وزارة الصحـــــة العامـــــة
Ministry of Public Health
State of Qatar • دولـــة قطـــر

QATAR NATIONAL ANTIMICROBIAL RESISTANCE ACTION PLAN(NAP) 2024 - 2030

INFECTION PREVENTION AND CONTROL (IPC) AND
ANTIMICROBIAL RESISTANCE (AMR) SECTION
HEALTHCARE QUALITY DEPARTMENT

Acknowledgements

The second edition of the National Action Plan to combat Antimicrobial Resistance (AMR) in the State of Qatar is the result of a comprehensive consultation process led by the Healthcare Quality Department at the Ministry of Public Health (MoPH), in collaboration with the National Antimicrobial Resistance Committee (NAMRC). This work was further supported by the members of the five technical working groups, many of who also contributed to the first edition (2018-2022) and continued their support in the current 2024-2030 version.

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Foreword

Antimicrobial resistance is spreading rapidly due to its' multisectoral involvement. Microorganisms can move rapidly between humans, animals, agricultural crops, food sources and the environment. Furthermore, resistant genes can transfer between different microorganisms resulting in untreatable infectious diseases. To effectively combat the spread of antimicrobial resistance, a "One Health" approach across all sectors where antimicrobials are implicated in the country is needed. It has an impact on human health, animal health as well as food security and safety. It poses a threat to achieving the Sustainable Development Goals (SDGs) by 2030.

The increase in antimicrobial resistance has been driven by the unrestrained use of antimicrobials in human health, agriculture, and animal health globally. In the State of Qatar, the increasing number of antimicrobial resistant infections appearing in the community and healthcare settings continues to represent a looming public health issue.

The World Health Organization (WHO) has called on nations to act, increasing national, regional, and global efforts to slow the development of antimicrobial resistance. In May 2014, the World Health Assembly (WHA) adopted a resolution to develop a Global Action Plan on antimicrobial resistance. Healthcare Quality Department (HQD) at the Qatar Ministry of Public Health (MoPH) led the development of a National Action Plan to combat the antimicrobial resistance threat in the State of Qatar in 2018 and was instrumental in the implementation of the plan particularly in the Human health sector.

The 2018-2022 National Action Plan called on all stakeholders to support a collaborative and integrated effort to combat antimicrobial resistance through changing practices that have contributed to the development of resistance and implementing new initiatives to reduce the inappropriate antimicrobial use. Implementing the National Action Plan involved many partners and required a high level of cross-sectoral cooperation including human, animal, food and environmental sectors at local, regional and international levels in alignment with the "One Health"Approach to combat antimicrobial resistance.

In its first phase, the National Action Plan delivered an effective and sustainable response to antimicrobial resistance in the State of Qatar along with contributing to the regional and global effort. All stakeholders worked together to combat antimicrobial resistance and ensure the continued widespread availability of effective antimicrobials to support delivery of world class human and animal health services. In the first phase, all governmental hospitals and primary care centers and majority of other healthcare facilities implemented antimicrobial stewardship programs. Antimicrobial resistance surveillance system was already established in human health with participation in the Global Antimicrobial and Use Surveillance System (GLASS) reporting on multidrug resistant organisms since 2019. Qatar also enrolled in the Global Antimicrobial and Use Surveillance System (GLASS) antimicrobial consumption (AMC) module and submitted data since 2021. The implementation of the National Action Plan remains to be in early stages. With Qatars' adoption of "One Health" framework, it is expected that significant gains will be made in combating antimicrobial resistance in the coming years.

In the next phase of the National Action Plan 2024-2030, Qatar will build on the gains from the first phase in all sectors and continue the cross-sector collaboration in combating antimicrobial resistance as required by the "One Health" Framework.

Abbreviation

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
AMU	Antimicrobial Use
AMC	Antimicrobial Consumption
AST	Antimicrobial Susceptibility Testing
ESBL	Extended Spectrum Beta-Lactamase
GCC	Gulf Cooperation Council
GLASS	Global Antimicrobial Resistance and Use Surveillance System
GNB	Gram Negative Bacilli
HAI	Hospital Acquired Infection
HMC	Hamad Medical Corporation
HQD	Healthcare Quality Department
IPC	Infection Prevention and Control
M&E	Monitoring and Evaluation
MDRO	Multidrug Resistant Organisms
MM	Ministry of Municipality
MOPH	Ministry of Public Health
MRSA	Methicillin-resistant Staphylococcus aureus
NRL	National Reference Laboratory
PHCC	Primary Health Care Corporation
QU	Qatar University
SDGs	Sustainable Development Goals
TWG	Technical Working Group
UN	United Nations
WHO	World Health Organization

Our Vision

A healthier Qatar free from antimicrobial resistance threats where antimicrobials are treated as precious resource across all sectors and are used appropriately only when needed.

Our Goal

To retain existing and develop new national capacities for prevention and control of AMR through a “One Health” approach.

Background

Antimicrobial medicines such as antibiotics, antivirals, antiprotozoal and antifungals have dramatically reduced morbidity and mortality related to infectious diseases in both humans and animals. They contributed to saving millions of lives around the world and helped advance medical, dental and surgical practices since the discovery of penicillin in 1928. Resistance to these antimicrobials was recognized almost as soon as antibiotics were discovered. Today, antimicrobial resistance is reversing the gains of the past eighty years, with many important drug choices for the treatment of infections becoming increasingly limited, expensive, and, in some cases, non-existent. The Centers for Disease Control and Prevention (CDC) estimates that each year at least two million illnesses and 23,000 deaths are caused by drug-resistant bacteria in the United States alone. Moreover, antimicrobial resistance also threatens animal health, agriculture, and the economy.

The global uncontrolled use of antimicrobials in the human and animal health and in agriculture has augmented the resistance emergence. The poor adherence of healthcare providers to infection control practices, particularly in low resource settings, contributes to transmission of multidrug resistant organisms (MDROs) in the healthcare settings. The lack of essential primary healthcare systems in some settings and legislations on the prudent and responsible use of antimicrobials is also a concern. Furthermore, the prevalent and sometimes unsupervised use of antibiotics in animal health sector adds to the burden of MDROs particularly in food producing animals.

In addition, some specific factors have been linked to the emergence and spread of AMR in States Countries of the Gulf Cooperation Council (GCC) including the State of Qatar, this includes heavy international travel due to the large population of expatriate workers and high turnover (where travel is a known risk factor for acquiring and spreading AMR). A significant AMR burden has been described in the GCC countries including Extended Spectrum Beta-Lactamase (ESBL) producing bacteria, Carbapenemase-Producing bacteria, Pan Drug Resistant Gram-negative bacilli (GNB), as well as multidrug-resistant tuberculosis. Between 60% and 90% of Klebsiella pneumoniae isolates are ESBL producers, which is associated with up to 40% mortality. Additionally, 60%—90% of Acinetobacter causing ventilator-associated pneumonia were shown to be resistant to most tested antibiotics, including Carbapenems, with significant negative clinical impact (Balkhy et al., 2016).

Looking at the resistance patterns in the State of Qatar, Methicillin-resistant Staphylococcus aureus (MRSA) prevalence did not present any significant change from 36% in 2009 to 36.5% in 2022 among hospitalized patients. On the other hand, the prevalence in the community showed a dramatic increase during the same time from 26% to 34.3%. Gram-negative Extended Spectrum Beta Lactamase (ESBL) producing E. coli increased from 32% to 58.2% of total E. coli infections between 2012 and 2022 with marked increase in the detection of Carbapenem-resistant Enterobacteriaceae.

The first Qatar National Action Plan (NAP) to combat AMR was developed and launched in 2018. The NAP aimed to ensure the continuity of successful treatment and prevention of infectious diseases with effective and safe medicines that are quality-assured, used in a responsible way, and accessible to all who need them. To effectively tackle the growing threat of AMR, Qatar adopted a “One Health” approach to combating AMR including human health, animal health, food safety, agriculture, and environmental sectors. The plan is aligned with the WHO Global Action Plan on combating AMR, the Strategic Plan for Combating AMR in Gulf Cooperation Council (GCC) states, and the National Health Strategy (NHS). The following section will display some of the achievements performed thus far in the implementation journey of the NAP 2018-2022.

In this phase of the plan (2024-2030), Qatar remains committed to tackling antimicrobial resistance in humans, animals, food, and the environment as a priority and under a "One Health" approach with increasing cross sector collaboration between human health, animal health, food, agriculture, and the environmental sectors, locally and nationally to contribute to reducing the global burden of the problem. Emphases will be placed on establishing national integrated AMR Surveillance System across all sectors, expanding AMR surveillance in human health to include semi-government and private healthcare facilities, and establishing antimicrobial consumption (AMC) surveillance system in human health and animal health. Another top priority will be to create a national agenda for AMR research across all sectors.

Summary of Achievements and Situational Analysis

1.1 Summary of Achievements of Qatar NAP to Combat AMR (2018-2022)

The NAP to combat AMR in Qatar (2018-2022) had 5 objectives considering its' alignment with the Global Action Plan to combat AMR. We will state some of the achievements under each objective. We also succeeded in establishing sections of the governance structure which we will cover here.

1. **Governance Structure**
   - A National AMR Committee was established by a ministerial decree in 2019. The committee is multidisciplinary and meets regularly each quarter. There are clear terms of reference to the committee and meeting minutes are regularly circulated to the members after each meeting with an action log to monitor implementation of the plan.
   - Five different technical working groups (TWGs) were formed equivalent to the 5 objectives of the plan to manage the implementation of the plan.
     i. Surveillance TWG meets regularly.
     ii. Stewardship TWG meets regularly.
     iii. IPC TWG is functional through the implementation of the national IPC program run by MOPH together with stakeholders from the human health sector.
     iv. The awareness TWG and research TWG were established with some achievements related to conducting awareness and education activities across the year in addition to conducting a couple of research studies.
   - The Coordinating Center is represented by the National IPC & AMR team that is running the activities of the program at the human health sector nationally, however lacking representation from other sectors.
   - Details will follow below on the achievements of each TWG.

2. **Awareness, Education and Behavior Change**
   - The State of Qatar is regularly participating in the WHO annual "World AMR Awareness Week" since 2015. Activities include live education sessions about AMR awareness, social media messages, distribution of educational material at healthcare facilities, newspaper articles, and participation in the "GO BLUE" campaign by lighting major landmarks in blue to increase the visibility of the campaign.
   - Education sessions are provided to hospitals and primary healthcare sector about antimicrobial consumption surveillance and the WHO DDD/ATC methodology.
   - The healthcare facilities conduct their own education/training sessions to their staff related to the appropriate use of antimicrobials.
   - A study was conducted at some primary healthcare centers to identify barriers and motivators to appropriate prescribing of antimicrobials to tailor improvement interventions accordingly. One paper was already published, and work is underway to formulate the interventions.

3. **National AMR Integrated Surveillance System**
   - **AMR Surveillance in Human Health:** Qatar enrolled in the WHO Global Surveillance System (GLASS) AMR module in 2019 to submit data on MDROs. So far, Qatar has submitted AMR data for 2019, 2020, 2021 & 2022 including data from all governmental facilities.
   - **Antimicrobial Consumption (AMC) Surveillance in Human Health:** Qatar enrolled in the WHO GLASS AMC module in 2022 and has submitted the 2021 data which included all government hospitals and primary healthcare centers covering 80% of the Qatar inhabitants. Data for 2022 was also submitted and more facilities participated in this submission from the private sector.
   - **Surveillance in Plants:** The Qatar Ministry of Municipality, Agriculture department is conducting surveillance of antimicrobial residues such as fungicides and bacterial pesticides in agricultural crops.
   - **Surveillance in Animal Health:** The Department of Animal Resources has recently developed a new electronic system to monitor the number of antimicrobials entering the country every year. The animal health laboratory is currently pursuing accreditation and has a plan to enhance their surveillance systems for antimicrobial resistance and sensitivity testing.
   - **Surveillance in Food:** the national food safety lab has established a surveillance system for tracing antibiotic residues and AMR pathogens in food products to ensure food safety in local produce as well as imported food. Our national food safety lab is internationally accredited as well.

4. **National IPC Program in Human Health and Biosecurity and Biosafety in animal health and food safety**
   - In the Human Health sector, we have a well-structured IPC program adopting the WHO core component at national level, a national IPC Committee, national IPC policies published on MoPH website, ongoing training programs, the healthcare associated infections surveillance has started and the service is working closely with other relevant stakeholders.
   - Biosafety and biosecurity in animal health sector is also a critical area for intervention to prevent the spread of diseases among livestock and accordingly reduce the use of antimicrobials. A draft for biosecurity standards by industry for example poultry and dairy industry has been developed. Also, there is a biosecurity auditing system for commercial farms that is being piloted in May 2024.

5. **Antimicrobial Stewardship**
   - **Human Health:**
     - Majority of governmental hospitals and primary healthcare centers (Primary Health Care Corporation Centers, Qatar Red Crescent Centers, and Qatar Energy Centers) and semi-governmental hospitals have well established AMS programs, and majority of private healthcare facilities have also made progress in implementing AMS Programs.
     - Developed National Key Performance Indicators (KPIs) to monitor the AMS program.

- The AMS TWG also prepared a set of reports and a policy to enhance their work. They are as follows:
  - ✓ Antimicrobial Stewardship and Prescribing Policy published on MOPH website. This policy mandates that all healthcare facilities must establish AMS programs in accordance with the WHO Core Element for AMS. It also provides guidance on antimicrobial prescribing.
  - ✓ AMR Surveillance Report 2019-2022.
  - ✓ AMR Surveillance Plan 2023-2030.

- **Animal Health:** Significant policies have been formulated and recently approved by the Qatar Veterinary Medical Licensing Board, aimed at restricting or prohibiting the use of antibiotics critically important to human health, including enrofloxacin and colistin. The Department of Animal Resources at the Ministry of Municipality has annual vaccination campaigns to prevent and control endemic animal diseases.
- **Agriculture:** The Qatar Ministry of Municipality has made significant gains in establishing best agricultural practices to ensure prevention of antimicrobial diseases in plants, accurate diagnosis, and treatment of bacterial and fungal diseases in plants, reducing the use of antimicrobials unless necessary, and limit the use and regulate the import of antimicrobials that work as pesticides.

6. Research

- Various academic research centers such as Qatar University, Qatar Biomedical Research Center, Hamad Medical Corporation (HMC), Primary Healthcare Corporation (PHCC) and Qatar Foundation and other academic institutions are actively conducting research on AMR and have published multiple research articles in the last 4 years.
- **Point Prevalence Survey (PPS) on Antimicrobial Use in Hospitals**: In collaboration with the WHO-EMRO, Qatar completed its first ever PPS on antimicrobial usage in hospitals. The aim of this study is to estimate the prevalence of antimicrobial use in hospitalized patients and provide a standardized tool for hospitals to identify targets for quality improvement and help in designing hospital antimicrobial stewardship programs.

1.2 Situational Analysis

Members of the national AMR program at the Healthcare Quality Department (HQD), MoPH in collaboration with the members of the five technical groups have conducted a comprehensive situational analysis of the current status of AMR in the State of Qatar to gain insight into what was achieved, and clarify the nature and burden of the problem in the country, as well as its' impact at the national level and what would be our next steps moving forward with our next action plan **(See Appendix 7)**. Our current governance structure was revisited and areas for improvement were identified. Assessing the capacity of the country to combat AMR using "One Health" approach was one of the indicators used in the evaluation. AMR detection and surveillance of infections caused by AMR pathogens, biosafety and biosecurity in Infection Prevention and Control (IPC) and Antimicrobial Stewardship (AMS) activities were some of the areas assessed.

The Plan is supported by six key strategic objectives that will guide all sectors. The first objective of the Plan is a multisectoral governance structure that is required to coordinate the wide range of implementation plans across multiple sectors. This overarching objective establishes clear accountability lines and helps coordinate actions to combat AMR across all sectors in synergy. Then, the following 5 objectives correspond to the 5 objectives in the global action plan to combat AMR which are briefly related to behavior change, AMR surveillance, antimicrobial stewardship (AMS) in both human health and animal health, infection prevention and biosecurity practices to reduce infection transmission and research.

The Strategic Objectives

2.1 The Strategic Objectives

1. Enhance the existing multisectoral governance structure for AMR program.
2. Develop nationally integrated and coordinated "One Health" antimicrobial resistance and consumption surveillance systems.
3. Develop and promote interlinked informed national infection prevention and control programs across sectors including IPC in human health and biosecurity and biosafety in animal health and food safety.
4. Optimize the use of antimicrobial medicine in human and animal health and other sectors.
5. Enhance the awareness and change behavior targeting antimicrobial use.
6. Promote AMR research in alignment with National Health Strategy and in partnership with national, regional, and international institutions.

Each objective outlines strategic priority areas for action to focus resources and to guide the development of action plans.

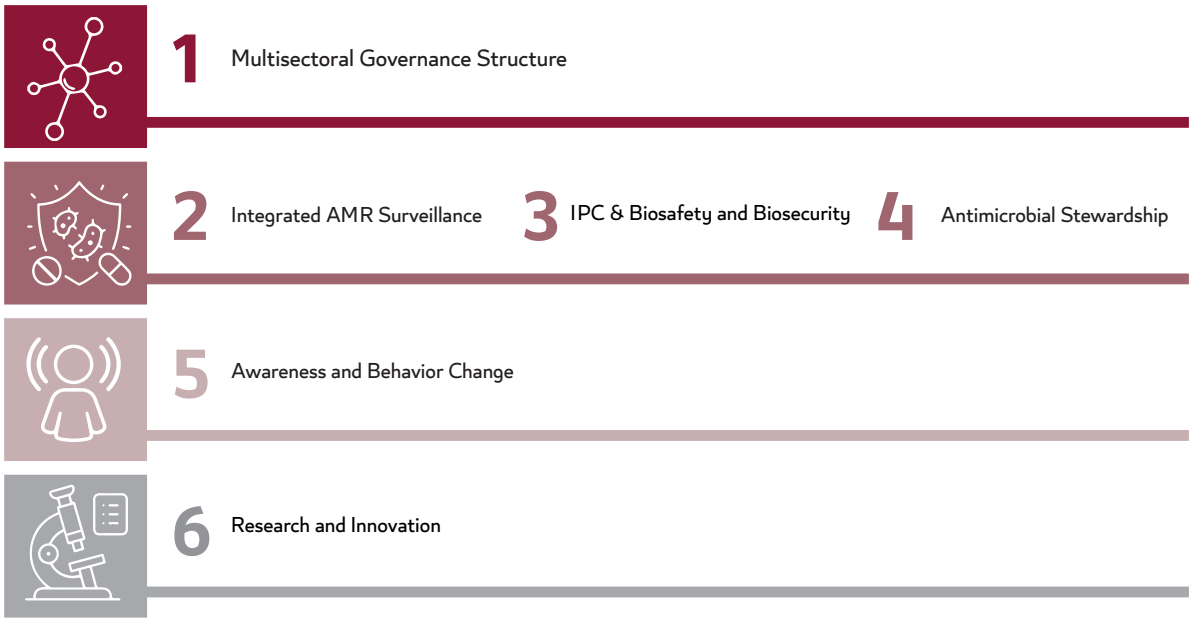

Figure 1: The six objectives of the national action plan and how they intersect with each other.

Figure 1 shows how the six objectives will create the building blocks for the implementation of this national action plan and how the work in these objectives intersects to achieve synergy.

The multisectoral governance structure will drive effective action across all objectives with clear roles and responsibilities at the national level (ministries and government entities) and the local level among providers, academic institutions, communities, farms...etc. to ensure leadership commitment and accountability for implementation of actions in the plan.

Then, there are 3 distinct objectives (numbers 2 to 4) that will work simultaneously each in their area to achieve clear activities that contribute to combating AMR such as having an integrated surveillance system (2), preventing infection transmission among humans and animals (3) and promoting the judicious use of antimicrobials (5).

The two remaining objectives related to raising awareness and behavior change (5) and research and innovation (6) will be operating across all the previous objectives to enhance their implementation and improve the sustainability of improvements/interventions achieved by these objectives while identifying innovative ideas to tackle the problem.

1. Enhance Multisectoral Governance for the National AMR Program

Priority areas for actions:

1.1 Enhance the existing governance structure to help better coordination of the work in synergy across all sectors.

1.2 Dedicate sustainable funding for combating antimicrobial resistance in all sectors.

1.3 Develop, implement and regularly report on the sector-specific plans.

1.4 Maintain and expand collaboration between stakeholders across all sectors to allow for a nationally coordinated "One Health" approach to combating antimicrobial resistance.

1.5 Monitor and review legislations and policies relevant to antimicrobial usage and resistance.

Leadership and governance are required to coordinate the wide range of implementation plans across multiple sectors. This requirement necessitates creating a governance structure that helps coordinate the work in synergy. It is crucial that AMR is steered at a high-level multisectoral political platform with decision making authority to facilitate official launch and oversee the implementation of the National Action Plan on AMR.

Endorsement of the plan from the Council of Ministers, after endorsement from MoPH leadership structure, is critical to the successful implementation of the plan.

The multisectoral interministerial AMR Board is yet to be established and become functional. It will have a critical role in engaging other sectors on actively writing the plan and committing to its' implementation. This board can also be part of the National "One Health" Framework governance structure. We will explore different ways for either establishing this board or utilizing already existing boards where the scope of the program can be added to their functions, where deemed relevant.

The multisectoral AMR Board will coordinate the work among all the relevant ministries (MoPH, MME, Finance, Agriculture, Economy & Commerce, Education, Ministry of Information and Communications Technology), Media, Academic Institutes, and other relevant stakeholders. The multisectoral AMR Board will show leadership and support across the relevant government sectors and will oversee the implementation of the AMR plan through regular reports, facilitate endorsing regulations, and making decisions.

The National AMR Committee should be reporting to the National multisectoral AMR Board through the National AMR Coordinating Center. The committee will be also receiving reports from the Technical Working Groups working on the strategic objectives.

The different technical working groups (TWGs) will have to continue meeting regularly. The terms of reference (TORs) of the TWGs will be developed and agreed on, as part of enhancing their performance. Also, the membership of all groups will be reviewed to ensure complete representation of all relevant sectors. As per the TORs for these TWGs, they will be looking into further development of detailed implementation plans for their objectives and monitor the implementation to provide regular reports. The members are also responsible for the implementation of the activities in their relevant organizations.

The MoPH will lead the coordination of the program with all relevant stakeholders and host the National AMR Coordinating Center. The National AMR Coordinating Center is the small group that links the governance structure with each other. The members of this group were identified in the first NAP as the national AMR focal points for human health, the national AMR focal points for animal health and the AMR team working at Healthcare Quality Department (HQD). This group was responsible for coordinating all the activities that were executed thus far to develop the national action plan. Their role is instrumental to the program, as they coordinate communication channels up and down the governance structure. Currently, this group is only made up of human health sector focal point and the team working at the Healthcare Quality Department. We need to have representation from the other relevant sectors to improve the performance of this center and achieve better engagement from all sectors.

Roles and Responsibilities

Each Ministry/Government entity and provider and academic institution will be accountable for the achievement of activities, outlined in this plan, of which they are the lead. Their responsibilities will also include monitoring progress quarterly and contributing to the development of an annual progress report.

Challenges and Risks related to Implementation of Objective 1: Governance

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Human Sector and Animal Sector	Patients and public are not represented in the governance structure of the program. Hence, the program is unable to capture their input into the program governance.	In human health, there are patient representation on multiple committees such as National Clinical Guidelines development, National Healthcare Quality Committee, however these committees feed indirectly into the work of the National AMR Program.	• Identify the right audience such as patients and family for human health and farm owners for animal health and so on. • Establish mechanisms for the engagement of the target audience into the governance. For example, add patient/public representation to the National AMR committee and all the technical working groups. • Ensure that their input is incorporated into the plans and interventions of the AMR program. • Link with other National Programs that have patients' representatives such as the Patient and Family advisory Board when established to involve them in the AMR program. • Organize industry-specific meetings, workshops, and forums where representatives from commercial farms and intensive farming operations can voice their concerns, suggestions, and feedback. This can include input on practical challenges, economic considerations, and operational insights. • Provide incentives for example financial or subsidies, or recognition programs for farms that adopt best practices in antimicrobial stewardship.

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
All	Lack of coordination among stakeholders particularly at the ministerial level.	The governance structure in the plan has the requirement for multisectoral representation at the Council of Ministers level to support decision making and facilitate implementation at all relevant sectors.	• Establish the highest tier of governance at the ministerial level with clear communication channels, regular meetings, and designated leadership roles. • Add members from the other relevant sectors to the national coordinating bureau and TWGs with communication channels, regular meetings, and designated leadership roles. • Harmonize policies and regulations across ministries to avoid conflicts and duplication and conduct comprehensive reviews of existing policies to identify and resolve inconsistencies. • Develop a detailed stakeholder engagement plan that includes regular high-level meetings, and progress reports. Clearly outline the roles and responsibilities of each stakeholder in the governance structure.

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
All	Ensure financial commitment from government.	• There is some funding to some of the AMR program activities at the national level and facility level in human health sector. However, there is no accurate costing of all the necessary activities. • Some facilities struggle to identify dedicated, sufficient funding for their local programs. • Dedicated funding for AMR at other sectors is unclear and questionable.	• Write a business case and secure funding approval through the governance structure to facilitate the implementation of the program. • Conduct a comprehensive cost-benefit analysis to demonstrate the long-term economic benefits of AMR control. This business case will facilitate dedication of funding to the implementation activities of AMR in all sectors. • Each sector needs to write their own business case to submit to their management with support from the governance of the National AMR Program to allocate funding to AMR. • Develop a detailed funding proposal highlighting the economic impact of AMR ensuring equitable distribution of resources based on need and impact. • Develop sustainable financing models, such as AMR trust funds. • Promote the integration of AMR funding into broader health and development programs.
Human Health	Ensure Universal Access to Care particularly with the Health Insurance Scheme.	• Currently the Public Health Services cover both nationals and residents with varied degree of funding.	• Ensure that the system allows access to healthcare to all residents in Qatar. • Address waiting time issues as it has direct impact particularly on infectious diseases management.

2. Enhance awareness and behavior change

Priority areas for actions:

2.1 Develop and implement AMR multimodal programs for advocacy, education, awareness and behavior change in various target groups.

2.2 Develop and promote local, regional, and international partnerships for AMR education, awareness, training, and behavior change.

2.3 Financial commitment to supporting AMR Awareness.

Enhancing awareness, understanding and behavior change regarding AMR are essential to the Plans' success. In addition to the "One Health" stakeholders across all sectors, engaging all members of the society will be key. Effectively communicating the threat of AMR, providing education and awareness of threat are vital in empowering communities to take ownership and share responsibility.

For effective implementation of these objectives, developing the governance structure to support awareness regarding AMR is key. This could be achieved through enhancing the work of the multi-sectoral National Technical Working Group for AMR awareness and education. Through this group, we will build partnerships with relevant stakeholders with clear responsibilities and accountabilities in government, semi government, and private sectors and include a focal person in each sector to ensure accountability to policy dissemination & compliance. We also need to ensure that there are members from the other technical working groups to represent their groups' objective and ensure that the education and behavior change interventions related to their objectives are included in the agenda of the education group for example education on AMS, IPC education, biosafety education...etc.

The technical working group will assess the knowledge gap about AMR and related topics in all relevant sectors and the community and define priorities and areas for action.

This will require creating tools to gather, analyze and report the results to stakeholders and tailor behavior change plans accordingly. The tool will allow us to identify behavioral drivers for antimicrobial use and AMR in all the relevant sectors such as food safety, environment, agriculture, human and animal health.

We will establish a robust multimodal educational awareness program and communication strategy to empower professionals across all sectors. The program will include awareness educational program (train the trainer, campaigns, workshops) for professionals in all the relevant sectors.

Also, one of the activities of this TWG is to work with academia and healthcare providers to incorporate antimicrobial stewardship principles and strategies in undergraduate and postgraduate curricula for medical, paramedical, and veterinary students and any relevant sectors. Facilitating and ensuring access to in-service training including continuous professional development (CPD) on antimicrobial prescribing and AMS for health-care professionals in the country are additional strategies for enhancing understanding and behavior change.

Developing and enhancing e-Learning is a tool to improve the outreach of the education to a wide range of audience across all sectors.

Enhancing local, regional, and international partnerships for AMR education, awareness, training, and behavior change is essential to improve and enhance education and awareness interventions in all sectors.

Using behavioral science and research, we aim to develop national communication strategy and interventions to communicate the threat of AMR to the public and explain the importance of appropriate use of antimicrobials. We will continue promoting AMR Awareness Week annually targeting both professionals and public while trying to widen the target audience to include professionals from sectors other than human health and relevant community members such as farm owners and relevant business organizations.

Promoting the use of technology can facilitate sharing knowledge and reliable data and information about antibiotics and AMR. This can be achieved through creating a "One Health" AMR Website to ensure access to reliable information.

Creating and sustaining funding for AMR behavioral interventions at national and facility level is important for successful implementation. This will be done through creating and maintaining a joint "One Health" AMR budget at the national level while supporting the facilities to allocate dedicated funding for their AMR activities.

Challenges and Risks related to Implementation of Objective 2: Awareness and Behavior Change

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
All	Resistance to adopt new behaviors.	Education and raising awareness campaigns such as WAAW, Qatar IPC, World Hand Hygiene Day and others.	• Utilize behavioral science to understand specific behaviors and tailor the interventions accordingly. • Ensure that the behavioral studies are spanning across the relevant sectors i.e. in both human health and animal health as each of them have different challenges with different set of interventions to address the challenges. • Implement pilot projects to demonstrate the effectiveness of behavior change. • Use multiple communication channels to reach different audiences.
Animal Health	Financial barriers preventing stakeholders from adopting recommended practices, for example farm owners afraid to lose their livestock to infections.	Availability of subsidies and financial support programs to farmers, potential for public-private partnerships.	• Provide incentives for example financial or subsidies, or recognition programs for farms that adopt best practices in antimicrobial stewardship and biosecurity best practices that reduce the incidence of infection among their flocks and livestock. • Promote cost-effective solutions and alternatives to antimicrobials. • Promote public-private partnerships to fund AMR initiatives.
Animal Health	Conflict of interest among veterinarians due to their dual role as healthcare providers and suppliers of antimicrobials.	Regulatory frameworks governing veterinary practice.	• Draft and distribute Professional codes of conduct for veterinarians .

3. Develop Nationally Integrated and Coordinated "One Health" AMR & AMC Surveillance Systems

Priority areas for actions:

3.1 Establish the National "One Health" surveillance system that includes all relevant sectors human, animal, food safety and environment.

3.2 Establish National surveillance system of resistance trends and antimicrobial use in human health, based on agreed National surveillance objectives.

3.3 Establish National surveillance system in animal health, food and environmental sectors.

3.4 Establish National Antimicrobial Consumption Surveillance across all human and animal health sectors.

3.5 Build lab capacity to support national AMR surveillance in human health sector, animal health sector and food safety and environment.

Establishing a nationally integrated and coordinated "One Health" surveillance system is important in order to establish continuous prospective surveillance of MDROs in Qatar and estimate trends in AMR rates and to detect the emergence and potential spread of MDROs across all sectors. Integrated surveillance data from all sectors will inform programs that formulate guidelines for treatment and prevention of infections and prevention of MDROs transmission and prioritize actions and resources to combat AMR.

A multisectoral and multidisciplinary National AMR Surveillance Technical Working Group (TWG) was established in 2019 to oversee the implementation and progress of National AMR Surveillance System and to coordinate implementation of action plans within facilities through the National AMR Committee. Scope, objectives, and terms of reference of AMR surveillance for each sector; human health, animal health, food safety, and environment will be created ensuring they align with the national "One Health" surveillance objectives. Membership will also be reviewed to ensure that all sectors are represented in the TWG.

AMR Surveillance in Human health is well established in Qatar since 2019 in the government sector with plans to expand to the private sector 2024-2030. Qatar has also been part of the WHO Global Surveillance System (GLASS) AMR module since 2019 and has since been submitting AMR data including all governmental healthcare facilities.

In terms of Antimicrobial Consumption (AMC) Surveillance in Human Health, Qatar enrolled in the WHO GLASS AMC module in 2022 and has submitted the 2021 and 2022 data from the government sector as well as some of the private healthcare sector providers. Next step is to establish national AMC surveillance system that includes all human health sectors (private and governmental) and establish AMC surveillance in animal health and agriculture.

Although AMR surveillance systems in other sectors are yet to be enhanced, significant initiatives have been taken by other sectors. For example, the Agriculture Department at the Ministry of Municipality is conducting surveillance of antimicrobial residues such as fungicides and bacterial pesticides in agricultural crops. The Department of Animal Resources has developed a new electronic system to monitor antimicrobial imports entering the country every year. However,

more work is needed to describe and understand the antimicrobial supply chain. The national food lab has established a surveillance system for tracing antibiotic residues and AMR pathogens in food products from local produce as well as imported food to ensure food safety.

Qatar National Reference Lab (NRL) was established to build laboratory capacity and support national AMR surveillance system in humans, animals, food and environment sectors, and will take an active role in standardizing methods. The NRL will help to establish integrated "One Health" AMR surveillance system that will unify AMR data across all sectors. The NRL will also establish and develop a national quality assurance program to improve current laboratory capacity, and support training program for laboratory staff for performing and interpretation of antimicrobial susceptibly testing (AST) and AMR. Representatives from this group will join the education TWG and research TWG to ensure education/building capacity and research in the area of surveillance is addressed.

Challenges and Risks related to Implementation of Objective 3: Surveillance

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Health Sector	Inappropriate use of diagnostics which could be over-use, under-use or misuse. Also, lack of standardization of methods of testing (diagnostic stewardship).	• HMC lab which acts as the reference lab for AMR is CAP accredited and has external quality assurance systems. • There are multiple accredited labs in the country.	• Develop a comprehensive diagnostic stewardship program to support appropriate use of diagnostics, with standardization of methods and a training program to multidisciplinary teams of clinicians to ensure having an impact on clinical management of patients.
Health sector	Lack of feedback on prescribing behaviors among clinicians.	Sporadic Clinical audits performed in some healthcare organizations.	• Regular clinical audits that can be facilitated electronically where feasible. The audit results to be fed to the relevant clinicians as deemed appropriate to enhance improvement of prescribing behaviors.
Health sector	Point of Care testing (POCT) is under utilized.	POCT is available only in some of the healthcare organizations and yet not necessarily utilized fully.	• Ensure the availability of highly sensitive and specific POCT at all organizations as deemed necessary. Improve the workflows to facilitate its successful utilization.

4. National IPC Program across sectors, Biosecurity & Biosafety in Animal Health and Food Safety

Priority areas for actions:

4.1 Enhance governance and multisectoral commitment to infection prevention and control (IPC), biosecurity and biosafety.

4.2 Enhance and promote cross-sectoral multidisciplinary national IPC program and biosafety /biosecurity across all sectors in Qatar.

Infection prevention and Control (IPC) practices comprise an important aspect in controlling the spread of Multidrug Resistant Organisms (MDROs), preventing MDROs transmission in healthcare settings between patients and healthcare workers and from community to healthcare facilities. However, IPC practices are not only required in healthcare settings. They are crucially important to prevent the transmission of MDROs between livestock animals and farmers/ owners, or between companion animals in the same herd or through food chain. Evidence based IPC programs are required across all settings, recognizing higher risk areas.

Surveillance data and research are crucial in development and implementation of effective interventions and approaches in IPC. Effective infection prevention and control in human health, animal health, environment as well as effective biosecurity and biosafety measures in animal health and food production help reduce the spread of infections in general with reduction in the need to use antimicrobials. It also reduces the transmission of infections caused by MDROs thus reducing the burden of AMR.

Qatar launched the national IPC program and IPC Task Force in 2016. Majority of healthcare facilities in the country have well established comprehensive IPC programs.

In the next phase of the plan, we will enhance governance and multi-sectoral commitment to IPC, biosecurity, and biosafety. Currently there is a National IPC Technical Working Group (TWG) that has multisectoral membership. The Plan will aim to strengthen a formal organizational structure to ensure proper implementation of infection prevention and control policies and strategies at national level as well as at the organizational level. This can be achieved by continuing to enforce national policies and guidelines including high policy statement, ensuring that sufficient human and financial resources are available, enhancing engagement of all categories of health care groups, with multidisciplinary representation, accountability from leadership and support from organizational and departmental level, enhance partnerships with relevant stakeholders with clear responsibilities and accountabilities in both public and private sector. We will also promote the collaboration of other departments at MOPH to enhance their role in improving the adoption of IPC policies such as Department of Healthcare Professions, Occupational Health and Safety Department, Facility Master Planning, Healthcare Facilities Licensing. Also, working with Environmental Health and Waste Management to ensure that there are safe systems in place for collection, storage, transport and final disposal of healthcare waste.

There is also a need to improve implementation of biosecurity by updating the biosecurity regulations, promoting compliance to biosecurity standards, creating awareness and education programs about biosecurity and animal health among farm workers, and developing a monitoring and evaluation framework to measure the effectiveness of enforcement of these regulatory measures.

Enhancing implementation of biosafety measures is also a top priority. This will be achieved by developing the required policies and control measures for ensuring biosafety in the different settings, defining all the organizations which must follow the policies and implement the control measures.

Challenges and Risks related to Implementation of Objective 4: Infection Prevention & Control and Biosecurity & Biosafety

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Health Sector	Lack of patient involvement in the IPC Committee.	The public is one of the target audiences in all the IPC campaigns, but this is usually a one-way communication rather than active involvement.	• Add patient representative to the committee members and liaise with the Patient & Family advisory board once established to get their engagement in the different plans and activities of the program. • Develop mechanisms for regular feedback from patients to improve IPC practices and communication.
Health sector	Vaccine hesitancy considering that vaccination will reduce the need to use antimicrobials.	There are multiple national vaccination campaigns and great vaccination coverage.	• Work with the vaccination department to tailor messages to the target audience to improve vaccine uptake . • Use data-driven insights to understand barriers to vaccination and develop targeted educational campaigns. • Engage community leaders and healthcare professionals in promoting the benefits of vaccination.
Health sector	Disposal of unused antibiotics is not regulated.	Currently, there is no clear advice on how to dispose of unused antimicrobials.	• Develop regulation and system for disposal of unused antimicrobials at the healthcare facilities and the public.

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Animal Health	Insufficient Biosecurity Measures.	Basic biosecurity guidelines and practices are in place. Regular health inspections of livestock. Limited educational resources and occasional workshops.	• Update biosecurity guidelines to include the latest best practices and ensure they are comprehensive. • Create online courses and resources that are easily accessible. • Conduct regular on-site training and field demonstrations to show practical application of biosecurity measures. • Establish certification programs for farms and individuals who complete biosecurity training. • Conduct regular audits and reviews to ensure adherence to protocols and identify areas for improvement. • Utilize technology such as electronic monitoring systems and automated data collection tools to enhance tracking and reporting.

5. Optimize the Use of Antimicrobial Medicine in Human Health, Animal Health and Other Sectors

Priority areas for actions:

5.1 Ensure Uninterrupted access to high -quality antimicrobial medicines.

5.2 Improve and measure appropriate use of antimicrobial agents in human health.

5.3 Ensure adequate access and prudent use of antimicrobial agents in terrestrial and aquatic animals and agriculture.

5.4 Enhance utilization of technology to support improvement in AMS practices and activities (decision support systems).

5.5 Ensure adequate funding and resources for AMS activities.

Overuse and misuse of antimicrobials is shown to amplify AMR. Therefore, efforts must be made to limit antimicrobial use judiciously through implementation of effective antimicrobial stewardship practices. As a first step to foster conservation of antimicrobials in Qatar, non-prescription use of antimicrobials in humans was banned in 2002. Similar legislation is also present in animal health sector however, monitoring and enforcing implementation is required. Similar measures need to be taken in other sectors.

The uninterrupted access to high quality antimicrobials in humans overall and especially narrow spectrum first line agents used for treating common infections is extremely important to minimize the misuse and overuse of broader spectrum agents. Also, the availability of last line agents for treatment of MDROs is important because they can be lifesaving in the vulnerable population. Qatar has regulations that ensure continued access to high quality antimicrobials and a quality management system for supply chain. Implementing an electronic track and trace system paired with an e-prescribing system will help track antimicrobials from the point of entry into the country to the point of dispensing at the community pharmacies and all healthcare facilities.

Implementing antimicrobial stewardship (AMS) programs in all sectors is essential for ensuring appropriate use of antimicrobials and reducing AMR in all sectors. A multisectoral and multidisciplinary National AMR Stewardship Technical Working Group (TWG) was formulated in 2019 to oversee the progress of AMS programs at facilities and to coordinate implementation of action plans with all sectors through the National AMR Committee. Clear and specific scope, objectives, and terms of references for the group for each sector will be created ensuring alignment with the national "One Health" objectives.

In human health, majority of hospitals and primary care centers have well established antimicrobial stewardship (AMS) programs according to the WHO core elements for antimicrobial stewardship (AMS). The level of implementation of the core elements varies based on the capacity of the healthcare facilities ranging from planned implementation to full implementation of the components within the six core elements. Currently, AMS programs is mandated by the government through the National AMS policy. Facilities' leadership will also be required to ensure adequate funding, human and other resources for AMS activities. For monitoring and evaluation of the AMS programs in healthcare facilities, key performance measures were developed and implemented in 2022.

Antimicrobial stewardship in other sectors is still at early stages. In animal health, important policies have been developed and recently endorsed by Qatar Veterinary Medical Licensing Board that restrict the use of critically important antibiotics to human health such as enrofloxacin and colistin. Annual vaccination campaigns are conducted to prevent and control endemic diseases in animals/livestock. The animal health department will develop antimicrobial prescribing guidelines that are industry specific; for poultry, cattle...etc. This should be followed by a program for implementation to monitor antimicrobial use and antimicrobial resistance at the farms.

We need to create a collaborative mechanism for animal industries to identify common research, development and extension priorities for the effective monitoring of antimicrobial use and surveillance of AMR to inform stewardship actions that meet Qatars' animal health and market access needs, without impacting food safety or human health.

The Department of Agriculture at the Ministry of Municipality has established best agricultural practices to ensure prevention of infectious diseases, accurate diagnosis, and treatment of bacterial and fungal diseases in plants to reduce the use of antimicrobials unless necessary and limit the use and regulate the import of antimicrobials that work as pesticides.

In the next phase of the plan, we will build on the achievements, enhance antimicrobial stewardship efforts in human health, build capacity in other sectors under the Qatar "One Health" framework.

Challenges and Risks related to Implementation of Objective 5: Stewardship

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Health Sector	Inappropriate antibiotic promotion.	None	• Develop policies and legislations to regulate any promotional activities.
Health sector	Appropriateness of prescriptions.	-National Clinical Guidelines and facility guidelines exist to provide guidance on the use of antimicrobials.	• Behavioral studies. • Audit system at physician level.
Health sector	Integrate AWaRe classification in the guidelines and prescription system.	None	• Implementation: universal IT system. • Clinical Audits.

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
Animal Sector	Insufficient education and training on AMR and stewardship practices for veterinarians, farmers, and other stakeholders.		• Developing standard prescribing guidelines and conducting regular training sessions for veterinarians and farmers. • Continuous professional development programs and accessible resources help keep stakeholders informed about the latest best practices. • Promote the use of advanced diagnostic tools to reduce unnecessary antimicrobial use. • Institutionalizing AMS practices in training programs and securing long-term funding commitments are crucial steps.
Animal Sector	• Insufficient data on antimicrobial use and resistance patterns hinders effective policy-making and practice. • lack of trained personnel to collect, analyze, and interpret AMU and AMR data.	Availability of fragmented AMR data from clinical samples in the National Veterinary Laboratory.	• Provide training and resources to build the capacity of personnel involved in AMU and AMR surveillance. • Collaborate with the National AMR Monitoring Center at HMC for standardizing testing protocols, data and forms. • Assess current practices and existing data collection systems. We need to survey large-scale farms to understand current AMU practices and data availability. Implementing the data collection protocol on a limited number of large-scale farms is suggested.

6. Promote and Support AMR Research

Priority areas for actions:

6.1 Establish the multisectoral TWG for AMR research and innovation with clear terms of reference.

6.2 Promote AMR research in partnership with national, regional and international organizations and institutions.

Although over the last four years, various academic research centers, such as Qatar University (QU), Hamad Medical Corporation (HMC), Weill Cornell Medicine – Qatar and Qatar Foundation, have actively been conducting research on AMR and have had multiple publications, there is no clear national agenda for AMR research. The first step to promote AMR research will be to establish a governance structure by creating a multisectoral National AMR Research Technical Working Group (TGW) with clear terms of reference.

The TWG will conduct a situation analysis by reviewing and assessing data generated by studies performed in the field of AMR in the State of Qatar and published in international peer-reviewed journals during the period 2018-2024. They will be evaluating the potential relevance of the data these studies may generate for Qatar, and analyze existing policies and guidelines related to AMR to assess their degree of alignment with the local epidemiological data generated by relevant publications between 2018 and 2022.

The TWG will also identify research gaps and develop a priority National research agenda for AMR with specific research topics and questions to be addressed in the timeframe 2024-2030 and identify the most suitable research groups to conduct studies within the priority research topics. The goal should not only be to fill a knowledge gap but also to produce novel approaches for AMR diagnosis, treatment and prevention. MOPH will ensure the allocation of resources and funds that enable research groups to perform priority research projects in AMR and ensure that the data produced by these studies can be translated into practice. Encouraging inter-sectoral partnerships, data sharing, and networking among national, regional and international research community on AMR using "One Health" Approach will be key. This can be done through creating a data sharing national repository-platform where data sets, presentations, and publications are accessible for all research groups and any relevant stakeholders who can utilize the data to improve practice to enhance collaborative endeavors, encouraging and supporting research groups to participate in regional and international collaborative research projects, and fostering and support local research groups to participate in local, regional, and international events on AMR and relevant topics.

Some of the research studies that were identified as priorities for this NAP were Point of prevalence surveys to measure antimicrobial consumption, clinical audits to assess compliance with guidelines, behavioral change studies to analyze antimicrobial prescription patterns, observational studies

aimed to characterize multidrug-resistant microorganisms using whole-genome sequencing, quasi-experimental studies aimed to assess the impact of diagnostic stewardship interventions and quality improvement studies.

A clear national agenda for AMR research will address the need to prioritize AMR research and research translation activities to ensure gaps in the evidence are addressed and to encourage collaboration and information sharing, both nationally and internationally.

Strong research in AMR and related topics and national systematic coordination of research effort are essential to advance the discovery of new therapies and diagnostic technologies to better prevent infectious disease, treat resistant infections and support the development, refinement, and implementation of evidence-based practices to limit the emergence and spread of antimicrobial resistance.

Challenges and Risks related to Implementation of Objective 6: Research

Sector	Risk	Existing Controls / Opportunities	Mitigation Strategy
All Sectors	Build capacities for implementing AMR research.	Currently, there are multiple AMR research studies conducted however they don't necessarily feed into the national AMR program.	• Collaboration with academic institutions. • Expertise, cooperation and funding.
All Sectors	Develop a national agenda for AMR research.		• Collaborate with academia, research institutions and providers such as HMC, PHCC. • Collaborate with relevant stakeholders in other sectors . • Establish a national AMR research database. • Secure fundings.
All Sectors	Poor coordination and communication among disciplines can lead to fragmented efforts and duplication of research.	Currently, some research institution includes multidisciplinary research in both human health and animal health (Biomedical Research Center – Qatar University).	• Promote interdisciplinary research to address AMR, highlighting the importance of collaborative approaches.
All Sectors	Promising laboratory findings may not be effectively translated into clinical settings or veterinary practice or farms.		• Utilize research findings to close the knowledge gaps and improve practices. • Conduct education and training programs for healthcare providers, veterinarians, and farmers on the latest research findings and their practical applications.

Operationalizing The Plan

The Plan outlines the framework to guide the implementation of a national coordinated approach to addressing the threat of AMR in the State of Qatar. There is a wide range of activities already taking place based on the situation analysis: regulatory restriction of antibiotics prescription and dispensing, national AMR IPC program, surveillance of MDROs across all sectors, participation in global AMR and AMC surveillance, antimicrobial stewardship programs in human health, and surveillance of MDROs in some healthcare facilities. However, there is still need of the concerted efforts at the national level of all relevant sectors to work synergistically to achieve the goals and objectives set in this plan.

The next steps are to strengthen cross sector collaboration and establish a framework for accountability of all "One Health" stakeholders in fighting AMR in Qatar. Successful implementation of the interventions and activities in the National Action Plan requires sustained, coordinated, and mutually reinforcing efforts of all stakeholders, including healthcare providers, healthcare leaders, veterinarians, agriculture industry leaders, policymakers, and patients and supported by the notion of “Health in All Policies” that Qatar National Development Strategy and the National Health Strategy promote for. Accordingly, there is a need for national policies that integrate the necessary actions across all the relevant sectors that can be endorsed at the highest level of governance (inter-ministerial board) which will enable successful implementation of the plan.

The operational plan outlining the Strategic Priorities, Secondary Objectives, and Activities identified were finalized after deep situation analysis by multisectoral stakeholders across the country. In the next phase of the Plan, it will be ensured that all five technical working groups covering the five Strategic Objectives will help coordinate the activities and track their progress. The operational plan will be reviewed annually against its progress indicators identified in the Monitoring and Evaluation (M&E) framework (to be developed).

Implementation

Budgeting

In the human health sector, there is budget for the National AMR program that is allocated by MOPH and the National Health strategy (2024-2030) and will continue to support AMR activities at the national level. Also, each healthcare facility is required to ringfence budget dedicated to the implementation of the NAP to combat AMR at the facility level.

Funding for AMR in other relevant sectors is required for successful implementation of the program. To implement national action plans (NAPs) on antimicrobial resistance (AMR), across other sectors, a clear approach to planning and budgeting the NAP on AMR is required. A business case to understand how much activities will cost, what is already being funded, and how to leverage additional funding can help estimate the necessary funding required. Knowing the gaps will help to mobilize extra resources to fill those gaps to allow for successful implementation of the AMR prevention activities.

Monitoring And Evaluation (M&E)

Monitoring and Evaluation (M&E) is an integral part of the NAP. The need for a comprehensive system to monitor and evaluate the NAP is important to track progress, prioritize actions, allocate resources appropriately, and identify learning to improve implementation plans to address the country's efforts to tackle AMR. It is expected to be part of the implementation plans. We will include process indicators, output indicators, outcome indicators and impact indicators. They are also tailored to the country's priorities and national and local interventions.

Monitoring

Monitoring is defined as a continuous process of collecting, analyzing and reporting specific indicators linked interventions set out to meet specific objectives. Monitoring these KPIs will inform decision makers on the progress of implementation of these specific interventions and how we approach meeting our objectives, whether we are on track, on time and within budget. M & E should also cover the progress in all the relevant sectors based on the interventions and the objectives of the plan. Accordingly, indicators will be monitored in human health, animal health, food safety, agriculture and environment.

Evaluation

"Evaluation is the objective and systematic assessment of an upcoming, ongoing or completed project, program, policy or strategy, its design, implementation and results with a view to assessing whether intended objectives have been achieved. The criteria utilized are relevance, effectiveness, efficiency, coherence, impact and sustainability to determine the level of achievement. (Molund et al., 2004 sited in Guidance to facilitate monitoring and evaluation for Antimicrobial resistance national action plans).

A subgroup will be formed to develop the M & E plan with all the relevant stakeholders. There are specific steps for the development of the M & E plan that are outlined by WHO which will be followed.

"One Health" Approach To Tackcling AMR

Success and sustainability of the Plan depends on strong collaboration across all "One Health" sectors due to the complex nature of the problem AMR poses. Establishing clear roles and responsibilities for all sectors and promoting accountability and ownership of the sector specific Strategic Priorities, from conducting the activities and interventions to establishing and performing periodic monitoring and evaluations of these activities, will be key to successfully combatting AMR. In the next phase 2024-2030 of the Plan, the aim will be to stay committed to tackling antimicrobial resistance in humans, animals, food, and the environment under a "One Health" approach with increasing cross sector collaboration between human health, animal health, food, agriculture, and the environmental sectors, locally, nationally, and globally. Priority interventions have been identified across all strategic priorities in the Plan.

Promoting AMR awareness among professionals is the most important step to ensure best practices in antimicrobial use, antimicrobial stewardship and IPC measures across the human, animal, food, and environmental health sectors.

Public engagement through community outreach campaigns will also be important in increasing awareness among the Qatar population about AMR that will help them understand the threat posed by AMR, the benefits, and risks of taking antimicrobials and using them only when needed and promoting personal and food hygiene and infection control in their daily lives.

In the human health sector, majority of healthcare is delivered at governmental healthcare facilities. Strengthening and sustaining antimicrobials stewardship and IPC programs across all governmental healthcare facilities is extremely important in ensuring appropriate use of antimicrobials, preventing infections, and curbing AMR. Strong leadership support from hospital administration such as dedicating financial and human resources to AMS and IPC programs will be key to successfully delivering the best and safest patient care. The private healthcare sector is rapidly growing in Qatar and is expected to grow more in the coming years. Majority of private healthcare facilities have implemented IPC programs and the national IPC team continuously supports them in training and building capacity. To assess and monitor the burden of healthcare associated infections and surgical site infections, the national IPC team has developed a plan for ongoing HAI and SSI surveillance across all healthcare facilities including the private sector. Stewardship programs, on the other hand, are still in early stages in private healthcare facilities. The enforcement of the Antimicrobial Stewardship and Prescribing policy which mandates all healthcare facilities to have AMS programs will expedite the implementation of AMS programs in the private sector.

Special emphasis will be placed on establishing national integrated AMR Surveillance System across all sectors. Efforts will include expanding AMR surveillance AMR surveillance in the human health sector to cover semi-government and private healthcare facilities, establish antimicrobial consumption (AMC) surveillance system in human and animal health, and build microbiology lab

capacity in animal health to ensure best laboratory practices with external quality assurance. Establishing and sustaining a national integrated AMR surveillance system across all sectors will be possible after the full activation of the National Reference Laboratory (NRL). The NRL will lead in building and enhancing lab capacity building, establishing, and enforcing standards for all sectors (human health, animal health, food sector and environment) across governmental and private facilities that meet the requirements for global reporting of AMR.

Taking into consideration the potential challenges, impact and complexities involved at the administrative level and also at the local industries, monitoring regulations on the restriction of use of all antimicrobials by prescription only in animals will be one of the top priorities. One of the prerequisites of the success of this intervention is to ensure that farmers have adequate access to veterinary services to avoid any negative impact on animal health due to the inability to obtain prescriptions. In addition, requiring a prescription for all antimicrobials might increase the operational costs for farmers and animal owners, due to the need for veterinary consultations. This could have economic implications, especially for small-scale operations. To ease the transition and allow stakeholders to adjust to new practices, a phased implementation approach can be adopted. This will involve gradually rolling out the regulations and conducting pilot programs in selected farms to test and refine the process before nationwide implementation This way, we can ease the transition and allow stakeholders to adjust to new practices.

Sustaining best practices established by the Agriculture Department will help prevent infectious diseases, ensure accurate diagnosis and treatment of bacterial and fungal diseases in plants, reduce unnecessary use of antimicrobials, and regulate the import and use of antimicrobials that work as pesticides.

Another top priority will be to create a national agenda for AMR research across all sectors. Drafting a "One Health" national research agenda will be essential in linking AMR in all sectors and better understanding the development and spread of resistant organisms to guide us on how to treat and contain them.

Appendix 1:

Governance Structure Operational Plan

Secondary Objectives	Activities	Led By	Implementation
1.1 Enhance the existing governance structure to help better coordination of the work in synergy across all sectors			
A. Endorse the NAP 2024-2030	Finalize and endorse the NAP 2024-2030 and submit to HE – MOPH Minister and the Executive Board for endorsement	National	National
	Share the approved NAP 2024-2030 with IHR to share with EMRO to publish on WHO/EMRO website	National	Regional & global
B. Activate the AMR Multisectoral Inter-Ministerial Board	Identify opportunities to activate the interministerial board either through National "One Health" Program or any other mechanism to enhance the governance structure of AMR program	National	National
C. Enhance the work of the National AMR Committee and the TWGs	Review the membership of the National AMR in light of the latest Ministerial changes based on Emiri Decree	National	National
	Develop TORs for the TWGs to enhance their performance	National	National
	Review the membership of the TWGs to ensure multisectoral representation	National	National
	Review the membership of the National AMR coordinating bureau to include members from other sectors	National	National
1.2 Dedicate sustainable funding for combating antimicrobial resistance in all sectors			
A. Place the NAP for combating AMR in the country's strategic priorities to ensure funding.	Include AMR program as one of the projects in Qatar National Development Strategy	National	National
	Include AMR program as one of the projects in National Health Strategy	National	National
	Develop a business case for AMR at the different sectors to support allocation of funds	Sector specific	Sector specific

Secondary Objectives	Activities	Led By	Implementation
1.3 Develop, implement and regularly report on the sector-specific plans			
A. Develop a comprehensive monitoring and evaluation framework for the NAP actions	Develop a comprehensive measurement system that successfully monitor the implementation of the NAP at all the relevant sectors at the national level	National	National
	Develop a comprehensive measurement system that successfully monitor the implementation of the NAP at all the relevant sectors at the facility level in all relevant facilities for example healthcare facilities, farms, veterinary.... etc.	Sector specific	Sector specific
1.4 Maintain and expand collaboration between stakeholder across all sectors to allow for a nationally coordinated "One Health" approach to combating antimicrobial resistance			
A. Work with relevant stakeholders in partnerships with collective goals	Create local partnerships with academia and research institutions Create regional and international partnerships with relevant organizations such as Gulf CDC, EMRO, WHO, Fleming Institute, Department for Environment, Food & Rural Affairs (DEFRA - UK), etc.		National, regional and international
1.5 Monitor and review legislation and policies relevant to antimicrobial usage and resistance			
A. Develop and update policies and legislations as deemed necessary to combat AMR	Identify the necessary legislations required to prohibit the inappropriate use of Antimicrobials across all the relevant sectors and monitor its' implementation		

Appendix 2:

Operational plan for awareness & Education

Secondary Objectives	Activities	Led By	Implementation
2.1 Develop and implement AMR multimodal programs for advocacy, education, awareness and behavior change in various target groups such as healthcare providers, veterinarians, farmers, the community, food safety sector and decision makers in collaboration with relevant stakeholders)			
A. Develop the governance structure to support awareness regarding AMR	i. Enhance the work of the TWG for AMR awareness represented by different sectors	MoPH	National
	ii. Build partnerships with relevant stakeholders with clear responsibilities and accountabilities in government, semi government, and private sectors.	MoPH	National
	iii.Nominate a focal person in each sector to ensure accountability to policy dissemination & compliance	MoPH	National
	iv. Recruit members from the other technical working groups to represent their groups' objective and ensure that the education and behavior change interventions of their objectives are included in the agenda of the education group for example education on AMS, IPC education, biosafety, etc.	MoPH	National
B. Assess the knowledge gap about AMR and related topics (Deep Situational Analysis) and define the prioritieswith relevant stakeholders)	i. Create tools for data gathering, analyzing, and reporting the results to stakeholders	All stakeholders	National
	ii. Create behavior change plan according to assessment result and identify behavioral drivers for antimicrobial use in all relevant sectors (campaigns, behavior change interventions, communication plans and awareness/education materials)	All stakeholders	National

Secondary Objectives	Activities	Led By	Implementation
C. Establish a robust multimodal educational awareness program and communication strategy	i. Develop awareness educational programs (train the trainer, campaigns, workshops) for healthcare professionals and for animal health, food safety and agriculture professionals	MoPH/ Educational Institutions	National
	ii. Develop and implement multidisciplinary team training in the field of AM Prescribing and dispensing for example physicians, clinical pharmacist, and nurses	MoPH/ Educational Institutions	National
	iii. Include antimicrobial stewardship principles and strategies in undergraduate and postgraduate curricula for medical, paramedical, and veterinary students and any relevant sectors	MoPH/ Educational Institutions	National
	iv. Facilitate and ensure access to in-service training including continuous professional development (CPD) on antimicrobial prescribing and AMS for health-care professionals in the country	MoPH/ Educational Institutions	National
	v. Strengthen communication and education initiatives for animal health, food safety and agriculture professionals	MoPH/ Educational Institutions	National
	vi. Work with media organizations, media channels, influencers, and community leaders to simplify and promote messages about AMR as an urgent issue, enhancing awareness and reporting	MoPH/ Educational Institutions	National
	vii. Set national communication strategy for AMR	MoPH/ Educational Institutions	National

Secondary Objectives	Activities	Led By	Implementation
	viii. Integrate AMR awareness education program /Campaign for public and cover different sectors (e.g. including AMR awareness program in school curriculum, all educational institutions), labor camps health centers, Food Industry, agri-business and community)	MoPH/ Educational Institutions	National
D. Promote AMR Awareness Week	i. Promote and upport World Antibiotic Awareness Week in all healthcare settings and public	MoPH/ all Stakeholders	National
	ii. Develop joint awareness and coordination of messages that reflect all sectors' objectives/priorities		
	iii. Promote and Support Antibiotic Awareness Week in animal health, agriculture and food safety	MoPH/ Animal and Environmental sectors	National
	iv. Endorse a "One Health" AMR Awareness approach	MoPH/all Stakeholders	National/ International
E. Develop and Enhance e-Learning	i. Develop e-Learning modules for health professionals in human health and animal health about national clinical guidelines	MoPH	National
	ii. Utilize the WHO e-learning module for human health	MoPH/ all Stakeholders	National
	iii. Mandate e-learning on AMR and IPC as part the National Health Insurance Scheme for clinical staff	MoPH	National
	iv. Monitor compliance with WHO AMS Core Element for Education and Training	MoPH	National

Secondary Objectives	Activities	Led By	Implementation
F. Develop a stakeholder engagement & communication plan to support the change of behavior using the "One Health" approach	i. Develop resources that promote appropriate antimicrobial prescribing, in human health care and veterinary settings	All stakeholders	National
	ii. Conduct behavioral studies within the community to develop resources that address patient pressure and misconceptions. These resources will help health professionals, especially general practitioners and veterinarians, reinforce key messages about proper antimicrobial use and actions to reduce antimicrobial consumption.	All stakeholders	National
2.2 Develop and promote local, regional, and international partnerships for AMR education, awareness, training and behavior changes.			
A. Develop robust partnerships on education, awareness and change of behavior	i. Develop local, regional, and international partnerships to improve and enhance all the interventions of the education, awareness and change of behavior activities in healthcare settings	Ministries	National level and international
	ii. Develop local, regional, and international partnerships to improve and enhance all the interventions of the education, awareness and change of behavior activities in animal, food and agriculture settings	Ministries	National level and international
B. Promote use of technology to achieve vision	i. Use technology to facilitate share of data and knowledge and change behavior (video conference)	All stakeholders	National
	ii. Standardize and improve the education programs (local regional)	All stakeholders	National
	iii. Create a "One Health" AMR website to ensure access to reliable sources of information on antibiotics and AMR	All stakeholders	National

Secondary Objectives	Activities	Led By	Implementation
C. Promote research in the field of AMR awareness and education	i. Conduct KAP research in the field of education and awareness and identify new ways of changing behavior in human health	All stakeholders	National
	ii. Conduct research on the farmers' perceptions and attitudes towards the use of antimicrobials	All stakeholders	National
2.3 Financial commitment to supporting AMR Awareness			
A. Create a budget for AMR program	1. Maintain a joint "One Health" AMR plans and budgets and mobilize resources together	Ministries	National
	2. Facilities to allocate funding for AMR awareness campaigns and staff CPD education	Facilities	National
	3. Allocate funding for AMR awareness to Integrate the awareness education program for public	Facilities	National

Appendix 3:

Operational plan for AMR surveillance

Secondary Objectives	Activities	Led By	Implementation
3.1. Establish the national "One Health" surveillance system including all relevant sectors human, animal, food AND environmental.			
A. Establish central national governance/ structure for "One Health" AMR surveillance at MoPH	i. Review membership of the National TWG for surveillance of AMR to include all relevant sectors and ensure active engagement ii. Define scope, objectives and terms of references of AMR surveillance for each sector, human, animal, food and environment ensuring they align with the national "One Health" surveillance objectives	MoPH	National
B. Develop national electronic surveillance system for AMR.	i. Set up electronic surveillance center at MoPH to centralize data collection and analysis from all stakeholders and relevant sectors ii. Identify and prioritize the organisms and relevant antimicrobials that will be reported in each sector iii. Create a national monitoring and evaluation framework for auditing KPI to ensure that surveillance efforts are effectively implemented iv. Participate in regional and global networks and sharing data, so the national and regional and global trends can be detected v. Collect and report dynamic data on antimicrobial consumption in all sectors	MoPH	National
C. Promote Research in the field of AMR surveillance	i. Enhance research on integrated AMR surveillance using "One Health" approach	MoPH	National
	ii. Enhance research on AMR trends and antibiotics use in humans	MoPH	National

Secondary Objectives	Activities	Led By	Implementation
3.2 Establish National surveillance system of resistance trends and antimicrobial use in human			
Based on agreed national surveillance objectives	i. Expand surveillance by identifying and assessing the eligibility of new sentinel sites that will contribute to the national AMR surveillance from public and private sectors including primary care settings, the community and hospital settings iv. Set up and use uniform LIS/reporting template e.g., compatible with WHONET at the coordinating center and participating facilities v. Determine national KPI to ensure that surveillance efforts are effectively implemented vi. Develop a national antibiogram and reporting system including reports/bulletin to inform clinicians and decision makers about emerging trends that could impact public health vii. Design mechanism/alert system to detect and report the newly emerging resistance viii. Develop framework for monitoring and reporting antimicrobial consumption in hospitals and primary care settings to assess appropriateness of use	MoPH	Facility

Secondary Objectives	Activities	Led By	Implementation
3.3 Establish National AMR Surveillance System in animal health, and food and environment sectors.			
B. Publish a list of country priority organisms (High alert pathogens) and associated antimicrobials for national reporting to be aligned with WHO surveillance model	i. Determine the organisms list and associated antimicrobials for surveillance and consider WHO recommended list that includes: • E. coli • K. pneumoniae • A. baumannii • Staph. aureus • Salmonella spp • Shigella spp • Neisseria gonorrhea Pseudomonas aeruginosa, Neisseria meningitidis, Haemophilus influenzae, Salmonella enterica serovar Typhi and Salmonella enterica serovar paratyphi A ii. Update the organism list in response to the changing incidence of resistant organisms iii. Standardize antimicrobial sensitivity testing (AST) and uniform reporting of national pathogens on an annual basis	MoPH	Facility

Secondary Objectives	Activities	Led By	Implementation
A. Design national AMR surveillance sentinel center in both animal health and food sector and environment	i. Identify and assess the eligibility of new sentinel sites that will contribute to the national AMR surveillance system from animal health, food safety and environment sectors ii. MoPH Food Safety lab will provide AMR surveillance and antimicrobial residue data to the MOPH AMR technical working group in a standard format iii. Enhance laboratory capacity in the animal sector through performing needs assessment and building capacity and capability in the animal health lab iv. Provide AMR surveillance data to the MoPH AMR technical working group in a standard format iiv. Establish a reporting system for sharing the data among the stakeholders and generating data that are internationally comparable and compatible with the "One Health" approach v. Identify the reportable organisms and relevant antimicrobials panel for integrated surveillance in animal health, food safety and environment sectors vi. Review the national regulations for testing food imports and include testing for antimicrobial residues	MoPH for food and environment Ministry of Municipality for Animal	Sector
3.4. Establish National Antimicrobial Consumption Surveillance across all human and animal health sectors.			

Secondary Objectives	Activities	Led By	Implementation
A. Develop central system to monitor and report antimicrobial use across all sectors, human and animal health, food safety sectors	i. Develop national standard tools to monitor and report antimicrobial consumption in human health and animal health, food and agriculture sectors ii. Collect dynamic data on antimicrobial consumption in human and animal sectors iii. Update the list of antimicrobials to be monitored on regular basis for surveillance according to national and international guideline recommendations iv. Link the resistance patterns to antimicrobial consumption across all humans, animal health, and food sectors v. Link AMR in all animals, food, and environment sectors to the human health	MoPH and Ministry of Municipality	Sector
3.5 Build laboratory capacity to support national AMR surveillance system in human health, animal health, food safety and environment/agriculture sectors.			
A. Establish and design National Reference Microbiology laboratory for each sector to provide an effective surveillance of AMR	i. The National reference lab (NRL) provides guidance and support to laboratories involved in surveillance systems. It aims to adopt national standards and protocols, enhancing local, regional, and national capabilities for AMR surveillance. The key functions of the PRL includes Guidance and Standardization (Policies and procedures), Reference Functions, training, Data collection and analysis, Assessments of laboratories and research ii. Each national lab will develop and include the AMR surveillance responsibilities in the future iii. Identify the international accredited laboratories/ centers that participate in the surveillance system in human health, animal health, food and environment laboratories	MoPH and Ministry of Municipality	Sector

Secondary Objectives	Activities	Led By	Implementation
B. Establish and develop a national quality assurance program to improve current laboratory capacity	i. Identify and determine quality assurance indicators as external proficiency test (PT), turnaround time (TAT), benchmarks ii. Form standard platform for laboratory testing methods for anti-microbial susceptibility among participating labs iii. Develop national guidelines and SOP with emphasis on the reportable national pathogens	MoPH and Ministry of Municipality	National
C. Support training program for laboratory staff on performing and interpretation of AST and AMR	i. Provide training or workshops to all sectors human, animal and food in collaboration with HMC Microbiology lab to standardize methods used for AST and AMR surveillance	MoPH and Ministry of Municipality	Sector

Appendix 4:

Operational plan for IPC, Biosecurity & Biosafety

Secondary Objectives	Activities	Led By	Implementation
4.1. Enhance governance and multi-sectoral commitment to IPC and biosecurity/ biosafety.			
A. Strengthen a formal organizational structure to ensure proper development and use of infection prevention and control policies and strategies at the national level and support and activate at the organizational level	I. Continue national policies and guidelines including high policy statement	MoPH/ Facilities	National and Facility
	ii. Ensure sufficient resources are available; human and financial	MoPH/ Facilities	National and Facility
	iii. Enhance engagement of all categories of health care groups, with multidisciplinary representation, accountability from leadership and support from organizational and departmental level	MoPH/ Facilities	National and Facility
	iv. Initiate IPC product evaluation process	MoPH/ Facilities	National and Facility
	v. Enhance partnerships with relevant stakeholders with clear responsibilities and accountabilities in both public and private sector (DHP, Occupational Health, facility master planning, waste management)	MoPH/ Facilities	National and Facility
	vi. Ensure that there are safe systems in place for collection, storage, transport and final disposal of healthcare waste	MoPH/ Facilities	National and Facility

Secondary Objectives	Activities	Led By	Implementation
B. Strengthen a formal organizational structure to ensure proper development and implementation of Biosecurity and biosafety measures at the national level and at the organizational level	Collaborate with relevant stakeholders, including farmers, veterinarians, and agricultural organizations, to develop sector-specific biosecurity manuals that emphasize responsible antibiotic use and AMR prevention Disseminate the farm biosecurity manuals and provide training to farmers and stakeholders on their implementation	Department of Animal Resources, MM	National and Facility

Appendix 5:

Operational plan for Antimicrobial Stewardship

Secondary Objectives	Activities	Lead Organization	Implementation Level
5.1. Ensure uninterrupted access to high-quality antimicrobial medicines – Primary and secondary and private and Community Pharmacy Network			
A. Improve regulation for access to high quality antimicrobials in all Qatar healthcare facilities	i. Review and strengthen national regulations regarding the use and access to high quality antimicrobial medicines	MoPH/ Pharmacy and Drug Control	National
	ii. Continue quality management system for supply chain management of antimicrobial medicines	MoPH/ Pharmacy and Drug Control	National and Facility
	iii. Create country essential medicine list (EML) for antimicrobials and classify by WHO AWaRe classification	MoPH/ Pharmacy and Drug Control	National and Facility
	iv. Develop and implement National Adverse Drug Reporting System to include monitoring safety of all antimicrobials, especially new agents.	MoPH/ Pharmacy and Drug Control	National and Facility
	v. Develop and enforce regulation for rationing of antimicrobials and distribution to facilities across Qatar with complete transparency of the process	MoPH/ Pharmacy and Drug Control	National
	vi. Develop a reporting system for issues related to procurement, access, shortages, and stockouts of antimicrobial medicines	MoPH/ Pharmacy and Drug Control	National
B. Activate and implement MoPH community pharmacy strategies to avoid overuse and misuse of antimicrobials	1. Introduce an integrated computer system across all healthcare sectors allowing pharmacies across the country to have access to antimicrobial dispensing information	MoPH/E-Health	National

Secondary Objectives	Activities	Lead Organization	Implementation Level
5.2. Improve and measure appropriate use of antimicrobial agents in health care – AMS in human health.			
A. Continue and enhance the National AMS Program in alignment with the National Health Strategy 2024-2030	i. Maintain and enhance National Antimicrobial Stewardship Technical Working Group to promote, coordinate, and monitor prudent antimicrobial medicine use in alignment with the national action plan	MoPH	National
	ii. Finalize and implement the national antimicrobial stewardship and prescribing policy	MoPH	National
	iii. Monitor the compliance of AMS programs in facilities using the WHO CDC AMS toolkit	MoPH	National
	iv. Mandate stewardship implementation as a part of the healthcare facilities	MoPH	National and Facility
	v. Create and audit the stewardship indicators to monitor the effectiveness of the program in the facilities	MoPH	National and Facility
	vi. Identify and develop new national guidelines for prescribing based on existing gaps (include all Qatar relevant infectious diseases) to standardize and optimize prescriptions and rational use of antimicrobial drugs in human	MoPH	National
	vii. Create good quality prescribing indicators and encourage benchmarking at the facility level	MoPH	Facility

Secondary Objectives	Activities	Lead Organization	Implementation Level
B. Establish Antimicrobial Stewardship education program	i. Improve and continue training and education for healthcare workers and public.	MoPH	National and Facility
	ii. Develop a curriculum for AMS and AMR awareness in undergraduate and postgraduate and residency and fellowship programs - adopting an interprofessional education (IPE) approach (doctors, pharmacists, nurses, dentists etc.)	MoPH	National
	iii. Develop e-module which is compulsory for licensing	MoPH	National
5.3. Ensure adequate access and prudent use of antimicrobial agents in terrestrial and aquatic animals and agriculture.			
A. Develop and establish a multisectoral (public/private) antimicrobial stewardship program	i. Create multidisciplinary antimicrobial stewardship team with clear terms of reference that facilitates antimicrobial stewardship activities and reports to the national AMR Committee	Animal Health Department	National and Facility
	ii. Optimize implementation and monitoring of animal health regulation	Animal Health Department	National and Facility
	iii. Establish policies and evidence based standard therapeutic guidelines for food production animals engaging all stakeholders in the process	Animal Health Department	National and Facility
	iv. Restrict the use of critically important antibiotics for human medicines in food production animals	Animal Health Department	National and Facility
	v. Develop and implement a system for antimicrobial consumption surveillance and collect data quarterly	Animal Health Department	National and Facility
	vi. Create a working group to develop a system for registering and ensuring access to high quality antimicrobials in animal health sector	Animal Health Department	National and Facility
	vii. Draft a policy document for off-label use of antimicrobials in food producing animals, and submit to the board		

Secondary Objectives	Activities	Lead Organization	Implementation Level
5.4. Enhance utilization of technology to support improvement in AMS practices and activities			
A. Introduce/ enhance electronic health records (EHR)	i. Mandate documentation of the appropriate clinical indication/diagnosis for each antibiotic prescriptions/order	MoPH/ Facilities	Facility
	ii. Introduce/Improve advanced clinical decision support system (CDSS) linking electronic prescribing with evidence-based medicine guidelines, diagnostic and laboratory results at facility level	Facilities	Facility
	iii. Collaborate with National Electronic Prescribing System. (E health national program)	MoPH/ Facilities	Facility
	iv. Incorporate tools such as antimicrobial stewardship module in the electronic system to guide appropriate prescribing of antimicrobials and help with conducting AMS activities and introduction of antimicrobial prescribing and stewardship application	Facilities	Facility
B. Introduce/ enhance lab technology capability to ensure timely treatment of serious infections	i. Promote microbiologic point of care testing to reduce unnecessary antimicrobial prescribing	Facilities	Facility
	ii. Promote the use of rapid microbiological and molecular testing to identify organisms quickly and ensure patients are on best antimicrobials	Facilities	Facility

Secondary Objectives	Activities	Lead Organization	Implementation Level
5.5 Ensure adequate funding and resources for AMS activities			
A. Leadership commitment, accountability, and responsibility	A. Ensure antimicrobial stewardship is a top priority for facility management and there is a facility AMS action plan with allocated human and financial resources to initiate/continue AMS activities	Facility	Facility
	B. Identify a dedicated AMS leader/ champion who has dedicated staff time for AMS activities	Facility	Facility
	C. Form/maintain multidisciplinary AMS committee with clear terms of reference that monitors and measures the implementation of AMS activities	Facility	Facility
	D. Form/maintain AMS team with dedicated staff time including the AMS lead/champion, AMS pharmacist, microbiologist, IT pharmacist, data analyst, quality reviewer, and infection prevention practitioner	Facility	Facility
	E. Ensure monitoring and auditing of fund allocation to justify further activities	Facility	Facility

Appendix 6:

Operational plan for AMR research

Secondary Objectives	Activities	Lead Organization	Implementation Level
6.1 Promote AMR research in alignment in partnership with national, regional, and international organization and institutions			
A. Establish a Multisectoral National AMR Research Technical Working Group (TGW)	i. Conduct a situation analysis by: a. Reviewing and assessing data generated by studies performed in the field of AMR in the state of Qatar and published in international peer-reviewed journals during the period 2018-2022 b. Evaluating the progress of ongoing studies and the potential relevance of the data these studies may generate for Qatar c. Analyzing existing policies and guidelines related to AMR to assess their degree of alignment with the local epidemiological data generated by relevant publications between 2018 and 2022	MoPH	National
	ii. Identify research gaps and develop a priority National research agenda in AMR with specific research topics and questions to be addressed in the timeframe 2024-2030	MoPH	National
	iii. Identify the most suitable research groups to study priority AMR research topics, aiming to fill knowledge gaps and develop innovative approaches for AMR diagnosis, treatment, and prevention, with MoPH ensuring the allocation of necessary resources and funds	MoPH	National
	iv. Ensure that the data produced by these studies can be translated into practice by ensuring that national guidelines and policies are updated with the evidence generated	MoPH	National

Appendix 7:
Terms Of Reference

1. Awareness/Education Technical Working Group

1. Purpose

To establish a nationwide well-coordinated Antimicrobial Resistance Program with well-defined and interconnected duties and functions of the program's many arms, with the goal of reducing AMR throughout the state of Qatar.

To oversee the implementation of the objectives and activities of the National Action Plan that require sustained, coordinated, and complementary efforts of individuals and groups around the country, including healthcare providers, healthcare leaders, veterinarians, agriculture industry leaders, manufacturers, policymakers, and patients.

The National IPC and AMR Section has established the AMR Program Technical Working Groups as a forum to support implementation of the AMR NAP 2024-2030.

NAP AMR 2024-2030 educational priorities include:

- Develop awareness educational program (train the trainer, campaigns, workshops) for healthcare professionals and for animal health, food safety and agriculture professionals.
- Develop and implement multidisciplinary team training in the field of AM Prescribing and dispensing for example physicians, clinical pharmacist, and nurses.
- Include antimicrobial stewardship principles and strategies in undergraduate and postgraduate curricula for medical, paramedical, and veterinary students and any relevant sectors.
- Facilitate and ensure access to in-service training including continuous professional development (CPD) on antimicrobial prescribing and AMS for health-care professionals in the country.
- Strengthen communication and education initiatives for animal health, food safety and agriculture professionals.
- Integrate AMR awareness education program/campaign for public and cover different sectors (e.g., including AMR awareness program in school curriculum, all educational institutions), labor camps health centers, Food Industry, agri-business, and community).
- Promote and Support World Antibiotic Awareness Week in all healthcare settings and public and animal health sector, agriculture, and food safety.
- Endorse a “One Health” AMR Awareness approach.
- Develop e-Learning modules for health professionals in human health and animal health.

- Develop local, regional, and international partnerships to improve and enhance all the interventions of the education, awareness and change of behavior activities in healthcare settings and animal, food, and agriculture settings.

2. Responsibilities

The objective of the Educational TWG is to contribute to the development of the awareness and educational programs related to AMR nationally by:

- Facilitating discussions to assess and review proposals
- Addressing issues relating to the implementation of the NAP educational priorities and objectives
- Provide oversight of implementation activities and readiness

3. Membership

Members will be representative of a cross-section of stakeholder groups and will provide technical expertise.

Members are expected to have a high level of personal and professional integrity, work together, and bring a broad perspective to issues and discussions raised.

Members are also expected to champion the AMS program in their own unit and demonstrate leadership for AMS in their areas of practice as well as in their knowledge and attitudes.

4. Meetings

Members will be required to meet regularly and contribute to the work of the TWG. The educational TWG will meet quarterly. Meetings may be held more or less frequently at the discretion of the Chair.

Meeting agendas minutes will be provided and includes:

- preparing agendas and supporting papers
- preparing meeting notes and information

5. Quorum

A quorum, consisting of half the number of members plus one, must be in attendance for decision-making.

6. Performance

The AMR Education TWG shall provide an annual report to the National AMR and IPC Committee, including a review of the TWG Terms of Reference.

2. Antimicrobial Resistance Surveillance Technical Working Group

1. Purpose

The purpose of the AMR Surveillance Technical Working Group (TWG) is to support the implementation of the National AMR Program by providing technical support for all National AMR Surveillance and National Antimicrobial Consumption Surveillance related activities in all "One Health" sectors.

2. Responsibilities

The National AMR TWG is a National Multisectoral group covers both human and animal health sectors as well as the food and environmental sectors

The AMR Technical Working Group Should:

- Work as a central national governance/structure for “One Health” AMR surveillance at Ministry of Public Health (MoPH)
- Support the National Coordination Center (NCC) for AMR Surveillance
- Provide support for establishing and maintaining the national electronic surveillance system for AMR including identifying and prioritizing organisms and relevant antimicrobials that will be reported in each sector
- Provide technical expertise for developing and enhancing a national monitoring and evaluations framework such as developing KPI to ensure that surveillance efforts are appropriately targeted
- Develop central surveillance system to monitor and report antimicrobial consumption across all humans, animal health, food, and environment sectors
- Support developing and reviewing AMR surveillance related policies
- Support training program for laboratory staff for performing and interpretation of AST and AMR in all sectors

3. Membership

The TWG will be led by a chair. Membership must include representatives from all "One Health" Sectors. These may include experts from areas such as infectious diseases, microbiology, infection prevention and control in human and animal health, pharmacy and drug control, public health surveillance system experts, environment, and others.

4. Meetings

Members will be required to meet regularly and contributing to the work of the TWG. Meetings will happen twice per year or as determined by the chair.

Members who do not show up to two meetings and/or fail to send an alternate, will be removed from the group.

5. Quorum

A quorum, consisting of half the number of members plus one, must be in attendance for decision-making.

6. Performance

Performance evaluation of the AMR Surveillance TWG will be conducted by the Chair of AMR Committee annually. The chair of the AMR Surveillance TWG shall provide an annual report to the National AMR Committee.

3. Infection Prevention and Control (IPC) Technical Working Group

1. Purpose

To establish a nationwide well-coordinated Antimicrobial Resistance Program with well-defined and interconnected duties and functions of the program's many arms, with the goal of reducing AMR throughout the state of Qatar.

To oversee the implementation of the objectives and activities of the National Action Plan that requires sustained, coordinated, and complementary efforts of individuals and groups around the country, including healthcare providers, healthcare leaders, veterinarians, agriculture industry leaders, manufacturers, policymakers, and patients.

National IPC and AMR Unit has established the AMR Program Technical Working Groups as a forum to support implementation of the AMR NAP 2024-2030.

NAP AMR 2024-2030 Infection Prevention and Control (IPC) priorities includes:

- Develop policy on IPC practices to control the spread of Multidrug Resistant Organisms (MDROs), including managing patients in healthcare settings and community, in collaboration with different entities.
- Create IPC guidelines for staff/workers/vets, farmers to prevent and control infection and potential contamination.
- To develop IPC audit program/ process, including formulation of a national audit team in partner with subject matter experts.
- Incorporate IPC program as part of the national biosecurity/ biosafety program.
- Review facility licensing and accreditation standards to be aligned with IPC program.
- Promote and Support World Antibiotic Awareness Week in all healthcare settings and public and animal health sector, agriculture, and food safety. Endorse a “One Health” AMR Awareness approach.
- Develop IPC e-Learning modules for health professionals in human health and animal health.
- Develop local, regional, and international partnerships to improve and enhance all the interventions of the IPC program and national biosecurity in healthcare settings, animal, food, and agriculture settings

2. **Responsibilities**

The objective of the IPC TWG is to contribute to the development and implementation of IPC programs related to AMR nationally by:

- Facilitating discussions to assess and review proposals
- Addressing issues relating to the implementation of the NAP IPC priorities and objectives
- Provide oversight of implementation activities and readiness

3. **Membership**

Members will be representative of a cross-section of stakeholder groups, will provide technical expertise.

Members are expected to have a high level of personal and professional integrity, work together and bring a broad perspective to issues and discussions raised.

Members are also expected to champion the AMS program in their own unit and demonstrate leadership for AMS in their areas of practice as well as in their knowledge and attitudes.

4. **Meetings**

Members will be required to meet regularly and contributing to the work of the TWG. The educational TWG will meet quarterly. Meetings may be held more or less frequently at the discretion of the Chair.

Meeting agendas minutes will be provided and includes:

- preparing agendas and supporting papers
- preparing meeting notes and information

5. **Quorum**

A quorum, consisting of half the number of members plus one, must be in attendance for decision-making.

6. **Performance**

The AMR Education TWG shall provide an annual report to the National AMR and IPC Committee, including a review of the TWG Terms of Reference.

4. Antimicrobial Stewardship Technical Working Group

1. Purpose

The National AMR TWG is a National Multisectoral group covers both human and animal health sectors as well as the food and environmental sectors. The purpose of the AMS -TWG is to provide support and guidance to promote the successful implementation and maintenance of a comprehensive AMS service across QATAR health care system. The aims of this group are to promote the efficient, safe, and appropriate use of antimicrobials thereby optimizing clinical outcomes while minimizing unintended consequences of antimicrobial use including toxicity; under or overdosing; inappropriate antimicrobial selection and emergence of resistant organisms.

2. Accountable to:

- The national safety and quality health service at ministry of public health
- National AMR committee

3. Function and Responsibilities

The AMR Technical Working Group Should:

- Work as a central national governance/structure for "One Health" AMR surveillance at MOPH
- Support the National Coordination Centre (NCC) for antimicrobial stewardship program implementation within health care facilities
- To review health care facilities AMS program progress and make recommendations in the implementation of WHO's priority activities to tackle AMR
- Provide support for maintaining the national electronic surveillance system for AMR including identifying and prioritizing organisms and relevant antimicrobials that will be reported in each sector
- Provide technical expertise for developing and enhancing a national monitoring and evaluations framework such as developing KPI to ensure that surveillance efforts are appropriately targeted
- Monitor and report antimicrobial consumption across all humans, animal health, food, and environment sectors
- Support developing and reviewing antimicrobial prescription related policies
- Provide an independent evaluation of the major scientific and technical challenges and opportunities in order to enhance progress in addressing AMR in the context of human health
- Review and make recommendations regarding the adequacy of health care facilities response to emerging national health risks with regards to AMR

4. **Membership and Chair**

Membership must include representatives from all "One Health" Sectors. These may include experts from areas such as infectious diseases, microbiology, infection prevention and control in human and animal health, pharmacy and drug control, public health surveillance system experts, environment, and others.

5. **Frequency of meetings:**

The meetings should be held on a regular basis, ideally quarterly. Meetings may be held more or less frequently at the discretion of the Chair. Members shall delegate a proxy to attend meeting of AMS -TWG in their absence. Guests are invited by the Chair to attend meetings of the AMS -TWG.

Meeting agendas minutes will be provided and includes:

- Preparing agendas and supporting papers
- Preparing meeting notes and information

The agenda will be distributed to the members and attendees 1 week prior to the meeting. The proceedings of all meetings will be recorded to reflect the work done by the AMS -TWG and these minutes will be endorsed by this committee at the following meeting.

6. **Quorum:**

A quorum, consisting of half the number of members plus one, must be in attendance for decision-making.

7. **Performance:**

The AMS -TWG shall provide an annual report to the national Safety and Quality Health Service at ministry of public health and the national AMR committee.

5. Research Technical Working Group

1. Purpose

- Provide strategic leadership on National AMR Research agenda under the National Action Plan on AMR.
- Provide a coordinated approach for national, healthcare, and non-healthcare organizations and community AMR Research programs (set priorities, financial allocations, etc.).
- Support national, regional, and international efforts as appropriate.

The overall aim of the National AMR Research Technical Working Group (TWG) is to set and implement a national research agenda into AMR in affected sectors (humans, animals, agriculture & environment) applying "One Health" approach. The TWG is accountable to:

- National AMR multisectoral Committee
- Research organizations and others as applicable

2. Responsibilities

- Develop & monitor national research agenda for the affected sectors in alignment with National Action Plan on AMR
- Review and prioritize research topics that align with the goals of the national AMR program and address the unique challenges of Qatar
- Coordinate mobilization of resources (fund & manpower) for the implementation of the research agenda into AMR within the sectors
- Support national work on strengthening national capacity in research to tackle AMR, in line with the National Antimicrobial Resistance Plan (NAP)
- Facilitate collaboration between researchers, institutions, and stakeholders both within Qatar and internationally
- Where possible, provide technical guidance on research methodologies, study designs, and data collection strategies to ensure high-quality research
- Where possible, monitor ongoing research projects, review interim findings, and ensure that the research remains on track and aligned with the program objectives
- Ensure effective dissemination of research findings to all stakeholders, policy makers, healthcare practitioners, and the public to influence evidence-based decision making
- Develop & monitor a national repository platform to where data sets, presentations, and publications are stored and accessible for all research groups to enhance collaborative endeavors

3. Membership

The national AMR RTWG will comprise multidisciplinary experts from various fields including, but not limited to:

- Members representing the relevant departments within the Ministry of Public Health (MOPH) responsible for the selection, supply, distribution, prescribing and use of antimicrobials at the national level.
- Members representing academia, infectious diseases, microbiology, epidemiology, clinical medicine, public health, pharmaceutical sciences, health economics, social sciences.
- Members representing animal health (veterinary medicine), food, and environment sectors.
- Representatives should be given sufficient authority by their institutions to make decisions.

The RTWG members should always remain engaged, striking a balance between full representation and the functionality of the group to coordinate a national RTWG.

4. Meetings

The meeting format and rules should conform to national norms. A chairperson should be selected based on his or her expertise in leadership. Rotation of the chair among members of the TWG could be considered. The RTWG should convene regularly, at least quarterly, or biannually, to discuss progress and address emerging challenges. Meeting minutes and recommendations will be documented and shared with relevant stakeholders.

5. Quorum

A quorum, consisting of half the number of members plus one, must be in attendance for decision-making.

6. Performance

Performance the Research -TWG shall provide an annual report to the national Safety and Quality Health Service at ministry of public health and the national AMR committee.

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