90, 95% CI 8.33, 9.47).[24]
  - Lower risk of symptoms of depression compared to the control group (13.7% vs. 49.9%, adjusted risk ratio 0.28, 95% CI 0.22, 0.34).[24]
  - Significant decrease in symptoms of depression on SSQ-14 for 78% of a random sample of patients.[2]

Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) in Nigeria and Ghana

TRADITIONAL FAITH HEALERS WORKING TOGETHER WITH PHC WORKERS

51

Geographic locale	Ghana (Ashanti region) and Nigeria (Ibadan city)
Program setting	PHC clinics, traditional faith healer facilities
Target diseases	Mental health disorders, specifically psychosis
Target population	Adults aged ≥ 18 with current active psychosis and admitted to facility
Partners/Stakeholders	University of Ibadan- University College Hospital Ethics Committee, Ethics Committee of the Kwame Nkrumah University of Science and Technology

Background: Nigeria is a lower-middle-income country with a population of 218.5 million.[1] In 2019, Nigeria had an estimated age-adjusted prevalence of 10.7%[2] for mental health disorders (MHDs), with an estimated disability-adjusted life years (DALYs) of 1,472.7 per 100,000 population due to MHDs.[2] Ghana is also a lower-middle-income country which has a population of 33.5 million.[1] In 2019, Ghana had an estimated age-adjusted prevalence of 11.4%[2] for MHDs, with an estimated DALYs of 1,584.2[2] per 100,000 population due to MHDs in the same year.

Model Overview: Often, traditional faith healers (TFHs) are the preferred source of care for mental disorders among the Nigerian and Ghanaian populations. The Collaborative Shared Care to Improve Psychosis Outcomes (COSIMPO) model aims to improve the clinical outcome of people with psychosis by fostering collaboration between TFHs and primary health care workers (PHCWs) at 71 complementary alternative health provider (CAP) facilities. The overall goal of the model was to improve outcomes and cost-effectiveness of care for patients admitted for psychosis relative to traditional care alone.[3]

Model Strategy: COSIMPO allowed TFHs and PHCWs to work together to provide care to people with psychotic disorders who were admitted to CAP facilities. There were two primary components of COSIMPO: (1) clinical care to respond to the medical needs of patients with psychosis (which could include the. administration of medication) and (2) clinical support to improve service on a continuous basis that involved the TFHs, the patient, and the patients' caregivers. PHCWs made both weekly, scheduled visits to the CAP facilities, as well as emergency visits when indicated by the TFH. During visits, PHCWs would provide information on clinical best practices and patient rehabilitation, psychoeducation, information on avoiding potentially harmful treatments, prescribe medication when needed and attend to any other clinical issues raised by the TFHs.[4] The clinical features were in addition to the treatment traditionally provided by TFHs.[3] When prescribing medication, the PHCW would take into account any herbs prescribed by the TFH and PHCW could also refer patients to a health facility if deemed necessary, but always following consultation with and with the consent of the TFH.[4]

Notable Features of the Model: Formal collaboration between PHCWs and TFHs was a novel approach to introduce clinical care and safe and effective medication provided by PHCWs into the practice of TFHs. While collaborative shared care models have proven effective in the care of people with HIV, this was one of the first applications of this model for treating severe MHDs.[3]

Model Funding: This model was supported by the National Institute of Mental Health.[3]

Human Resources: Key personnel for COSIMPO included TFHs and PHCWs. TFHs are herbalists or diviners who either gather and manipulate herbs or practice non-allopathic forms of medicine/healing, respectively, and PHWCs consisted of registered nurses, clinical officers, community health officers, or community health extension workers. In addition, supervision was provided by psychiatrists with regards to the prescription of medication whenever indicated. PHCWs received a three-day interactive training on the medical management of psychosis. TFHs were also trained over a two-day period on which traditional practices could bring harm, as well as how to identify features and symptoms of psychosis. Both groups were trained on the implementation of COSIMPO, including each group's expectations, their roles, and factors to facilitate successful collaboration.[3]

Key Messages

- The COSIMPO collaborative care model demonstrated clinical effectiveness by significantly reducing symptom severity in patients with psychotic disorders, particularly schizophrenia, and resulted in greater improvements in functioning, significantly less disability, better course of illness and better adjustment to work compared to care as usual.
- COSIMPO also shows that collaborative care between PHCWs and TFHs can be a cost-effective approach to expand evidence-based care for people with psychosis in resource-constrained settings where TFHs are trusted sources of care for MHDs.

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory or diagnostic services. Medication, including chlorpromazine and other psychotropic medications, could be provided by PHCWs only. In Ghana specifically, PHCWs could also prescribe olanzapine.[3]

Digital Solutions: No digital solutions were integral to this model's implementation.

Impact of the Model: A cluster randomized controlled trial assessed the clinical and cost-effectiveness of the COSIMPO collaborative care model in Nigeria and Ghana.[4] Specifically, the study measured the effect of collaboration between TFHs and PHCWs on improving symptom severity in patients with psychotic disorders through a reduction in positive and negative symptoms as measured by the Positive and Negative Symptom Scale (PANSS) score. Of the 71 clusters initially identified (a cluster consisted of one PHC clinic and all the TFH facilities its catchment area), 51 were found eligible to participate in the collaborative activities across the two sites in Ghana and Nigeria and were randomly assigned to the intervention group (IG) or the control group (CG). In the IG, the study found that the PANSS mean total score decreased from 107.3 at baseline to 53.4 at six months, compared to 108.9 at baseline to 67.6 at six months in the CG. The study also found that the model led to greater improvements on the World Health Organization Disibility Assessment Scale (WHODAS): the intervention group experienced a significantly greater reduction on the WHODAS scale to 52.3 (SD 25.0), reflecting greater improvements in functioning, compared to 61.8 (SD 28.3) for the control group, an adjusted mean difference of -10.5 (95% CI -17.0, -4.0, *p=0.0015*). COSIMPO participants had significantly less disability and better adjustment to work. The study also found some evidence that patients in the admission group had shorter admission duration and were more likely to live independently following discharge.[4] Both the IG and CG groups experienced a similar but significant reductions in harmful treatment practices.[4]

COSIMPO was also more cost-effective in terms of total costs (health service costs plus time costs) compared to enhanced usual care in improving the total PANSS score (the primary outcome). At six-month follow-up, the total cost associated with a one-point improvement on the PANSS in the IG was –US$4 (95% CI, -29 to 15). Similarly, the total cost associated with a one-point improvement on WHODAS in the IG was −US$4 (%% CI, -29 to 18), meaning that the intervention was both more effective and less costly than enhanced care as usual. When only health-service costs were assessed, collaborative shared care was marginally less cost-effective than enhanced care as usual: the cost associated with a one-point improvement on the PANSS in the IG at six months was US$2 (95% CI −US$6, US$14) and US$2 (95% CI −US$5, US$14) for a one-point improvement on WHODAS.[4]

Resources

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INPUTS

- Existing cadres of TFHs and PHCWs (including registered nurses, clinical officers, community health officers, or community health extension workers).
- Support and supervision from psychiatrists.
- Financial support from the National Institute of Mental Health.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- PHCWs made weekly, scheduled visits to the TFH facilities, as well as emergency visits when indicated by the TFH.
- During visits PHCWs provided medications, information on clinical best practices and patient rehabilitation, psychoeducation, and information on avoiding potentially harmful treatments.

2 COMMUNITY-BASED ACTIVITIES

- None reported.

3 TRAINING & CAPACITY BUILDING

- Supervision by psychiatrists was provided whenever indicated in the prescription of medication.
- PHCWs received a three-day interactive training on the medical management of psychosis.
- TFHs were also trained over a two-day period on which traditional practices could bring harm, as well as how to identify features and symptoms of psychosis.

4 INTEGRATION & COORDINATION

- TFHs and PHCWs worked together to provide care to patients with psychotic disorders who were admitted to TFH facilities.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- **Quality of care:** Both IG and CG experienced similar but significant decreases in harmful practices: harmful practices decreased from 57% of patients at baseline to 9% at 6 months in the IG ($p<0.001$) compared to a decrease from 42% at baseline to 10% in the CG ($p<0.001$)[4]

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** In the IG, the PANSS total mean score improved significantly (107.3 at baseline vs. 53.4 at 6-months) compared to the CG (108.9 at baseline vs. 67.6 at 6-months).[4]
- IG patients were more likely to have episodic rather than continuous illness, had significantly less disability, and were more likely to be rated “fair” or “good” in work or living situations.[4]
- **Neutral or improved cost-benefit (M):** COSIMPO was more cost-effective for total costs than enhanced usual care.[4]

Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda

IMPROVING HEALTH OUTCOMES FOR CHRONIC DISEASES IN RURAL COMMUNITIES USING A MULTI-DISEASE SCREENING AND PERSON-CENTERED CARE MODEL

52

Geographic locale	Uganda and Kenya
Program setting	Community health campaigns; primary health facilities
Target diseases	Hypertension, HIV, diabetes
Target population	Adults with HIV infection, diabetes, and/or hypertension
Partners/Stakeholders	Ministry of Health of Uganda; Ministry of Health of Kenya; Kenya Medical Research Institute; Infectious Diseases Research Collaboration, Uganda; Makerere University, Kampala, Uganda; National Institutes of Health; the President's Emergency Plan for AIDS Relief; Gilead Sciences; UNAIDS; University of California San Francisco; University of Pennsylvania; Viiv Healthcare; University of California Berkeley; University College London; World Health Organization; Infectious Diseases Research Collaboration

Key Messages

- Holistic approach improving access to NCD care and outcomes in rural communities through screening, treatment, integrated care, and community engagement.
- Implemented nurse-driven triage, flexible clinic hours, and improved clinician access to reduce barriers to care and foster strong patient-provider relationships.
- Improved hypertension control and reduced all-cause mortality.

Background: Kenya is a lower-middle-income country with a population of 54.0 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 4.0%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.4%[3] for males and 34.7%[3] for females. The estimated age-adjusted years of life lost was 627.0[4] and 539.4[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively.

Uganda is a low-income country with a population of 47.2 million.[1] In 2021, the estimated age-adjusted type 2 diabetes mellitus prevalence was 4.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 30.9%[3] for males and 33.9%[3] for females. The estimated age-adjusted years of life lost was 777.1[4] and 560.7[4] per 100,000 population for type 2 diabetes and hypertensive heart disease, respectively.

Model Overview: The Sustainable East Africa Research in Community Health (SEARCH) model aimed to reduce HIV incidence and improve health outcomes for chronic diseases in rural communities using a multi-disease, person-centered care model.[5] It implemented a comprehensive and community-centered approach, including community-wide multi-disease testing (HIV, tuberculosis, malaria, hypertension, diabetes), universal antiretroviral therapy (ART) for patients with HIV, integrated person-centered care, and community engagement. The goal was to develop sustainable health care strategies that addressed the burden of chronic diseases in Uganda and Kenya.[6,7]

Model Strategy: There were two major components to the model strategy: 1) population-level multi-disease screening and 2) implementation of an integrated, patient-centered care model.[5,6] For screening, SEARCH staff, in conjunction with the Kenyan and Ugandan Ministries of Health local staff, conducted community health campaigns to facilitate multi-disease screening at a population level. During community health campaigns, nurses screened adults for high blood pressure (BP) using electronic sphygmomanometers. If participants were found to have hypertension, irrespective of their past or current engagement in hypertension care, they were connected to the nearest government-operated primary

health facility. To ensure effective linkage to care, several measures were implemented, such as introducing patients to clinicians during community health campaign events, providing patients with contact numbers for any inquiries about their condition, and actively following up with patients who experienced lapses in care. A core component of the patient-centered care model was a focus on reducing barriers to care and building strong relationships between clinicians and patients. It implemented a nurse-driven triage system to cater to patients' needs, making their experience and follow-up more convenient. Additionally, the model incorporated flexible clinic hours, phone-based appointment reminders, improved access to clinicians, and a welcoming environment with friendly service providers. Patients with both hypertension and HIV received additional follow-up from clinicians through phone calls and home visits if they missed appointments. During clinic visits, they received services and medications for both conditions, ensuring comprehensive care for their comorbidities.[7,8]

Notable Features of the Model: An essential aspect of the model was its implementation of a comprehensive screening program for hypertension at the community level, followed by referral and linkage support to further assessment and treatment. Furthermore, a significant focus of the model was the training of health care providers to provide care that is friendly and centered on the needs of the patients, with the aim of nurturing positive relationships between patients and providers.[7,8]

Model Funding: The research received support from various sources, including the Division of AIDS and the National Institute of Allergy and Infectious Diseases, which is part of the National Institutes of Health, and the President's Emergency Plan for AIDS Relief. Non-financial support was also provided by Gilead Sciences (provision of tenofovir-emtricitabine for HIV prevention).[7,8]

Human Resources: The core implementation of the model relied on the clinic staff, consisting of nurses and clinical officers.[7,8] Nurses played a crucial role in conducting BP checks during the community health campaigns, overseeing the triage system, and managing patient care. Clinical officers were responsible for delivering health care services, prescribing medications, and providing health education. Additionally, SEARCH staff members actively participated in screening, managing community health campaigns, and following up with patients.[7,8] Providers underwent an initial training, as well as refresher training and on-site mentorship visits three to four times annually, to deliver hypertension treatment, streamlined care, and person-centered care that facilitated relationship-building.

Laboratory, Diagnostic, or Pharmacy Services: A consistent system for dispensing medications was implemented, following standardized patterns derived from national guidelines. Medications were made available to patients free of charge.[7,8]

Digital Solutions: To maintain continuity of care, SEARCH staff members utilized phone-based appointment reminders to reach out to patients who had experienced interruptions in their health care attendance. These reminders were intended to ensure that patients were informed and reminded of their upcoming appointments, facilitating their return to regular care.[7,8]

Impact of the Model: The SEARCH trial randomly assigned 32 rural communities in Kenya and Uganda to baseline multi-disease screening with annual testing, universal antiretroviral therapy (ART) eligibility, and patient-centered care (intervention group) or baseline multi-disease screening and national guideline-restricted ART (control group).[5] At three years of follow up, 47% of adults with hypertension in the intervention group and 37% in the control group achieved hypertension control (relative prevalence 1.26, 95% CI 1.15, 1.39). A secondary analysis isolating the effect of integrated patient-centered hypertension care within the trial also reported an improvement in hypertension control after three years of follow-up among adults with baseline hypertension (53% vs. 44%; RR = 1.22; 95% CI = 1.12, 1.33).[7] Notably, implementation of the patient-centered hypertension care model was associated with a 21% reduction in 3-year all-cause mortality compared to standard care.[7]

Another analysis focused on hypertension control in ten Ugandan communities participating in the intervention arm of the SEARCH trial reported that among all patients who screened positive for hypertension, 45% were linked to NCD care within one year.[6] Patients' BP was controlled at 46% (44-48%) of follow-up visits, showing an increase from 15% at baseline. Two-thirds of patients were treated with BP-lowering medication, while the remaining one-third received lifestyle counseling only.

An implementation fidelity and outcome evaluation study demonstrated that SEARCH staff completed BP screening on 91% of participants, with SEARCH hypertension screening achieving 91% sensitivity and over 99% specificity for hypertension as compared to measured BP and patient history.[8] Investigators identified that the SEARCH model to implement population-level hypertension screening and treatment through an existing HIV test-and-treat program may be adapted and scaled up in other resource-limited settings, while also suggesting that efforts to link patients to care through the SEARCH model should be strengthened.

INPUTS

- Existing human resources for health in PHC centers.
- Financial support from Division of AIDS, National Institute of Allergy and Infectious Diseases of the National Institute of Health; the President's Emergency Plan for AIDS Relief; and Gilead Sciences.
- Anti-hypertensive medications from the governments of Uganda and Kenya, with support as needed from SEARCH.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- SEARCH staff conducted active follow-up of patients experiencing gaps in care.
- A nurse-drive triage system was developed and employed to meet patients' needs, often making the experience and follow-up more convenient.
- Facilities introduced flexible clinic hours, increased access to clinicians, and a welcome environment with friendly providers.
- Hypertensive patients with comorbid HIV received services and medications for both conditions in the same visit.

2 COMMUNITY-BASED ACTIVITIES

- Using community health campaigns, SEARCH screened community adults (at least 18 years of age) for elevated BP
- SEARCH staff conducted active follow-up for hypertensive patients with comorbid HIV, conducting home visits as necessary.

3 TRAINING & CAPACITY BUILDING

- Clinicians were trained on treatment and streamlined care via one initial training, followed by refreshers and on-site mentorship visits 3 to 4 times per year.
- Clinicians were trained on friendly service provision.

4 INTEGRATION & COORDINATION

- Participants with uncontrolled hypertension were linked to care at government-run primary health facilities.
- Measures were taken to foster patient-provider relationships, including introducing patients to clinicians at community health campaigns and providing patients with phone numbers to call with questions about their condition,
- Standardized medication dispensing patterns were established.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- SEARCH personnel sent phone-based appointment reminders to patients experiencing gaps in care.

OUTPUTS

- **Coverage (R):** 34,704 individuals were screened, with 4,554 screening positive for hypertension, 2,071 positive for HIV, and 199 positive for both.[6]

- **Providers trained (A):** providers were trained 3-4 time per year in 1) hypertension care, and 2) friendly service provision.[7]

- **Coverage (R):** 91% of community members attending community health campaigns received hypertension screening.[8]

OUTCOMES

PROXIMAL

- **Compliance with guidelines (A):**
  - SEARCH staff conducted screening for hypertension according to national guidelines with 91% sensitivity and 100% specificity.[8]
- **Linkage to care (I):**
  - In Uganda, 45% of individuals who screened positive for hypertension were linked to NCD care within one year, with two-thirds receiving BP-lowering medications and one-third receiving only lifestyle counseling.[6]

INTERMEDIATE

- **Retention in care (E):** In Uganda, among those who linked to hypertension care, 42% of the intervention group and 22% of the control group attended at least one clinic visit per year ($p<0.0001$).[7]

DISTAL

- **Patient health outcomes (E):**
  - 47% of adults with hypertension achieved control in the intervention group compared to 37% in the control group (relative prevalence 1.26, 95% CI 1.15, 1.39).[5]
  - In Uganda, patients' BP was controlled in 46% (44–48%) of follow-up visits, up from 15% at baseline.[6]
  - Among adults with baseline hypertension, 53% of the intervention group achieved hypertension control compared to 44% in the control group at 3 years (RR = 1.22; 95% CI 1.12, 1.33).[7]
  - There was a 21% reduction in 3-year all-cause mortality in the intervention group compared to the control group.[7]

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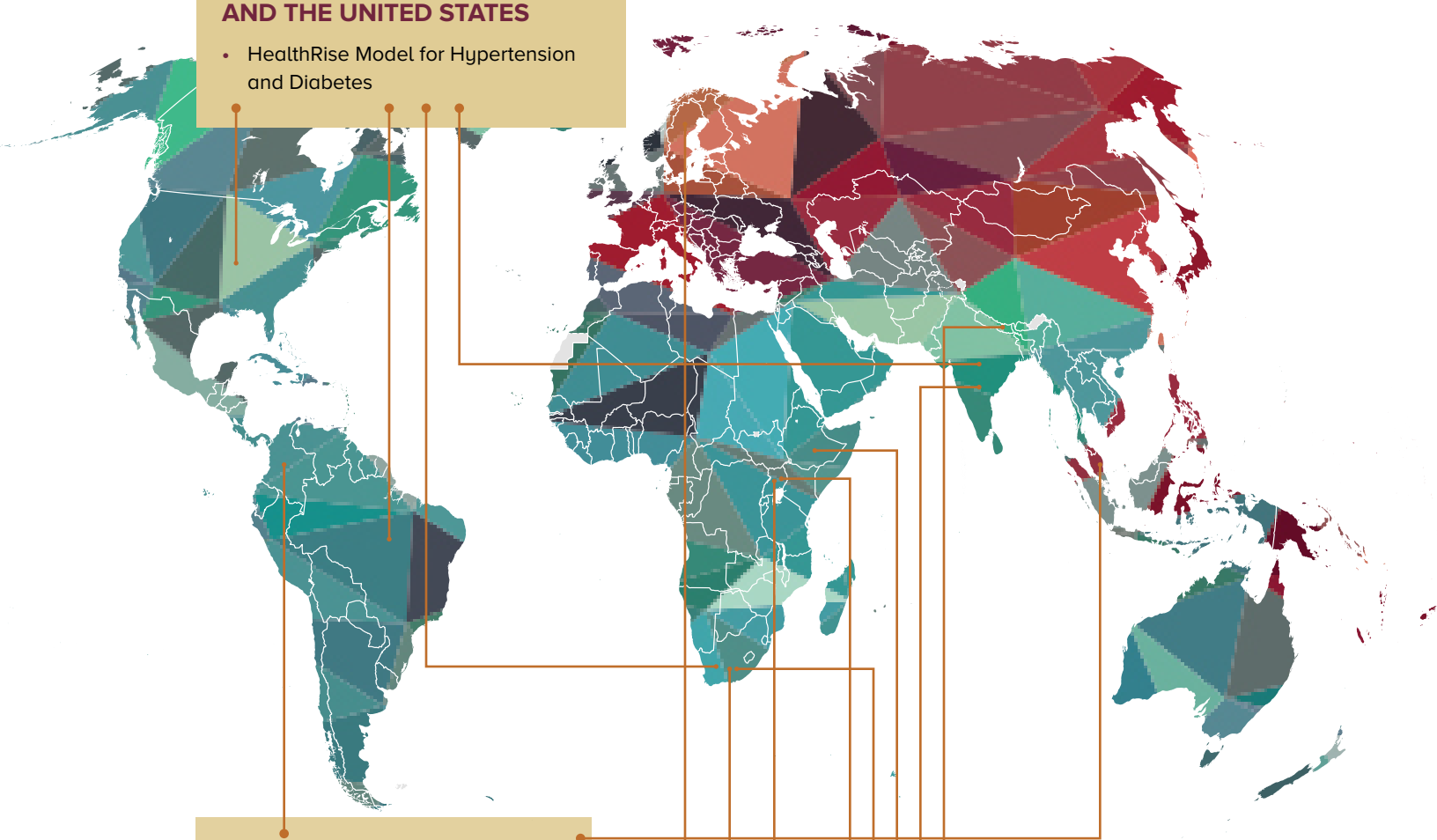

BRAZIL, INDIA, SOUTH AFRICA, AND THE UNITED STATES

- HealthRise Model for Hypertension and Diabetes

COLOMBIA AND MALAYSIA

- Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model

UGANDA, SOUTH AFRICA, AND SWEDEN

- Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model

ETHIOPIA, INDIA, NEPAL, SOUTH AFRICA, AND UGANDA

- Programme for Improving Mental Health Care (PRIME) Model

Multi-region: Models of care

HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States

IMPROVING SCREENING, DIAGNOSIS, AND MANAGEMENT IN UNDERSERVED COMMUNITIES

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Geographic locale	Brazil (region of Teófilo Otoni and city of Vitória da Conquista); India (Udaipur and Shimla); South Africa (uMgungundlovu and Pixley ka Seme); United States (Rice, Hennepin, and Ramsey counties in Minnesota)
Program setting	PHC units or clinics; workplace screenings
Target diseases	Hypertension and type 2 diabetes mellitus
Target population	Adults 30-69 years of age from underserved communities with poor access to health care
Partners/Stakeholders	Medtronic Foundation, Institute for Health Metrics and Evaluation, Federal University of Minas Gerais, Federal University of Bahia, NCD Alliance, Brazilian Ministry of Health, local health care facilities, community health workers, PHC centers, and non-governmental organizations

Background: Brazil is an upper-middle-income country with a population of 215.3 million.[1] In 2021, Brazil had an estimated age-adjusted type 2 diabetes mellitus prevalence of 8.8%.[2] In 2019, the age-adjusted prevalence of hypertension was 47.9%[3] for males and 42.1%[3] for females, with an estimated 532.7[4] and 225.9[4] average years of life lost per 100,000 population due to type 2 diabetes and hypertensive heart disease, respectively, in the same year.

India is a lower-middle-income country with a population of 1.4 billion.[1] In 2021, India had an estimated age-adjusted type 2 diabetes mellitus prevalence of 9.6%.[2] In 2019, the age-adjusted prevalence of hypertension was 31.6%[3] for males and 30.5%[3] for females, with an estimated 499.0[4] and 203.4[4] average years of life lost per 100,000 population due to type 2 diabetes and hypertensive heart disease, respectively, in the same year.

South Africa is an upper-middle-income country with a population size of 59.8 million.[1] In 2021, South Africa had an estimated age-adjusted diabetes prevalence of 10.8%.[2] In 2019, the age-adjusted prevalence of hypertension was 43.8%[3] for males and 44.3%[3] for females, with an estimated 1,296.0[4] and 561.0[4] average years of life lost per 100,000 population due to type 2 diabetes and hypertensive heart disease, respectively, in the same year.

Model Overview: HealthRise was a global initiative launched in 2014 to implement and evaluate pilot programs to improve screening, diagnosis, management, and control of hypertension and diabetes. Between 2016 and 2018, HealthRise community-based pilot programs were implemented at nine sites in Brazil (region of Teófilo Otoni (TO) and the city of Vitória da Conquista (VC), India (Udaipur and Shimla), South Africa (uMgungundlovu and Pixley ka Seme) and the United States (Rice, Hennepin, and Ramsey counties in Minnesota).[5] Intervention components and implementation varied by site, with the pilot programs aiming to address specific barriers identified through needs assessments.[5] HealthRise pilot programs involved health care worker training, health education, patient empowerment, and patient monitoring, alongside unique intervention components by site.[5]

Model Strategy: The primary aim of the model was to improve screening, diagnosis, and management of hypertension and diabetes. This model was geared toward under-resourced communities with gaps in access to care in local health systems and can be implemented in tandem with PHC services. The implementation strategy consisted of an adaptable package of interventions that fell into six key domains: 1) PHC centers were equipped with technologies to better coordinate care (computers, tablets, internet), as well as clinical decision support systems for clinicians and digital screening tools for community health workers (CHWs); 2) health care service organization, including optimization of human resources, providing equipment for specialized exams, and supporting the referral process; 3) strengthening health worker capacity, including trainings on diabetes and hypertension care management and on new digital technologies; 4) community-based screening services at events, in homes, and in the workplace; 5) disease management and health promotion activities including patient tracing, home visits, mobile health text messages for adherence, and healthy lifestyle workshops; and 6) patient empowerment through support groups and educational workshops.[6]

Notable Features of the Model: The HealthRise program was a community-based initiative that was implemented in multiple countries, including Brazil, India, South Africa, and the United States.[5,6] The program aimed to fill gaps in health care delivery within decentralized and resource-constrained PHC systems and improve outcomes for individuals with chronic diseases.[5]

Key Messages

- In Brazil, there were significant reductions in BP and hemoglobin A1C (HbA1C) among patients at facilities in HealthRise areas over time.
- No differences were seen in BP and HbA1C with patients in facilities in HealthRise areas in India and South Africa as compared to patients in comparison areas.
- Need for context-adapted community-based interventions.

Model Funding: HealthRise was funded by the Medtronic Foundation.[5,6]

Human Resources: The model relied on existing PHC staff and CHWs and trained them in clinical management, care coordination, and digital solutions to better screen, diagnose, and manage the care processes.[5,6]

Laboratory, Diagnostic, or Pharmacy Services: Across all sites in Brazil, HealthRise increased the availability of specialized exams, including electrocardiograms, echocardiograms, fundus oculi photography, and HbA1C point-of-care testing.[6] The TO region also hired a laboratory to visit remote areas.[6] In uMgungundlovu in South Africa, community caregivers were equipped with digital blood pressure (BP) monitors and glucometers.[5]

Digital Solutions: Each site in Brazil was equipped with technologies to manage care (computers, tablets, internet).[6] Some health care units in TO were equipped with a clinical decision support system.[6] In VC, some sites developed digital screening and job aid tools on promoting healthy lifestyles for CHWs and a web-based medical record system called e-SUS was implemented in 16 PHC units.[6] In Udaipur and Shimla, India an electronic management information system (MIS) was developed.[5] In Shimla, an electronic Health Card—a tablet application for accredited social health activists to track individual risk factors and support referral follow up at PHC clinics—was also developed and implemented.[5] In Pixley ka Seme, South Africa, a database of diabetes and hypertension patients was created, and tablet-based data collection was used for community screening events and home visits.[5]

Impact of the Model: A mixed methods quasi-experimental evaluation of the HealthRise program was conducted in nine sites across Brazil, India, South Africa, and the United States between 2016 and 2018.[5] Nearly 60,000 screenings were conducted in Brazil, India and South Africa (primarily in India), yielding 1,464 new hypertension and 295 new diabetes diagnoses.[5] Across all nine sites, 3,637 health care workers were trained, with CHWs comprising 60.7% of all trained health workers.[5]

In Brazil, the analysis tracked patient-level changes over time since program enrollment, whereas in India and South Africa an endline analysis compared patients seen at facilities in HealthRise implementation and comparison areas. While HealthRise patients demonstrated statistically significant reductions in BP and HbA1C in Brazil, in India and South Africa, where implementation periods were shorter, there were no significant differences seen between HealthRise and control group patients.[5] In Brazil, systolic blood pressure (SBP) and HbA1C significantly decreased in both the TO and VC sites.[5,6] SBP declined by an average of 1.9 mmHg (0.7-3.1; $p<0.01$) in TO and 4.2 mmHg (3.1-5.2; $p<0.001$) in VC.[5,6] The average reduction in HbA1C was 0.6 (0.4-0.9; p<0.001) in TO and 0.9 (0.5-1.4; $p<0.001$) in VC.[5,6] There were also significant increases in achievement of hypertension treatment targets at endline as compared to baseline in both TO (52.2% vs. 48.3%, $p<0.05$) and VC (45.9% vs. 35.4%, $p<0.001$).[5,6] Achievement of diabetes treatment targets significantly improved in both TO (59.7% vs. 49.4%, $p<0.01$) and VC (61.8% vs. 35.4%, $p<0.001$).[5,6]

Qualitative results highlighted linkages between providers, services, communities, and information systems as positive impacts of the HealthRise program.[5] Health system infrastructure and social determinants of health including poverty, education, and nutrition presented ongoing challenges.[5] Given the differences in results across sites, the authors conclude that additional research is needed to understand which community-based interventions will work best in local contexts.[5]

Resources

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INPUTS

- Existing human resources at PHCs and CHWs.
- Financial resources from the Medtronic Foundation.
- Technical support from partner organizations (see the main case document).

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Each PHC center was equipped with tools to perform HTN and DM diagnostics and monitoring, such as electrocardiograms, echocardiograms, fundus oculi photography, and HbA1C point-of-care testing.

2 COMMUNITY-BASED ACTIVITIES

- Providers conducted disease management and health promotion activities in communities including patient tracing, home visits, and healthy lifestyle workshops.
- Providers conducted community-based screening services at events, in homes, and in workplaces.
- Patients were empowered in self-management of diseases through support groups and educational workshops.

3 TRAINING & CAPACITY BUILDING

- PHC staff and CHWs were trained in clinical management of NCDs, specifically HTN and T2DM, care coordination, and the digital solutions to better screen, diagnose, and manage the care processes.

4 INTEGRATION & COORDINATION

- Health care services were organized to optimize human resources and supported through an established referral process.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- PHC centers were equipped with technology to better coordinate care (computers, tablets, internet). TO included a clinical decision support system. VC developed digital screening and job aid tools on healthy lifestyles for CHWs and a web-based medical record system called e-SUS.
- An electronic MIS was developed in Udaipur and Shimla. In Pixley ka Seme, a database of HTN and DM patients was created and tablet-based data collection was used for community screening events and home visits.

OUTPUTS

EQUITY (R)

- **Socio-economic equity:** the model is geared toward under-resourced communities with gaps in the accessibility of care in local health systems.[5,6]

- **Providers trained (A):** 3,637 health workers trained across nine sites in Brazil, India, South Africa and the U.S.[5]

- **Compliance with guidelines (A):** providers qualitatively spoke positively about patient flows and health unit routines, resulting in better and more structured care delivery.[6]

- **Compliance with guidelines (A):** digital technologies allowed providers and CHWs to provide more efficient care while also effectively digitizing most services.[6]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** Improvements were seen in reaching treatment targets in Brazil:
  - For HTN patients in TO and VC (+3.9pp, *p<0.05*; +10.5pp, *p<0.001*, respectively).[5]
  - For T2DM patients in TO and VC (+10.2pp, *p<0.01*; +25.0pp, *p<0.001*, respectively).[5]
- Improvements were seen in SBP and HbA1C between baseline and endline in Brazil:
  - Reductions in SBP in TO and VC (−1.9 mmHg, *p<0.01*; −4.2 mmHg, *p<0.001*, respectively).[5,6]
  - Decreases in HbA1C levels in TO and VC (-0.6, *p<0.001*; -0.9, *p<0.001*, respectively).[5,6]
- No significant differences seen in SBP and HbA1C between HealthRise and comparison patients in India and South Africa.[6]

Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia

PROVIDING COMMUNITY SCREENING BY NON-PHYSICAN HEALTH CARE WORKERS, ACCESS TO FREE ANTIHYPERTENSIVES AND STATINS, AND ENCOURAGING SUPPORT FROM FAMILY AND FRIENDS.

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Geographic locale	Colombia and Malaysia
Program setting	Urban and rural townships
Target disease(s)	Hypertension
Target population	Adults ≥50 years
Partners/Stakeholders	Colombia (Clínica Fundación Oftalmológica de Santander), Malaysia (Universiti Teknologi Majlis Amanah Rakyat)

Background: Colombia and Malaysia are upper-middle-income countries with populations of 51.9[1] and 33.9[1] million respectively. In 2019, Colombia had an estimated hypertension prevalence of 31.1%[2] for males and 30.8%[2] for females and estimated age-adjusted years of life lost (YLL) of 138.5[3] per 100,000 population due to hypertensive heart disease. In 2019, Malaysia had an estimated hypertension prevalence of 40.5%[2] for males and 41.0%[2] for females and an estimated age-adjusted YLL of 49.6[3] per 100,000 population due to hypertensive heart disease.

Model Overview: HOPE 4 was a collaborative and contextually appropriate model of care aimed to decrease cardiovascular disease (CVD) and improve blood pressure (BP) control. This model involved three core elements: (1) community screening, detection, treatment, and control of CVD by non-physician health workers (NPHWs), (2) provision of locally available antihypertensive medications and statins, and (3) support from a friend or family member (treatment supporter) to aide in adherence to the treatment plan.[4,5]

Model Strategy: The HOPE 4 model was a multifaceted intervention comprised of three core elements provided as a package: (1) *Community screening, detection, treatment, and control of CVD by NPHWs* in collaboration with local physicians, guided by tablet-based simplified management algorithms and counselling programs. The NPHWs were responsible for the initial screening, recruitment, and follow-up visits and visited patients in their home or at a local clinic. (2) *Provision of free locally available combination antihypertensive medications and statins* recommended by an NPHW (under supervision by local physicians). Medications were dispensed by local pharmacies, trained pharmacists, or at a doctor's office. NPHWs also delivered or arranged for patients to obtain their medications either through home or clinic visits based on their preference and local context. (3) *Support from a family member or friend* on treatment plan adherence and healthy behavior promotion.[4,5]

Notable Features of the Model: A unique feature of HOPE 4 was its health system approach tailored to specific national contexts. The active involvement of a family member or friend in the patient's management of CVD risk to enhance medication adherence and promote healthy behaviors was also a distinguishing feature.[5]

Key Messages

- Model developed and implemented based on an extensive barriers assessment, together with the findings of qualitative health-system appraisals in Colombia and Malaysia.
- Improved access to antihypertensives and statins by providing free medication through clinics, pharmacies, or NPHW home visits, depending on patient preference.
- HOPE 4 resulted in significantly greater reductions in Framingham risk score, BP control status, total cholesterol, and LDL cholesterol compared to the control group.

Model Funding: Implementation was financed by the Canadian Institutes of Health Research; Grand Challenges Canada; Ontario SPOR Support Unit and the Ontario Ministry of Health and Long-Term Care; Boehringer Ingelheim; Department of Management of Non-Communicable Diseases, World Health Organization; and Population Health Research Institute.[5] Local governments provided partial financial support for NPHWs.[5]

Human Resources: Key personnel for the HOPE 4 model were NPHWs and existing PHC staff (primary care physician, pharmacists, nurses). The NPHWs had a minimum of a secondary school diploma or equivalent and were recruited from newly hired and retrained community health workers and research staff.[5] NPHWs received a one-week training which emphasized the multifactorial nature of CVD prevention and management. The training also focused on addressing lifestyle factors such as diet, physical activity, smoking cessation, and alcohol misuse and included strategies like risk stratification, motivational interviewing, and goal-setting to guide the NPHWs counseling approach.

Laboratory, Diagnostic, or Pharmacy Services: The antihypertensives and statins were available free of cost. There were no significant changes to existing laboratory, diagnostic services.[5]

Digital Solutions: NPHWs were provided with a tablet for mobile health decision-support that they brought with them to patients' homes. The tablet aided in screening, diagnosing CVD risk, recommending effective medications, and managing disease.[5]

Impact of the Model: A cluster-randomized controlled trial was conducted in 30 urban and rural communities in Colombia and Malaysia to assess the impact of the HOPE 4 model of care on CVD risk.[6] After 12 months of implementation, there was a reduction in the Framingham Risk Score (FRS) 10-year CVD risk of –11.17% (–12.88 to –9.47) in the intervention group vs. –6.40% (95% CI 8.00 to –4.80) in the control group, with a difference of change of –4.78% (95% CI –7.11 to –2.44; $p<0.0001$). There was an absolute 11.45 mm Hg (95% CI –14.94 to –7.97) greater reduction in systolic BP, a 0.45 mmol/L greater reduction in total cholesterol, and a 0.41 mmol/L (95% CI –0.60 to –0.23) greater reduction in low-density lipoprotein (LDL) cholesterol in the intervention group as compared with the control group ($p<0.0001$). Change in BP control status (<140 mm Hg) was more than twice as high in the intervention group as compared to the control group (69% vs 31%; $p<0.0001$). The authors concluded that this comprehensive model of care—informed by local context, led by NPHWs, and involving primary care physicians and family—substantially improved BP control and CVD risk. Overall, the strategy was found to be effective and pragmatic, with the potential to substantially reduce CVD compared with current physician-based strategies.[6]

Resources

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INPUTS

- Existing human resources in health at PHC facilities, including primary care physicians, pharmacists, nurses, and new NPHWs.
- Financial resources from multiple partner (see Model Financing section for details)
- Technical support from Colombia (Clínica Fundación Oftalmológica de Santander), Malaysia (Universiti Teknologi Majlis Amanah Rakyat).

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Primary care physicians prescribed antihypertensive medications or statins to patients as appropriate.
- Patients picked up HTN medications during clinic visits (or NPHWs delivered HTN medications at home), based on their preference and local context.

2 COMMUNITY-BASED ACTIVITIES

- NPHWs conducted community CVD screenings, detection, treatment and control.
- NPHWs counselled patients on lowering their CVD risk using risk stratification, motivational interviewing, and goal-setting approaches.
- NPHWs delivered HTN medications to patients during home visits based on their preference and local context.
- Patients' friend or a family member (treatment supporter) was encouraged to provide continuous support to patients in treatment plan adherence and healthy behavior promotion.

3 TRAINING & CAPACITY BUILDING

- NPHWs were trained in the multifactorial nature of CVD prevention and management, including addressing lifestyle factors (diet, physical activity, smoking cessation, and alcohol misuse) and strategies for reducing CVD risk (e.g. risk stratification, motivational interviewing, and goal-setting).
- Local physicians supervised NPHWs.

4 INTEGRATION & COORDINATION

- Free combination antihypertensive medications and statins were made locally available at local pharmacies or clinics.
- Coordination also occurred between NPHWs, physicians and pharmacists.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- NPHWs utilized tablet-based simplified management algorithms and decision support tools for CVD screening, risk diagnosis, recommendation of effective medications, and disease management.

OUTPUTS

- None reported.

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E):** At 12 months, compared to the control group, the intervention group had:
  - Reduced Framingham Risk Score (FRS) 10-year CVD risk (IG: -11.8% vs. CG: -6.4%, *p<0.0001*)[5]
  - Reduced systolic BP (-11.45 mm Hg, *p<0.0001*)[5]
  - Higher proportion with a change in BP control status to <140 mm Hg (69% vs 31%; *p<0.0001*).[5]
  - Reduced total cholesterol (-0·45 mmol/L, *p<0.0001*)[5]
  - Reduced LDL cholesterol (-0·41 mmol/L, *p<0.0001*).[5]

Programme for Improving Mental Health Care (PRIME) Model in Ethiopia, India, Nepal, South Africa, and Uganda

A MULTI-COUNTRY EFFORT TO GENERATE EVIDENCE FOR IMPLEMENTING AND SCALING TREATMENT PROGRAMS FOR MENTAL DISORDERS IN PHC SETTINGS

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Geographic locale	Sodo District, Ethiopia; Madhya Pradesh, India; Chitwan District, Nepal; Dr Kenneth Kaunda District, South Africa; Kamuli District, Uganda
Program setting	PHC facilities; maternal care facilities
Target diseases	NCDs and mental health disorders including alcohol use disorder, depression, psychosis, and epilepsy
Target population	All patients 18 years or older
Partners/Stakeholders	Ministry of Health Ethiopia, Addis Ababa University, Ministry of Health India, Public Health Foundation of India, Ministry of Health Nepal, TPO Nepal, Department of Health South Africa, University of Cape Town, University of Kwazulu-Natal, Human Sciences Research Council, Ministry of Health Uganda, Makerere University/Butabiika Hospital, the World Health Organization, London School of Hygiene and Tropical Medicine

OVERVIEW

The Programme for Improving Mental Health Care (PRIME) consortium was formed in 2010 in response to a call for proposals made by the United Kingdom Department for International Development to identify and respond to the great burden of disease caused by alcohol use disorder (AUD), including maternal depression, psychosis, and epilepsy. PRIME utilized "theory of change" (ToC) methodology to design district-level mental health programs in each target country, aiming to integrate mental health care into primary and maternal care systems.[1] The program was built upon five guiding principles: 1) strengthening health systems, 2) utilizing partnerships, 3) prioritizing significant mental disorders, 4) applying robust frameworks to design and evaluate complex interventions, and 5) reducing inequities.[1] The consortium aimed to generate a high-quality evidence base for the implementing and scaling up treatment programs for mental disorders in PHC settings. The program was implemented in one district in Ethiopia, Nepal, South Africa, India, and Uganda, with local teams developing context-responsive programs, policy, and interventions in each context.

In addition to the integration of care, PRIME activities across countries included stigma reduction work, creation of patient support groups, training of health care providers on detection, referral and care for common mental disorders (CMDs), and community-based rehabilitation for patients.[2–6] The project was eventually scaled up to 94 facilities across five countries including, Ethiopia, India, Nepal, South Africa, and Uganda.[7] Select program activities common across all countries are highlighted in this case study.

NOTABLE FEATURES OF THE MODEL

Limited guidance exists on how to effectively integrate mental health care programs into PHC systems in low-resource settings. PRIME created an evidence base across the five countries for planning, implementing, and evaluating such programs and complementary activities. This fostered capacity building within these settings. The model emphasizes translation of research findings to policy and practice, viewing reduction of inequities and meeting the needs of vulnerable populations as a critical piece to the model.[1]

BURDEN OF NCDS

Ethiopia, India, and Nepal are lower-middle-income countries with a population of 123.3 million, 1.4 billion, and 30.5 million, respectively.[8] South Africa is an upper-middle-income country with a population of 59.8 million, and Uganda is a low-income country with a population of 45.9 million.[8] In 2015, the estimated prevalence of depression in Ethiopia, India, and Nepal was 4.7%,[9] 4.5%,[9] and 3.2%,[9] respectively; the estimated prevalence of depression in both South Africa and Uganda was 4.6%.[9] In 2019, the estimated age-adjusted prevalence of alcohol use disorders in the five countries ranged between 0.9% in Uganda to 2.7% in Ethiopia; the estimated age-adjusted prevalence of schizophrenia was 0.2% in Ethiopia, South Africa, and Uganda and 0.3% in India and Nepal.[10] The estimated age-adjusted prevalence of idiopathic epilepsy in 2019 was 0.3% in India and Ethiopia, 0.4% in Nepal, and 0.5% in South Africa and Uganda.[10]

IMPLEMENTATION CONTEXT

Health Policy Environment

The countries where PRIME was implemented were purposively selected, in part due to their governments' commitments to scale up mental health care. Ministries of Health from each country were strong collaborators.[11] All collaborating governments have enabling policies (see below) and are generally committed to universal health coverage (UHC) and provision of mental health services. The country context of each is detailed below.

In Ethiopia, the 2005 Health Sector Development Program III in 2005 aimed to expand and strengthen primary health services.[12] The first Mental Health Strategy was developed in 2012 and the current National Mental Health Strategy (2020-2025) aims to address mental health and substance use.[13]

India's constitution enshrines the right to health for all, with each state required to provide free universal access to health services.[14] The Ministry of Health and Family Welfare adopted the 2014 National Mental Health Policy of India, which outlines the country's strategy to comprehensively address mental health with medical and non-medical interventions. The policy continues to evolve with the 2017 Mental Healthcare Act, which decriminalized attempted suicide and outlined the responsibility for the government to establish the Central Mental Health Authority to improve mental health services.[15,16]

Nepal's constitution also enshrines the right to free basic health care, with the National Health Sector Strategy 2015-2020 prioritizing UHC.[17] The 2020 Mental Health Strategy and Action Plan was incorporated into the 2019 National Health Policy and aims to ensure access to mental health services, in part by integrating mental health services into PHC.[18]

The South African constitution guarantees citizens access to free health services in both public and private sectors.[19] The 2013-2020 National Mental Health Policy Framework and Strategic Plan includes one key objective of scaling up decentralized, integrated primary mental health services.[20]

Uganda has utilized the PHC system as the main provisioner of health care since 1999 as set in the National Health Policy 1.[21] In 2012 UHC and its application to primary health services was introduced.[21,22]

Health System Structure

The Ethiopian health system is structured in three tiers. The primary level includes primary hospitals, health centers, and health posts. Health posts are the lowest level of care, focused primarily on maternal and child health, and are staffed by two health extension workers to care for patients. The secondary level of care consists of general hospitals, while the tertiary level of care includes specialized hospitals.[12]

In India, health and wellness centers are the first point of medical contact for patients, and a new program, Ayushman Bharat, aims to increase the capacity of these centers to provide free comprehensive care. The Ayushman Bharat-Health and Wellness Centre (AB-HWC) also allows for comprehensive mental health services at the primary care level, though resources and mental health workforce are limited.[14] Primary health centers are the first point of referral, providing curative and preventative services.

The Nepal health system is a three-tiered system comprised of village-level health posts offering basic services, primary health centers for general care and referral from health posts, and district hospitals for specialized care.[23] Prior to the implementation of PRIME, mental health services were only offered in district level hospitals.[23]

The South Africa public health system is divided into primary care facilities, district-level hospitals, and tertiary hospitals.[19] Primary care facilities are the first point of care for patients and are typically staffed by nurses. PRIME was introduced in Dr. Kenneth Kaunda district municipality in South Africa, where integration of clinical services management for chronic conditions were also being introduced.

Uganda utilizes its PHC system as citizens' first point of contact with the health care system. PHC is delivered through both public and private institutions, with the public sector providing the majority (66%) of the services.[21]

Model Strategy

The PRIME model operated from 2011 to 2019 and aimed to create a knowledge base for 1) creating a situational analysis tool, 2) developing mental health care program plans using ToC methodology, 3) implementing mental health programs that are responsive to patients and stakeholders, and 4) evaluating and disseminating program impact.[11]

The situational analysis tool was developed by PRIME and aimed to describe the landscape of mental health care in each project country by collecting information about the environment, mental health policy, treatment coverage, existing district-level health services, community demographics and culture, and existing monitoring and evaluation systems. Feedback was solicited from other field experts to ensure rigor and suitability.[24]

Informed by results from the situational analysis, mental health care plans (MHCPs) were tailored for each country. These plans outlined specific goals and implementation plans to best integrate mental health services into PHC, in addition to other activities to complement integration. PRIME teams conducted consultative meetings, two to four ToC workshops, and primary research (including in-depth interviews with health care providers and people with mental disorders) to assess what interventions should be applied to each context. The program utilized the ToC approach with extensive stakeholder consultation to develop ToC maps (which link project activities with intended outcomes) to implement within study districts and eventually scale-up nationally.[11] ToC maps were linked to the mental health care plans for each country, with each activity linked to a ToC goal.

During the implementation phase in years two to four, PRIME activities focused on integrating mental health care into primary and maternal health settings. In addition to the activities directly related to integration of care, complementary activities were introduced at the community, facility, and health service organization levels.[1] All countries implemented activities to improve or expand upon 1) health service organization, 2) planning and coordinating, 3) medication supply, 4) capacity building, and 5) quality improvement. Similarly, all countries intervened at the primary health facility level through awareness raising and anti-stigma campaigns for patients and providers, improving screening and assessment, strengthening basic psychosocial support, and engaging in continual case review and continuing care. All health facility staff also received capacity building activities and supportive supervision.[1]

Key complementary activities in each country included:

1. **Ethiopia, South Africa, and Uganda:** "Training of trainers" model to increase capacity to train PHC workers.
2. **Ethiopia, Nepal, Uganda:** Including epilepsy care in service delivery.
3. **India:** Community-based screening through informational films in villages to sensitize about mental health.[25]
4. **Nepal:** Home-based adherence support by female community health workers who received a two-day training on care;[23] community informant case detection and referral by mother's group members and female community health volunteers using a narrative-based detection tool.[4]
5. **South Africa:** Strengthening and monitoring of referral systems by stakeholders at various levels of the health system, including PHC nurses and mental health coordinators;[3] training lay-counsellors to provide counseling within PHC clinics.

Model funding

Ethiopia's health sector is primarily financed by international loans and donations (47%), out-of-pocket (OOP) payments (36%), and the government (16%). 15% of total health expenditure goes to PHC.[12] India's AB-HWC is financed through national taxes.[13,14] Nepal's health system is largely dependent on external aid for funding; however, this dependency seems to be decreasing (21.5% in 2000 to 11.7% in 2016). The health services delivered through the government are mainly funded by taxes and external donors.[23] Most of the South African public health sector is funded by National Revenue funds, which collects payment from federal, provincial, and local government.[3] Uganda's health system finances come from the government, public and private sources.[21] Private sources, including OOP funds, private firms, and not-for-profit organizations, provide the majority (76%) of funding for the health system and for PHC.[21,25]

The PRIME model was supported by the United Kingdom Department for International Development.[26]

Human Resources

The PRIME project worked with stakeholders at every level of the health system. PHC providers were engaged in the trainings and integration efforts within the facility. Medical officers, health assistants, and auxiliary health workers were involved in trainings to advance assessment, diagnosis, and management of mental disorders.[23] Nurses were involved in trainings and in some countries were involved in task-shifting to provide psychosocial support within facilities. Counsellors and trained health workers worked within communities to provide sensitization, home-based care, case detection, and community-based activities.[23]

Responsibility and management of program activities varied by country. In Nepal, PRIME project staff conducted most of the program management activities to support implementation. In Ethiopia and India, PRIME offered support to government administrators and coordinators to roll out activities. In Uganda and South Africa, coordination was carried out by the existing administration.

The project actively engaged with countries' Ministries of Health who co-developed the ToC maps and design models of care that could be feasibly integrated into existing health structures and policies. Actively including policymakers in the project increased the likelihood of translating evidence to practice.[26]

Laboratory, Diagnostic, or Pharmacy Services

Laboratory, diagnostic, or pharmacy service changes were not necessarily part of the PRIME model, though some country specific projects did work in these areas. For example, the mental health care plans in South Africa and Nepal provided enhanced guidelines for prescribers to ensure that patients received appropriate psychotropic drugs and referrals as necessary.[3,4] Project personnel in Nepal worked with the Drug Procurement Department of PHC Revitalization Division, district public health office Drug Procurement Committee, and the Ministry of Health to ensure supply of necessary medications at the health post and sub-health post levels.[4]

Digital Solutions

No digital solutions were integral to this model's implementation.

IMPACT OF THE MODEL

Across all five countries, the PRIME project demonstrated that with investment in training, supervision, and health system strengthening, mental health care can feasibly be integrated into primary care.[27,28] In four of the five countries, the model increased case detection for depression and AUD.[30] The findings from PRIME evaluations have been used to inform and guide national policy in Nepal and Ethiopia and have guided regional health planning in South Africa and India.[7]

Results from the cross-sectional and cohort studies utilized in the impact evaluation found that PRIME MHCP in India had a moderate impact on rate of response defined as a 50% reduction in Patient Health Questionnaire (PHQ-9) score at follow-up assessment) (52% in the intervention group compared to 27% in the control group). The model also was associated with early remission (70% in the intervention group compared to 45% in the control group), and recovery (56% in the intervention group compared to 28% in the control group) for patients presenting with depression. The study found a modest effect on detection and initiation of treatment for depression and AUD.[31]

In Nepal, the PRIME project has been used to advocate for the inclusion of psychotropic medications on the free drugs list and the development of a national mental health curriculum for health workers and to inform national mental health policy.[7] An evaluation (which utilized cross sectional and cohort study designs) of the Nepal MHCP found that from 2013 to 2016 the intervention was associated with increased detection of mental illness by health workers and significant increases in contact coverage (the proportion of patients with probable depression and/or AUD who contact a PHC provider) for all priority mental disorders: contact coverage at baseline was 0-3.2% compared to endline coverage of 12.2% for depression; 7.5% for AUD; 53.4% for psychosis; and 13.0% for epilepsy.[23] The intervention was also associated with initiation of treatment for depression and alcohol use disorder: diagnosis for depression increased by 16% from baseline to midline and 10% from midline to endline; diagnosis for alcohol use disorder increased from baseline to midline by 59% and from midline to endline by 11%.[23]

In a randomized controlled trial, the South African PRIME task-sharing model was shown to be non-inferior to the standard of care.[32] A counselling intervention that was introduced as a part of the PRIME model was associated with a significant reduction in depression severity after one year, with a positive association between dose and clinical condition.[33]

A Uganda cohort study found a significant improvement in three-month facility detection of depression (4.2 at baseline compared to 12.7 at 3 months) and AUD (0 at baseline compared to 12.5 at 3 months). Another cohort study found that improvements were also made in the clinical condition of patients with depression and epilepsy and in functional impairment (based on the World Health Organization (WHO) Disability Assessment Schedule 2.0) of individuals with psychosis who received treatment.[28,34]

COSTING

Prior to the implementation, the estimated cost of implementing district-level mental health plans in all five program countries ranged from US$0.20 to US$0.56 per capita in Ethiopia, India, Nepal, and Uganda (using 2008 US$). In South Africa, due to higher price and quantity of service inputs, the cost for scale-up was US$1.86 per capita.[34]

LESSONS LEARNED

Several lessons were learned during the implementation of PRIME activities. First, the situational analysis found that there were several cross-country challenges to overcome, including high levels of poverty, limited levels of community awareness, high levels of stigma and abuse, and the absence of structures to support mental health care. Limited systems for mental health treatment coverage and a lack of mental health workforce, including lack of specialist care, were major challenges. This scarcity of mental health care infrastructure underscored the need to intervene at all levels of the health system and informed mental health care plans.[11]

Second, implementers learned that opportunities exist to integrate other NCDs alongside mental health care, especially given the high prevalence of depression and AUD in people with chronic NCDs. Integrating mental health into care delivery for HIV, tuberculosis, and other NCDs may be mutually beneficial.[11]

Third, it is important to actively engage with local stakeholders at a variety of levels of the health system. Much of the success of the PRIME model can be attributed to the ToC workshops, which fostered collaboration and community buy-in. It also allows implementers to design culturally-appropriate models of care.[35] Similarly, making use of "policy windows," i.e. instances of increased political will, is of the utmost importance. When there is growing interest in change, it behooves implementers to act on the moment and provide solutions or recommendations.[35]

Finally, compensating non-specialist health workers, such as community or village health workers, is extremely important, especially when interventions place demand on their capacity and workloads. Expecting work without compensation can be a barrier to continued efforts and commitment.[35]

IMPLEMENTER ADVICE TO OTHERS CONSIDERING THE MODEL

Implementer feedback was not available.

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INPUTS

- Existing human resources in health within each implementing country
- Financial and technical support from the United Kingdom government's Department for International Development
- Technical support from the governments of each implementing country and multiple partners (see main case document for more information)

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- Interventions focused on screening and assessment at PHC level for CMDs, including alcohol abuse, depression, psychosis, and epilepsy.
- Interventions to strengthen basic psychosocial support for CMDs (e.g. trained lay-counsellors provide counseling within PHC clinics in South Africa).
- Interventions to increase continual case review and continuing care for CMDs.
- Interventions to raise awareness and decrease stigma for CMDs among patients and providers.

2 COMMUNITY-BASED ACTIVITIES

- Interventions for community screening, detection, and referral of CMDs (e.g. community case detection and referral by mother's group members and female community health volunteers using a narrative-based detection tool in Nepal).
- Interventions to raise awareness and decrease stigma for CMDs among communities.
- Interventions for community-based rehabilitation for patients (e.g. home-based adherence support by trained female community health workers in Nepal).

3 TRAINING & CAPACITY BUILDING

- Training of health care providers for detection, referral and care for CMDs (e.g. "Training of trainers" model to increase capacity to train PHC workers in Ethiopia, South Africa, and Uganda).
- Supportive supervision for health care providers implementing CMD interventions.

4 INTEGRATION & COORDINATION

- PRIME develops integrated MHCPs to deliver mental health packages in primary and maternal health care settings.
- MHCPs are tailored for each country based on the results of situational analyses that describe the landscape of mental health care in each project country.
- PRIME utilized a ToC approach with extensive stakeholder consultations.
- Guidelines or protocol development (e,g, enhanced guidelines for prescribers to ensure that patients receive appropriate psychotropic drugs and referrals as necessary in South Africa and Nepal).
- Interventions to strengthen referral systems for CMDs (e.g. strengthening and monitoring of referral systems by stakeholders at various levels of the health system, including PHC nurses and mental health coordinators in South Africa).
- Interventions to strengthen the medication supply chain for CMDs (e.g. ensuring supply of necessary medications at the health post and sub-health post levels in Nepal).

5 TECHNOLOGY & DIGITAL SOLUTIONS

- None reported.

OUTPUTS

COVERAGE (R)

- **Contact coverage –** In Nepal, contact coverage (i.e. % of patients with probable depression and/or alcohol use disorder who contact a PHC provider) significantly increased for all priority mental disorders from 0-3% at baseline to 8% (alcohol use disorder), 12% (depression); 13% (epilepsy), and 53% (psychosis) in the intervention group.[23]
- **Detection –** In 4 out of 5 countries, the PRIME increased case detection for depression and alcohol use disorder.[29]
- **Diagnosis –**
  - In Nepal, diagnosis for depression increased by 16% from baseline to midline and 10% from midline to endline for the intervention group.[23]
  - In Nepal, diagnosis for alcohol use disorder increased by 59% from baseline to midline and 11% from midline to endline for the intervention group.[23]
  - In Uganda, significant improvement was found in detection of depression (4.2 at baseline compared to 12.7 at 3-months follow-up) and alcohol use disorder (0 at baseline compared to 12.5 at 3-months follow-up) for the intervention group.

- **Sites equipped (A) –** PRIME scaled up to 94 health facilities across 5 countries including, Ethiopia, India, Nepal, South Africa, and Uganda.
- **Providers trained (A) –** Providers trained across 5 countries, including medical officers, nurses, health assistants, counsellors, and auxiliary health workers.[23]

OUTCOMES

PROXIMAL

- No proximal outcomes reported.

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Patient health outcomes (E)**
  - In South Africa, a counselling intervention as part of the PRIME model showed a significant reduction in depression severity after 1 year, with a positive association between dose and clinical condition.[33]
  - In India, PRIME patients with depression experienced a 50% reduction in the PHQ-9 score at follow up assessment (intervention group [IG]: 52%; control group [CG]: 27%). PRIME was also associated with early remission (IG: 70%; CG: 45%), and recovery (IG: 56%; CG: 28%).[31]
  - In Uganda, patients with depression or epilepsy experienced improvements in clinical condition; patients with psychosis who received treatment experienced improvements in functional impairment (based on the WHO Disability Assessment Schedule 2.0).[28,34]

Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden

CONTEXTUALLY APPROPRIATE SELF-MANAGEMENT STRATEGIES TO PREVENT AND CONTROL TYPE 2 DIABETES

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Geographic locale	Uganda, South Africa, Sweden
Program setting	Primary care clinics and local communities
Target diseases	Type-2 diabetes mellitus
Target population	Adults ≥18 years
Partners/Stakeholders	SMART2D consortium included the following six partner institutions: Makerere University, School of Public Health, Uganda; the University of the Western Cape, School of Public Health, South Africa; Karolinska Institute (Coordinator) and Uppsala University, Sweden; Institute of Tropical Medicine, Belgium; and Collaborative Care Systems Finland; European Commission's Horizon 2020 Health Coordination Activities; the Swedish International Development Cooperation Agency; the Caring Network Community Health Workers and Management, Diabetes SA; Chronic Disease Initiative for Africa

Background: Uganda, South Africa, and Sweden are low-income, upper-middle-income, and high-income countries with population sizes of 47.2, 59.9, and 10.4 million, respectively.[1] In 2021, Uganda had an estimated age-adjusted type 2 diabetes mellitus prevalence of 4.6%,[2] with estimated years of life lost (YLL) due to type 2 diabetes of 777.1[3] per 100,000 population as of 2019. In 2021, South Africa had an estimated age-adjusted diabetes prevalence of 10.8%,[2] with estimated YLL of 1,296.0[3] per 100,000 population as of 2019. In 2021, Sweden had an estimated age-adjusted type 2 diabetes prevalence of 5.0%,[2] with estimated YLL of 121.9[3] per 100,000 population as of 2019.

Model Overview: Self-management and Reciprocal Learning for Type-2 Diabetes (SMART2D) was a community-based self-management support model, in addition to facility-based care, implemented in three different settings: a rural community in Uganda, a semi urban township in Cape Town, South Africa, and socioeconomically disadvantaged suburbs with a high proportion of immigrants in Stockholm, Sweden. The project aimed to develop self-management strategies that were contextually appropriate for the prevention and control of diabetes in each specific setting. In Uganda, the implementation primarily focused on peer support; in South Africa, it focused on newly established peer support groups at the community level, coupled with individual household visits by community health workers (CHWs); and in Sweden, it focused on a telehealth coaching component with trained facilitator-participant dyads and complementary care companion activities and community meetings. Recruitment occurred largely through community mobilization efforts in Uganda, through health facilities in South Africa, and with a mixed strategy in Sweden. The community-based activities were delivered in community settings in Uganda and South Africa and through a combined approach of telephone coaching and community meetings in Sweden. Community extension efforts, meant to establish the link between the community-based self-management intervention and the facility-based care, varied. Uganda and Sweden organized introductory meetings between facilitators and health care staff, while South Africa relied on existing links through CHWs.[4]

Model Strategy: The model implementation strategy varied slightly across countries, but generally comprised of integrated facility and community-focused strategies. The community strategies included: *(a) community mobilization; (b) establishing a peer support program; (c) identifying care companions; and (d) creating community extensions linking the community and facility.* The community mobilization component involved delivering messages pertaining to healthy lifestyle and type 2 diabetes information. A peer support program was implemented with peer support facilitators leading sessions on topics like type 2 diabetes risk factors and complications, adopting healthy eating habits, engaging in physical activity, understanding risks associated with alcohol and smoking, practicing self-care

and adhering to medications, as well as organizing community walks. The care companion component encouraged patients to identify a trusted individual. In Uganda and Sweden this role was fulfilled by a participant-identified family member, or a close neighbor who could support in self-management and overall well-being, while in South Africa, this involved the CHWs. The community extension created a link function between patient representatives and care companions, primary care and local administrations, and/or non-governmental organizations (NGOs) and facilities, local administrations, and the community. The link function ensured the flow of information, feedback, and support that is vital for the proper management of type 2 diabetes between community and facility. Facility-focused strategies included: *(a) organization of care and (b) strengthening of the patient role in self-management*.[7] The organization of care process incorporated ensuring the availability and functionality of minimal adequate infrastructure and the availability of guidelines and information systems to follow-up patients. Active facility strategies were therefore implemented only in Uganda, while in Sweden and South Africa, the focus was on ensuring some level of consistency between health centers. The process of enhancing the patient's role in self-management encompassed providing patients with brief motivational behavioral coaching, ensuring access to measurement devices, and increasing patient awareness about the care process.[4]

Notable Features of the Model: One unique feature of the SMART2D intervention was its contextual implementation of agreed on generic functions in the three diverse settings, including a rural community in Uganda, a semi-urban township in Cape Town, South Africa, and socioeconomically disadvantaged suburbs in Stockholm, Sweden.[5] This allowed for a comprehensive understanding of the challenges and opportunities associated with managing diabetes in different contexts. Additionally, the reciprocal learning approach used in the implementation of SMART2D played a crucial role in identifying uncertainties and operational research questions specific to each country context.[6] This approach fostered a collaborative and interactive learning process between the project team and the communities involved.[4]

Key Messages

- Overall high screening rates and establishment of contextualized peer groups.
- Varying levels of care companion engagement in the three countries.
- Environmental factors led to different delivery options across countries, with safety issues, rural settings, and economic and local challenges influencing implementation.

Model Funding: The SMART2D project was funded by the European Commission's Horizon 2020 Health Coordination Activities under the call 'HCO-05-2014: Global Alliance for Chronic Diseases: prevention and treatment of diabetes.' The Uganda site specifically was co-funded by the Swedish International Development Cooperation Agency in a capacity-building grant to Makerere University 2015–2010.[4] The Swedish site was co-financed by the Stockholm County Council.

Human Resources: Key personnel for the SMART2D facility-based intervention were PHC facility nurses (and doctors in Uganda). For the community-based intervention, facilitators for the program varied by country. In Uganda, peer facilitators were people with diabetes, while CHWs served as peer facilitators in South Africa; and in Sweden, research assistants played the role of tele-health coaching facilitators. These individuals received start-up and refresher training from the program prior to leading any meetings.[4]

Laboratory, Diagnostic, or Pharmacy Services: There were no significant changes to existing laboratory, diagnostic, or pharmacy services. Facilities in the facility-only and integrated care arms in the Uganda site received diagnostic and medication supplies for the duration of the trial to ensure minimal adequate infrastructure and facilities.

Digital Solutions: Digital patient registration and telephone-facilitated health coaching facilitators were used in Sweden, and telephone patient appointment tracking was implemented in Uganda.[4]

Impact of the Model: A pragmatic cluster randomized trial designed to evaluate the effectiveness of integrated care (facility plus community care) compared to facility-only care in improving type 2 diabetes outcomes was conducted

in nine PHC facilities in Uganda and two in South Africa.[7] Uganda also had an additional usual care arm. In Uganda, among participants with type 2 diabetes, retention in care was 84% in the integrated care arm and 82% in the facility care arm compared to 59% in the usual care arm. Among Ugandan participants who were at high risk of developing type 2 diabetes, retention in care was 87% in the integrated care arm and 61% in the facility care arm compared to 25% in the usual care arm. In South Africa, among participants with type 2 diabetes, retention in care was 44% in the integrated care arm and 52% in the facility care arm. Among South African participants who were at high risk of developing type 2 diabetes, retention in care was 51% in the integrated care arm and 49% in the facility care arm. On adjusted analysis, in Uganda, participants in integrated care and facility care had statistically significantly higher retention in care compared to those in the usual care arm for both groups of participants (participants with type 2 diabetes and those at high risk of type 2 diabetes); in South Africa, patients in integrated care vs. facility care also had significantly higher retention in care for both groups of patients. There was no improvement in glycemic control or reduction in HbA1c in either country (although unbalanced loss to follow-up compromised evaluation of the intervention's effect on HbA1c).

A process evaluation assessed implementation of the SMART2D integrated care intervention in all three countries.[8] Environmental and contextual factors across the three countries were found to have influenced the different options for intervention delivery. For example, an existing service organization in South Africa was involved based on the health system tradition of using CHWs. As the field site in Uganda was rural, peer support was organized around parish communities where there were existing social connections. In South Africa, safety and security issues were a concern for implementation rollout and participation. Overall, the steep learning curve and lack of organizational capacity of implementers was more of a limiting factor than the physical and contextual constraints. In Sweden, participants faced economic challenges, language barriers and feelings of isolation, but also found the peer support intervention provided trust-building opportunities through participation. In Uganda, 28,976 households were screened, with 268 participants enrolled (142 with type 2 diabetes and 126 at high-risk of type 2 diabetes). In South Africa, 2,150 individuals were screened, resulting in 285 participants (140 with type 2 diabetes and 145 at risk). In Sweden, 1,965 individuals were screened, with 131 participants (51 with type 2 diabetes and 80 at high risk) enrolled. It is worth noting that due to context related factors, particularly a restructuring of primary care administration in Stockholm, the implementation trial in Sweden was limited to a feasibility trial with fewer primary care centers and participants. Uganda established 19 peer groups, holding a median of 10 sessions per group. South Africa formed three groups, and Sweden had 72 peer-facilitator dyads. To meet the minimum intervention requirement, participants were expected to attend at least one-third of the sessions, which was fulfilled by only 76 individuals (28%) in Uganda, 53 individuals (19%) in South Africa, and 49 individuals (28%) in Sweden. Care companion engagement was high, with 100% of enrolled patients in Uganda, 73% in South Africa, and 61% in Sweden reporting having a care companion.[8]

Resources

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INPUTS

- Existing human resources in health.
- Financial resources from European Commission's Horizon 2020 Health Coordination Activities. The Uganda site was co-funded by the Swedish International Development Cooperation Agency capacity-building grant to Makerere University 2015–2010. The Swedish site was co-financed by the Stockholm County Council.
- Technical support from multiple partners (see main case document for more information).
- Diagnostics and medication to health centers in Uganda for the trial to optimize facility care.

PROGRAM ACTIVITIES

1 FACILITY-BASED ACTIVITIES

- T2DM care as usual in South Africa and Sweden.
- Minimum clinical care standards for T2D introduced in Uganda.

2 COMMUNITY-BASED ACTIVITIES

- Intervention to recruit and mobilize communities using messages on lifestyle and T2DM.
- In Sweden, research assistants provided health coaching via telephone; in both Sweden and Uganda, care companions (spouse, household member, or neighbor who can support self-management and well-being) and community meetings also provided community support.
- In South Africa, CHWs served as care companions to patients and also facilitated peer groups to discuss T2DM risk factors and complications, healthy eating habits, physical activity, alcohol and smoking risk, self-care and medications. Peer support groups organized community walks.

3 TRAINING & CAPACITY BUILDING

- T2DM health education training (initial and refresher).

4 INTEGRATION & COORDINATION

- Community extension created linkages between representatives of participants, care companions, primary care providers, and local administration and/or NGOs.

5 TECHNOLOGY & DIGITAL SOLUTIONS

- Digital patient registration and telephone-facilitated health coaching facilitators in Sweden.
- Telephone patient appointment tracking in Uganda.

OUTPUTS

- **Coverage (R)** - Screening and Enrollment:
  - in Uganda, 28,976 households were screened, with 268 participants enrolled (142 with T2DM and 126 at high-risk of T2DM).[8]
  - in South Africa, 2,150 individuals were screened, resulting in 285 participants (140 with T2DM and 145 at risk).[8]
  - in Sweden, 1,965 individuals were screened, with 131 participants (51 with T2DM and 80 at high-risk) enrolled.
  - Establishment of peer groups in Uganda (19 groups, holding a median of 10 sessions each) and South Africa (3 groups including a total of 75 patients) and 72 peer-coach dyads in Sweden.[8]

OUTCOMES

PROXIMAL

- **Patient support (I)**
  - Proportion of patients with a care companion in Uganda (100%), South Africa (73%), and Sweden (61%).[8]

INTERMEDIATE

- No intermediate outcomes reported.

DISTAL

- **Retention in care (E):**
  - in Uganda, among participants with T2DM, retention in care was 84% in the integrated care arm and 82% in the facility care arm compared to 59% in the usual care arm.[7]
  - in South Africa, among participants with T2DM, retention in care was 44% in the integrated care arm and 52% in the facility care arm.[7]
- **Patient health outcomes (E):**
  - No improvement in glycemic control or reduction in HbA1c in Uganda or South Africa.[7]

Conclusion

The escalating burden of NCDs is a pressing issue, particularly in low- and middle-income countries, where resources and preparedness to tackle this challenge are limited. This compendium serves as a resource in addressing the rising burden of NCDs by offering a range of options for restructuring PHC systems. With its compilation of 56 case studies, this compendium explores diverse models of care that effectively incorporate NCD management within PHC settings in low- and middle-income countries.

The case studies featured in this compendium offer a wealth of insights and lessons learned from real-world program implementation. By examining the design options, successes, and challenges of different models, implementers and policymakers can gain valuable knowledge to inform their own strategies for combating NCDs. These case studies encompass a wide range of world regions, economic development levels, and implementation settings, underscoring the importance of tailoring approaches to the specific contexts in which they are implemented.

The information provided in this compendium empowers implementers and policymakers to make informed decisions regarding strategies and service delivery designs for NCD care in their respective countries. By leveraging the experiences shared within this resource, stakeholders can identify and adapt successful models of care that align with their local realities and health care systems. The authors hope this will contribute to the development of context-specific approaches that are both effective and sustainable in managing the burden of NCDs.

In conclusion, the wide array of case studies presented in this compendium offer a valuable resource for addressing the growing burden of NCDs. It is hoped that this resource will serve as a catalyst for PHC restructuring and innovation and strengthen the foundation for evidence-based decision-making, ultimately paving the way for improved NCD management and better health outcomes in low- and middle-income countries globally.

Appendices

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Appendix

1. SEARCH TERMS EXAMPLE

Reach

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Treatment Outcome"[Mesh] OR "treatment outcome" OR “coverage outcomes” OR “screening” OR “treatment initiation” OR "Health Equity"[Mesh] OR "health equity" OR "equity" OR "Gender Equity"[Mesh] OR "gender equity" OR "gender equality" OR “gender inequality” OR "Health Services Accessibility"[Mesh] OR "health services accessibility" OR "access to health care" OR "access to care" OR "health services availability" OR "access to treatment" OR "access to medicine" OR "medication access" OR "Socioeconomic Factors"[Mesh] OR "socioeconomic factors" OR "Economic Status"[Mesh] OR "economic status" OR "Vulnerable Populations"[Mesh] OR "vulnerable populations" OR "underserved populations" OR "disadvantaged populations" OR "Health Disparate, Minority and Vulnerable Populations"[Mesh] OR "health disparate populations" OR "minority populations" OR "Health Status Disparities"[Mesh] OR "health status disparities" OR "Socioeconomic Disparities in Health"[Mesh] OR "socioeconomic disparities in health" OR "socioeconomic disadvantage" OR "socioeconomic disparities" OR "Healthcare Disparities"[Mesh] OR "healthcare disparities" OR "healthcare inequalities") AND (y_10[Filter])

AND ("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH Terms] OR "guyana"[MeSH Terms] OR "haiti"[MeSH Terms] OR "honduras"[MeSH Terms] OR "hungary"[MeSH Terms] OR "india"[MeSH Terms] OR "indonesia"[MeSH Terms] OR "iran"[MeSH Terms] OR "iraq"[MeSH Terms] OR "jamaica"[MeSH Terms] OR "jordan"[MeSH Terms] OR "kazakhstan"[MeSH Terms] OR "kenya"[MeSH Terms] OR "democratic people s republic of korea"[MeSH Terms] OR "republic of korea"[MeSH Terms] OR "kosovo"[MeSH Terms] OR "kyrgyzstan"[MeSH Terms] OR "laos"[MeSH Terms] OR "latvia"[MeSH Terms] OR "lebanon"[MeSH Terms] OR "lesotho"[MeSH Terms] OR "liberia"[MeSH Terms] OR "libya"[MeSH Terms] OR "lithuania"[MeSH Terms] OR "macau"[MeSH Terms] OR "republic of north macedonia"[MeSH Terms] OR "madagascar"[MeSH Terms] OR "malawi"[MeSH Terms] OR "malaysia"[MeSH Terms] OR "indian ocean islands"[MeSH Terms] OR "mali"[MeSH Terms] OR "malta"[MeSH Terms] OR "micronesia"[MeSH Terms] OR "palau"[MeSH Terms] OR "mauritania"[MeSH Terms] OR "mauritius"[MeSH Terms] OR "mexico"[MeSH Terms] OR "moldova"[MeSH Terms] OR "mongolia"[MeSH Terms] OR "montenegro"[MeSH Terms] OR "morocco"[MeSH Terms] OR "mozambique"[MeSH Terms] OR "myanmar"[MeSH Terms] OR "namibia"[MeSH Terms] OR "nepal"[MeSH Terms] OR "netherlands antilles"[MeSH Terms] OR "nicaragua"[MeSH Terms] OR "niger"[MeSH Terms] OR "nigeria"[MeSH Terms] OR "oman"[MeSH Terms] OR "pakistan"[MeSH Terms] OR "panama"[MeSH Terms] OR "papua new guinea"[MeSH Terms] OR "paraguay"[MeSH Terms] OR "peru"[MeSH Terms] OR "philippines"[MeSH Terms] OR "poland"[MeSH Terms] OR "portugal"[MeSH Terms] OR "puerto rico"[MeSH Terms] OR "romania"[MeSH Terms] OR "russia"[MeSH Terms] OR "rwanda"[MeSH Terms] OR "samoa"[MeSH Terms] OR "sao tome and principe"[MeSH Terms] OR "saudi arabia"[MeSH Terms] OR "senegal"[MeSH Terms] OR "serbia"[MeSH Terms] OR

"seychelles"[MeSH Terms] OR "sierra leone"[MeSH Terms] OR "slovakia"[MeSH Terms] OR "slovenia"[MeSH Terms] OR "melanesia"[MeSH Terms] OR "somalia"[MeSH Terms] OR "south africa"[MeSH Terms] OR "south sudan"[MeSH Terms] OR "sri lanka"[MeSH Terms] OR "saint kitts and nevis"[MeSH Terms] OR "St. Lucia"[MeSH Terms] OR "saint vincent and the grenadines"[MeSH Terms] OR "sudan"[MeSH Terms] OR "suriname"[MeSH Terms] OR "syria"[MeSH Terms] OR "tajikistan"[MeSH Terms] OR "tanzania"[MeSH Terms] OR "thailand"[MeSH Terms] OR "timor leste"[MeSH Terms] OR "togo"[MeSH Terms] OR "tonga"[MeSH Terms] OR "trinidad and tobago"[MeSH Terms] OR "tunisia"[MeSH Terms] OR "turkey"[MeSH Terms] OR "turkmenistan"[MeSH Terms] OR "uganda"[MeSH Terms] OR "ukraine"[MeSH Terms] OR "uruguay"[MeSH Terms] OR "uzbekistan"[MeSH Terms] OR "vanuatu"[MeSH Terms] OR "venezuela"[MeSH Terms] OR "viet nam"[MeSH Terms] OR "middle east"[MeSH Terms] OR "yemen"[MeSH Terms] OR "yugoslavia"[MeSH Terms] OR "zambia"[MeSH Terms] OR "zimbabwe"[MeSH Terms] OR "africa south of the sahara"[MeSH Terms] OR "africa, central"[MeSH Terms] OR "africa, northern"[MeSH Terms] OR "africa, southern"[MeSH Terms] OR "africa, eastern"[MeSH Terms] OR "africa, western"[MeSH Terms] OR "west indies"[MeSH Terms] OR "indian ocean islands"[MeSH Terms] OR "caribbean region"[MeSH Terms] OR "central america"[MeSH Terms] OR "latin america"[MeSH Terms] OR "south america"[MeSH Terms] OR "asia, central"[MeSH Terms] OR "asia, northern"[MeSH Terms] OR "asia, southeastern"[MeSH Terms] OR "asia, western"[MeSH Terms] OR "europe, eastern"[MeSH Terms] OR "developing countries"[MeSH Terms] OR ("afghanistan"[Text Word] OR "albania"[Text Word] OR "algeria"[Text Word] OR "american samoa"[Text Word] OR "angola"[Text Word] OR "antigua"[Text Word] OR "barbuda"[Text Word] OR "argentina"[Text Word] OR "armenia"[Text Word] OR "armenian"[Text Word] OR "aruba"[Text Word] OR "azerbaijan"[Text Word] OR "bahrain"[Text Word] OR "bangladesh"[Text Word] OR "barbados"[Text Word] OR "belarus"[Text Word] OR "byelarus"[Text Word] OR "belorussia"[Text Word] OR "byelorussian"[Text Word] OR "belize"[Text Word] OR "british honduras"[Text Word] OR "benin"[Text Word] OR "dahomey"[Text Word] OR "bhutan"[Text Word] OR "bolivia"[Text Word] OR "bosnia"[Text Word] OR "herzegovina"[Text Word] OR "botswana"[Text Word] OR "bechuanaland"[Text Word] OR "brazil"[Text Word] OR "brasil"[Text Word] OR "bulgaria"[Text Word] OR "burkina faso"[Text Word] OR "burkina fasso"[Text Word] OR "upper volta"[Text Word] OR "burundi"[Text Word] OR "urundi"[Text Word] OR "cabo verde"[Text Word] OR "cape verde"[Text Word] OR "cambodia"[Text Word] OR "kampuchea"[Text Word] OR "khmer republic"[Text Word] OR "cameroon"[Text Word] OR "cameron"[Text Word] OR "cameroun"[Text Word] OR "central african republic"[Text Word] OR "ubangi shari"[Text Word] OR "chad"[Text Word] OR "chile"[Text Word] OR "china"[Text Word] OR "colombia"[Text Word] OR "comoros"[Text Word] OR "comoro islands"[Text Word] OR "mayotte"[Text Word] OR "congo"[Text Word] OR "zaire"[Text Word] OR "costa rica"[Text Word] OR "cote d ivoire"[Text Word] OR "cote d ivoire"[Text Word] OR ("cote"[All Fields] AND "divoire"[Text Word]) OR "cote d ivoire"[Text Word] OR "ivory coast"[Text Word] OR "croatia"[Text Word] OR "cuba"[Text Word] OR "cyprus"[Text Word] OR "czech republic"[Text Word] OR "czechoslovakia"[Text Word] OR "djibouti"[Text Word] OR "french somaliland"[Text Word] OR "dominica"[Text Word] OR "dominican republic"[Text Word] OR "ecuador"[Text Word] OR "egypt"[Text Word] OR "united arab republic"[Text Word] OR "el salvador"[Text Word] OR "equatorial guinea"[Text Word] OR "spanish guinea"[Text Word] OR "eritrea"[Text Word] OR "estonia"[Text Word] OR "eswatini"[Text Word] OR "swaziland"[Text Word] OR "ethiopia"[Text Word] OR "fiji"[Text Word] OR "gabon"[Text Word] OR "gabonese republic"[Text Word] OR "gambia"[Text Word] OR "georgia"[Text Word] OR "georgian"[Text Word] OR "ghana"[Text Word] OR "gold coast"[Text Word] OR "gibraltar"[Text Word] OR "greece"[Text Word] OR "grenada"[Text Word] OR "guam"[Text Word] OR "guatemala"[Text Word] OR "guinea"[Text Word] OR "guyana"[Text Word] OR "guiana"[Text Word] OR "haiti"[Text Word] OR "hispaniola"[Text Word] OR "honduras"[Text Word] OR "hungary"[Text Word] OR "india"[Text Word] OR "indonesia"[Text Word] OR "timor"[Text Word] OR "iran"[Text Word] OR "iraq"[Text Word] OR "isle of man"[Text Word] OR "jamaica"[Text Word] OR "jordan"[Text Word] OR "kazakhstan"[Text Word] OR "kazakh"[Text Word] OR "kenya"[Text Word] OR "korea"[Text Word] OR "kosovo"[Text Word] OR "kyrgyzstan"[Text Word] OR "kirghizia"[Text Word] OR "kirgizstan"[Text Word] OR "kyrgyz republic"[Text Word] OR "kirghiz"[Text Word] OR "laos"[Text Word] OR "lao pdr"[Text Word] OR "lao people s democratic republic"[Text Word] OR "latvia"[Text Word] OR "lebanon"[Text Word] OR "lesotho"[Text Word] OR "basutoland"[Text Word] OR "liberia"[Text Word] OR "libya"[Text Word] OR "libyan arab jamahiriya"[Text Word] OR "lithuania"[Text Word] OR "macau"[Text Word] OR "macao"[Text Word] OR "macedonia"[Text Word] OR "madagascar"[Text Word] OR "malagasy republic"[Text Word] OR "malawi"[Text Word] OR "nyasaland"[Text Word] OR "malaysia"[Text Word] OR "maldives"[Text Word] OR "indian ocean"[Text Word] OR "mali"[Text Word] OR "malta"[Text Word] OR "micronesia"[Text Word] OR "kiribati"[Text Word] OR "marshall islands"[Text Word] OR "nauru"[Text Word] OR "northern mariana islands"[Text Word] OR "palau"[Text Word] OR "tuvalu"[Text Word] OR "mauritania"[Text Word] OR "mauritius"[Text Word] OR "mexico"[Text Word] OR "moldova"[Text Word] OR "moldovian"[Text Word] OR "mongolia"[Text Word] OR "montenegro"[Text Word] OR "morocco"[Text Word] OR "ifni"[Text Word] OR "mozambique"[Text Word] OR "portuguese east africa"[Text Word] OR "myanmar"[Text Word] OR "burma"[Text Word] OR "namibia"[Text Word] OR "nepal"[Text Word] OR "netherlands antilles"[Text Word] OR "nicaragua"[Text Word] OR "niger"[Text Word] OR "nigeria"[Text Word] OR "oman"[Text Word] OR "muscat"[Text Word] OR "pakistan"[Text Word] OR "panama"[Text Word] OR "papua new guinea"[Text Word] OR "paraguay"[Text Word] OR "peru"[Text Word] OR "philippines"[Text Word] OR "philipines"[Text Word] OR "phillipines"[Text Word] OR "phillippines"[Text Word] OR "poland"[Text Word] OR "polish people s republic"[Text Word] OR "portugal"[Text Word] OR "portuguese republic"[Text Word] OR "puerto rico"[Text Word] OR "romania"[Text Word] OR "russia"[Text Word] OR "russian federation"[Text Word] OR "ussr"[Text Word] OR "soviet union"[Text Word] OR "union of soviet socialist republics"[Text Word] OR "rwanda"[Text Word] OR "ruanda"[Text Word] OR "samoa"[Text Word] OR "pacific islands"[Text Word] OR "polynesia"[Text Word] OR "samoan islands"[Text Word] OR "sao tome and principe"[Text Word] OR "saudi arabia"[Text Word] OR "senegal"[Text Word] OR "serbia"[Text Word] OR "seychelles"[Text Word] OR "sierra leone"[Text Word] OR "slovakia"[Text Word] OR "slovak republic"[Text Word] OR "slovenia"[Text Word] OR "melanesia"[Text Word] OR "solomon island"[Text Word] OR "solomon islands"[Text Word] OR "norfolk island"[Text Word] OR "somalia"[Text Word] OR "south africa"[Text Word] OR "south sudan"[Text Word] OR "sri lanka"[Text Word] OR "ceylon"[Text Word] OR "saint kitts and nevis"[Text Word] OR "st kitts and nevis"[Text Word] OR "St. Lucia"[Text Word] OR "st lucia"[Text Word] OR "saint vincent"[Text Word] OR "st vincent"[Text Word] OR "grenadines"[Text Word] OR "sudan"[Text Word] OR "suriname"[Text Word] OR "surinam"[Text Word] OR "syria"[Text Word] OR "syrian arab republic"[Text Word] OR "tajikistan"[Text Word] OR "tadjikistan"[Text Word] OR "tadzhikistan"[Text Word] OR "tadzhik"[Text Word] OR "tanzania"[Text Word] OR "tanganyika"[Text Word] OR "thailand"[Text Word]

OR "siam"[Text Word] OR "timor leste"[Text Word] OR "east timor"[Text Word] OR "togo"[Text Word] OR "togolese republic"[Text Word] OR "tonga"[Text Word] OR "trinidad"[Text Word] OR "tobago"[Text Word] OR "tunisia"[Text Word] OR "turkey"[Text Word] OR "turkmenistan"[Text Word] OR "turkmen"[Text Word] OR "uganda"[Text Word] OR "ukraine"[Text Word] OR "uruguay"[Text Word] OR "uzbekistan"[Text Word] OR "uzbek"[Text Word] OR "vanuatu"[Text Word] OR "new hebrides"[Text Word] OR "venezuela"[Text Word] OR "viet nam"[Text Word] OR "viet nam"[Text Word] OR "middle east"[Text Word] OR "west bank"[Text Word] OR "gaza"[Text Word] OR "palestine"[Text Word] OR "yemen"[Text Word] OR "yugoslavia"[Text Word] OR "zambia"[Text Word] OR "zimbabwe"[Text Word] OR "northern rhodesia"[Text Word] OR "global south"[Text Word] OR "africa south of the sahara"[Text Word] OR "sub saharan africa"[Text Word] OR "subsaharan africa"[Text Word] OR "central africa"[Text Word] OR "north africa"[Text Word] OR "northern africa"[Text Word] OR "magreb"[Text Word] OR "maghrib"[Text Word] OR "sahara"[Text Word] OR "southern africa"[Text Word] OR "east africa"[Text Word] OR "eastern africa"[Text Word] OR "west africa"[Text Word] OR "western africa"[Text Word] OR "west indies"[Text Word] OR "indian ocean islands"[Text Word] OR "caribbean"[Text Word] OR "central america"[Text Word] OR "latin america"[Text Word] OR "south america"[Text Word] OR "central asia"[Text Word] OR "north asia"[Text Word] OR "northern asia"[Text Word] OR "southeastern asia"[Text Word] OR "south eastern asia"[Text Word] OR "southeast asia"[Text Word] OR "south east asia"[Text Word] OR "western asia"[Text Word] OR "east europe"[Text Word] OR "eastern europe"[Text Word] OR "developing country"[Text Word] OR "developing countries"[Text Word] OR "developing nation"[Text Word] OR "developing nations"[Text Word] OR "developing population"[Text Word] OR "developing populations"[Text Word] OR "developing world"[Text Word] OR "less developed country"[Text Word] OR "less developed countries"[Text Word] OR "less developed nation"[Text Word] OR "less developed nations"[Text Word] OR "less developed world"[Text Word] OR "lesser developed countries"[Text Word] OR "lesser developed nations"[Text Word] OR "under developed country"[Text Word] OR "under developed countries"[Text Word] OR "under developed nations"[Text Word] OR "under developed world"[Text Word] OR "underdeveloped country"[Text Word] OR "underdeveloped countries"[Text Word] OR "underdeveloped nation"[Text Word] OR "underdeveloped nations"[Text Word] OR "underdeveloped population"[Text Word] OR "underdeveloped populations"[Text Word] OR "underdeveloped world"[Text Word] OR "middle income country"[Text Word] OR "middle income countries"[Text Word] OR "middle income nation"[Text Word] OR "middle income nations"[Text Word] OR "middle income population"[Text Word] OR "middle income populations"[Text Word] OR "low income country"[Text Word] OR "low income countries"[Text Word] OR "low income nation"[Text Word] OR "low income nations"[Text Word] OR "low income population"[Text Word] OR "low income populations"[Text Word] OR "lower income country"[Text Word] OR "lower income countries"[Text Word] OR "lower income nations"[Text Word] OR "lower income population"[Text Word] OR "lower income populations"[Text Word] OR "underserved countries"[Text Word] OR "underserved nations"[Text Word] OR "underserved population"[Text Word] OR "underserved populations"[Text Word] OR "under served population"[Text Word] OR "under served populations"[Text Word] OR "deprived countries"[Text Word] OR "deprived population"[Text Word] OR "deprived populations"[Text Word] OR "poor country"[Text Word] OR "poor countries"[Text Word] OR "poor nation"[Text Word] OR "poor nations"[Text Word] OR "poor population"[Text Word] OR "poor populations"[Text Word] OR "poor world"[Text Word] OR "poorer countries"[Text Word] OR "poorer nations"[Text Word] OR "poorer population"[Text Word] OR "poorer populations"[Text Word] OR "developing economy"[Text Word] OR "developing economies"[Text Word] OR "less developed economy"[Text Word] OR "less developed economies"[Text Word] OR "underdeveloped economies"[Text Word] OR "middle income economy"[Text Word] OR "middle income economies"[Text Word] OR "low income economy"[Text Word] OR "low income economies"[Text Word] OR "lower income economies"[Text Word] OR "low gdp"[Text Word] OR "low gnp"[Text Word] OR "low gross domestic"[Text Word] OR "low gross national"[Text Word] OR "lower gdp"[Text Word] OR "lower gross domestic"[Text Word] OR "lmic"[Text Word] OR "lmics"[Text Word] OR "third world"[Text Word] OR "lami country"[Text Word] OR "lami countries"[Text Word] OR "transitional country"[Text Word] OR "transitional countries"[Text Word] OR "emerging economies"[Text Word] OR "emerging nation"[Text Word] OR "emerging nations"[Text Word])

Filters: Adult: 19+ years

Effectiveness (Health behavior outcomes)

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Health Behavior"[Mesh] OR "health behavior" OR "health related behavior" OR "health behavior outcome" OR "Treatment Adherence and Compliance"[Mesh] OR "treatment adherence" OR "treatment compliance" OR "patient compliance" OR "Smoking Reduction"[Mesh] OR "smoking reduction" OR "smoking cessation" OR "Tobacco Use Cessation"[Mesh] OR "tobacco use cessation" OR "tobacco cessation" OR “alcohol cessation” OR “alcohol use decrease” OR "Exercise"[Mesh] OR "exercise" OR "physical activity" OR "aerobic exercise" OR "Diet"[Mesh] OR "diet" OR "improved diet") AND (y_10[Filter])

AND ("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH 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"mongolia"[MeSH Terms] OR "montenegro"[MeSH Terms] OR "morocco"[MeSH Terms] OR "mozambique"[MeSH Terms] OR "myanmar"[MeSH Terms] OR "namibia"[MeSH Terms] OR "nepal"[MeSH Terms] OR "netherlands antilles"[MeSH Terms] OR "nicaragua"[MeSH Terms] OR "niger"[MeSH Terms] OR "nigeria"[MeSH Terms] OR "oman"[MeSH Terms] OR "pakistan"[MeSH Terms] OR "panama"[MeSH Terms] OR "papua new guinea"[MeSH Terms] OR "paraguay"[MeSH Terms] OR "peru"[MeSH Terms] OR "philippines"[MeSH Terms] OR "poland"[MeSH Terms] OR "portugal"[MeSH Terms] OR "puerto rico"[MeSH Terms] OR "romania"[MeSH Terms] OR "russia"[MeSH Terms] OR "rwanda"[MeSH Terms] OR "samoa"[MeSH Terms] OR "sao tome and principe"[MeSH Terms] OR "saudi arabia"[MeSH Terms] OR "senegal"[MeSH Terms] OR "serbia"[MeSH Terms] OR "seychelles"[MeSH Terms] OR "sierra leone"[MeSH Terms] OR "slovakia"[MeSH Terms] OR "slovenia"[MeSH Terms] OR "melanesia"[MeSH Terms] OR "somalia"[MeSH Terms] OR "south africa"[MeSH Terms] OR "south sudan"[MeSH Terms] OR "sri 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OR "ivory coast"[Text Word] OR "croatia"[Text Word] OR "cuba"[Text Word] OR "cyprus"[Text Word] OR "czech republic"[Text Word] OR "czechoslovakia"[Text Word] OR "djibouti"[Text Word] OR "french somaliland"[Text Word] OR "dominica"[Text Word] OR "dominican republic"[Text Word] OR "ecuador"[Text Word] OR "egypt"[Text Word] OR "united arab republic"[Text Word] OR "el salvador"[Text Word] OR "equatorial guinea"[Text Word] OR "spanish guinea"[Text Word] OR "eritrea"[Text Word] OR "estonia"[Text Word] OR "eswatini"[Text Word] OR "swaziland"[Text Word]

OR "ethiopia"[Text Word] OR "fiji"[Text Word] OR "gabon"[Text Word] OR "gabonese republic"[Text Word] OR "gambia"[Text Word] OR "georgia"[Text Word] OR "georgian"[Text Word] OR "ghana"[Text Word] OR "gold coast"[Text Word] OR "gibraltar"[Text Word] OR "greece"[Text Word] OR "grenada"[Text Word] OR "guam"[Text Word] OR "guatemala"[Text Word] OR "guinea"[Text Word] OR "guyana"[Text Word] OR "guiana"[Text Word] OR "haiti"[Text Word] OR "hispaniola"[Text Word] OR "honduras"[Text Word] OR "hungary"[Text Word] OR "india"[Text Word] OR "indonesia"[Text Word] OR "timor"[Text Word] OR "iran"[Text Word] OR "iraq"[Text Word] OR "isle of man"[Text Word] OR "jamaica"[Text Word] OR "jordan"[Text Word] OR "kazakhstan"[Text Word] OR "kazakh"[Text Word] OR "kenya"[Text Word] OR "korea"[Text Word] OR "kosovo"[Text Word] OR "kyrgyzstan"[Text Word] OR "kirghizia"[Text Word] OR "kirgizstan"[Text Word] OR "kyrgyz republic"[Text Word] OR "kirghiz"[Text Word] OR "laos"[Text Word] OR "lao pdr"[Text Word] OR "lao people s democratic republic"[Text Word] OR "latvia"[Text Word] OR "lebanon"[Text Word] OR "lesotho"[Text Word] OR "basutoland"[Text Word] OR "liberia"[Text Word] OR "libya"[Text Word] OR "libyan arab jamahiriya"[Text Word] OR "lithuania"[Text Word] OR "macau"[Text Word] OR "macao"[Text Word] OR "macedonia"[Text Word] OR "madagascar"[Text Word] OR "malagasy republic"[Text Word] OR "malawi"[Text Word] OR "nyasaland"[Text Word] OR "malaysia"[Text Word] OR "maldives"[Text Word] OR "indian ocean"[Text Word] OR "mali"[Text Word] OR "malta"[Text Word] OR "micronesia"[Text Word] OR "kiribati"[Text Word] OR "marshall islands"[Text Word] OR "nauru"[Text Word] OR "northern mariana islands"[Text Word] OR "palau"[Text Word] OR "tuvalu"[Text Word] OR "mauritania"[Text Word] OR "mauritius"[Text Word] OR "mexico"[Text Word] OR "moldova"[Text Word] OR "moldovian"[Text Word] OR "mongolia"[Text Word] OR "montenegro"[Text Word] OR "morocco"[Text Word] OR "ifni"[Text Word] OR "mozambique"[Text Word] 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islands"[Text Word] OR "sao tome and principe"[Text Word] OR "saudi arabia"[Text Word] OR "senegal"[Text Word] OR "serbia"[Text Word] OR "seychelles"[Text Word] OR "sierra leone"[Text Word] OR "slovakia"[Text Word] OR "slovak republic"[Text Word] OR "slovenia"[Text Word] OR "melanesia"[Text Word] OR "solomon island"[Text Word] OR "solomon islands"[Text Word] OR "norfolk island"[Text Word] OR "somalia"[Text Word] OR "south africa"[Text Word] OR "south sudan"[Text Word] OR "sri lanka"[Text Word] OR "ceylon"[Text Word] OR "saint kitts and nevis"[Text Word] OR "st kitts and nevis"[Text Word] OR "St. Lucia"[Text Word] OR "st lucia"[Text Word] OR "saint vincent"[Text Word] OR "st vincent"[Text Word] OR "grenadines"[Text Word] OR "sudan"[Text Word] OR "suriname"[Text Word] OR "surinam"[Text Word] OR "syria"[Text Word] OR "syrian arab republic"[Text Word] OR "tajikistan"[Text Word] OR "tadjikistan"[Text Word] OR "tadzhikistan"[Text Word] OR "tadzhik"[Text Word] OR "tanzania"[Text Word] OR "tanganyika"[Text Word] OR "thailand"[Text Word] OR "siam"[Text Word] OR "timor leste"[Text Word] OR "east timor"[Text Word] OR "togo"[Text Word] OR "togolese republic"[Text Word] OR "tonga"[Text Word] OR "trinidad"[Text Word] OR "tobago"[Text Word] OR "tunisia"[Text Word] OR "turkey"[Text Word] OR "turkmenistan"[Text Word] OR "turkmen"[Text Word] OR "uganda"[Text Word] OR "ukraine"[Text Word] OR "uruguay"[Text Word] OR "uzbekistan"[Text Word] OR "uzbek"[Text Word] OR "vanuatu"[Text Word] OR "new hebrides"[Text Word] OR "venezuela"[Text Word] OR "viet nam"[Text Word] OR "viet nam"[Text Word] OR "middle east"[Text Word] OR "west bank"[Text Word] OR "gaza"[Text Word] OR "palestine"[Text Word] OR "yemen"[Text Word] OR "yugoslavia"[Text Word] OR "zambia"[Text Word] OR "zimbabwe"[Text Word] OR "northern rhodesia"[Text Word] OR "global south"[Text Word] OR "africa south of the sahara"[Text Word] OR "sub saharan africa"[Text Word] OR "subsaharan africa"[Text Word] OR "central africa"[Text Word] OR "north africa"[Text Word] OR "northern africa"[Text Word] OR "magreb"[Text Word] OR "maghrib"[Text Word] OR "sahara"[Text Word] OR "southern africa"[Text Word] OR "east africa"[Text Word] OR "eastern africa"[Text Word] OR "west africa"[Text Word] OR "western africa"[Text Word] OR "west indies"[Text Word] OR "indian ocean islands"[Text Word] OR "caribbean"[Text Word] OR "central america"[Text Word] OR "latin america"[Text Word] OR "south america"[Text Word] OR "central asia"[Text Word] OR "north asia"[Text Word] OR "northern asia"[Text Word] OR "southeastern asia"[Text Word] OR "south eastern asia"[Text Word] OR "southeast asia"[Text Word] OR "south east asia"[Text Word] OR "western asia"[Text Word] OR "east europe"[Text Word] OR "eastern europe"[Text Word] OR "developing country"[Text Word] OR "developing countries"[Text Word] OR "developing nation"[Text Word] OR "developing nations"[Text Word] OR "developing population"[Text Word] OR "developing populations"[Text Word] OR "developing world"[Text Word] OR "less developed country"[Text Word] OR "less developed countries"[Text Word] OR "less developed nation"[Text Word] OR "less developed nations"[Text Word] OR "less developed world"[Text Word] OR "lesser developed countries"[Text Word] OR "lesser developed nations"[Text Word] OR "under developed country"[Text Word] OR "under developed countries"[Text Word] OR "under developed nations"[Text Word] OR "under developed world"[Text Word] OR "underdeveloped country"[Text Word] OR "underdeveloped countries"[Text Word] OR "underdeveloped nation"[Text Word] OR "underdeveloped nations"[Text Word] OR "underdeveloped population"[Text Word] OR "underdeveloped populations"[Text Word] OR "underdeveloped world"[Text Word] OR "middle income country"[Text Word] OR "middle income countries"[Text Word] OR "middle income nation"[Text Word] OR "middle income nations"[Text Word] OR "middle income population"[Text Word] OR "middle income populations"[Text Word] OR "low income country"[Text Word] OR "low income countries"[Text Word] OR "low income nation"[Text Word] OR "low income nations"[Text Word] OR "low income population"[Text Word] OR "low income populations"[Text Word] OR "lower income country"[Text Word] OR "lower income countries"[Text Word] OR "lower income nations"[Text Word] OR "lower income population"[Text Word] OR "lower income populations"[Text Word] OR "underserved countries"[Text Word] OR "underserved nations"[Text Word] OR "underserved population"[Text Word] OR "underserved populations"[Text Word] OR "under served population"[Text Word] OR "under served populations"[Text Word] OR "deprived countries"[Text Word] OR "deprived population"[Text Word] OR "deprived populations"[Text Word] OR "poor country"[Text Word] OR "poor countries"[Text Word] OR "poor nation"[Text Word] OR "poor nations"[Text Word] OR "poor population"[Text Word] OR "poor populations"[Text Word] OR

"poor world"[Text Word] OR "poorer countries"[Text Word] OR "poorer nations"[Text Word] OR "poorer population"[Text Word] OR "poorer populations"[Text Word] OR "developing economy"[Text Word] OR "developing economies"[Text Word] OR "less developed economy"[Text Word] OR "less developed economies"[Text Word] OR "underdeveloped economies"[Text Word] OR "middle income economy"[Text Word] OR "middle income economies"[Text Word] OR "low income economy"[Text Word] OR "low income economies"[Text Word] OR "lower income economies"[Text Word] OR "low gdp"[Text Word] OR "low gnp"[Text Word] OR "low gross domestic"[Text Word] OR "low gross national"[Text Word] OR "lower gdp"[Text Word] OR "lower gross domestic"[Text Word] OR "lmic"[Text Word] OR "lmics"[Text Word] OR "third world"[Text Word] OR "lami country"[Text Word] OR "lami countries"[Text Word] OR "transitional country"[Text Word] OR "transitional countries"[Text Word] OR "emerging economies"[Text Word] OR "emerging nation"[Text Word] OR "emerging nations"[Text Word])

Filters: Adult: 19+ years

Effectiveness (Health outcomes)

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Outcome Assessment, Health Care"[Mesh] OR "health care outcome assessment" OR "health outcomes" OR "Retention in Care"[Mesh] OR "retention in care" OR "care retention" OR "Quality-Adjusted Life Years"[Mesh] OR "quality-adjusted life years" OR "adjusted life years" OR "QUALYs" OR "QALYs" OR "Disability-Adjusted Life Years"[Mesh] OR "disability-adjusted life years" OR "Years Lived With Disability" OR "DALYs") AND (y_10[Filter])

AND ("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH Terms] OR "guyana"[MeSH Terms] OR "haiti"[MeSH Terms] OR "honduras"[MeSH Terms] OR "hungary"[MeSH Terms] OR "india"[MeSH Terms] OR "indonesia"[MeSH Terms] OR "iran"[MeSH Terms] OR "iraq"[MeSH Terms] OR "jamaica"[MeSH Terms] OR "jordan"[MeSH Terms] OR "kazakhstan"[MeSH Terms] OR "kenya"[MeSH Terms] OR "democratic people s republic of korea"[MeSH Terms] OR "republic of korea"[MeSH Terms] OR "kosovo"[MeSH Terms] OR "kyrgyzstan"[MeSH Terms] OR "laos"[MeSH Terms] OR "latvia"[MeSH Terms] OR "lebanon"[MeSH Terms] OR "lesotho"[MeSH Terms] OR "liberia"[MeSH Terms] OR "libya"[MeSH Terms] OR "lithuania"[MeSH Terms] OR "macau"[MeSH Terms] OR "republic of north macedonia"[MeSH Terms] OR "madagascar"[MeSH Terms] OR "malawi"[MeSH Terms] OR "malaysia"[MeSH Terms] OR "indian ocean islands"[MeSH Terms] OR "mali"[MeSH Terms] OR "malta"[MeSH Terms] OR "micronesia"[MeSH Terms] OR "palau"[MeSH Terms] OR "mauritania"[MeSH Terms] OR "mauritius"[MeSH Terms] OR "mexico"[MeSH Terms] OR "moldova"[MeSH Terms] OR "mongolia"[MeSH Terms] OR "montenegro"[MeSH Terms] OR "morocco"[MeSH Terms] OR "mozambique"[MeSH Terms] OR "myanmar"[MeSH Terms] OR "namibia"[MeSH Terms] OR "nepal"[MeSH Terms] OR "netherlands antilles"[MeSH Terms] OR "nicaragua"[MeSH Terms] OR "niger"[MeSH Terms] OR "nigeria"[MeSH Terms] OR "oman"[MeSH Terms] OR "pakistan"[MeSH Terms] OR "panama"[MeSH Terms] OR "papua new guinea"[MeSH Terms] OR "paraguay"[MeSH Terms] OR "peru"[MeSH Terms] OR "philippines"[MeSH Terms] OR "poland"[MeSH Terms] OR "portugal"[MeSH Terms] OR "puerto rico"[MeSH Terms] OR "romania"[MeSH Terms] OR "russia"[MeSH Terms] OR "rwanda"[MeSH Terms] OR "samoa"[MeSH Terms] OR "sao tome and principe"[MeSH Terms] OR "saudi arabia"[MeSH Terms] OR "senegal"[MeSH Terms] OR "serbia"[MeSH Terms] OR "seychelles"[MeSH Terms] OR "sierra leone"[MeSH Terms] OR "slovakia"[MeSH Terms] OR "slovenia"[MeSH Terms] OR

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Filters: Adult: 19+ years

Adoption

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Guideline Adherence"[Mesh] OR "guideline adherence" OR "guideline compliance" OR "policy compliance") AND (y_10[Filter])

("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo

verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH Terms] OR "guyana"[MeSH Terms] OR "haiti"[MeSH Terms] OR "honduras"[MeSH Terms] OR "hungary"[MeSH Terms] OR "india"[MeSH Terms] OR "indonesia"[MeSH Terms] OR "iran"[MeSH Terms] OR "iraq"[MeSH Terms] OR "jamaica"[MeSH Terms] OR "jordan"[MeSH Terms] OR "kazakhstan"[MeSH Terms] OR "kenya"[MeSH Terms] OR "democratic people s republic of korea"[MeSH Terms] OR "republic of korea"[MeSH Terms] OR "kosovo"[MeSH Terms] OR "kyrgyzstan"[MeSH Terms] OR "laos"[MeSH Terms] OR "latvia"[MeSH Terms] OR "lebanon"[MeSH Terms] OR "lesotho"[MeSH Terms] OR "liberia"[MeSH Terms] OR "libya"[MeSH Terms] OR "lithuania"[MeSH Terms] OR "macau"[MeSH Terms] OR "republic of north 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"sudan"[Text Word] OR "suriname"[Text Word] OR "surinam"[Text Word] OR "syria"[Text Word] OR "syrian arab republic"[Text Word] OR "tajikistan"[Text Word] OR "tadjikistan"[Text Word] OR "tadzhikistan"[Text Word] OR "tadzhik"[Text Word] OR "tanzania"[Text Word] OR "tanganyika"[Text Word] OR "thailand"[Text Word] OR "siam"[Text Word] OR "timor leste"[Text Word] OR "east timor"[Text Word] OR "togo"[Text Word] OR "togolese republic"[Text Word] OR "tonga"[Text Word] OR "trinidad"[Text Word] OR "tobago"[Text Word] OR "tunisia"[Text Word] OR "turkey"[Text Word] OR "turkmenistan"[Text Word] OR "turkmen"[Text Word] OR "uganda"[Text Word] OR "ukraine"[Text Word] OR "uruguay"[Text Word] OR "uzbekistan"[Text Word] OR "uzbek"[Text Word] OR "vanuatu"[Text Word] OR "new hebrides"[Text Word] OR "venezuela"[Text Word] OR "viet nam"[Text Word] OR "viet nam"[Text Word] OR "middle east"[Text Word] OR "west bank"[Text Word] OR "gaza"[Text Word] OR "palestine"[Text Word] OR "yemen"[Text Word] OR 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europe"[Text Word] OR "eastern europe"[Text Word] OR "developing country"[Text Word] OR "developing countries"[Text Word] OR "developing nation"[Text Word] OR "developing nations"[Text Word] OR "developing population"[Text Word] OR "developing populations"[Text Word] OR "developing world"[Text Word] OR "less developed country"[Text Word] OR "less developed countries"[Text Word] OR "less developed nation"[Text Word] OR "less developed nations"[Text Word] OR "less developed world"[Text Word] OR "lesser developed countries"[Text Word] OR "lesser developed nations"[Text Word] OR "under developed country"[Text Word] OR "under developed countries"[Text Word] OR "under developed nations"[Text Word] OR "under developed world"[Text Word] OR "underdeveloped country"[Text Word] OR "underdeveloped countries"[Text Word] OR "underdeveloped nation"[Text Word] OR "underdeveloped nations"[Text Word] OR "underdeveloped population"[Text Word] OR "underdeveloped populations"[Text Word] OR "underdeveloped 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populations"[Text Word] OR "poor country"[Text Word] OR "poor countries"[Text Word] OR "poor nation"[Text Word] OR "poor nations"[Text Word] OR "poor population"[Text Word] OR "poor populations"[Text Word] OR "poor world"[Text Word] OR "poorer countries"[Text Word] OR "poorer nations"[Text Word] OR "poorer population"[Text Word] OR "poorer populations"[Text Word] OR "developing economy"[Text Word] OR "developing economies"[Text Word] OR "less developed economy"[Text Word] OR "less developed economies"[Text Word] OR "underdeveloped economies"[Text Word] OR "middle income economy"[Text Word] OR "middle income economies"[Text Word] OR "low income economy"[Text Word] OR "low income economies"[Text Word] OR "lower income economies"[Text Word] OR "low gdp"[Text Word] OR "low gnp"[Text Word] OR "low gross domestic"[Text Word] OR "low gross national"[Text Word] OR "lower gdp"[Text Word] OR "lower gross domestic"[Text

Word] OR "lmic"[Text Word] OR "lmics"[Text Word] OR "third world"[Text Word] OR "lami country"[Text Word] OR "lami countries"[Text Word] OR "transitional country"[Text Word] OR "transitional countries"[Text Word] OR "emerging economies"[Text Word] OR "emerging nation"[Text Word] OR "emerging nations"[Text Word])

Filters: Adult: 19+ years

Implementation

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Quality of Health Care"[Mesh] OR "quality of health care" OR "quality of care" OR "quality of care outcomes" OR "care quality" OR "Referral and Consultation"[Mesh] OR "referral and consultations" OR "referral" OR "referral process" OR "second opinion" OR "Insurance Selection Bias"[Mesh] OR "insurance selection bias" OR "enrollment bias" OR "enrollment barrier" OR "Time-to-Treatment"[Mesh] OR "time-to-treatment" OR "time to treatment" OR "treatment delays" OR "Patient Satisfaction"[Mesh] OR "patient satisfaction" OR "Patient Reported Outcome Measures"[Mesh] OR "patient reported outcome measures" OR "patient reported satisfaction") AND (y_10[Filter])

("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH Terms] OR "guyana"[MeSH Terms] OR "haiti"[MeSH Terms] OR "honduras"[MeSH Terms] OR "hungary"[MeSH Terms] OR "india"[MeSH Terms] OR "indonesia"[MeSH Terms] OR "iran"[MeSH Terms] OR "iraq"[MeSH Terms] OR "jamaica"[MeSH Terms] OR "jordan"[MeSH Terms] OR "kazakhstan"[MeSH Terms] OR "kenya"[MeSH Terms] OR "democratic people s republic of korea"[MeSH Terms] OR "republic of korea"[MeSH Terms] OR "kosovo"[MeSH Terms] OR "kyrgyzstan"[MeSH Terms] OR "laos"[MeSH Terms] OR "latvia"[MeSH Terms] OR "lebanon"[MeSH Terms] OR "lesotho"[MeSH Terms] OR "liberia"[MeSH Terms] OR "libya"[MeSH Terms] OR "lithuania"[MeSH Terms] OR "macau"[MeSH Terms] OR "republic of north macedonia"[MeSH Terms] OR "madagascar"[MeSH Terms] OR "malawi"[MeSH Terms] OR "malaysia"[MeSH Terms] OR "indian ocean islands"[MeSH Terms] OR "mali"[MeSH Terms] OR "malta"[MeSH Terms] OR "micronesia"[MeSH Terms] OR "palau"[MeSH Terms] OR "mauritania"[MeSH Terms] OR "mauritius"[MeSH Terms] OR "mexico"[MeSH Terms] OR "moldova"[MeSH Terms] OR "mongolia"[MeSH Terms] OR "montenegro"[MeSH Terms] OR "morocco"[MeSH Terms] OR "mozambique"[MeSH Terms] OR "myanmar"[MeSH Terms] OR "namibia"[MeSH Terms] OR "nepal"[MeSH Terms] OR "netherlands antilles"[MeSH Terms] OR "nicaragua"[MeSH Terms] OR "niger"[MeSH Terms] OR "nigeria"[MeSH Terms] OR "oman"[MeSH Terms] OR "pakistan"[MeSH Terms] OR "panama"[MeSH Terms] OR "papua new guinea"[MeSH Terms] OR "paraguay"[MeSH Terms] OR "peru"[MeSH Terms] OR "philippines"[MeSH Terms] OR "poland"[MeSH Terms] OR "portugal"[MeSH Terms] OR "puerto rico"[MeSH Terms] OR "romania"[MeSH Terms] OR "russia"[MeSH Terms] OR "rwanda"[MeSH Terms] OR "samoa"[MeSH Terms] OR "sao tome and principe"[MeSH Terms] OR "saudi arabia"[MeSH Terms] OR "senegal"[MeSH Terms] OR "serbia"[MeSH Terms] OR "seychelles"[MeSH Terms] OR "sierra leone"[MeSH Terms] OR "slovakia"[MeSH Terms] OR "slovenia"[MeSH Terms] OR "melanesia"[MeSH Terms] OR "somalia"[MeSH Terms] OR "south africa"[MeSH Terms] OR "south sudan"[MeSH Terms] OR "sri lanka"[MeSH Terms] OR "saint kitts and nevis"[MeSH Terms] OR "St. Lucia"[MeSH Terms] OR "saint vincent and the grenadines"[MeSH Terms] OR "sudan"[MeSH Terms] OR "suriname"[MeSH Terms] OR "syria"[MeSH Terms] OR "tajikistan"[MeSH Terms] OR "tanzania"[MeSH Terms] OR "thailand"[MeSH Terms] OR "timor leste"[MeSH Terms] OR "togo"[MeSH Terms] OR "tonga"[MeSH Terms] OR "trinidad and tobago"[MeSH Terms] OR "tunisia"[MeSH Terms] OR "turkey"[MeSH Terms] OR "turkmenistan"[MeSH Terms] OR "uganda"[MeSH Terms] OR "ukraine"[MeSH Terms] OR "uruguay"[MeSH Terms] OR

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Filters: Adult: 19+ years

Maintenance

("Primary Health Care"[Mesh] OR "Care, Primary Health" OR "Health Care, Primary" OR "Primary Healthcare" OR "Healthcare, Primary" OR "Primary Care" OR "Care, Primary") AND ("Diabetes Mellitus"[Mesh] OR Diabetes OR "Hypertension"[Mesh] OR "Blood Pressure, High" OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Cardiovascular Diseases"[Mesh] OR "Cardiovascular Disease" OR "Disease, Cardiovascular" OR "Diseases, Cardiovascular" OR "Pulmonary Disease, Chronic Obstructive"[Mesh] OR "Chronic Obstructive Lung Disease" OR "Chronic Obstructive Pulmonary Diseases" OR "COAD" OR "COPD" OR "Chronic Obstructive Airway Disease" OR "Chronic Obstructive Pulmonary Disease" OR "Airflow Obstruction, Chronic" OR "Airflow Obstructions, Chronic" OR "Chronic Airflow Obstructions" OR "Chronic Airflow Obstruction" OR "Mental Disorders"[Mesh] OR "Mental Disorder" OR "Psychiatric Illness" OR "Psychiatric Illnesses" OR "Psychiatric Diseases" OR "Psychiatric Disease" OR "Mental Illness" OR "Illness, Mental" OR "Mental Illnesses" OR "Psychiatric Disorders" OR "Psychiatric Disorder" OR "Behavior Disorders" OR "Diagnosis, Psychiatric" OR "Psychiatric Diagnosis" OR "Mental Disorders, Severe" OR "Mental Disorder, Severe" OR "Severe Mental Disorder" OR "Severe Mental Disorders") AND ("Costs and Cost Analysis"[Mesh] OR "costs and cost analysis" OR "cost" OR "cost analysis" OR "cost comparison" OR "affordability" OR "cost measures" OR "pricing" OR "Cost-Effectiveness Analysis"[Mesh] OR "cost-effectiveness analysis" OR "cost effectiveness" OR "cost effectiveness ratio" OR "Cost-Benefit Analysis"[Mesh] OR "cost-benefit analysis" OR "cost benefit" OR “cost-benefit ratio” OR "cost utility analysis" OR "benefits and costs" OR "marginal analysis" OR "economic evaluations") AND (y_10[Filter])

AND ("afghanistan"[MeSH Terms] OR "albania"[MeSH Terms] OR "algeria"[MeSH Terms] OR "american samoa"[MeSH Terms] OR "angola"[MeSH Terms] OR "antigua and barbuda"[MeSH Terms] OR "argentina"[MeSH Terms] OR "armenia"[MeSH Terms] OR "aruba"[MeSH Terms] OR "azerbaijan"[MeSH Terms] OR "bahrain"[MeSH Terms] OR "bangladesh"[MeSH Terms] OR "barbados"[MeSH Terms] OR "republic of belarus"[MeSH Terms] OR "belize"[MeSH Terms] OR "benin"[MeSH Terms] OR "bhutan"[MeSH Terms] OR "bolivia"[MeSH Terms] OR "bosnia and herzegovina"[MeSH Terms] OR "botswana"[MeSH Terms] OR "brazil"[MeSH Terms] OR "bulgaria"[MeSH Terms] OR "burkina faso"[MeSH Terms] OR "burundi"[MeSH Terms] OR "cabo verde"[MeSH Terms] OR "cambodia"[MeSH Terms] OR "cameroon"[MeSH Terms] OR "central african republic"[MeSH Terms] OR "chad"[MeSH Terms] OR "chile"[MeSH Terms] OR "china"[MeSH Terms] OR "colombia"[MeSH Terms] OR "comoros"[MeSH Terms] OR "democratic republic of the congo"[MeSH Terms] OR "congo"[MeSH Terms] OR "costa rica"[MeSH Terms] OR "cote d ivoire"[MeSH Terms] OR "croatia"[MeSH Terms] OR "cuba"[MeSH Terms] OR "cyprus"[MeSH Terms] OR "czech republic"[MeSH

Terms] OR "djibouti"[MeSH Terms] OR "dominica"[MeSH Terms] OR "dominican republic"[MeSH Terms] OR "ecuador"[MeSH Terms] OR "egypt"[MeSH Terms] OR "el salvador"[MeSH Terms] OR "equatorial guinea"[MeSH Terms] OR "eritrea"[MeSH Terms] OR "estonia"[MeSH Terms] OR "eswatini"[MeSH Terms] OR "ethiopia"[MeSH Terms] OR "fiji"[MeSH Terms] OR "gabon"[MeSH Terms] OR "gambia"[MeSH Terms] OR ("georgia"[MeSH Terms] OR "georgia"[All Fields] OR "georgia republic"[MeSH Terms] OR ("georgia"[All Fields] AND "republic"[All Fields]) OR "georgia republic"[All Fields] OR "georgia s"[All Fields])) AND ("republic"[All Fields] OR "republic s"[All Fields] OR "republics"[All Fields])) OR "ghana"[MeSH Terms] OR "gibraltar"[MeSH Terms] OR "greece"[MeSH Terms] OR "grenada"[MeSH Terms] OR "guam"[MeSH Terms] OR "guatemala"[MeSH Terms] OR "guinea"[MeSH Terms] OR "guinea bissau"[MeSH Terms] OR "guyana"[MeSH Terms] OR "haiti"[MeSH Terms] OR "honduras"[MeSH Terms] OR "hungary"[MeSH Terms] OR "india"[MeSH Terms] OR 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"sudan"[MeSH Terms] OR "suriname"[MeSH Terms] OR "syria"[MeSH Terms] OR "tajikistan"[MeSH Terms] OR "tanzania"[MeSH Terms] OR "thailand"[MeSH Terms] OR "timor leste"[MeSH Terms] OR "togo"[MeSH Terms] OR "tonga"[MeSH Terms] OR "trinidad and tobago"[MeSH Terms] OR "tunisia"[MeSH Terms] OR "turkey"[MeSH Terms] OR "turkmenistan"[MeSH Terms] OR "uganda"[MeSH Terms] OR "ukraine"[MeSH Terms] OR "uruguay"[MeSH Terms] OR "uzbekistan"[MeSH Terms] OR "vanuatu"[MeSH Terms] OR "venezuela"[MeSH Terms] OR "viet nam"[MeSH Terms] OR "middle east"[MeSH Terms] OR "yemen"[MeSH Terms] OR "yugoslavia"[MeSH Terms] OR "zambia"[MeSH Terms] OR "zimbabwe"[MeSH Terms] OR "africa south of the sahara"[MeSH Terms] OR "africa, central"[MeSH Terms] OR "africa, northern"[MeSH Terms] OR "africa, southern"[MeSH Terms] OR "africa, eastern"[MeSH Terms] OR "africa, western"[MeSH Terms] OR "west indies"[MeSH Terms] OR "indian ocean islands"[MeSH Terms] OR "caribbean region"[MeSH Terms] OR "central america"[MeSH Terms] OR "latin america"[MeSH Terms] OR "south america"[MeSH Terms] OR "asia, central"[MeSH Terms] OR "asia, northern"[MeSH Terms] OR "asia, southeastern"[MeSH Terms] OR "asia, western"[MeSH Terms] OR "europe, eastern"[MeSH Terms] OR "developing countries"[MeSH Terms] OR ("afghanistan"[Text Word] OR "albania"[Text Word] OR "algeria"[Text Word] OR "american samoa"[Text Word] OR "angola"[Text Word] OR "antigua"[Text Word] OR "barbuda"[Text Word] OR "argentina"[Text Word] OR "armenia"[Text Word] OR "armenian"[Text Word] OR "aruba"[Text Word] OR "azerbaijan"[Text Word] OR "bahrain"[Text Word] OR "bangladesh"[Text Word] OR "barbados"[Text Word] OR "belarus"[Text Word] OR "byelarus"[Text Word] OR "belorussia"[Text Word] OR "byelorussian"[Text Word] OR "belize"[Text Word] OR "british honduras"[Text Word] OR "benin"[Text Word] OR "dahomey"[Text Word] OR "bhutan"[Text Word] OR "bolivia"[Text Word] OR "bosnia"[Text Word] OR "herzegovina"[Text Word] OR "botswana"[Text Word] OR "bechuanaland"[Text Word] OR 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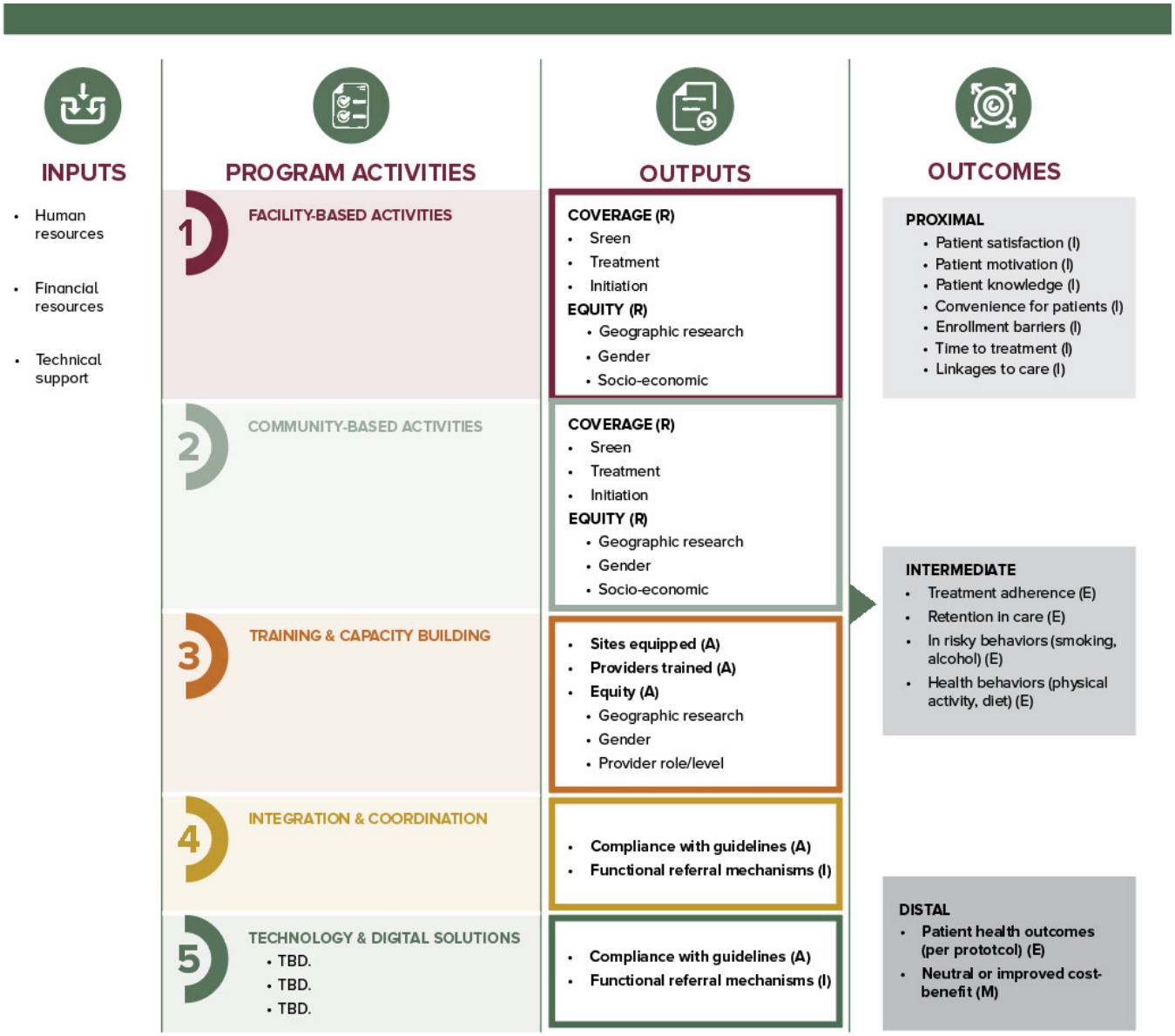
Filters: Adult: 19+ years

2. DEFINITION OF KEY ITEMS IN THE DATA COLLECTION PROCESS FOR THE SYSTEMATIC REVIEW

Table 4. Definition of data items extracted from sources for the systematic review

	Data field in model matrix	Definition
1	Case study number	Case study number associated with source. Numbers starting with 2 indicate a short case study; those starting with 5 indicate an in-depth case study
2	Covidence number	Five-digit number linking source to the systematic review software
3	Author year	Last name of first author followed by the year published (YYYY)
4	Publication year	Year published (YYYY)
5	Source title	Entire title of the source
6	Source abstract	Entire abstract of the source
7	Region	Region of the world where model is implemented
8	Country	Country or countries where model is implemented
9	Economy	Classification as: low income, lower-middle income, upper-middle income, or combined/multi-income (for multi-country models)
10	Targeted NCD focus	Includes all targeted NCDs
11	Model name	Full name and acronym when available
12	Model mechanism	Primary and secondary mechanisms categorized as: task-shifting/task-sharing, integrated care teams, education/training, mobile health, new services and/or conditions integrated into existing delivery model, community-based services
13	Aim of model	Primary aim of the model
14	Partners involved	Described as governments, implementing partners, funders, etc.
15	Geographical setting	Primary geographical setting for service delivery categorized as: rural, urban, peri-urban, mixed, sub-urban, or not specified
16	Health care setting	Described as primary care clinics, community setting, hospital, etc.
17	Scale of model	Scale categorized as: single center, small- to medium-scale, large-scale, national, or multi-country
18	Target population	Description of target population, including age and health status of cohort
19	Study design	Type of study used to evaluate the model
20	Year enrollment started	In format of YYYY
21	Year enrollment ended	In format of YYYY
22	Period of follow-up	Time patients were followed
23	Total # of subjects	
24	Biological sex (% female)	
25	Control/unexposed group	Description of the control group when appropriate
26	Specific aim of study	
27	Human resources used	
28	Laboratory services used	
29	Diagnostic services used	Includes technologies, screening tools, etc. used to diagnose NCDs
30	Pharmacy services used	
31	Digital solutions used	
32	Outcomes	Extensive process and outcome indicators (detailed in Table 2) and estimates

3. LOGIC MODEL TEMPLATE



4. SUMMARY OF DIGITAL HEALTH INTERVENTIONS

This appendix summarizes the digital components of models that utilize digital health interventions (DHIs) to support NCD service delivery (n=31). For each case study, the model's digital components are mapped to the relevant DHI classification, health system strengthening (HSS) objective, and system category, following the WHO Classification of Digital Health Interventions v1.0.

East Asia and Pacific

System-integrated and Technology-enabled Model of Care (SINEMA) in China

Digital component of model	DHI classification	HSS objective	System category
Component 1. Patient data collected through the SINEMA app.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 2. Follow-up visit schedules and health education information provided through the SINEMA app based on clinical algorithms and patient data.	Health care provider decision support	Improve adherence to guidelines; improve quality of provider-patient communication	Decision support
Component 3. Performance-based financing rates for village doctors based on SINEMA app data.	Health care provider training	Improve supportive supervision	Client application
Component 4. Patients send daily educational voice messages through third-party dispatching platform linked to the SINEMA app.	Targeted client communication	Strengthen patient knowledge; improve patient engagement	Client communication system
Component 5. Weekly village doctors group activities organized through WeChat.	Health care provider communication	Strengthen support for providers	Client communication system

Cardiovascular Risk Factors Intervention Strategies (CORFIS) Model in Malaysia

Digital component of model	DHI classification	HSS objective	System category
Component 1. Telemedicine services by trained nurse advisors.	Telemedicine	Strengthen patient treatment adherence; improve patient engagement	Telemedicine
Component 2. Secure web-based application to collect patient data, coordinate care among providers, and share medical records with patients.	Personal health tracking; client health records; referral coordination	Improve access to and utilization of information or data; strengthen coordination of care and referrals; improve patient engagement	Electronic medical record
Component 3. Reminders to both providers and patients on specific actions to take (e.g., clinical visit appointments, blood sampling needed, and home monitoring) through secure web-based application.	Targeted client communication; health care provider decision support	Reduce loss to follow-up; improve patient engagement; improve adherence to guidelines	Client communication system

EffectiveNess of LIfestyle with Diet and Physical Activity Education ProGram Among Prehypertensive and HyperTENsives (ENLIGHTEN) Model in the Philippines

Digital component of model	DHI classification	HSS objective	System category
Participants received monthly health education lectures and were sent health education information and appointment notifications via text messages or phone calls.	Targeted client communication	Strengthen patient knowledge; improve patient engagement; reduce loss to follow-up	Client communication system

Communities for Healthy Viet Nam Model

Digital component of model	DHI classification	HSS objective	System category
Component 1. eHypertension Tracker developed as a searchable, online registry of hypertensive patients.	Client health records; data collection, management, and use	Improve access to and utilization of information or data; strengthen coordination of care and referrals	Electronic medical record; health management information system; public health and disease surveillance system
Component 2. Healthy App mobile app provided health education and diagnosis and treatment information to patients. Patients received support and referrals through the app and inputed information on appointments, treatment, and blood pressure measures. Appointment and adherence SMS reminders sent to patients through the app.	Targeted client communication; personal health tracking; on-demand information services to clients; referral coordination	Strengthen patient knowledge; improve patient engagement; reduce loss to follow-up; strengthen patient treatment adherence; strengthen coordination of care and referrals	Client applications; client communication system

Latin America and the Caribbean

DIAbetes Primary Care, Registry, Education, and Management (DIAPREM) Model in Argentina

Digital component of model	DHI classification	HSS objective	System category
Component 1. Online training for physicians to effectively manage diabetes using treatment algorithms.	Health care provider training	Improve adherence to guidelines	Learning and training system
Component 2. Structured patient registry established to track patient progress and prompt clinicians on best clinical care practices for patients not reaching treatment targets.	Client health records; health care provider decision support	Improve access to and utilization of information or data	Electronic medical record; decision support

Model for the Care of Individuals with Chronic Diseases (MAPEC)-Salta in Argentina

Digital component of model	DHI classification	HSS objective	System category
Component 1. Clinical practice guidelines on hypertension available on office computers.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 2. WhatsApp groups used to share updates, reminders, and information on events with patients.	Targeted client communication	Improve patient engagement	Client communication system

HealthRise Model for Hypertension and Diabetes in Brazil, India, South Africa, and the United States

Digital component of model	DHI classification	HSS objective	System category
Component 1. Technologies to better coordinate care (computers, tablets, internet).	Health care provider communication; referral coordination	Strengthen coordination of care and referrals	Telemedicine, decision support, electronic medical record
Component 2. Clinical decision support systems for clinicians.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 3. Digital screening and job aid tools on promoting healthy lifestyles for CHWs.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 4. Web-based medical record system.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 5. Mobile health text messages to patients.	Targeted client communication	Strengthen patient treatment adherence; reduce loss to follow-up	Client communication system

Detection and Integrated Care for Depression and Alcohol Use in Primary Care (DIADA) Model in Colombia

Digital component of model	DHI classification	HSS objective	System category
Component 1. Patients screened for depression and alcohol use disorder using waiting room kiosks.	Health worker activity planning and scheduling; Telemedicine	Improve workflow management	Telemedicine; decision support
Component 2. Tablet-based clinical decision support system used to guide diagnosis of depression and alcohol use disorder.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 3. Digital therapeutic software called Laddr offered evidence-based behavioral therapy.	On-demand information services to clients	Improve patient engagement	Learning and training system

Community-oriented PHC Model for NCD Care in Costa Rica

Digital component of model	DHI classification	HSS objective	System category
Electronic medical record used by Equipos Basicos de Atencion Integral en Salud, or EBAIS, team, with health area and EBAIS team performance assessed against target.	Client health records; health care provider training	Improve access to and utilization of information or data; improve supportive supervision	Electronic medical record

Integrated Measurement for Early Detection (MIDO) Model in Mexico

Digital component of model	DHI classification	HSS objective	System category
Component 1. First national registry of NCDs, the Sistema Nominal de Información en Crónicas, used to provide continuity of care for NCDs across all levels of the public health system.	Client health records; data collection, management, and use	Improve access to and utilization of information or data; strengthen coordination of care and referrals	Electronic medical record; health management information system; public health and disease surveillance system
Component 2. Proprietary software called SI-MIDOTM used on computer, tablet, or mobile phone to assess patient risk, provide health education and counseling, and refer patients.	Health care provider decision support; referral coordination; targeted client communication	Improve adherence to guidelines; strengthen coordination of care and referrals; strengthen patient knowledge; improve patient engagement	Telemedicine; decision support

Diabetic Retinopathy Referral Network Model in Peru

Digital component of model	DHI classification	HSS objective	System category
Component 1. Electronic medical record for data management and coordinated care.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 2. Telemedicine technology for remote assessment and monitoring of diabetic retinopathy cases.	Telemedicine	Improve accessibility of services	Telemedicine
Component 3. Provider decision support systems for diagnosis and management of diabetic retinopathy.	Health care provider decision support	Improve adherence to guidelines	Decision support
Component 4. Social media was used for a public awareness campaign on diabetes and diabetic retinopathy.	Targeted client communication	Strengthen community awareness	Client communication system

HEARTS Initiative Model for Hypertension Care in St. Lucia

Digital component of model	DHI classification	HSS objective	System category
Component 1. Electronic health information system captured information from diabetes and hypertension registers, included electronic laboratory test requests, and provided indicator reports.	Client health records	Improve access to and utilization of information or data; strengthen coordination of care and referrals	Electronic medical record

Digital component of model	DHI classification	HSS objective	System category
Component 2. The electronic health information system also included the Finnish Diabetes Risk Score, or FINDRISC, calculator and a CVD risk calculator.	Health care provider decision support	Improve adherence to guidelines	Decision support

Latin America Telemedicine Infarct Network (LATIN) Model in Brazil, Colombia, Mexico, and Argentina

Digital component of model	DHI classification	HSS objective	System category
LATIN sites equipped with ECG devices connected through the internet to a remote diagnostic center, with result to be interpreted by remote cardiologists. Telemedicine company sent phone message to interventional cardiologist to communicate patient diagnosis with ST-segment elevation myocardial infarction, or STEMI, and emailed with brief clinical summary and ECG results.	Telemedicine	Improve accessibility of services; strengthen coordination of care and referrals	Telemedicine

Middle East and North Africa

Model for the Integration of Suicide Prevention into PHC in I. R. of Iran

Digital component of model	DHI classification	HSS objective	System category
Web-based registration program recorded statistics on suicide attempts and deaths, with data reported monthly through the routine health information system.	Data collection, management, and use	Improve access to and utilization of information or data	Health management information system; public health and disease surveillance system

South Asia

Service with Care and Compassion Initiative (SCCI) Model in Bhutan

Digital component of model	DHI classification	HSS objective	System category
District health offices established social group chats using WhatsApp to discuss patient cases, medication refills, and referrals.	Health care provider communication	Strengthen support for providers; strengthen coordination of care and referrals	Client application

mWellcare Model for Integrated Management of NCDs in India

Digital component of model	DHI classification	HSS objective	System category
Component 1. mWellCare mobile app generated tailored and guideline-based recommendations for managing hypertension, diabetes, depression, and alcohol and tobacco use. mWellcare app also used to register patients, conduct initial patient evaluation, and generate decision support recommendations.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 2. mWellcare app stored electronic health records for all patients diagnosed with hypertension and diabetes.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 3. Patients sent customized SMS reminders to take medications and attend follow-up appointments through mWellcare app.	Targeted client communication	Reduce loss to follow-up; strengthen patient treatment adherence	Client communication system

Systematic Medical Appraisal, Referral, and Treatment (SMART) Mental Health Model in India

Digital component of model	DHI classification	HSS objective	System category
Component 1. Electronic decision support system facilitated screening, diagnosis, management, and referral of common mental disorders.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 2. Electronic decision support system developed on an OpenMRS medical record system platform and allowed clinical data to be shared between the ASHA and physician using cloud computing.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 3. Algorithm-based interactive voice response system sent pre-recorded messages to patients who screened positive for common mental health disorders to continue their care; ASHAs and physicians also received IVRS messages to facilitate follow-up and treatment adherence.	Targeted client communication; health care provider communication	Reduce loss to follow-up; strengthen patient treatment adherence	Client communication system

mPower Heart Model in India

Digital component of model	DHI classification	HSS objective	System category
Component 1. Mobile phone–based decision support system called mDSS used to generate personalized patient management plans.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support
Component 2. Electronic patient records generated within the mDSS.	Client health records	Improve access to and utilization of information or data	Electronic medical record

Public-private Partnership Model for Hypertension Care in Urban Pakistan

Digital component of model	DHI classification	HSS objective	System category
Patients who missed appointments received phone calls with appointment reminders.	Targeted client communication	Reduce loss to follow-up	Client communication system

Integrated Model for COPD and Asthma Care in Punjab, Pakistan

Digital component of model	DHI classification	HSS objective	System category
Patients who missed monthly follow-up appointments called or messaged by doctors and allied staff.	Targeted client communication	Reduce loss to follow-up	Client communication system

Sub-Saharan Africa

Integrated Primary Care Model for Hypertension and Diabetes Management in Conflict-affected Areas of the DRC

Digital component of model	DHI classification	HSS objective	System category
Program data was entered into EpiInfo7 for cohort monitoring to evaluate the program. A dashboard and monthly health facility reports were used to monitor program metrics.	Data collection, management, and use	Improve access to and utilization of information or data	Public health and disease surveillance system

Medication Adherence Club (MAC) Model for Hypertension, Diabetes, and HIV in Kibera, Kenya

Digital component of model	DHI classification	HSS objective	System category
Component 1. MAC database used to store information from patient-based records; electronic medical record data also used for MAC patients during traditional follow-up visits in the clinic.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 2. Health promotion staff reached out to MAC patients by SMS to confirm attendance at group visits.	Targeted client communication	improve patient engagement	Client communication system

Integrated Chronic Care Clinic (IC³) Model for HIV and NCDs in Malawi

Digital component of model	DHI classification	HSS objective	System category
Component 1. Comprehensive electronic medical record using OpenMRS for both HIV and chronic NCD care. Unified NCD mastercard implemented to combine all patient charts into one unique patient file.	Client health records	Improve access to and utilization of information or data	Electronic medical record
Component 2. Daily report piloted to capture number of patients seen, screened, and diagnosed with a new condition.	Data collection, management, and use	Improve access to and utilization of information or data	Public health and disease surveillance system

Mental Health in Primary Care (MeHPriC) Model in Nigeria

Digital component of model	DHI classification	HSS objective	System category
Patients receiving treatment were sent SMS reminders 24 hours before each appointment through a centralized, automated mobile telephone service. Patients who missed one appointment received a voice prompt. If they missed two appointments, patients received a phone call.	Targeted client communication	Reduce loss to follow-up	Client communication system

Nurse-led Model for Integrated NCD Care in Rural Rwanda

Digital component of model	DHI classification	HSS objective	System category
Disease-specific clinical forms integrated into the OpenMRS electronic medical record system.	Client health records	Improve access to and utilization of information or data; strengthen coordination of care and referrals	Electronic medical record; public health disease and surveillance system

Integrated Care Disease Management (ICDM) Model in South Africa

Digital component of model	DHI classification	HSS objective	System category
Component 1. Patient health record integrated into DHIS2 to ensure availability of comprehensive patient data.	Client health records	Improve access to and utilization of information or data	Electronic medical record; public health disease and surveillance system
Component 2. Mobile technology used to send patients reminders and health promotion information.	Targeted client communication	Reduce loss to follow-up; strengthen patient treatment adherence; strengthen patient knowledge	Client communication system
Component 3. Patient education materials disseminated through social media platforms.	Targeted client communication	Strengthen patient knowledge; improve patient engagement	Client communication system

Friendship Bench Model for Mental Health Care in Zimbabwe

Digital component of model	DHI classification	HSS objective	System category
Component 1. Cognitive behavioral therapy services provided via WhatsApp.	Telemedicine	Improve accessibility of services	Telemedicine
Component 2. Mobile app called Inuka under development to provide therapy sessions and mental health information to patients.	Telemedicine; on-demand information services to clients	Improve accessibility of services; improve patient engagement	Telemedicine; learning and training system

Sustainable East Africa Research in Community Health (SEARCH) Model in Kenya and Uganda

Digital component of model	DHI classification	HSS objective	System category
Patients introduced to clinic staff member in person or by phone during community health screenings and given a phone number to call with questions. Patients with comorbid HIV infection who missed their initial clinic appointment received a phone call to reschedule their appointment.	Targeted client communication	Reduce loss to follow-up	Client communication system

Multi-region

Heart Outcomes Prevention and Evaluation Program (HOPE 4) Model in Colombia and Malaysia

Digital component of model	DHI classification	HSS objective	System category
Tablet-based clinical decision support system to guide screening for CVD risk, diagnosis, and treatment recommendations.	Health care provider decision support	Improve adherence to guidelines	Telemedicine, decision support

Self-management and Reciprocal Learning for the Prevention and Management of Type-2 Diabetes (SMART2D) Model in Uganda, South Africa, and Sweden

Digital component of model	DHI classification	HSS objective	System category
Component 1. Telephone-facilitated health coaching implemented in Sweden.	Targeted client communication	Improve patient engagement; strengthen community support for patients	Client communication system
Component 2. Patients who missed an appointment followed up by telephone in Uganda.	Targeted client communication	Reduce loss to follow-up	Client communication system

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