



Antimicrobial Resistance National Action Plan Pakistan

**Ministry of National Health Services
Regulations & Coordination
Government of Pakistan**

May 2017

Contents

Contents	2
Abbreviations and Acronyms	3
Foreword.....	5
Executive summary	6
Background.....	7
Introduction.....	7
Governance.....	8
Situation analyses and assessment	9
SWOT Analysis: GAP Strategic Objectives	14
Vision	211
Mission Statement.....	211
Strategic Priorities	21
Strategic Plan	22
Operational Plan	29
Monitoring & Evaluation Plan	444
List of Publications & References Cited in the Document.....	644

Abbreviations and Acronyms

AMR	Antimicrobial resistance
ARI	Acute Respiratory Infection
ASP	Antibiotic Stewardship Programs
AST	Antibiotic Susceptibility Testing
CDC	Centre for Disease Control, Atlanta
CLSI	Clinical and Laboratory Standard Institute
DGHS	Directorate General of Health Services
DRAP	Drug Regulatory Authority of Pakistan
EARS- Net	European Antimicrobial Resistance Surveillance Network
EMRO	Eastern Mediterranean Regional office (WHO)
ESBLs	Extended spectrum beta lactamases
FAO	Food & Agriculture Organization
FELTP	Pakistan Field Epidemiology and Laboratory Training Program
GAP	WHO Global Action Plan for AMR
GLASS	Global Antimicrobial Resistance Surveillance System
HAIs	Hospital-acquired infections
HCWs	Healthcare workers
HCP	Healthcare Professional
ICC	Inter-sectoral Core Committee
IPC	Infection Prevention & Control
IHR	International Health Regulation
ICUs	Intensive care units
LIS	Laboratory Information System
MDR	Multi-drug Resistant
MDROs	Multidrug Resistant Organisms
MIS	Management Information System
MMIDSP	Medical Microbiology and Infectious Diseases Society of Pakistan
MNHS&RC	Ministry of National Health Services Regulations & Coordination
MNFS&R	Ministry of National Food Security and Research
NARC	National Agricultural Research Centre
PARC	Pakistan Agricultural Research Council
NACP	National AIDS Control Program Pakistan
NIH	National Institute of Health
NGOs	Non-Governmental Organizations

NTP	National TB Program
NVL	National Veterinary Laboratory
OIE	World Organization for Animal Health
OTC	Over the counter
PARN	Pakistan Anti-Microbial Resistance Network
PHRC	Pakistan Health Research Council
PNC	Pakistan Nursing Council
PVMC	Pakistan Veterinary & Medical Council
TB	Tuberculosis
USAID	United States Agency for International Development
VAP	Ventilator Associated Pneumonia
WHA	World Health Assembly
WHO	World Health Organization
NAP	National Action Plan
DST	Drug Susceptibility Testing
EQAP	External Quality Assessment Programme
PPE	Personal Protective Equipment
SSI	Survey Sampling International
EML	Essential Medicine List
IEC	Information Education & Communication
LQMS	laboratory Quality Management System
TCH	Tertiary Care Hospital
CSSD	Central Sterile Supply Department
HSA	Health Service Academy
WASA	Water and Sanitation Agency
HEC	Higher Education Commission
DHIS	District Health Information System
DALYS	Disability-Adjusted Life Years
EUCAST Testing	European Committee on Antimicrobial Susceptibility
DHQ	District Headquarter
CME	Continuous Medical Education
EPA	Environmental Protection Agency
GARP	Global Antibiotic Resistance Partnership

Foreword

The growing problem of Antimicrobial Resistance (AMR) has emerged as a major health crisis in almost all countries of the world including Pakistan, resulting in an alarming increase in the burden of infections due to multi-resistant bacteria and limiting the choice of Antimicrobials for treatment.

The Global Action Plan to tackle AMR was endorsed in the 68th session of the World Health Assembly (WHA) in Geneva during May 2015 by all countries including Pakistan. The first follow-up action to the commitment of the Minister of State, Ministry of National Health Services Regulations & Coordination (NHSR&C) was the development of the '**National Strategic Framework for Containment of Antimicrobial Resistance**' through a comprehensive consultative process undertaken through January to April 2016.

The next logical step is translating the National AMR Strategic Framework into an AMR National Action Plan (NAP), with involvement and full participation of the health, veterinary, agriculture, and other sectors at the federal, provincial and regional levels in the One Health Approach. The process was undertaken through a consultative workshop conducted from 27th February to 3rd March 2017 in Islamabad, in close collaboration with the National Institute of Health, National Agricultural Research Centre and National Veterinary Laboratory as the designated focal points for AMR in health and veterinary sectors respectively. The workshop was technically supported and financed by the World Health Organization; and a team of international consultants and national experts also participated for facilitating technical discussions during the workshop.

The development of National Action Plan is fulfilment of the commitment of the Government of Pakistan on WHA68.7 resolution on AMR. The work plan is aligned with the objectives of the Global Action Plan and includes strategic and operational components as well as a framework for monitoring and evaluation. The AMR NAP will be shared with all the stakeholders including relevant Health Development Partners (HDPs) at the national, provincial/regional levels under the One Health Approach for adoption and development of respective provincial and regional implementation plans.

Executive summary

The increasing global trend of Antimicrobial resistance (AMR) has emerged as major challenge for the health and public health sectors. AMR has spread to almost all countries and regions, including Pakistan owing to the "misuse and overuse" of Antibiotics, contributing to the increasing burden of infections due to resistant bacteria while limiting out the treatment options for managing such infections. The growing burden of AMR in Pakistan requires a National Action Plan (NAP), aligned with the World Health Assembly Resolution (WHA68.7) in May 2015 to tackle the issue of AMR through a 'One Health' Approach. The national action plan development process needs to be embedded in an overall multi-sectoral "One Health" Approach for containment of AMR to ensure reduction of adverse impact of inappropriate Antimicrobial use on health in terms of cost, resistance and poor outcomes in both human and veterinary sector, agriculture as well as finance, environment and consumers.

An AMR Oversight Committee representing different sectors, ministries, departments of health and provincial authorities along with subject matter experts was notified by the MNHS&RC vide Notification No F. No 8-30/2015-DDP-1 dated 27th November 2015. The committee members along with the subject matter experts representing various sectors participated in the whole process of National Action Plan development. This process ensured national ownership as well as the commitment of all relevant stakeholders. The following major strategic priorities emerging from this all- inclusive consultative process are include in the NAP:

- I. Development and implementation of a national awareness raising and behavioral change strategy on antimicrobial resistance;
- II. Establishment of an integrated national AMR surveillance (human, animal usage and resistance monitoring);
- III. Improve prevention & control of infections in health care, community, animal health, food, agriculture and environment;
- IV. Update and enforce regulations for human and veterinary antimicrobial utilization;
- V. Phase out use of antimicrobials as Growth Promoters and provide appropriate alternatives (such as prebiotics, probiotics);
- VI. Integration of AMR in all public health research agendas including research on vaccines; and,
- VII. Estimation of health and economic burden of AMR for decision making.

The primary objective of the National AMR Action Plan is to ensure that current Antimicrobials remain effective as long as possible for all those who need them, and minimise the expense associated with indiscriminate use. The country needs to have consistent, coherent, comprehensive and integrated approach at the national level to address AMR which is aligned with, and complements the global and regional efforts. The NAP will go a long way in improving the health in both humans and animals. It will take priority actions incrementally to combat AMR in a phased process with involvement and commitment of all stakeholders to ensure successful implementation in all relevant sectors.

Background

Introduction

Antimicrobial resistance refers to intrinsic and extrinsic factors causing the microbes to become resistant to Antimicrobials, resulting in limiting options for treatment of infectious diseases. The increasing prevalence of resistance to a range and broad categories of Antimicrobial medicines is reported from all over the world, which significantly threatens human and animal health. The direct consequences of infection with resistant microorganisms are severe, may result in longer illness, prolonged hospital stay, loss of protection for patients undergoing operations and other medical procedures, with increased mortality and health care costs. AMR is cross cutting and affects all areas of health, involves many sectors and has an overall impact on the society as a whole.

The WHA Resolution WHA68.7 in May 2015 urged the Member States on the critical need for development of Global Action Plan as a reflection of the global consensus on the profound threat of AMR to human and animal health. Accordingly, the 68th WHA through a resolution A68/20 Corr.1 adopted the Global Action Plan on AMR in May 2015. The Global Action Plan aims to ensure, for as long as possible, 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. The Global Action Plan has defined the following five strategic objectives for containment of AMR:

1. Improve awareness and understanding of antimicrobial resistance;
2. Strengthen knowledge through surveillance and research;
3. Reduce the incidence of infection;
4. Optimize the use of antimicrobial agents; and,
5. Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions.

Likewise, at the 71st UNGA session on 21 Sep 2017, for the first time, Heads of State committed to taking a broad coordinated approach to addressing the root causes of AMR across multiple sectors, especially human health, animal health and agriculture. Countries reaffirmed their commitment to develop NAPs on AMR, based on the "Global Action Plan on Antimicrobial Resistance"- the blueprint for tackling AMR developed in 2015 by the World Health Organization in coordination with the Food & Agriculture Organization of the United Nations and the World Organization for Animal Health.

The resolution (WHA68.7) has also urged Member States to develop and implement inclusive and informed National Action Plans for containment of AMR by May 2017, by taking into account the five-strategic objectives. In this regard, a Regional AMR Steering Committee and Task Force were established by WHO EMRO in 2015 with the mandate to develop the outline of a Regional Operational Framework for implementation of the draft GAP on AMR, and assist the member states to develop and implement national action plans with "One Health Approach". The action plans underscore the need for a cross-sectoral coordination among national governments and international partners in the human, veterinary, agriculture, finance, environment, and other sectors.

The Government of Pakistan following the commitment to the WHA Resolution of May 2015 has already taken several initiatives to address AMR. An early implementation of the National AMR Surveillance System in the health sector, aligned with the Global Antimicrobial Resistance Surveillance System (GLASS) and in collaboration with the WHO, is in place through a sentinel approach.

An Intra-sectoral Core Committee (ICC) on AMR was also notified on 27th Nov 2015 by the Government of Pakistan, with the mandate to (i) identify key stakeholders and experts in policy making, infectious diseases, pharmaceuticals, animal health and agriculture sector, etc. (ii) assess the existing status of AMR in Pakistan through systemic review of WHO docs/ guidelines/reports and national literature on AMR in Pakistan (iii) prepare a policy document/ strategic framework outlining the details of the proposed areas for National AMR Framework and Action Plan narrated through a consultative process with key stakeholders and experts (iv) provide recommendations for engagement of public and private sector including professional societies in terms of resource mobilization for awareness, standardized testing, surveillance and monitoring of AMR and regulatory framework (v) provide recommendations for development of provincial plans of actions for implementation of AMR NAP.

The ICC under the technical oversight of the Ministry of NHR&C developed a "National Strategic Framework for Containment of Antimicrobial Resistance" through a comprehensive consultative process involving Health, Veterinary, Agriculture & Other sectors which was endorsed on 1st Dec 2016. The National AMR Strategic Framework has collated several policy statements and interventions which were aligned to the strategic objectives of the Global Action Plan.

The Ministry of National Health Services Regulations & Coordination subsequently notified a Core Group on AMR in March 2017, composed of technical members from relevant entities (Ministry of National Health Services Regulations & Coordination, NIH/ AMR Focal Point, Ministry of National Food Security & Research (NARC/NVL), Provincial IHR focal points, WHO, CDC & Shifa Hospital) to: (i) compile, refine and finalize AMR NAP; (ii) coordinate with One Health and other relevant stakeholders (National & Provincial) for follow-up activities; (iii) assist provinces to prepare Provincial AMR operational plans; and, (iv) provide technical, coordination and monitoring oversight for implementation of AMR activities in Pakistan.

A national consultative workshop was conducted from 27th Feb to 3rd March 2017 with the support of the World Health Organization. Very careful consideration and meticulous workshop planning resulted in a notable multi-sectoral participation of over 90 people from all levels. The comprehensive consultative process ensured consensus, commitment, and ownership of the participating stakeholders from all levels. The workshop methodology was able to generate in depth discussions and build consensus to define strategic direction and priorities for systematically addressing AMR in Pakistan.

The National AMR Strategic Framework has been the guiding document and basis of the AMR National Action Plan. It which includes an operational plan based on seven identified strategic priorities, which are based on the strategies defined earlier in the National AMR Strategic Framework developed in 2016. The strategic interventions have been further elaborated into main activities, with outcomes, timeframe and defined responsibilities of all the stakeholders at the Federal, Provincial and District levels, including Health Development Partners where relevant.

The process of NAP development initiated and strategized in the national consultative workshop, was subsequently compiled and collated through April 2017 by the technical Core Group notified for the purpose.

Governance

The Governance in Pakistan is decentralized with the country administratively divided into four major provinces of Punjab, Sindh, Khyber Pakhtunkhwa and Baluchistan and four federating areas: Federally Administered Tribal Areas (FATA), Gilgit- Baltistan (GB), Azad Jammu & Kashmir (AJ&K) and Islamabad Capital Territory (ICT). Following devolution in 2011, the Provincial Governments are fully autonomous and responsible to

define their health needs, develop and implement policies, strategies and operational plans. However, the Ministry of National Health Services Regulations and Coordination sets the national framework for policies, setting standards, and fulfils international mandates and obligations on health.

In order to oversee the process of implementation of IHR and GHSA across Pakistan, the MNHS&RC issued notification designating the Health Planning, System Strengthening and Information Analysis (HPSIA) Unit as the focal point for IHR and GHSA to collaborate and work with the Federal Line Ministries, Provinces/ Area Health Department and International Health Development Partners (HDP). The previously notified National Taskforce for IHR has also been revised to constitute 'Multi-sectoral National Taskforce for International Health Regulations (IHR), 2005 and Global Health Security Agenda (GHSA)' with composition of both Health and Non-Health sectors and Terms of Reference to oversee and coordinate the process of IHR implementation across Pakistan.

Pakistan under the guidance of the Ministry of NHR&C in early 2016 completed the process of Joint External Evaluation (JEE) of IHR and GHSA for assessment in 19 technical areas, in which AMR was recommended as one of the priority areas for action due to very limited capacity in all the 4 indicators on AMR. Results of the JEE, further reiterated the need, and endorsed the parallel process of development of National Strategic Framework for Containment of AMR. In the ensuing focus, several health development partners like WHO, CDC, PHE, GARP also indicated their interest to join and support the ongoing AMR activities in Pakistan.

The National Framework for Containment of Antimicrobial Resistance (AMR) developed and endorsed by the Ministry of NHR&C in Dec 2016, has collated several policy statements and interventions which were aligned to the strategic objectives of the Global Action Plan on AMR. In order to operationalize this framework, there is a need to identify the priority interventions and develop activities with timeframe, commitment with clarity on roles and responsibilities of all the stakeholders at the Federal, Provincial and District levels. The process involves comprehensive participation of provincial and other sub-national levels to ensure commitment, ownership and subsequent endorsement of the NAP.

The National Institute of Health, as the national focal point for IHR and AMR designated by Ministry of NHR&C is responsible for implementation of important IHR/GHSA technical areas such as surveillance, response, workforce development, Laboratory system and AMR. However, AMR Focal Point for the Veterinary sector remains to be nominated officially by the Ministry of National Food Security & Research (NFS&R). In the interim of awaiting designated AMR focal points, the Provincial Departments of Health (DOH) have been similarly requested for assigning additional responsibility of being AMR Focal Points to the Provincial IHR Focal Points.

The Ministry of NHR&C is likewise, in the process of designating a National Focal Point for Infection Prevention and Control with defined responsibilities and terms of reference. At present there are no domestic resources allocated so far for AMR and the funding from donors may not be sufficient. Therefore prioritization of activities will be carried out while costing of the NAP is done.

Situation analyses and assessment

Antibiotic resistance is one of the major health crises in Pakistan with the overall situation being much more grim than indicated in many studies published over the last two decades. A number of factors have been contributory in this regard. The major challenges and issues identified include unnecessary large number of registered products (approximately 50,000); unjustified or misleading advertisements with only about 15% promotional brochures meeting WHO criteria; self-medication in more than 50% of the

population according to different studies/surveys; and, a high number of quacks in the country. The highest numbers of drugs are prescribed with more than 3 drugs per patient with 70% of patients being prescribed Antibiotics. This irrational and indiscriminate use is more common among General Physicians (GPs) and public sector hospitals with a bias towards costly broad spectrum Antibiotics. Availability of over the counter (OTC) without prescription medications, especially Antibiotics is a common practice and usage of potent Antibiotics for highly resistant infections is also a common phenomenon. These practices have created a vicious cycle with emergence of resistance in common bacteria resulting from Antibiotic selection pressure. Only a few institutions have full or partial institutional policies on optimal prescription of Antibiotics. However, any impact at country level will be minimal unless majority of the health care institutions and community based general practitioners and physicians are also fully implementing uniform policies.

Bacterial resistance has been well documented in several studies and surveys conducted over a decade in Pakistan. Almost a decade ago resistance in Gram-negative organisms was increasingly being recognized, with extended spectrum beta lactamases (ESBLs) being a major concern. A study conducted by Aga Khan University, Karachi between 2001-2006 indicated an increase in ESBL and multidrug-resistant organisms (MDR) producing *K. pneumoniae* to >30% and 0.4% Carbapenem resistant. A study of blood stream infections (BSIs) from Lahore revealed an alarmingly high 93.7% resistance in *Enterobacteriaceae* against 3rd generation Cephalosporins; and, 6.5% carbapenem resistance among *Pseudomonas* and *Acinetobacter* isolates. Pan-drug resistant *Acinetobacter* infections are also increasing and many hospital settings across Pakistan, with reported high mortality among patients with such infections. Different studies conducted during 2004 – 2013 also report increasing resistance of *E. coli* to 3rd generation Cephalosporins ranging from 12.6% to 94% among clinical isolates. Similarly, high resistance of *E. coli* against 3rd generation Cephalosporins has been reported among *Klebsiella* spp isolates with high frequency.

Typhoid continues to be an important public health threat across the country, with increasing concern due to drug resistance and associated treatment failure. A study conducted by Aga Khan University on a sample size of over 5,000 isolates of *Salmonella typhi* and *S. paratyphi A* between 2001-2006 indicated that MDR rate has increased significantly from 34.2% to 48.5% among *S. typhi* isolates, while quinolone resistance has increased from 1.6% to 64.1% among *S. typhi* and from 0% to 47% among *S. paratyphi A* isolates.

Methicillin-resistant *S. aureus* (MRSA), commonly associated with soft tissue and skin infections (SSTIs), bone and joint infections, blood stream infections (BSIs) and hospital acquired infections (HAIs) has reportedly revealed high rates of infections. High prevalence (35%-40%) of MRSA isolates in different hospitalized patients has increasingly led to the use of second line costly drugs. Various studies published between 2004 – 2013 reports Methicillin resistance between 1.2% - >72% among clinical isolates of *S. aureus*. Anecdotal evidence suggests that MRSA infections within the community may also be on the rise.

Tuberculosis and malaria are also major public health problems in Pakistan. Resistance has emerged with potential negative fallout on the National Programs and grave implications for the public at large. Drug-resistant tuberculosis is increasingly being encountered with over 15,000 MDR TB cases reported annually. The incidence of *P. falciparum* compared to *P. vivax* is increasing in Pakistan. One of the serious obstacles to Roll Back Malaria is resistance and poor cure rates of Anti-malarial drugs. Over the years *P. falciparum* has shown continuous increase in all endemic areas of Pakistan. More studies to observe, find impediments and conduct drug resistance surveillance on Anti-malarials are required.

Most studies have shown a secular upward trend in resistance in all fields of human and veterinary medicine, with MDROs being isolated with increasing frequency across the country. However, there is no nationwide surveillance to capture data or any action plan to address the growing threat of AMR. The use of Antimicrobial agents in animals, poultry and agriculture has recognized benefits but overuse has potentially serious implications for human health. Appropriate use of Antimicrobials in the Veterinary sector (selection, administration, monitoring and assessment) is a highly skilled task requiring the experience and expertise of veterinarians and farmers. Practices to increase production have involved regular use of antimicrobials, potentially increasing selection pressure on bacteria to become resistant.

Transmission of resistant bacteria of animal origin to humans is possible through the environment and food chain and to the agricultural workers by direct contact. Causality of AMR due to Antibiotic use in animals is difficult to establish. However, there is some direct evidence to show a close association between the prevalence of livestock-associated resistant bugs in animals and humans, levels of antimicrobial use in animals and the prevalence of resistant bacteria in animals and in humans.

In low- and middle-income countries there is a huge and unprecedented growth in demand for animal protein. The global consumption of Antimicrobials in animal food production estimated at 63,151 (\pm 1,560) tons in 2010 is projected to rise by 67%, to 105,596 (\pm 3,605) tons by 2030. Pakistan is one of the top ten producers of livestock and poultry in the world. The overuse of Antibiotics is common, with the potential public health hazard for compounding the AMR situation. Few studies have been done on Antibiotic residues in poultry; and, experts in the field have warned against this threat, urging the government to address this pressing issue on a priority basis.

In fast-growing Asian countries including Pakistan, meeting the increasing demand for meat products constitutes a significant challenge. The widespread Antimicrobial resistance has grave implications for densely populated countries like Pakistan. This is further compounded by the fact that regulations on Antimicrobial use are not in place and surveillance information on Antimicrobial consumption does not exist. A survey of World Organization for Animal Health (OIE) in 2012 in the OIE Member Countries revealed that only 27% countries have quantitative data on Antimicrobial use in livestock with no regulations controlling the use of Antimicrobial agents. Pakistan and other countries must learn these lessons for better surveillance to collect data, maintain resistant patterns, improve diagnostics and help in implementation and regulation that is acceptable and applicable.

Limiting the consumption of Antimicrobials in countries like Pakistan, Bangladesh, Nepal, and Sri Lanka is likely to be beneficial on a broader regional framework, given the interconnectedness of the pharmaceutical commerce and trade industries. Antibiotic use in animals, poultry and agriculture can be detrimental, with the potential to enhance AMR. However, limiting the non-essential use will mean safe and secure food and also help in controlling the spread of AMR. In this regard, monitoring and regulatory framework in all sectors including animal and agriculture health needs to be in place and aligned with the GAP to tackle the growing menace of AMR.

All studies from human and animal sectors on resistance reinforce the assumption that the problem of AMR may already be out of control. There is great concern, that unless contributing factors such as Antibiotic misuse and poor IPC practices are not tackled, we will become helpless in treating even the most common infections.

Deliberations during the National AMR Framework development in Pakistan, revealed that at the national level there is lack of relevant AMR experts; almost complete lack of AMR awareness among professionals from both the human and veterinary health, and the community. In public and private health hospitals, there is mostly no

Antibiotic policy or Antibiotic Stewardship Programs (ASP). Infection Prevention Control (IPC) is compromised due to poor practices in Antibiotic use and basic hygiene. Microbiology laboratories are not standardized, national AMR surveillance system is also not in place and there is lack of collaboration for containment of AMR between human health and other sectors such as veterinary, poultry and agriculture sector. Other threats to AMR include lack of data on consumption, quality of Antibiotics and vaccines, misuse of funds, and lack of sustained implementation of Infection Prevention and Control programs in healthcare settings. The enactment and implementation of legislation related to education, IPC & ASP programs for hospitals, Antibiotic use and quality, establishment of referral laboratories are some of the additional challenges.

However, there is optimism as some existing health and livestock infrastructure can be used for AMR surveillance through upgradation of the existing facilities, with the existing National Programs serving as a model for replication. Similarly, available specific expertise already existing in the human and animal health can be garnered to establish national bodies for implementation of AMR activities using the One Health Approach. Furthermore, many professional national and international organizations are interested to work together and support the Government of Pakistan for addressing AMR through implementing the National Action Plan.

A National Action Plan to contain and control the rapid spread of these “superbugs” is a critical requirement at the country level. Strategies and interventions focusing on the prudent use of Antibiotics, Anti-malarials, and Anti-tuberculosis drugs while limiting their random and irrational use in all healthcare settings, have to be implemented as an immediate priority. These steps are expected to have major impact on reducing infection rates, resistance patterns, costs and improving the clinical outcomes. The aim to contain AMR can be achieved at both the institutional and community levels through multi-sectoral involvement of all key stakeholders from the Government, professionals, societies and policy makers, to public and private health care institutions. In this context, it is also necessary that the multi-sectoral AMR Oversight Committee designated by Ministry of NHR&C, remains engaged not only in the process of AMR action plan development, but also continues to provide technical and monitoring oversight during subsequent operational and implementation at the federal, provincial, district and community levels.

In many developed countries there have been recent initiatives at the national level to address AMR. These countries include USA, where an Executive Order has been passed calling for sustained, coordinated, and complementary efforts of individuals and groups around the world, including healthcare providers, healthcare leaders, veterinarians, agriculture industry leaders, manufacturers, policymakers, and patients to detect, stop, and prevent the emergence and spread of resistant bacteria.¹ Similarly, other countries like the G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States),² have shown similar urgency and a call for action. European Council,³ and Trans-Atlantic Task Force on Antimicrobial Resistance (TATFAR), aims to enhance cooperation between the USA and Europe in the field of Antibiotic resistance.⁴ Similarly, in other countries including India, Kenya, Cambodia, Fiji, Japan, Philippines, Vietnam, Ethiopia and South Africa⁵ initial steps for National action Plans have been taken over the last few years to include all key stakeholders and all priority areas especially in view of the “One Health Approach” and the GHSA.

A significant global step for tackling AMR was achieved during the 71st session of United Nations General Assembly (UNGA) in New York on 21st September 2016 by a declaration on AMR⁶ which has been widely hailed as a milestone in the global effort to confront AMR. There was a commitment to work at national, regional, and global levels to develop, as per resolution WHA 68.7, develop multi-sectoral national action plans, programs and policy initiatives. The national plans are expected to align with the One Health Approach and the five overarching strategic objectives of the WHO Global Action Plan on

AMR⁷ and its. The declaration also includes a plan to bring together a new governance structure, which will report on progress made in two years' time.

In the recent past there was limited attention and political prioritization of AMR in Pakistan. However, following commitment in the WHA and development of National AMR Strategic Framework for Containment of AMR, the focus has shifted to seriously address this important public health crisis. The development of AMR NAP is the next sequential step and fulfilment of global, regional and national commitment by the Ministry of National Health Services Regulations & Coordination. This document addresses all the five objectives outlined in the WHO Global Action Plan for Antimicrobial Resistance. The main focus of the NAP has been on major critical aspects such as burden of AMR and surveillance, IPC practices, Antimicrobial stewardship efforts and judicious use of Antibiotics, in all fields including human, agriculture, poultry and veterinary medicine. Special emphasis has been on the 'low hanging fruits' such as improving awareness and understanding on AMR, education and training commencing from the school and undergraduate levels. Simple measures like effective compliance with sanitation and hygienic practices at the community and in health care settings can greatly reduce the incidence and transmission of infections.

Optimal use of Antimicrobials both in human and animal health is essential for ensuring the continuing effectiveness of these medicines. The NAP includes activities to implement national measures for strengthening and developing steps to curtail Antibiotic use in humans and animals. The vision for longer term containment of AMR, however, requires consideration and focus for investment on local solutions for new medicines and vaccines, diagnostic tools and other innovative interventions as part of the overall research agenda in Pakistan. There are activities to further assess resource needs, sustained technical and financial investment for integrated research, laboratories and regulatory capacities, as well as professional education and training. It is now expected that this joint effort of all relevant sectors from health, animal and agriculture sectors will galvanize national efforts to deal comprehensively and successfully with the critical issue of addressing and containing AMR in Pakistan.

SWOT Analysis: GAP Strategic Objectives

SWTO analysis was done during the development of strategic Framework for AMR through a consultative process. This however also involved discussions and deliberations by the subject matter experts, onsite visits and meetings with the key informants and stakeholders from different sectors. The SWOT analysis has been further refined for the scope and purpose of the NAP

Objective 1: To improve awareness and understanding of antimicrobial resistance through effective communication, education and training

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Availability of some relevant expertise within the country 2. Proactive media, availability and widespread use of internet across the country 3. Educational infra-structure available 4. Health infrastructure available 	<ol style="list-style-type: none"> 1. No Strategic Framework available at national and provincial levels 2. Shortage of skilled human resource regarding AMR related issues 3. Weak curriculum of professional education 4. Low quality of education regarding AMR at different levels 5. Weak understanding and lack of awareness of AMR among professionals 6. Poor general public awareness regarding AMR related problems
Opportunities	Threats
<ol style="list-style-type: none"> 1. NGO and community based organizations can be engaged to improve AMR awareness 2. Expertise available at certain levels can be engaged for advisory and educational purpose 3. Experience from vertical programs like TB can be used to promote awareness and education regarding AMR 4. Strategic Framework makers and politicians can be sensitized to address the AMR related problems 5. Engagement of Federal and Provincial Governments for legislation and implementation 6. Integration of academia and research institutions with clinical/field professionals 7. Highly proactive electronic media can carry out Positive media campaigns 8. International agencies and donors for funding to carry out awareness activities related to AMR 	<ol style="list-style-type: none"> 1. Security situation at certain areas 2. Conflict of interest among stake holders 3. Non-availability of specific funds for AMR 4. Weak political will

9. International commitments by the Government of Pakistan, and AMR inclusion in the Global Health Security Agenda (GHSA) as a major action package and priority agenda by the MINISTRY OF NHR&C	
--	--

Objective 2: Strengthen the knowledge and evidence base through surveillance and research

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Initiation of early implementation of GLASS through sentinel surveillance in Punjab and Sindh. 2. Availability of potential laboratories across the country which can easily generate and share data with federal level 3. Available expertise can be used for establishing surveillance system 4. Labs doing Drug Susceptibility Testing (DST) exist at different levels of human and animal health care and system (in both private and public sector) can be involved in surveillance system. Some of them are Quality Assured 5. Existence of regulations and models for surveillance in place e.g. for TB program, other communicable diseases (including those under One Health). 6. Disease surveillance systems that can be adapted / modified for AMR surveillance include DHIS and FELTP programs 7. Established research and academic base at institutions like NIH, PHRC, PARC, Academia can contribute towards system development 8. National Public Health Laboratories with infrastructure for AMR is available at NIH 	<ol style="list-style-type: none"> 1. No AMR related central coordinating body /unit/cell/ data centre 2. Partial diagnostic infrastructure available 3. Weak microbiology lab system with variable standardized system for DST 4. Lack of resources for performing DST 5. Limited EQA for labs 6. Cultures/ DST are not uniformly requested for diagnosing infection due to lack of diagnostic guidelines 7. Institutions reluctant to share AMR data 8. Limited AMR related diagnostic stewardship 9. Limited awareness and utilization of WHONET software 10. Lack of provincial labs that can serve as reference labs for AMR 11. Inadequate AMR surveillance infrastructure 12. Lack of AMR advocates for surveillance & research 13. Limited awareness /education / training regarding AMR surveillance 14. Lack of AMR research training/ programs 15. Lack of national policy on surveillance and enforcement mechanisms with political support 16. Many laboratories are publishing their anti-biograms regularly, however complete clinical and epidemiological data of cases is not available.
Opportunities	Threats
<ol style="list-style-type: none"> 1. Willingness at different levels (national & international & donors) exist for AMR surveillance including One Health partners 2. National Laboratory Strategic Framework available 3. Provincial health regulatory authorities (KPK, Punjab) and Sindh Health Care Commissions are in place 	<ol style="list-style-type: none"> 1. Vested interests of professionals, Pharmaceutical, veterinary and agriculture industry may influence AMR surveillance system 2. Conflict of interest in antimicrobial prescription 3. Pressure to conceal information in some situations 4. Lack of sustainable resources for doing surveillance, which should be provided by the public sector rather than by donors

<ol style="list-style-type: none"> 4. IHR related provisions, programs and Global demands for food safety can be utilized for strengthening surveillance system 5. Available labs can be upgraded to do DST through public private partnership models 6. DHIS/MIS can be modified for AMR surveillance in provinces 7. Several Academic Research units for AMR research are available for high level research 8. WHO guidelines for surveillance under GLASS protocol available and can be adopted 9. Capacity review mission conducted for setting up sentinel surveillance for AMR in Pakistan using GLASS protocol by WHO 10. Established health and livestock infrastructure can be used for surveillance system 	<ol style="list-style-type: none"> 5. New extreme resistance may create panic, if not detected in timely manner 6. Inadequate bio-risk management in surveillance network labs 7. High cost for existing and new diagnostics
---	---

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

Strengths	Weaknesses
<p><u>IPC</u></p> <ol style="list-style-type: none"> 1. Awareness among health care professionals in some settings 2. Expertise available within country <ol style="list-style-type: none"> 1. Media support to communicate at mass level 2. Expertise available 3. <p><u>Hygiene and sanitation</u></p> <ol style="list-style-type: none"> 1. Religious and social beliefs 2. Existing sanitation system available in some cities 3. Awareness through media 4. Know-how about Bio-remediation of waste water available at some institutions (MINISTRY OF NFS&R, QAU etc.) <p><u>Vaccination</u></p> <ol style="list-style-type: none"> 1. Awareness among general public 2. Availability / support to masses 3. Parental intent 4. Fear of infections 5. Manufacturing facilities available at some institutions 	<p><u>IPC</u></p> <ol style="list-style-type: none"> 1. No institutional, Provincial, National IPC policies / programs 2. Waste management Strategic Framework developed with weak implementation 3. Non-availability of accountability / audit systems 4. Shortage of trained IPC professionals 5. Negative attitude / behaviour towards IPC and prevention 6. Weak political will 7. Lack of dedicated funds and staff at national and provincial levels 8. Lack of vaccination of HCW in most hospitals <p><u>Hygiene and sanitation</u></p> <ol style="list-style-type: none"> 1. Standards of drinking water and food are not well defined 2. Irresponsible attitude of the relevant authorities 3. High cost of potable water 4. Weak sanitation systems 5. Untreated dumping of contaminated water 6. Poor awareness of personal and food hygiene 7. Limited funding

<p><u>Sustainable animal husbandry practices</u></p> <ol style="list-style-type: none"> 1. Veterinary Hospitals Network existing at provincial level and some coordination with national institutions 2. Awareness in professionals 3. Trained manpower available 4. Vaccines available and routine vaccination is carried out in some parts of the country <p><u>Public health</u></p> <ol style="list-style-type: none"> 1. National Institute of Health (NIH) has a key role at National level 2. Availability of trained workforce through academic institutions and other training programs like FELTP 3. Willingness and on-going campaigns by majority of the stakeholders 	<p><u>Vaccination</u></p> <ol style="list-style-type: none"> 1. Shortage of trained manpower 2. Cold chain and storage of vaccines due to extreme weathers conditions and frequent power failures 3. Inadequate vaccination coverage 4. Inadequate transportation facilities 5. Inadequate local manufacturing 6. Vaccination records and ledgers poorly maintained <p><u>National standards for IPC</u></p> <ol style="list-style-type: none"> 1. No national IPC program in place 2. Financial constraints <p><u>Sustainable animal husbandry practices</u></p> <ol style="list-style-type: none"> 3. Unhygienic practices are common in almost all sectors 4. Weak implementation of existing national livestock policies 5. Quality of vaccines is not according to international standards and supply of vaccines is irregular 6. Low vaccination coverage 7. Lack of proper surveillance and monitoring systems for animal communicable diseases and zoonosis <p><u>Public health</u></p> <ol style="list-style-type: none"> 1. One Health integration at federal and provincial levels is poor 2. Weak public health system due to improper public health legislation and enforcement
Opportunities	Threats
<ol style="list-style-type: none"> 1. Availability of guidelines and training modules at international level 2. Availability of donors to support IPC 3. Availability of supplies including PPE for IPC 4. International guidance can be availed through WHO or other organizations 5. Engagement of NGOs <p><u>Hygiene and sanitation</u></p> <ol style="list-style-type: none"> 6. Support from donors available in public health sector <p><u>Vaccination/Immunizations</u></p> <ol style="list-style-type: none"> 7. International donors support available 	<ol style="list-style-type: none"> 1. Misuse of funds and wrong re-direction of funds 2. Emerging new pathogens 3. Medical tourism 4. Transfer of resistant pathogens between hospital 5. Overcrowded health care facilities <p><u>Hygiene and sanitation</u></p> <ol style="list-style-type: none"> 1. Misuse of funds and resources 2. Poor infrastructure <p><u>Vaccination</u></p> <ol style="list-style-type: none"> 1. Terrorists attacks on vaccination workers, especially polio teams and fear among HCWs to work in difficult areas

<p>8. Requirement at international level under Global Health Security Agenda (GHSA) <u>Sustainable animal husbandry practices</u></p> <p>9. Evidence based research can help in improving practices</p> <p>10. Public / private partnership in Research & Development</p> <p>11. Capacity building on existing resources <u>Public health</u></p> <p>12. Support of Donors and international sources</p> <p>13. Governmental requisites</p>	<p>2. Mind set in certain groups opposing vaccination <u>National standards for IPC</u></p> <p>1. Misuse of funds <u>Sustainable animal husbandry practices</u></p> <p>1. Large number of Quacks</p> <p>2. Irrational use of antimicrobials as therapeutics, prophylaxis and growth promoters</p> <p><u>Public health</u></p> <p>1. Outbreaks with MDR pathogens or any extensive epidemics that consumes the resources</p>
---	---

Objective 4: Optimize the use of antimicrobial medicines in human and animal health

Strengths	Weaknesses
<p>1. DRAP published guidelines with defined PHRC criteria for voluntary ethical marketing code</p> <p>2. DRAP activities related to regulation and quality management improved in past 3 years</p> <p>3. Some poultry farms have established labs and practicing culture based Antibiotic use</p> <p>4. Development of the One Health forum/network on the National and Provisional level</p> <p>5. Research and Development and production of veterinary vaccines within Pakistan</p> <p>6. Increase in number of trained ID physicians and microbiologists in last 5-6 years</p> <p>7. ASP in some hospitals showing benefit in prudent use of Antibiotics</p>	<p>1. Large number of unregistered medical and veterinary practitioners</p> <p>2. Weak training and poor practices in healthcare provider (HCP)</p> <p>3. Unethical incentives to doctors from drug industry</p> <p>4. Laboratory methodology not uniform</p> <p>5. Community certified pharmacies are insufficient in number and run by un-trained personnel</p> <p>6. Easy accessibility to over-the-counter Antibiotics</p> <p>7. Overuse of Antibiotics in veterinary use responsible for drug resistance in human</p> <p>8. Farmers self-prescribing Antibiotics as growth enhancers</p> <p>9. Lack of efforts to introduce Antibiotics replacement products as growth promoters in animals</p> <p>10. Limited activities to develop or enforce regulations to control promotional practices by industry</p> <p>11. In-effective mechanisms for identification and reports on substandard and falsified antibacterial medicines.</p>
Opportunities	Threats
<p>1. Inclusion of certified infectious diseases specialists in the DRAP Advisory Committee for essential drugs</p>	<p>1. Enforcement / implementation of over the counter drug list of Antibiotics will not be easily accepted by community</p>

<ol style="list-style-type: none"> 2. List of drugs that are to be dispensed only on prescription by Registered Medical Practitioner to include antimicrobials 3. Standardized prescriptions bearing physician's name, address, telephone # and PMDC & PVMC registration number 4. Specific syndrome- related messages for health care providers, e.g. URTI, AGE, UTI 5. Discourage production of irrational Antibiotic combinations in human and veterinary practices 6. Media campaign for general public explaining the problems associated with Antibiotic use 7. Strengthening and upgrading of community pharmacies 8. Optimal harmonization of diagnostic kits and microbiology lab procedures 9. Remove obsolete tests like typhoid and TB serology 10. Learning modules/programs for HCPs and farmers 11. Certification program and incentives for institutions and individuals embarking on ASP 12. Certification of Antibiotic- free poultry, meat and milk products 13. PVMC and/or FAO guidelines to be implemented through the Ministry of National Food Security and Research (MNFS&R) 14. Education of farmers for judicious antimicrobial use in livestock and poultry 15. Drug sale rules should be implemented in letter and spirit to check injudicious use of Antibiotics 16. Un-registered medical practitioners should be given training in performing safe procedures where such qualified persons are not available 	<p>pharmacists</p> <ol style="list-style-type: none"> 2. Lack of infrastructure to implement an electronic record of Antibiotic prescription 3. Lack of current human resources for building an ASP (trained ID specialist, microbiologist, IPC nurse, pharmacist) in most hospitals 4. Financial support for ASP is unlikely at this time 5. Lack of general health infrastructure in the country 6. Resistance from the farmers as lack of replacement of Antibiotics as growth promoters 7. Drug companies may resist wide-spread implementation
---	---

Objective 5: Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Availability of vaccine production facilities and infrastructure in public and private sectors in veterinary and human health 	<ol style="list-style-type: none"> 1. Lack of evidence based research for proper intervention and therapeutics

<p>sector</p> <ol style="list-style-type: none"> 2. Availability of lab for drug residue testing in food of animal source (National Veterinary Laboratory (NVL)) 3. Availability of skilled personnel in diagnosis and vaccine production. 4. Reports of several new antimicrobials under research in Pakistan 5. Availability of strong research system in agriculture including plant and animal health coordinated by PARC throughout out the country. 6. Availability of funds through academia interest linkage programmes (e.g. through HEC) 7. Availability of Patent filing and intellectual property rights organization 	<ol style="list-style-type: none"> 2. Personnel available for diagnostics and vaccine are not well trained 3. No organization to regulate import of diagnostic kits/equipment according to WHO recommendation 4. Lack of data for financial impact of infectious diseases (e.g. DALYS) 5. No state of the art reference lab and weak microbiological support for diagnosis of infectious disease 6. Lack of interprovincial and interdepartmental harmony, collaboration and coordination 7. Lack of sustainability of diagnostic or treatment strategy due to ad-hoc solutions 8. No national proficiency scheme for standardized AMR testing in public and animal health sectors
Opportunities	Threats
<ol style="list-style-type: none"> 1. International interest to develop regional and international linkages for AMR research 2. Some Laboratories in academic institutes and private sector with advance research facilities 	<ol style="list-style-type: none"> 1. Massive negative economic impact on the country 2. Some stakeholders can create hurdles 3. Weakness of political will 4. Import of substandard antimicrobials and diagnostic kits/reagents 5. Insufficient investment in Research & Development by local pharmaceutical industry

Vision

No Pakistani should suffer from AMR in the coming years

Mission Statement

To have a functional coordinated, collaborative and sustainable AMR containment system in place using “One Health” Approach aligned with WHO Global Action Plan on AMR.

Strategic Priorities

1. Development and implementation of a national awareness raising and behavioural change strategy on antimicrobial resistance.
2. Establishment of an integrated national AMR surveillance (human, animal usage and resistance monitoring)
3. Improve prevention & control of infections in health care, community, animal health, food, agriculture and environment
4. Update and enforce regulations for human and veterinary antimicrobial utilization
5. Phase out use of antimicrobials as Growth Promoters and provide appropriate alternatives (such as prebiotics, probiotics)
6. Integration of AMR in all public health research agendas including research on vaccines
7. Estimation of health and economic burden of AMR for decision making

Strategic Plan

GAP Objective 1: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training**1st Strategic Priority****Development and implementation of a national awareness raising & behavioural change strategy on AMR****Interventions****Activities**

1.1.1 Establishment of mechanism for coordination and harmonization on AMR

- 1.1.1.1 Mapping of high level platforms/forums at National level with the core mandate of public health
- 1.1.1.2 Advocacy for inclusion of AMR in national public health agenda
- 1.1.1.3 Constitution of National Coordination Group for AMR
- 1.1.1.4 Establishment of multi-sectorial National AMR secretariat to ensure inter-sectorial information sharing and orchestration of the intervention

1.2.1 Establishment and implementation of awareness and behaviour change strategy

- 1.2.1.1 Preparation of awareness raising tools about AMR
- 1.2.1.2 Preparation of a customized Training material on AMR for Professionals involved in all related fields
- 1.2.1.3 Training of implementers (Prescribers) in Teaching Public & Private Hospital Practitioners including community (Health and Veterinary)
- 1.2.1.4 Advocacy for Administrative Heads/ Policy makers of relevant departments
- 1.2.1.5 Change of behaviour and social norms of manufacturers, prescribers and consumers regarding misuse of Antibiotics
- 1.2.1.5 Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week campaign

1.3.1 Establish and promote educational system including AMR covering undergraduate and post graduate education

- 1.3.1.1 Include AMR, IPC in school curricula
- 1.3.1.2 Include AMR as core component of professional education and training programs for HCPs and Veterinary medicine (for e.g. AMR/ Rational Use of Antibiotics)

GAP Objective 2: Strengthen the knowledge and evidence base through surveillance and research**2nd Strategic Priority****Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)****Interventions****Activities**

2.1.1 Establishment of AMR reference centres and laboratories to undertake quality surveillance of AMR in all sectors such as health, veterinary and agriculture, etc.	<ul style="list-style-type: none"> 2.1.1.1 Development of National & Provincial /Regional Reference Labs in Human, Veterinary & Agriculture sectors 2.1.1.2 Strengthening of AMR Reference Labs (Health & Veterinary Sectors) 2.1.1.3 Designation of integrated AMR surveillance sites for each sector 2.1.1.4 Development of formal mechanisms among various stakeholders for coordination and collaboration on surveillance and research on AMR 2.1.1.5 Implementation of LQMS for AMR surveillance at all levels 2.1.1.6 Development & implementation of EQA program at national level 2.1.1.7 Establishment of common dashboard for data sharing among Public, Private Stakeholders from District to Provincial to National level (National Focal Point) 2.1.1.8 Development and implementation of mechanism for data collection, reporting, data sharing for each sector (laboratories, private clinics and GPs)
2.2.1 Development of tiered AMR diagnostics in all sectors	<ul style="list-style-type: none"> 2.2.1.1 Up-gradation of selected tier based labs according to the national standards 2.2.1.2 Capacity building of the technical staff at various tiers
2.3.1 Development of Functional AMR Network in All Sectors according to GLASS Protocols	<ul style="list-style-type: none"> 2.3.1.1 Identification and nomination of national focal point for GLASS for AMR reporting and coordination 2.3.1.2 Questionnaire/tools development and distribution according to GLASS Protocols 2.3.1.3 Resource mapping on AMR Surveillance for each sector (Human and Veterinary Health) 2.3.1.4 Development of AMR Surveillance SOPs in line with GLASS Protocol and AST reporting SOPs according to international standards (CLSI; EUCAST) 2.3.1.5 Develop and review priority pathogens and Antimicrobials list for each sector based on local data
2.3.2 Establishment of Integrated AMR operational research plans	<ul style="list-style-type: none"> 2.3.2.1 Development of integrated collaboration mechanism between Academia and Research institutions/ organizations for AMR surveillance and research in public and private sectors 2.3.2.2 Developing a sharing mechanism for pathogens for research purposes.
GAP Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures	

3 rd Strategic Priority	Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment	
	Interventions	Activities
	3.1.1 Create a formal organizational structure to ensure proper development and use of IPC policies and strategies	3.1.1.1 Formulation of IPC National & Provincial & Regional Advisory Boards including district committees 3.1.1.2 Notify National, Provincial & District IPC coordinators 3.1.1.3 Establishment of Infection control team in every healthcare facility 3.1.1.4 Establishment of Antibiotic stewardship programs at all health facilities 3.1.1.5 Development, dissemination and implementation of IPC guidelines
	3.2.1 Availability of trained human resource at all levels (national advisory board; provincial; district; regional IC teams)	3.2.1.1 Ensure availability of IC Nurse for every 150-200 beds in Healthcare facilities 3.2.1.2 Ensure availability of ID Physicians for each teaching hospital 3.2.1.3 Microbiologists for every DHQ 3.2.1.4 Epidemiologist for every DHQ 3.2.1.5 Clinical Pharmacist for every DHQ
	3.2.2 Training of human resource on all aspects of IPC	3.2.2.1 Development of certified courses on IPC and Trainings Imparted 3.2.2.2 CME related to IPC for trainers and trainees 3.2.2.3 Specialized Training and education for IPC professionals 3.2.2.4 Train and educate healthcare and veterinary workers on all IPC aspects and practices
	3.3.1 Enable conducive environment for IPC in health care settings	3.3.1.1 Availability of clean drinking water in tertiary care hospitals and clean water for technical/clinical purposes (eg. Sterilization, renal dialysis, dental units etc) 3.3.1.2 Availability of hand washing facilities at Tertiary Care Hospital (TCH) 3.3.1.3 CSSD/ Storage of sterile supplies 3.3.1.4 Availability of isolation facilities 3.3.1.5 Identification and proper construction/design of high containment rooms/areas in reference hospitals of each province/region 3.3.1.6 Establishing/integration IPC building codes for Health care facilities
	3.3.2 Enabling conducive environment for IPC in the	3.3.2.1 Improve awareness about Hygiene & Safety in Food chain

community	<p>3.3.2.2 Seek support of Religious and community leaders through awareness campaigns</p> <p>3.3.2.3 Seek involvement of political leaders for domestic budgetary allocation</p> <p>3.3.2.4 Integration of AMR/ IPC messages in social, print & electronic media with existing campaigns for prevention of infectious diseases</p> <p>3.3.2.5 Integrate IPC protocols in building codes for farm hygiene, biosecurity & food chain surveillance</p>
3.3.3 Provision of IPC supplies and waste management	<p>3.3.3.1 PPE ; N95 face masks, surgical masks, gowns, gloves, hand sanitizers & soaps in all health care facilities</p> <p>3.3.3.2 Improvement of environmental cleaning & disinfection in healthcare settings: UVGI's, Extraction fans, HVAC units</p> <p>3.3.3.3 Autoclave, sterilization and disinfection supplies</p> <p>3.3.3.4 Implementation of waste management according to EPA Act</p>
3.3.4 Microbiology lab support	<p>3.3.4.1 Establishing or strengthening of lab quality system</p> <p>3.3.4.2 Strengthening Capability for Point of Care testing (POCT) and Diagnostics stewardship</p> <p>3.3.4.3 Establish regional Reference labs for advance and rare diagnostics to harmonize and standardize practices and to provide confirmatory and/or specialized testing (e.g molecular testing)</p> <p>3.3.4.4 Procuring essential reagents and supplies</p>
3.3.5 Disease surveillance and assessment of compliance with IPC practices	<p>3.3.5.1 Adapt WHO list of priority pathogens including TB as per GLASS</p> <p>3.3.5.2 Monitor Antibiotic utilization & Stewardship compliance in human and animal healthcare settings</p> <p>3.3.5.3 Monitoring of Hand Hygiene compliance</p> <p>3.3.5.4 Establish and strengthen healthcare associated Infection Surveillance: CAUTI, CLABSI, VAP, SSI</p> <p>3.3.5.5 Monitoring of compliance to Occupational Safety of HCWs: Vaccination, Needle Stick Injury (NSI), blood & body fluid exposures</p> <p>3.3.5.6 Monitoring of access and compliance to use personal protective equipment (PPE)</p>
3.3.6 Strengthen animal health and agricultural IPC practices	<p>3.3.6.1 Guidelines and policies to promote vaccines in animal husbandry</p> <p>3.3.6.2 Review of existing vaccines and vaccination strategies in livestock for alignment with OIE and FAO guidelines</p> <p>3.3.6.3 Ensuring availability of effective vaccines</p>

		<p>3.3.6.4 Development of new vaccines and improvements in existing vaccines</p> <p>3.3.6.5 Revision of policies regarding slaughter houses and promotion of hygienic slaughtering practices</p> <p>3.3.6.6 Establish quarantine/isolation facilities at all levels</p> <p>3.3.6.7 Adapt the existing standards (e.g. OIE Terrestrial and aquatic animal's health codes and FAO/WHO/ Codex Alimentarius) to minimize and control AMR</p> <p>3.3.6.8 Establish, maintain and monitor hygienic standards for food storage sites (Silos/godowns)</p> <p>3.3.6.9 Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks</p> <p>3.3.6.10 Monitoring Antibiotic usage in Veterinary practices</p>
	3.3.7 Hygiene and sanitation at community level	<p>3.3.7.1 Provision and monitoring of quality of safe drinking water</p> <p>3.3.7.2 Strengthen waste water treatment system</p> <p>3.3.7.3 Strengthen solid waste collection, transportation and management systems and services</p> <p>3.3.7.4 Integration of personal hygiene to primary and secondary education curriculum, water, sanitation and hygiene (WASH) improvement programs in national development plan, hygiene and disease prevention awareness campaigns into health promotion and management programs, personal hygiene/disease prevention/WASH into professional education for all sectors</p>
GAP Objective 4: Optimize the use of Antimicrobial medicines in human and animal health		
4th Strategic Priority	Update and enforce regulations for human and veterinary Antimicrobial utilization	
	Interventions	Activities
	4.1.1 Advocacy & common sensitization on: prescribing, sales and use of Antimicrobials	<p>4.1.1.1 Implementation of Drugs Act, 1976 and DRAP Act 2012 regarding sale of antimicrobials on prescription</p> <p>4.1.1.2 Advocacy & awareness/understanding of relevant clauses to the stakeholders</p> <p>4.1.1.3 Training of Drug Inspectors to ensure prescription based sale of Antimicrobials</p> <p>4.1.1.4 Strengthening and enforcement of market surveillance of Antimicrobials</p> <p>4.1.1.5 Coordination of relevant departments at district/divisional level</p>

		4.1.1.6 Establish or strengthening mechanisms for identification and reports on substandard and falsified antibacterial medicines.
4.1.2 Review/ amendment/ harmonization in drug sales rules (human and veterinary) to ensure supervision only by Pharmacist (category A)		4.1.2.1 Advocacy of policy makers and other relevant stakeholders 4.1.2.2 Legislation procedure initiated with consensus of all stakeholders 4.1.2.3 Review and up gradation of EML
4.1.3 Antimicrobials (human & veterinary) sale & utilization audit		4.1.3.1 Regular monitoring of Antimicrobial sale and utilization at all levels and sectors 4.1.3.2 Coordinated and synchronized mechanism for keeping record of antimicrobial sale and use at all levels (Pharmacies, medical & Vet. Hospitals/ GPs in both sectors) 4.1.3.3 Compilation of sale and usage record at provincial/federal and national level (Data management)
4.1.4 Strengthening of National mechanism for drug testing to ensure the safety and quality of antimicrobials		4.1.4.1 Strengthening of DTLs (Human Resource, infrastructure, Equipment and supplies) 4.1.4.2 Accreditation of DTLs (Federal and Provincial level)
4.2.1 Antibiotic Stewardship program developed and started at national & provincial levels		4.2.1.1 Advocacy of all stakeholders through meetings, seminars and briefs for establishment of ASP at tertiary level hospitals 4.2.1.2 Standard treatment guidelines (STG) for Antimicrobial use in view of domestic need and scenarios 4.2.1.3 *Development & Implementation of ASP through Oversight Committees at Provincial/Regional levels 4.2.1.4 Document audit of ASP at tertiary care hospitals (Public and Private)
4.2.2.Promote use of vaccines for VPDs to minimize Antimicrobial use in both human and vet sector		4.2.2.1 Advocacy of all stakeholders through meetings, seminars and briefings 4.2.2.2 Ensure availability, access and usage of effective vaccines in both sectors 4.2.2.3 Formulation of legislation for mandatory vaccination against VPDs in both sectors
5th Strategic Priority	Phase out use of Antimicrobials as Growth Promoters and provide appropriate alternatives	
	Interventions	Activities
	4.3.1 Review and improve existing practices regarding use of Antimicrobials as growth promoters & prophylaxis as per international standards	4.3.1.1 Baseline survey on usage of Antimicrobials as growth promoters in Animal feed industry including assessment of feed (utilization audit) 4.3.1.2 Addition/inclusion of relevant clauses in DRAP Act 2012 and

		Drug Act 1976 for the control of antimicrobials usage as growth promoters and prophylaxis in veterinary sector (link with amendment proposed in strategy 2)
		4.3.1.3 Monitoring of Antimicrobials as growth promoter by relevant authorities
		4.3.1.4 Strengthening of Food Testing Laboratories for antimicrobial residues in food at regional/divisional level
GAP Objective 5: Develop economic case for sustainable development based on country needs and increase investment in new vaccines, diagnostics and other interventions Ensure Sustainable Investment in countering AMR		
6th Strategic Priority	Integration of AMR in all public health research agendas including research on vaccines and diagnostics	
	Interventions	Activities
	5.1.1 Develop mechanism for conducting survey and resource mapping on AMR	5.1.1.1 Performa based survey of available resources (Equipment; Human resource; Infra-structure; funding) 5.1.1.2 Integration of available resources for development of new vaccines, diagnostics & Antibiotic alternatives
	5.1.2 Conducting research on clinical practices on AMR	5.1.2.1 Conduction of clinical research determining gaps in clinical practices in medical and veterinary fields with in regard to the prescription, usage and availability/ manufacturing of antimicrobials 5.1.2.2 Minimizing the use of antimicrobials by development of effective vaccines and diagnostics
7th Strategic Priority	Promote research on estimation of health and economic burden of AMR	
	Interventions	Activities
	5.2.1 Baseline data collection on economic burden due to AMR	5.2.1.1 Analysis of published data on AMR from Pakistan in order to evaluate the economic impact 5.2.1.2 Collection of Data on AMR from existing functional labs
	5.2.2 Need Assessment for internal and external support (Technical & Financial Assistance)	5.2.2.1 Development of national AMR research priority agenda 5.2.2.2 Coordination with HDPs /experts to support and finance research
	5.3.1 Conduct operational research on rational use of Antimicrobials	5.3.1.1 Identification of gaps in clinical practices (prescription & usage) through research in medical and veterinary fields 5.3.1.2 Promote research and development through public private partnership on production and application of vaccines for disease prevention

Operational Plan

Activity	Outcome	Responsibility	Year	Quarter
Objective 1: Improve awareness and understanding of Antimicrobial resistance through effective communication, education and training				
1st Strategic Priority: Development and implementation of a national awareness raising & behavioural change strategy on AMR				
Strategy 1.1: Ensure coordination and harmonization on AMR at regional level				
Intervention 1.1.1: Establishment of mechanism for coordination and harmonization on AMR				
1.1.1.1 Mapping of high level platforms/forums at National level with the core mandate of public health	Mapping conducted	Ministry of NHR&C/NIH	2017	Q2
1.1.1.2 Advocacy for inclusion of AMR in national public health agenda	AMR included in National public Health Agenda	Ministry of NHR&C	2017	Q1 and Q2
1.1.1.3 Constitution of national Coordination Group for AMR	Group constituted and notified with defined TORs	Ministry of NHR&C	2017	Q1
1.1.1.4 Establishment of multi-sectorial National AMR secretariat to ensure inter-sectorial information sharing and orchestration of the intervention	AMR secretariat developed and mechanism for inter-sectorial information sharing developed	Ministry of NHR&C/NIH	2017	Q3
Strategy 1.2: Promote behaviour change through communication programs targeting different audience				
Intervention 1.2.1: Establishment and implementation of awareness and behaviour change strategy				
1.2.1.1.Preparation of awareness raising tools about AMR	Guidelines, document and communication material developed	NIH/ Ministry of NHR&C/ Ministry of NFS&R/WHO/OIE/UNICEF	2017	Q3 and Q4
1.2.1.2 Preparation of a customized training material on AMR for professionals involved in all related fields	Training material developed	NIH/ Ministry of NHR&C /Ministry of NFS&R/WHO/OIE/FAO Provincial DOH	2017	Q3 and Q4

Activity	Outcome	Responsibility	Year	Quarter
1.2.1.3 Training of implementers (Prescribers) in Public & Private Hospital practitioners including community (Health and Veterinary)	HCP trained in public & private Health & Veterinary sectors	NIH/ Ministry of NHR&C / Ministry of NFS&R/WHO/OIE/FAO Provincial DOH	2018	Q3 and Q4
1.2.1.4 Advocacy for Administrative Heads/ Policy makers of relevant departments	Advocacy Sessions Conducted	NIH/ WHO/ Ministry of NHR&C and ProvincialDOH / Ministry of NFS&R	2018	Q1 and Q2
1.2.1.5 Change of behaviour and social norms of manufacturers, prescribers and consumers regarding misuse of Antibiotics	Dialogue/ Advocacy; Develop and conduct comprehensive IEC campaigns using electronic and print media	Ministry of NHR&C /DRAP/ Ministry of NFS&R/ DOH/Relevant HDPs	2017-2022	All Qs
1.2.1.6 Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week campaign	Community awareness program developed	Ministry of NHR&C; UNICEF; Ministry of NFS&R	2017-2022	All Qs
Strategy 1.3: Promote education to improve knowledge of AMR and related topics				
Intervention 1.3.1: Establish and promote educational system including AMR covering undergraduate and post graduate education				
1.3.1.1 Include AMR including IPC in school curricula	Consultative curriculum development workshop Curriculum adopted by Regulatory bodies	Ministry of NHR&C/ Mo Education/ Depts. of Education/ HDP/ UNESCO/ UNICEF	2018	Q1-3
1.3.1.2 Include AMR as core component of professional education and training programs for HCPs and Veterinary medicine (for e.g. AMR/ Rational Use of Antibiotics)	AMR included in the core component of professional training in all sectors; Curriculum adopted by PMDC; PVMC; PNC; Pharmacy Council; etc.	PMDC/Veterinary Council/Nursing Council	2018	Q1-3
Objective 2: Strengthen the knowledge and evidence base through surveillance and research				
2nd Strategic Priority: Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)				
Strategy 2.1: Establishment of comprehensive, integrated AMR surveillance system and quality assurance				
Intervention 2.1.1: Establishment of AMR reference centres and laboratories to undertake quality assured AMR surveillance data in all sectors such as health, veterinary and agriculture, etc.				

Activity	Outcome	Responsibility	Year	Quarter
2.1.1.1 Development of National & Provincial /Regional Reference Labs in Human, Veterinary & Agriculture sectors	NRLs established and functional in all sectors	NIH/ Ministry of NHSR&C/ Ministry of NFS&R /DOH/ PL&DD	2018	Q2 and 3
2.1.1.2 Strengthening of AMR Reference Labs (Health & Veterinary Sectors)	<ul style="list-style-type: none"> Standardizing Antibiotic Sensitivity Testing protocols at AMR Reference labs; Harmonization of Antibiotic Sensitivity Testing; Preservation of resistant isolates; Conduction of research on resistant isolates to identify leading reasons of resistance development and sharing through publications/reports Lab standards and SOPs are updated and implanted according to the international standards and lab quality management is in place 	NIH/ Ministry of NHSR&C/ Ministry of NFS&R /DOH/ PL&DD	2017	Q4
2.1.1.3 Designation of integrated AMR surveillance sites for each sector	Functional designated AMR surveillance sites	AMR & GLASS Focal point, NIH/ Ministry of NHSR&C/ DOH/ Ministry of NFS&R/ PL&DD	2017	Q3-4
2.1.1.4 Development of formal mechanisms among various stakeholders for coordination and collaboration on surveillance and research on AMR	MoU between different stakeholders	NIH/ Ministry of NHSR&C/ DOH/ Ministry of NFS&R/ PL&DD	2017	Q3 and Q4
2.1.1.5 Implementation of LQMS for AMR surveillance at all levels	Plan for LQMS for AMR surveillance developed & implemented using WHO LQMS Tool	AMR/GLASS Focal point, NIH/ NARC/ Provincial Reference Labs	2018	Q3

Activity	Outcome	Responsibility	Year	Quarter
2.1.1.6 Development & implementation of EQA program at national level	Development of EQAS panel with implementation (shipment & feedback)	AMR & GLASS Focal point, NIH/ Ministry of NFS&R	2018	Q3 onwards
2.1.1.7 Establishment of common dashboard for data sharing among Public, Private Stakeholders from District to Provincial to National level (National Focal Point)	Dashboard established and linked with all stakeholders	NIH	2018	Q3
2.1.1.8 Development and implementation of mechanism for data collection, reporting, data sharing for each sector (laboratories, private clinics and GPs)	Data collection, reporting, data sharing mechanism developed	NIH	2018	Q3
Strategy 2.2: Establishment of tier based microbiology lab network in all sectors aligned with national lab policy				
Intervention 2.2.1: Development of tiered AMR diagnostics in all sectors				
2.2.1.1 Up-gradation of selected tier based labs according to the national standards	Up gradation of selected AMR surveillance sites	AMR & GLASS Focal point, NIH/ Ministry of NHR&C/ DOH/ Ministry of NFS&R/ PL&DD	2017	Q3-4
2.2.1.2 Capacity building of the technical staff at various tiers	Trained technical staff at various tiers	AMR & GLASS Focal point, NIH/ Ministry of NHR&C/ DOH/ Ministry of NFS&R/ PL&DD	2017-22	All Qtr
Strategy 2.3: Strengthening of AMR surveillance labs or sites				
Intervention 2.3.1: Development of Functional AMR Network in All Sectors according to GLASS Protocols				
2.3.1.1 Identification and nomination of national focal point for GLASS for AMR reporting and coordination	National focal point for AMR & GLASS identified and notified	Ministry of NHR&C/ Ministry of NFS&R	2017	Q3
2.3.1.2 Questionnaire/tools development and distribution according to GLASS	Questionnaire/Tools developed & distributed among stakeholders	GLASS Focal point/ NIH/ Ministry of NFS&R	2017	Q3 and Q4

Activity	Outcome	Responsibility	Year	Quarter
Protocols				
2.3.1.3 Resource mapping on AMR Surveillance for each sector (Human and Veterinary Health)	Resource mapping tool developed, distributed, information collected and compiled for mapping	AMR & GLASS Focal point, NIH/ Ministry of NHR&C/ DRAP/ DOH/ Ministry of NFS&R/ PL&DD	2017 and 2018	Q4 (2017) & Q1 & Q2 (2018)
2.3.1.4 Development of AMR Surveillance SOPs in line with GLASS Protocol and AST reporting SOPs according to international standards (CLSI; EUCAST)	SOPs for AMR surveillance and reporting SOPs developed and in place	AMR & GLASS Focal point, NIH/ Ministry of NHR&C/ DRAP/ DOH/ Ministry of NFS&R/ PL&DD	2017 and 2018	Q4 (2017) & Q1 (2018)
2.3.1.5 Develop and review priority pathogens and Antimicrobials list for each sector based on local data	List of priority pathogens and Antimicrobial agents finalized for all sectors	AMR & GLASS Focal point, NIH/ Ministry of NHR&C/ DRAP/ DOH/ Ministry of NFS&R/ PL&DD	2017 and 2018	Q4 (2017) & Q1 (2018)
Intervention 2.3.2: Establishment of integrated AMR operational research plans				
2.3.2.1 Development of integrated collaboration mechanism between Academia and Research institutions/ organizations for AMR surveillance and research in public and private sectors	Established and functional integrated collaboration mechanisms	HEC/ PHRC/ PARC/ Ministry of NHR&C/Ministry of NFS&R/ NIH/IPH/HSA	2018	Q2 onwards
2.3.2.2 Developing a sharing mechanism for pathogens for research purposes.	Pathogen sharing mechanism developed	Ministry of NHR&C (NIH)/ Ministry of NFS&R (PARC)	2018	Q1 onwards
Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures				
3rd Strategic Priority: Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment				
Strategy 3.1: Establish National IPC Program				
Intervention 3.1.1: Create a formal organizational structure to ensure proper development and use of IPC policies and strategies				
3.1.1.1 Formulation of IPC National & Provincial & Regional Advisory Boards including district committees	IPC National, Provincial & Regional Advisory Boards formulated District committees constituted	Ministry NHR&C; Ministry of NFS&R/DOH/ PL&DD/ District Management	2017	Q4

Activity	Outcome	Responsibility	Year	Quarter
3.1.1.2 Notify National, Provincial & District IPC coordinators	National & Provincial & District IPC coordinators notified	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH	2017	Q4
3.1.1.3 Establishment of Infection control team in every healthcare facility	Notification of Infection control teams in every healthcare facility	DOH	2018	Q2 onwards
3.1.1.4 Establishment of Antibiotic stewardship programs at all health facilities	Antibiotic stewardship implemented in major teaching hospitals in public and private sectors	MINISTRY OF NHR&C/MINISTRY OF NFS&R /DOH	2018	Q1 onwards
3.1.1.5 Development, dissemination and implementation of IPC guidelines	IPC guidelines implemented	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH	2017	Q4 onwards
Strategy 3.2: Human Resource development for implementation of AMR NAP				
Intervention 3.2.1: Availability of trained human resource at all levels (national advisory board; provincial; district; regional IC teams)				
3.2.1.1 Ensure availability of IC Nurse for every 150-200 beds in Healthcare facilities	Nurses identified and trained	MINISTRY OF NHR&C/ DOH	2018	Q2 onwards
3.2.1.2 Ensure availability of ID Physicians for each teaching hospital	Physician identified & trained	MINISTRY OF NHR&C/ DOH	2018	Q2 onwards
3.2.1.3 Microbiologists for every DHQ	Vacancies created where applicable	MINISTRY OF NHR&C/ DOH	2018	Q2 onwards
3.2.1.4 Epidemiologist for every DHQ	Vacancies created where applicable	MINISTRY OF NHR&C/ DOH	2018	Q2 onwards
3.2.1.5 Clinical Pharmacist for every DHQ	Vacancies created where applicable	MINISTRY OF NHR&C/ DOH	2018	Q2 onwards
Intervention 3.2.2: Training of human resource on all aspects of IPC				
3.2.2.1 Development of certified courses on IPC and Trainings Imparted	Course Curriculum for IPC developed and trainings imparted in University/ Institute	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH/ Universities	2018	Q4
3.2.2.2 CME related to IPC for trainers and trainees	CME for IPC training issued by concerned University/ Institute	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH/ Universities	2018	Q4

Activity	Outcome	Responsibility	Year	Quarter
3.2.2.3 Specialized Training and education for IPC professionals	Trainings of health professional conducted through collaboration of different partners	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH/ Universities	2019	Q1 onwards
3.2.2.4 Train and educate healthcare and veterinary workers on all IPC aspects and practices	Human & veterinary health professional trained on all aspects IPC; Biosafety / Biosecurity	MINISTRY OF NHR&C/NIH/MINISTRY OF NFS&R/DOH/ Universities	2019	Q1 onwards
Strategy 3.3: Building conducive environment for IPC in healthcare settings & community				
Intervention 3.3.1: Enable conducive environment for IPC in health care settings				
3.3.1.1 Availability of clean drinking water in tertiary care hospitals and clean water for technical/clinical purposes (eg. Sterilization, renal dialysis, dental units etc)	Filter units in tertiary care hospital installed	DOH/ Provincial allied departments	2018	Q2 onwards
3.3.1.2 Availability of hand washing facilities at Tertiary Care Hospital (TCH)	Liquid detergents and hand sanitizers available at all sites of TCH	DOH	2018	Q2 onwards
3.3.1.3 CSSD/ Storage of sterile supplies	CSSD in every TCH established	DOH	2019	Q1
3.3.1.4 Availability of isolation facilities	Areas for isolation facilities identified and operational	DOH	2019	Q1
3.3.1.5 Identification and proper construction/design of high containment rooms/areas in reference hospitals of each province/region	Containment rooms in TCH of all regions identified, design approved & construction started	DOH	2019	Q1
3.3.1.6 Establishing/integration IPC building codes for Health care facilities	IPC building codes for health care facilities identified and disseminated	Ministry of NHR&C/ IPC FP/ NIH/ DOH	2019	Q1
Intervention 3.3.2: Enabling conducive environment for IPC in the community				
3.3.2.1 Integration of personal hygiene to primary and secondary education curriculum	Personal hygiene integrated in educational curricula through Ministry of Education	DOH/ Mo Education/ Department of Education/ HEC	2018	Q2 onwards
3.3.2.2 Improve awareness about Hygiene & Safety in Food chain	Awareness campaigns/ seminar & meetings conducted	NIH/ Mo NHR&C/ DOH/ Mo NFS&R	2018	Q1 onwards

Activity	Outcome	Responsibility	Year	Quarter
3.3.2.3 Seek support of Religious and community leaders through awareness campaigns	Advocacy meetings conducted	NIH/ WHO/ Mo NHR&C/ DOH/ Mo NFS&R	2017	Q3 onwards
3.3.2.4 Seek involvement of political leaders for domestic budgetary allocation	Budgetary allocation for AMR	NHR&C/ DOH/ Mo NFS&R	2017	Q3 onwards
3.3.2.5 Integration of AMR/ IPC messages in social, print & electronic media with existing campaigns for prevention of infectious diseases	Advocacy meetings conducted	NHR&C/ DOH// Mo NFS&R	2017	Q3 onwards
3.3.2.6 Integrate IPC protocols in building codes for farm hygiene, biosecurity & food chain surveillance	Implementation of building codes for farm hygiene, biosecurity & food chain surveillance	Mo NFS&R	2018	Q2 onwards
Intervention 3.3.3: Provision of IPC supplies and waste management				
3.3.3.1 PPE ; N95 face masks, surgical masks, gowns, gloves, hand sanitizers & soaps in all health care facilities	Supplies procured & available	Ministry of NHR&C/ DOH/ WHO/ Mo NFS&R	2018	Q1 onwards
3.3.3.2 Improvement of environmental cleaning & disinfection in healthcare settings: UVGI's, Extraction fans, HVAC units	Equipment and supplies procured & available	Ministry of NHR&C/ DOH/ WHO/ Mo NFS&R	2018	Q1 onwards
3.3.3.3 Autoclave, sterilization and disinfection supplies	Supplies procured & available	MINISTRY OF NHR&C/ DOH/ WHO/ Mo NFS&R	2018	Q1 onwards
3.3.3.4 Implementation of waste management practices according to EPA Act	Waste management protocols implemented	Ministry of NHR&C/ DOH/ WASA/ WHO/ Mo NFS&R	2018	Q1 onwards
Intervention 3.3.4: Microbiology lab support				
3.3.4.1 Establishment of standardized Microbiology labs at all defined levels with LQMS	Microbiology Labs established & standardized at DHQ levels	NIH/ DOH/MINISTRY OF NFS&R	2018	Q1 onwards
3.3.4.2 Strengthening Capability for Point of Care testing (POCT) and Diagnostics stewardship	Evaluated & recommended assays for POCT	NIH/ Ministry of NFS&R	2018	Q4
3.3.4.3 Establish regional Reference labs for advance and rare diagnostics to harmonize and standardize practices and to provide confirmatory and/or	Regional Reference labs established	NIH/ DOH/Ministry of NHR&C/ Ministry of NFS&R	2018	Q3

Activity	Outcome	Responsibility	Year	Quarter
specialized testing (e.g molecular testing)				
3.3.4.4 Procuring essential reagents and supplies	Supplies and reagents procured	Ministry of NHR&C/ NIH/ DOH/ WHO	2018	Q1
Intervention 3.3.5: Disease surveillance and assessment of compliance with IPC practices				
3.3.5.1 Adapt WHO list of priority pathogens including TB	National and WHO priority list of pathogens developed & adopted as per GLASS	Ministry of NHR&C/ NIH/Ministry of NFS&R/DOH/ WHO/	2017	Q3
3.3.5.2 Monitor Antibiotic utilization & Stewardship compliance in human and animal healthcare settings	Monitoring of Antibiotic utilization & stewardship compliance	FP AMR/ NIH/ Ministry of NHR&C/ Mo NFS&R	2018	Q4
3.3.5.3 Monitoring of Hand Hygiene compliance	Hand Hygiene practices in place	DOH/PL&DD	2017	Q4
3.3.5.4 Establish and strengthen healthcare associated Infection Surveillance: Device associated infections like CAUTI, CLABSI, VAP, SSI	Healthcare associated Infection Surveillance system established	DOH	2018	Q2
3.3.5.5 Monitoring of compliance to Occupational Safety of HCWs: Vaccination, Needle Stick Injury (NSI), blood & body fluid exposures	Monitoring mechanism in place for occupational safety of HCWs	DOH	2019	Q2
3.3.5.6 Monitoring of access and compliance to use personal protective equipment (PPE)	Monitoring mechanism for PPEs in place	DOH	2019	Q2
Intervention 3.3.6: Strengthen animal health and agricultural IPC practices				
3.3.6.1 Guidelines and policies to promote vaccines in animal husbandry	Guidelines & policies developed & implemented in animal husbandry	L&DD/ Ministry of NFS&R	2018	Q3
3.3.6.2 Review of existing vaccines and vaccination strategies in livestock for alignment with OIE and FAO guidelines	Vaccine strategy reviewed	Ministry of NFS&R/L&DD	2019	Q1
3.3.6.3 Ensuring availability of effective vaccines	Mechanism for availability of effective vaccines in place	Ministry of NFS&R/L&DD	2019	Q3

Activity	Outcome	Responsibility	Year	Quarter
3.3.6.4 Development of new vaccines and improvements in existing vaccines	Existing vaccines improved & new vaccines developed	Ministry of NFS&R/L&DD	2020	Q1
3.3.6.5 Revision of policies regarding slaughter houses and promotion of hygienic slaughtering practices	Policies for hygienic slaughtering houses & practices in place	Ministry of NFS&R/PL&DD	2018	Q4
3.3.6.6 Establish quarantine/isolation facilities at all levels	National and Provincial quarantine/ isolation facilities operationalized	Ministry of NFS&R/PL&DD	2018	Q4
3.3.6.7 Adapt the existing standards (e.g. OIE Terrestrial and aquatic animal's health codes and FAO/WHO/Codex Alimentarius) to minimize and control AMR	International standards in place to minimize & control AMR	Ministry of NFS&R/PL&DD	2018	Q4
3.3.6.8 Establish, maintain and monitor hygienic standards for food storage sites (Silos/godowns)	Hygienic standards for food storage sites established, maintained and monitoring system in place	Ministry of NFS&R/DOH/PL&DD	2018	Q4
3.3.6.9 Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks	Zoonotic & food-borne outbreaks guidelines developed & in place	NFS&R/ DOH/PL&DD	2018	Q2
3.3.6.10 Monitoring Antibiotic usage in Veterinary practices	Monitoring system for Antibiotics usage in Veterinary practice in place	DRAP/Mo NFS&R/ DOH/PL&DD	2018	Q4
Intervention 3.3.7: Hygiene and sanitation at community level				
3.3.7.1 Provision and monitoring of quality of safe drinking water	Provision of safe drinking water with periodic lab testing done	Mo Climate Change/ PCRWR/ WASA/ Municipalities/ District Governments	2017	Q3-4
3.3.7.2 Strengthen waste water treatment system	Installed & functional water treatment plants	WASA/ Municipality/ District Governments /DOH	2018	Q1 onward
3.3.7.3 Strengthen solid waste collection, transportation and management systems and services	Protocols and mechanisms developed for solid waste collection, transportation, dumping & recycling	WASA/ DOH/ Ministry of Climate Change	2018	Q1 onward

Activity	Outcome	Responsibility	Year	Quarter
3.3.7.4 Integration of personal hygiene to primary and secondary education curriculum, water, sanitation and hygiene (WASH) improvement programs in national development plan, hygiene and disease prevention awareness campaigns into health promotion and management programs, personal hygiene/disease prevention/WASH into professional education for all sectors	Different IEC programs developed and implemented	MoNHSR&C, MoNFS, Mo Climate Change, DoH, L&DD Municipalities/District Governments	2017-22	All Qtrs
Objective 4: Optimize the use of Antimicrobial medicines in human and animal health				
4th Strategic Priority: Update and enforce regulations for human and veterinary Antimicrobial utilization				
Strategy 4.1: Implementation of DRAP Act 2012 read with Drugs Act 1976 and rules framed thereunder regarding sale of Antimicrobials on prescription				
Intervention 4.1.1: Advocacy & common sensitization on: prescribing, sales and use of Antimicrobials				
4.1.1.1 Implementation of Drugs Act, 1976 and DRAP Act 2012 regarding sale of antimicrobials on prescription	Drugs Act disseminated & implemented	DRAP/ Ministry of NHSR&C/DOH	2017	Q4
4.1.1.2 Advocacy & awareness/understanding of relevant clauses to the stakeholders	No of advocacy meetings for stockholders conducted	DRAP/ Ministry of NFS&R/ Ministry of NHR&C/ DOH/ WHO	2018	Q4
4.1.1.3 Training of Drug Inspectors to ensure prescription based sale of Antimicrobials	No. of drug inspectors trained for Antimicrobial sale on prescription	DRAP/ DOH	2018	Q3
4.1.1.4 Strengthening and enforcement of market surveillance of Antimicrobials	*Conduct baseline survey for establishing mechanism/ body for regular market surveillance on Antimicrobials use	DRAP/ DOH/WHO/HDPs	2018	Q3
4.1.1.5 Coordination of relevant departments at district/divisional level	No. of coordination meetings conducted	DRAP/ DOH	2018	Q3 onwards
Intervention 4.1.2: Review/ amendment/ harmonization in drug sales rules (Human and Veterinary) to ensure supervision only by Pharmacist (Category A)				

Activity	Outcome	Responsibility	Year	Quarter
4.1.2.1 Advocacy of policy makers and other relevant stakeholders	Consensus developed for review/amendment/harmonization of Drug Sales Rules	DRAP/ DOH/ Ministry of NFS&R/ PL&DD	2018	Q1
4.1.2.2 Legislation procedure initiated with consensus of all stakeholders	Amended and Harmonized Drug Sales Rules with consensus of all stakeholders at national & provincial/regional level	DRAP/ Ministry of NHR&C/ DOH/ Ministry of Law & Justice Division	2018	Q4
4.1.2.3 Review and upgradation of EML	EML revised as per WHO requirement with categorization of Antimicrobials	DRAP/DOH/WHO	2018	Q1
Intervention 4.1.3: Antimicrobials (human & veterinary) sale & utilization audit				
4.1.3.1 Regular monitoring of Antimicrobial sale and utilization at all levels and sectors	Audit mechanism for Antimicrobial sale & utilization developed and implementation initiated	DRAP/ Ministry of NHR&C/ Ministry of NFS&R/ DOH/ PL&DDs	2018	Q4 onward
4.1.3.2 Coordinated and synchronized mechanism for keeping record of antimicrobial sale and use at all levels (Pharmacies, medical & Vet. Hospitals/ GPs in both sectors)	Mechanism of record keeping for antimicrobial sale & use developed, implemented and initiation of periodic monitoring	DRAP/ Ministry of NHR&C/ Ministry of NFS&R/ DOH/ PL&DDs	2018	Q1 onward
4.1.3.3 Compilation of sale and usage record at provincial/federal and national level (Data management)	Antimicrobials sale & usage data compiled, analysed at national & provincial levels	DRAP/ Ministry of NHR&C/Mo NFS&R/ DOH/ PL&DDs	2018	Q3 onward
Intervention 4.1.4: Strengthening of National mechanism for drug testing to ensure the safety and quality of antimicrobials				
4.1.4.1 Strengthening of DTLs (Human Resource, infrastructure, Equipment and supplies)	Strengthened / upgraded DTLs as per international standards	DRAP/ DOH	2018	Q4
4.1.4.2 Accreditation of DTLs (Federal and Provincial level)	ISO 17025 certified and WHO accredited laboratories	DRAP/ DOH	2018	Q4
Strategy 4.2: Establishment of Antibiotic stewardship program (ASP) at all levels				
Intervention 4.2.1: Antibiotic Stewardship program developed and started at national & provincial levels				

Activity	Outcome	Responsibility	Year	Quarter
4.2.1.1 Advocacy of all stakeholders through meetings, seminars and briefs for establishment of ASP at tertiary level hospitals	Advocacy meetings/ seminars/ briefs for establishment of ASP initiated at TCH and DHQs	FP AMR NIH/ DRAP/ Ministry of NFS&R/ DOH/ WHO	2017	Q4 onwards
4.2.1.2 Standard treatment guidelines (STG) for Antimicrobial use in view of domestic need and scenarios	Developed standard treatment guidelines	Relevant Regulatory bodies	2017	Q3
4.2.1.3 *Development & Implementation of ASP through Oversight Committees at Provincial/Regional levels	Monitoring of ASP in DHQs	FP AMR NIH/ DRAP/ Ministry of NFS&R / WHO	2018	Q3 onwards
4.2.1.4 Document audit of ASP at tertiary care hospitals (Public and Private)	Audit ASP at public & private TCH started	FP AMR/ DRAP/ Ministry of NFS&R/ NIH/ WHO/ External Evaluators	2018	Q4 yearly
*Market surveillance should precede this activity				
Intervention 4.2.2: Promote use of vaccines for VPDs to minimize Antimicrobial use in both human and vet sector				
4.2.2.1 Advocacy of all stakeholders through meetings, seminars and briefings	Increased utilization of VPD vaccines in both sectors	M Ministry of NHR&C/ Ministry of NFS&R/ DOH/ PL&DD	2017	Q4 onwards
4.2.1.2 Ensure availability, access and usage of effective vaccines in both sectors	Reduction in usage of Antimicrobials	Ministry of NHR&C/ Ministry of NFS&R/ DOH/ PL&DD	2017	Q4
4.2.1.3 Formulation of legislation for mandatory vaccination against VPDs in both sectors	Legislation enacted in both sectors	Relevant Regulatory bodies; Ministry of NHR&C/ Ministry of NFS&R/ DOH/ PL&DD	2018	Q2 onwards
5th Strategic Priority: Phase out use of Antimicrobials as Growth Promoters and Provide Appropriate Alternatives				
Strategy 4.3: Rationalize Use of Antimicrobials as Growth Promoters and Discourage Prophylactic use of Antibiotics in Veterinary sector				
Intervention 4.3.1: Review and improve existing practices regarding use of Antimicrobials as growth promoters & prophylaxis as per international standards				
4.3.1.1 Baseline survey on usage of Antimicrobials as growth promoters in Animal feed industry including assessment of feed (utilization audit)	Baseline data available for strategizing interventions	DRAP/ Ministry of NFS&R	2018	Q1
4.3.1.2 Addition/inclusion of relevant clauses in DRAP Act 2012 and Drug Act 1976 for the control of antimicrobials	Necessary amendments incorporated, approved & promulgated	DRAP/ Ministry of NFS&R/ DOH	2018	Q3

Activity	Outcome	Responsibility	Year	Quarter
usage as growth promoters and prophylaxis in veterinary sector (link with amendment proposed in strategy 2)				
4.3.1.3 Monitoring of Antimicrobials as growth promoter by relevant authorities	Monitoring mechanism on Antibiotic utilization, sale & prescription established and functional	DRAP/ Ministry of NFS&R/ PL&DD	2019	Q1
4.3.1.4 Strengthening of Food Testing Laboratories for antimicrobial residues in food at regional/divisional level	Food testing labs strengthened at national & provincial levels	NIH/ Ministry of NFS&R/ DOH	2018	Q3
Objective 5 : Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions				
6th Strategic Priority: Integration of AMR in all public health research agendas including research on vaccines and diagnostics				
Strategy 5.1: Identification and integration of available indigenous resources for research				
Intervention 5.1.1: Develop mechanism for conducting survey and resource mapping on AMR				
5.1.1.1 Performa based survey of available resources (Equipment; Human Resource; Infra-structure; Funding)	Identified and mapped resources for integrated research on AMR	NIH/ Ministry of NHR&C/ Ministry of NFS&R/ PHRC/ DOH	2018	Q1
5.1.1.1 Integration of available resources for development of new vaccines, diagnostics & Antibiotic alternatives	Availability of new vaccines, diagnostics & Antibiotic alternatives	Pharmaceuticals/ Academia/ NIH/ Ministry of NFS&R/ VRIs/ PHRC/PRI/CASVAB/SPVC	2018	Q1 onwards
Intervention 5.1.2:Conducting research on clinical practices on AMR				
5.1.2.1 Conduction of clinical research determining gaps in clinical practices in medical and veterinary fields with in regard to the prescription, usage and availability/ manufacturing of antimicrobials	No of research projects conducted	Ministry of NHR&C/ PHRC/ NIH/ PSF/ Ministry of NFS&R/ HEC/ Academia/ Pharmaceuticals	2018	Q4 onwards
5.1.2.2 Minimizing the use of antimicrobials by development of effective vaccines and diagnostics	No of research projects conducted	Ministry of NHR&C/ PHRC/ NIH/ PSF/ Ministry of NFS&R/ Academia/ Pharmaceuticals	2018	Q4 onwards
7th Strategic Priority: Estimation of health and economic burden of AMR for decision making				

Activity	Outcome	Responsibility	Year	Quarter
Strategy 5.2: Development of economic case for sustainable investment that takes into account the country needs				
Intervention 5.2.1: Baseline data collection on economic burden due to AMR				
5.2.1.1 Analysis of published data on AMR from Pakistan in order to evaluate the economic impact	AMR published data collected, analysed for economic impact	Ministry of NHR&C/ NIH/ Ministry of NFS&R/ DOH	2017	Q4
5.2.1.2 Collection of Data on AMR from healthcare facilities including labs	AMR data from sentinel sites collected and analysed	Ministry of NHR&C/ NIH/ Ministry of NFS&R/ DOH	2017	Q4 onwards
Intervention 5.2.2: Need Assessment for internal and external support (Technical & Financial Assistance)				
5.2.2.1 Development of national AMR research priority agenda	Research agenda developed with domestic allocation	Ministry of NHR&C/ NFS&R/NIH/PHRC /HEC/Mo S&T/DOH/PL&DD	2018	Q2
5.2.2.2 Coordination with HDPs /experts to support and finance research	Technical & financial assistance available	Ministry of NHR&C/ NFS&R/NIH/PHRC /HEC/Mo S&T/DOH/PL&DD	2018	Q2
Strategy 5.3: Focused R & D framework promoting responsible use of Antimicrobials for infection prevention				
Intervention 5.3.1: Conduct operational research on rational use of Antimicrobials				
5.3.1.1 Identification of gaps in clinical practices (prescription & usage) through research in medical and veterinary fields	Clinical practice gaps identified to strategize effective interventions	PHRC/ NIH/ PSF/ Ministry of NFS&R/ HEC/ Academia/Mo S&T	2018	Q4 onwards
5.3.1.2 Promote research and development through public private partnership on production and application of vaccines for disease prevention	New local vaccines available	Ministry of NHR&C/ Ministry of NFS&R/NIH/PHRC /HEC/ Mo S&T/DOH/PL&DD	2017	Q4 on wards

Monitoring & Evaluation Plan

Monitoring and Evaluation Plan of the AMR NAP - Pakistan, April 2017							
Planning element (activity linked to the strategic plan)	Indicator	Type and purpose	Value (calculation)	Frequency of data collection	Data source	Method	Baseline
Objective 1: Improve awareness and understanding of Antimicrobial resistance through effective communication, education and training							
1st Strategic Priority: Development and implementation of a national awareness raising & behavioural change strategy on AMR							
Strategy 1.1: Ensure coordination and harmonization on AMR at regional level							
Intervention 1.1.1: Establishment of mechanism for coordination and harmonization on AMR							
1.1.1.1 Mapping of high level platforms/forums at National level with the core mandate of public health	Mapping conducted	M&E of input	Yes/No	Once	Mo NHSR, MoNFS&R, DRAP, Environment, Education, Information, Food, Law, IT, Inter Provincial Coordination	Meeting of stakeholders	Inter-sectoral Core Committee (ICC) for AMR in place Multi-sectorial IHR Task force
1.1.1.2 Advocacy for inclusion of AMR in national public health agenda	AMR included in national public health agenda	M&E of input	Yes/No	Once	Mo NHSRC, DoH	Meetings	JEE and IHR-GHSA Roadmap
1.1.1.3 Constitution of National Coordination Group for AMR	Group constituted and notified with defined TORS	M&E of input/process	Yes/No	Once	Notification	Relevant correspondence	TWG/Core group for AMR; Inter-sectoral Core Committee
1.1.1.4 Establishment of multi-sectorial National AMR secretariat to ensure inter-sectorial information sharing and orchestration of the intervention	AMR Secretariat established and mechanism for inter-sectorial information sharing developed	M&E of input/	One National Unit	Once	Notification	Relevant correspondence	NIH as National Focal Point
Strategy 1.2: Promote behaviour change through communication programs targeting different audience							
Intervention 1.2.1: Establishment and implementation of awareness and behaviour change strategy							
1.2.1.1 Preparation of awareness raising tools about AMR	Awareness raising tools developed as per needs of target	M&E of input	Yes/No	Once in Three years	TWG, National & International communication experts & Academia	Consultative meeting for development of tools & communication	No tools & communication materials exist locally

	audience					material	
1.2.1.2 Preparation of a customized training material on AMR for professionals involved in all related fields	Customized training modules on AMR for each audience developed	M&E of Input	Yes/No	Once in Three years	TWG, National & International communication experts & Academia	Consultative meeting for development of tools & communication material	No training material exists locally
1.2.1.3 Training of implementers (Prescribers) in public & private hospital practitioners including community (Health and Veterinary)	Percentage of trained implementers and prescribers level of knowledge	M&E output M&E of Outcome	Proportion Knowledge scores stratified by target groups (composite indicator)	10 % Increase Annual	MoNHSRC, MoNFS&R, National Focal Point for AMR, DOH, TWG	Knowledge survey	No data available. Measured by baseline survey
1.2.1.4 Advocacy for Administrative Heads/ Policy makers of relevant departments	Advocacy session conducted	M&E of Input	No of sessions/Proportion of policy makers sensitized	At least once per department	Health, Livestock, Agriculture, Food, Environment, DRAP, Wildlife	Briefing and advocacy meetings	National Strategic Framework; WHO resolutions and GoP commitments, NAP
1.2.1.5 Change of behaviour and social norms of manufacturers, prescribers and consumers regarding misuse of Antibiotics	Advocacy events and IEC campaigns	M&E of input	No of advocacy sessions and IEC campaigns	Ongoing	Relevant Ministries/Department of Health/DRAP/MNFS&R	KAP Surveys/Studies	No baseline assessment available
1.2.1.6 Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week campaign	Community awareness programs developed for relevant sectors	M&E of input	No of Programs developed for relevant sectors	Once in Three years	Relevant Ministries/Department of Health/DRAP/MNFS&R	Consultations for program development	No community programs available
Strategy 1.3: Promote education to improve knowledge of AMR and related topics							
Intervention 1.3.1: Establish and promote educational system including AMR covering undergraduate and post graduate education							
1.3.1.1 Include	-Consultative	M&E of	No of	Every	school curricula, National	curriculum review	AMR not included

AMR and IPC in school curricula	workshops -Adoption of revised curriculum by regulatory authorities	inputs	consultative workshops No of regulatory authorities adopting the revised curriculum	5years	and Provincial/regional Education Department		in the present school curriculum
1.3.1.2 Include AMR as core component of professional education and training programs for HCPs and Veterinary medicine (for e.g. AMR/Rational Use of Antibiotics)	No of sector adopting curricula	M&E of Input	Yes/No	Every 5years	PMDC, PCP, PNC, HEC, PVC etc.	curriculum review	AMR not included in the present medical and veterinary curricula
Objective 2: Strengthen the knowledge and evidence base through surveillance and research							
2nd Strategic Priority: Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)							
Strategy 2.1: Establishment of comprehensive, integrated AMR surveillance system and quality assurance							
Intervention 2.1.1: Establishment of AMR reference centres and laboratories to undertake quality surveillance of AMR in all sectors such as health, veterinary and agriculture, etc.							
2.1.1.1 Development of National & Provincial /Regional Reference Labs in Human, Veterinary & Agriculture sectors	No of Labs notified and functional	M&E Input	Yes/No	Onetime activity	Ministry of NHR&C, Ministry of MNFS&R, DOH, PL&DD	communication with institution	Not available
2.1.1.2 Strengthening of AMR Reference Labs (health and veterinary sectors)	<ul style="list-style-type: none"> No of Labs strengthened No of projects conducted 	M&E Input	yes/no	One time activity	Ministry of NHR&C, Ministry of NFRS, DOH, PL&DD	Laboratory assessments	Not available
2.1.1.3 Designation of integrated AMR surveillance sites for each sector	No of sites designated and functional	M&E Input	yes/no	One time activity	Ministry of NHR&C, Ministry of NFRS, DOH, PL&DD	communication with institution	4 sentinel sites (2 each in Sindh and Punjab)
2.1.1.4 Development of formal mechanisms	No of Formal mechanisms	M&E Input	yes/no	One time activity	Ministry of NHR&C, Ministry of NFRS, DOH,	communication with institution	Not available

among various stakeholders for coordination and collaboration on surveillance and research on AMR	developed				PL&DD		
2.1.1.5 Implementation of LQMS for AMR surveillance at all levels	No. of Facilities participating in LQMS	M&E process	yes/no	on-going	NIH/NARC and provincial reference labs	Facility based technical assessmentLQSI Tool	WHO LQMs Tool
2.1.1.6 Development & implementation of external quality assurance program at national level	No of Labs/sites participating in EQAP	M&E input	yes/no	One Time	NIH/Ministry of NFS&R	Development of EQAS Panel with implementation (Shipment and Feedback)	EQAS Lab established at NIH
2.1.1.7 Establishment of common dashboard for data sharing among Public, Private Stakeholders from District to Provincial to National level (National Focal Point)	Dashboard established and linked with relevant stakeholders	M&E input	No of stakeholder s linked	One time for dashboard Linkages on-going	Ministry of NHSRC, Ministry of NFSR, DOH, PL&DD	Infrastructure and relevant correspondence	Not available
2.1.1.8 Development and implementation of mechanism for data collection, reporting, data sharing for each sector (laboratories, private clinics and GPs)	Data collection, reporting and data sharing mechanism developed	M&E input	No of public and private stakeholder s involved	on-going	Ministry of NHSRC, Ministry of NFSR, DOH, PL&DD	Relevant correspondence	Not available
Strategy 2.2: Establishment of tier based microbiology lab network in all sectors aligned with national lab policy							
Intervention 2.2.1: Development of tiered AMR diagnostics in all sectors							
2.2.1.1 Up-gradation of selected tier based labs according to the national standards	Laboratories Participating in Integrated AMR surveillance from each	M&E input	No of Laboratories Participating in	On-going	All relevant Ministries/departments	Renovations/supplies and equipment	National Lab at NIH upgraded

	sector		Integrated AMR surveillance from each sector				
2.2.1.2 Capacity building of the technical staff at various tiers	Trained technical staff available at various tiers	M&E input	No of staff trained	On-going	All relevant ministries	Assessments and feedbacks	Training materials (WHO and others)
Strategy 2.3: Strengthening of AMR surveillance labs or sites							
Intervention 2.3.1: Development of Functional AMR Network in All Sectors according to GLASS Protocols							
2.3.1.1 Identification and nomination of national focal point for GLASS for AMR reporting and coordination	Notification issued	M&E input	yes/no	One time	Ministry of NHR&C and Ministry of NFS&R	communication with institution	NIH as AMR Focal Point notified
2.3.1.2 Questionnaire/tools development and distribution according to GLASS Protocol	No of tools developed No of stakeholders engaged	M&E input	yes/no	One time activity	NIH/ Ministry of NFS&R	Communication with institutions	GLASS Framework
2.3.1.3 Resource mapping on AMR Surveillance for each sector (Human and Animal Health)	No. of Facilities Mapped	M&E input	Yes/no	One time activity	NIH/ Ministry of NFS&R/DOH/PL&DD	Survey	WHO/ GLASS tools/ OIE
2.3.1.4 Development of AMR Surveillance SOPs in line with GLASS Protocol and AST reporting SOPs according to international standards (CLSI; EUCAST)	SOPs developed and in place	M&E input	No of SOPs available	One time	NIH/ Ministry of NFS&R/DOH/PL&DD	Facility based technical assessment	WHO/ GLASS/ CLSI/ EUCAST/ OIE
2.3.1.5 Develop and review priority pathogens and	List developed	M&E input	yes/no	One time	Ministry of NHR&C/ Ministry of NFS&R	Consultations	Not available

antimicrobial lists for each sector based on local data							
Intervention 2.3.2: Establishment of integrated AMR operational research plans							
2.3.2.1 Development of integrated collaboration mechanism between academia and research institutions/ organizations for AMR surveillance and research in public and private sectors	Integrated collaboration strengthened between academia and research institutions/ organizations for AMR surveillance and research in public and private sectors	M&E input	yes/no	One time	HEC, PHRC, PARC, Ministry of NHR&C, Ministry of NFS&R, IPH, HSA, FP AMR	Consultations	Not available
2.3.2.2 Developing a sharing mechanism for pathogens for research purposes	Pathogen sharing mechanism developed	M&E input	yes/no	One time	Ministry of NHR&C, Ministry of NFS&R, NARC, NIH, FP AMR	Sample referral & reference testing	Not available at present
Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures							
3rd Strategic Priority: Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment							
Strategy 3.1: Establish National IPC Program							
Intervention 3.1.1: Create a formal organizational structure to ensure proper development and use of IPC policies and strategies							
3.1.1.1 Formulation of National, provincial & regional IPC Advisory Boards including district committees	National, provincial & regional IPC advisory boards notified along with formulation of district committees	M&E of Input	yes/no	Once & revise after every 2 years	Ministry of NHR&C, Ministry of NFS&R DOH, District Management	Notification to all stakeholders	Not available
3.1.1.2 Notify National, provincial & district/equivalent IPC coordinator	National, provincial & district IPC Coordinators notified	M&E of Input	yes/no	Once & revise after every 2 years	NHR&C, NFS&R DOH, District Management	Notification to all stakeholders	Not available

3.1.1.3 Establishment of infection control team at every healthcare facility	Number of healthcare facilities with IPC teams	M&E of Output	25% of the healthcare facilities with IPC team in first year	Ongoing	DOH	Survey/ visits/ District Record	Not available/ Only available in some private sector
3.1.1.4 Establishment of Antibiotic stewardship programs at all health facilities	No of health facilities engaged in Antimicrobial stewardship	M&E of Input	25% of the healthcare facilities in first year	DOH	Ministry of NHSRC, NIH, FP AMR, DOH	Survey/ visits/ District Record	Not available
3.1.1.5 Development, dissemination and implementation of IPC guidelines	No of IPC guidelines/ Manual developed	M&E of Input	yes/no	Once in three years	Ministry of NHR&C, Ministry of NFS&R, DOH, NIH, FP AMR	Archives& updated through consultations	Guidelines available in archives (public health programs)
Strategy 3.2: Human Resource development for implementation of AMR NAP							
Intervention 3.2.1: Availability of trained human resource at all levels (national advisory board; provincial; district; regional IC teams)							
3.2.1.1 Ensure availability of IC Nurse for every 150-200 beds in Healthcare facilities	Trained IC nurses available	M&E input	Proportion of nurses available per 150-200 beds annually	On-going	Ministry of NHSRC, DOH, PNC	Facility survey/ assessments	Not available
3.2.1.2 Ensure availability of ID Physicians for each teaching hospital	Trained ID physicians available per teaching hospital	M&E of Input	Proportion of ID Physicians available annually	On-going	Ministry of NHSRC, DOH	Facility survey/ assessments	Not available
3.2.1.3 Microbiologists for every DHQ	No of microbiologist appointed	M&E of Input	25% annual increase in number	On-going	Ministry of NHR&C, DOH	Facility survey/ assessments	Not available
3.2.1.4 Epidemiologist for every DHQ	No of epidemiologist appointed	M&E of Input	25% annual increase in number	On-going	Ministry of NHR&C, DOH	Facility survey/ assessments	Not available
3.2.1.5 Clinical Pharmacist for every DHQ	No of clinical pharmacist appointed	M&E of Input	25% annual increase in	On-going	Ministry of NHR&C, DOH	Facility survey/ assessments	Not available

			number				
Intervention 3.2.2: Training of human resource on all aspects of IPC							
3.2.2.1 Development of certified courses on IPC and Trainings Imparted	No of courses developed No of trainings Imparted	M&E of Input	yes/no	Annual	Ministry of NHR&C, Ministry of NFS&R, DOH, NIH, FP AMR, Academia	Consultations & training sessions	Not available
3.2.2.2 CME related to IPC for trainers and trainees	No of CME awarding universities/ institutes available	M&E of Input	yes/no	Ongoing	Ministry of NHR&C, Medical Colleges/Universities/PMD C	Communication with institutions	Some institutions are providing CME
3.2.2.3 Specialized training and education for IPC professionals	No of IPC trainings No of Professionals trained	M&E of Input	yes/no	Ongoing	Ministry of NHR&C, Ministry of NFS&R, DOH, NIH, FP AMR, Academia	Training Sessions	Specialized trainings not available
3.2.2.4 Train and educate healthcare and veterinary workers on all IPC aspects and practices	No of healthcare and veterinary workers trained per hospital for IPC	M&E of Input	30% to be trained per year	Ongoing	Ministry of NHR&C, Ministry of NFS&R, DOH, NIH, FP AMR, Academia	Training Sessions	Not available
Strategy 3.3: Building conducive environment for IPC in healthcare settings & community							
Intervention 3.3.1: Enable conducive environment for IPC in health care settings							
3.3.1.1 Availability of clean drinking water in tertiary care hospitals and clean water for technical/clinical purposes (eg. Sterilization, renal dialysis, dental units etc)	Tertiary care hospitals with clean water facility	M&E of Output	30 % in first year	On going	DOH/MS Hospitals	Survey/Site assessments	Not available
3.3.1.2 Availability of hand washing facilities at Tertiary Care Hospital (TCH)	No of tertiary care hospitals (TCH) with hand washing facility	M&E of Output	25 % annually	On going	DOH/MS Hospitals	Survey/Site assessments	Not available
3.3.1.3 CSSD/ Storage	No of tertiary	M&E of	25 %	On going	DOH/MS Hospitals	Site assessment/	Not available

of sterile supplies	care hospitals with CSSD	Input	annually			physical verification	
3.3.1.4 Availability of isolation facilities	Percentage of tertiary care hospitals with Isolation facilities	M&E of Input	25 % annually	On going	DOH/MS Hospitals	Survey/Site assessments	Not available
3.3.1.5 Identification and proper construction/design of high containment rooms/areas in reference hospitals of each province/region	No of Provinces/regions with identified high containment rooms	M&E of Input	25 % annually	On going	DOH/MS Hospitals	Facility Assessment	Not available
3.3.1.6 Establishing/integration IPC building codes for Health care facilities	No of buildings compliant with IPC codes	M&E of Input	yes/no	On going	DOH/MS	Facility Assessment/Inspections	Not available
Intervention 3.3.2: Enabling conducive environment for IPC in the community							
3.3.2.1 Integration of personal hygiene to primary and secondary education curriculum	No of Curricula incorporation in school courses	M&E of Input	yes/no	Every 5 years	Ministry of Education/Mo NHR&C/Education departments	Consultations	Not available
3.3.2.2 Improve awareness about Hygiene & Safety in Food chain	No of campaigns	M&E of outcome	yes/no	Ongoing	NIH, Ministry of NHR&C, Ministry of NFS&R,	Pre-post campaign Surveys	Not available
3.3.2.3 Seek support of Religious and community leaders through awareness campaigns	No of advocacy meetings conducted	M&E of outcome	yes/no	Annually	Ministry of Religious Affairs/Dist. management	Survey	Not available
3.3.2.4 Seek involvement of political leaders for domestic financial support	No of advocacy workshops Percentage of budget increase	M&E of outcome	yes/no	Annually	Ministry of finance/DC/DN/District council	Advocacy meetings; Domestic budgetary allocation	Not available

3.3.2.5 Involvement/integration of AMR/IPC message in Social, print & electronic media with existing campaigns for prevention of infectious diseases	Proportion of people receiving IPC information through media Number of campaigns	M&E of outcome	20% increase awareness every year	Annually	PEMRA/PTA/Provincial/Regional health programmes and survey	Survey, media polls	Not available
3.3.2.6 Integrate IPC protocols in building codes for farm hygiene, biosecurity & food chain surveillance.	Building codes made according to the need of IPC		yes/no		PEC/DGHS/PWD/DHO	Review of building codes and adoption	Not available
Intervention 3.3.3: Provision of IPC supplies and waste management							
3.3.3.1 PPE; N95 face masks, surgical masks, gowns, gloves, hand sanitizers & soaps in all health care facilities	Percent availability of IPC supplies at all levels Percent usage by HCPs	M&E of output	10% increase every year	Annually	Sec health (P+C)/DGHS/DHO/provincial /regional health services/Field survey	Survey	Not available
3.3.3.2 Improvement of environmental cleaning & disinfection in healthcare settings: UVGI's, Extraction fans, HVAC units	Percent availability in planned high containment facilities	M&E of output	10% increase every year	Annually	Sec health (P+C)/DGHS/DHO/provincial/regional health services/Field survey	Survey	Not available
3.3.3.3 Autoclave, sterilization and disinfection supplies	Percent facilities with availability	M&E of output	10% increase every year	Annually	Sec health (P+C)/DGHS/DHO/provincial/regional health services/Field survey	Survey	Not available
3.3.3.4 Implementation of waste management practices according to EPA Act	Percentages of health care facilities implementing waste management policies according to	M&E of outcome	10% increase every year	Annually	EPA/Sec health (P+C)/DGHS/DHO/provincial /regional health services/Field survey	Baseline survey Regular inspections and assessments	Not available

	EPA Act						
Intervention 3.3.4: Microbiology lab support							
3.3.4.1 Establishing or strengthening of lab quality system	Percentage of operational microbiology labs at district level	M&E of output	25% of microbiology labs working at district level	Annually	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH	Survey/ assessments based on prescribed tools	Not available
3.3.4.2 Strengthening Capability for Point of Care testing (POCT) and Diagnostics stewardship	Percentage of facilities utilizing POCT	M&E of output	10% facilities at district level with POCT	Annually	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH	Survey/ assessments based on prescribed tools	Not available
3.3.4.3 Establish regional Reference labs for advance and rare diagnostics to harmonize and standardize practices and to provide confirmatory and/or specialized testing (e.g molecular testing)	Number of Reference and regional labs established	M&E of output	AJK, G-B and 4 provincial reference labs; At least 2 labs in one year	Annually	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH	Assessments based on prescribed tools	NVL/NRLPD/Animal Health care/NIH
3.3.4.4 Procuring essential reagents and supplies	No of health care facilities with available supplies	M&E of output	20% in year one	Annually	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH, WHO, CDC	Annual stock situation	Not available
Intervention 3.3.5: Disease surveillance and assessment of compliance with IPC practices							
3.3.5.1 Adapt WHO list of priority pathogens including TB as per GLASS	WHO list of priority pathogens including TB adopted as per GLASS	M&E input	yes/no	One time	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH, WHO, CDC	Consultation	GLASS framework available
3.3.5.2 Monitor Antibiotic utilization & stewardship compliance in human and animal healthcare	Regular reports	M&E input	yes/no	Ongoing	Ministry of NHR&C, Ministry of NFS&R, NIH, DOH, PL&DD	Regular Assessments and audits	Not available

settings							
3.3.5.3 Monitoring of hand hygiene compliance	Regular reports	M&E output	yes/no	annually	NIH, DOH	Survey	M&E tools available
3.3.5.4 Establish and strengthen healthcare associated Infection Surveillance: CAUTI, CLABSI, VAP, SSI	No of syndromic surveillance established & strengthened	M&E input	yes/no	Ongoing	DOH	Regular reporting to Provincial & National IPC Focal Points	M&E tools available
3.3.5.5 Monitoring of compliance to Occupational Safety of HCWs: Vaccination, Needle Stick Injury (NSI), blood & body fluid exposures	No of occupational safety mechanisms developed	M&E output	yes/no	annually	DOH	Regular reporting to Provincial & National IPC Focal Points	Not available
3.3.5.6 Monitoring of access and compliance to use personal protective equipment (PPE)	No of PPEs available per healthcare facility	M&E output	yes/no	annually	DOH	Regular reporting to Provincial & National IPC Focal Points	Not available
Intervention 3.3.6: Strengthen animal health and agricultural IPC practices							
3.3.6.1 Guidelines and policies to promote vaccines in animal husbandry	No of policies & guidelines available in animal husbandry	M&E of output	yes/no	One time	Ministry of NFS&R, PL&DD	Notification Consultation	Not available
3.3.6.2 Review of existing vaccines and vaccination strategies in livestock for alignment with OIE and FAO guidelines	No. of review reports available	M&E of input	yes/no	Once	Ministry of NFS&R, PL&DD	Consultation	Not available
3.3.6.3 Ensuring availability of effective vaccines	No of Vaccines available	M&E of output	Percentage of vaccines	Annually	Ministry of NFS&R, PL&DD	Annual stock situation review	some vaccines available
3.3.6.4 Development of new vaccines and improvements in existing vaccines	No of new vaccines developed & introduced	M&E of output	Percentage of vaccine units	Annually	Ministry of NFS&R, PL&DD	Vaccine trials/ review of technical reports	Some centres available

3.3.6.5 Revision of policies regarding slaughter houses and promotion of hygienic slaughtering practices.	No of policies revised No of slaughter houses practicing hygienic slaughtering	M&E of output	yes/no	Annually	Ministry of NFS&R, PL&DD	Notification & Reporting	Not available
3.3.6.6 Establish quarantine/isolation facilities at all levels	No of facilities available	M&E of output	yes/no	Ongoing	Municipalities and PL&DD department	survey	Not available
3.3.6.7 Adapt the existing standards (e.g. OIE Terrestrial and aquatic animal's health codes and FAO/WHO Codex Alimentarius) to minimize and control AMR	No of standards available to minimize and control AMR	M&E of output	yes/no	Once	Archives	survey	OIE Terrestrial and aquatic animal's health codes and FAO/WHO Codex Alimentarius available
3.3.6.8 Establish, maintain and monitor hygienic standards for food storage sites (Silos/go downs).	No of standards developed. No of food storage sites (Silos/go downs) established according to hygiene standards	M&E of input	yes/no	Annually	FAO, PARC, Ministry of NFS&R, PL&DD	Review Reports	Not available
3.3.6.9 Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks	No of guidelines developed	M&E of output	yes/no	One time	FAO/PARC/Ministry of NFS&R/ PL&DD	Outbreaks reported according to guidelines Consultations	Not available
3.3.6.10 Monitoring antibiotic usage in veterinary practices	No of reports on antibiotic consumption available	M&E of output	yes/no	Annually	PARC/PL&DD	Regular reporting	Not available
Intervention 3.3.7: Hygiene and sanitation at community level							
3.3.7.1 Provision and monitoring of quality	No of household with access to	M&E outcom	Yes/ No	Annually	Municipalities/WASA/ PCRWR/ Ministry of	Survey	Not available

of safe drinking water	safe drinking water	e			Climate Change		
3.3.7.2 Strengthen waste water treatment system	No of waste water treatment plants installed	M&E outcome	Yes/ No	Annually	Municipalities/WASA	Review of reports	Not available
3.3.7.3 Strengthen solid waste collection, transportation and management systems and services	No of protocols & mechanisms developed for safe solid waste disposal	M&E outcome	Yes/ No	Annually	Municipalities/WASA	Consultations, communications and assessments	Not available
3.3.7.4 Integration of personal hygiene to primary and secondary education curriculum, water, sanitation and hygiene (WASH) improvement programs in national development plan, hygiene and disease prevention awareness campaigns into health promotion and management programs, personal hygiene/disease prevention/WASH into professional education for all sectors	IEC Programs developed and implemented	M&E outcome	No of IEC Programs	On-going	Relevant ministries and departments	Consultations, communications and assessments	Not available
Objective 4: Optimize the use of Antimicrobial medicines in human and animal health							
4th Strategic Priority: Update and enforce regulations for human and veterinary Antimicrobial utilization							
Strategy 4.1: Implementation of DRAP Act 2012 read with Drug Act 1976 and rules framed thereunder regarding sale of Antimicrobials on prescription							
Intervention 4.1.1: Advocacy & common sensitization on: prescribing, sales and use of Antimicrobials							
4.1.1.1 Implementation of Drug Act, 1976 and DRAP Act 2012 regarding sale of	No of Acts implemented	M&E outcome	Yes/ No	Ongoing	Ministry of NHSRC, DRAPP, DOH	Review of implementation status	Drug Act, 1976 and DRAP Act 2012 available

antimicrobials on prescription							
4.1.1.2 Advocacy & awareness/understanding of relevant clauses to the stakeholders	No. of seminars/meeting conducted	M&E of Input	25 % in first Year	Ongoing	DOH, DRAP, PL&DD	Review of reports and Department Record	Not available
4.1.1.3 Training of Drug Inspectors to ensure prescription based sale of Antimicrobials	No of Drug Inspectors trained	M&E of Output	25 % in first Year	Ongoing	DRAP, DOH	Review of reports and Department Record	Not available
4.1.1.4 Strengthening and enforcement of market surveillance of antimicrobials	Baseline Information collected	M&E of Input	Yes/No	Once	DRAP, DOH, WHO, HDP	Survey	Not available
4.1.1.5 Coordination of relevant departments at district/divisional level	No. of coordination meetings conducted	M&E of Input	Yes/No	Once	DRAP, DOH	Departmental meeting minutes	Not available
Intervention 4.1.2: Review/ amendment/ harmonization in drug sales rules (human and veterinary) to ensure supervision only by Pharmacist (category A)							
4.1.2.1 Advocacy of policy makers and other relevant stakeholders	No of Seminars/Advocacy meetings conducted	M&E of Input/process	Yes/No	Quarterly	Ministry of NHSRC, Ministry of MNFSR, DRAP, DOH, PL&DD	Departmental records	No data available
4.1.2.2 Legislation procedure will be initiated with consensus of all stakeholders	Amended legislation approved	M&E of Input/process	Yes/No	Once	Ministry of NHSRC, DRAP, Ministry of Law & Justice, DOH	Review of legislature, consultations	Not available
4.1.2.3 Review and upgradation of EML	EML list upgraded with categorization of antimicrobials	M&E of Input/process	Yes/ No	Once	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH, WHO	Review of literature, Consultation	Baseline EML available
Intervention 4.1.3: Antimicrobials (human & veterinary) sale & utilization audit							
4.1.3.1 Regular monitoring of Antimicrobial sale and utilization at all levels	Audit mechanism developed Regular	M&E of Input/process	Yes/ No	Once	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH,	Consultations, Review of reports	Not available

and sectors	Reporting						
4.1.3.2 Coordinated and synchronized mechanism for keeping record of antimicrobial sale and use at all levels (Pharmacies, medical & Vet. Hospitals/ GPs in both sectors)	Mechanism for coordinated and synchronized record keeping of antimicrobial sale is available	M&E of Input/process	Yes/No	Once	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH	Consultations, Review of reports	Not available
	Notification of DCUs available and functional	M&E of Input/process	Yes/No	Once			
4.1.3.3 Compilation of sale and usage record at provincial/federal and national level (Data management)	No of audit reports available	M&E of Input/process	Yes/No	Annually	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH	Information Management System	Not available
Intervention 4.1.4: Strengthening of National mechanism for drug testing to ensure the safety and quality of antimicrobials							
4.1.4.1 Strengthening of DTLs (Human Resource, infrastructure, Equipment and supplies)	No of labs strengthened	M&E of Input/process	Yes/No	One time	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH, WHO	Departmental records, facilities assessments	Some facilities available
4.1.4.2 Accreditation of DTLs (Federal and Provincial level)	No of labs accredited according to ISO& WHO standards	M&E of Input/process	Yes/No	Ongoing	Ministry of NHSRC, Ministry of NFSR, DRAP, DOH, WHO	Departmental records, facilities assessments	Some ISO/ WHO standards available
Strategy 4.2 : Establishment of Antibiotic stewardship program (ASP) at all levels							
Intervention 4.2.1: Antibiotic Stewardship program developed and started at national & provincial levels							
4.2.1.1. Advocacy of all stakeholders through meetings, seminars and briefs for establishment of ASP at tertiary level hospitals	No of advocacy seminars, meetings conducted	M&E of output	25% of tertiary hospitals where ASP has been established annually	Annually	Ministry of NHSR&C, DRAP, DOH	Departmental facility records	ASP available in Limited number of tertiary care hospitals
4.2.1.2 Standard	No of guidelines	M&E of	Yes/No	One time	Ministry of NHSR&C,	Consultation	Archives

treatment guideline (STG) for antimicrobial use in view of domestic need and scenarios	developed	output			DRAP, DOH		
4.2.1.3 Development*& Implementation of ASP through Oversight Committees at Provincial/Regional levels	Notification of ASP Committee is available	M&E of Input	Yes/No	Every 3 Years	Ministry of NHSR&C, DRAP, DOH	Archives	Not available
4.2.1.4 Document audit of ASP at tertiary care hospitals (Public and Private)	Audit document available	M&E of Input	Yes/No	Annually	Ministry of NHSR&C, DRAP, DoH	Documents & Records review	Not available
*Market surveillance should precede this activity							
Intervention 4.2.2: Promote use of vaccines for VPDs to minimize Antimicrobial use in both human and vet sector							
4.2.2.1 Advocacy of all stakeholders through meetings, seminars and briefs	No of meetings, seminars and briefs conducted	M&E of output	Proportion of tertiary hospitals where ASP has been established annually	Annually	Ministry of NHSR&C, Ministry of NFSR, DRAP, DOH	Departmental facility records	ASP available in limited number of tertiary hospitals in private sector
4.2.2.2 Ensure availability, access and usage of effective vaccines in both sectors	No of effective vaccines available in both sectors	M&E of output	Yes/ No	On-going	Ministry of NHSR&C, Ministry of NFSR, DOH	Departmental records and	vLMIS implemented
4.2.2.3 Formulation of legislation for mandatory vaccination against VPDs in both sectors	Legislation formulated in both sectors	M&E of output	Yes/ No	One time activity	Ministry of NHSR&C, Ministry of NFSR, DOH, Relevant regulatory bodies	Consultative process or consensus building	Draft bill on immunization in health sector
5th Strategic Priority: Phase out use of Antimicrobials as Growth Promoters and Provide Appropriate Alternatives							
Strategy 4.3: Rationalize Use of Antimicrobials as Growth Promoters and Discourage Prophylactic use of Antibiotics in Veterinary sector							
Intervention 4.3.1: Review and improve existing practices regarding use of Antimicrobials as growth promoters & prophylaxis as per international standards							
4.3.1.1.Baseline	Baseline survey	M&E of	Yes/No	One Time	Ministry of NHSR&C,	Survey	Not available

survey on usage of Antimicrobials as growth promoters in Animal feed industry including assessment of feed (utilization audit)	conducted	outcome			Ministry of NFS&R, DRAP,		
4.3.1.2.Addition/inclusion of relevant clauses in DRAP Act 2012 and Drug Act 1976 for the control of antimicrobials usage as growth promoters and prophylaxis in veterinary sector (link with amendment proposed in strategy 2)	Amended acts available	M&E of outcome	Yes/No	Every 5 Years	Ministry of NHR&C, Ministry of NFS&R, DRAP, DOH, Ministry of Law and Justice	Review of literature and consultation	Parliament Archives
4.3.1.3.Monitoring of Antimicrobials as growth promoter by relevant authorities	% reduction in usage of antimicrobials as growth promoters and prophylaxis in 2 years	M&E of Output	Proportion reduction in usage of antimicrobials as growth promoters and prophylaxis	Annually	Ministry of NHR&C, Ministry of NFS&R, DRAP, DOH	Survey	Not available
4.3.1.4.Strengthening of Food Testing Laboratories for antimicrobial residues in food at regional/divisional level	Proportion of Food Labs meeting International standards	M&E Output	% of Food Labs meeting International standards in first year	Annually	Federal & Provincial Food, health, livestock and agriculture departments	Laboratory assessment	Not available
Objective 5 : Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions							
6th Strategic Priority: Integration of AMR in all public health research agendas including research on vaccines and diagnostics							
Strategy 5.1: Identification and integration of available indigenous resources for research							
Intervention 5.1.1: Develop mechanism for conducting survey and resource mapping on AMR							
5.1.1.1.Performan	Number of	M & E	Yes / no	One time	PHRC , NIH, Ministry of	Survey	Not available

based survey of available resources (Equipment; Human resource; Infra-structure; funding)	resources mapped	output		activity	NHSR&C, Ministry of NFS&R,		
5.1.1.2 Integration of available resources for development of new vaccines, diagnostics & Antibiotic alternatives	No of research projects on new vaccines, diagnostics and antibiotic alternatives	M & E output	Yes / no	On-going	PHRC, NIH, Ministry of NHSR&C, Ministry of NFS&R, Academic Institutions, PSF, Pharmaceuticals, HEC	Applied basic research support, clinical trials, applied research, operational research	Various health research projects currently supported
Intervention 5.1.2: Conducting research on clinical practices on AMR							
5.1.2.1 Conduction of clinical research determining gaps in clinical practices in medical and veterinary fields with in regard to the prescription, usage and availability/ manufacturing of antimicrobials	No of research projects conducted	M & E output	Yes / no	On-going	PHRC, NIH, Ministry of NHSRC, Ministry of NFS&R, Academic institutions, PSF, Pharmaceuticals, HEC	Applied basic research support, clinical trials, applied research, operational research	Various health research projects currently supported
5.1.2.2 Minimizing the use of antimicrobials by development of effective vaccines& diagnostics	No of new vaccines & diagnostics developed	M & E output	Yes / no	On-going	NIH, Ministry NHSR&C, Ministry of NFS&R, Academic institutions, Pharmaceuticals	Basic research	Not known
7th Strategic Priority: Estimation of health and economic burden of AMR for decision making							
Strategy 5.2: Development of economic case for sustainable investment that takes account of the country needs							
Intervention 5.2.1: Baseline data collection on economic burden due to AMR							
5.2.1.1 Analysis of published data on AMR from Pakistan in order to evaluate the economic impact	No of report on economic losses incorporating all sectors (medical, veterinary, agriculture, environment)	M & E output	Yes/ No	On-going	Ministry NHSR&C, Ministry of NFS&R	Literature review & report writing	Expertise available
5.2.1.2 Collection of	No. of reports	M & E	Yes/ No	On-going	Ministry of NHSR&C,	Survey	Reference labs

Data on AMR from healthcare facilities including labs	collected	output			ministry of NFS&R, NIH, DOH		
Intervention 5.2.2: Need Assessment for internal and external support (Technical & Financial Assistance)							
5.2.2.1 Development of national AMR research priority agenda	National AMR research priority agenda developed with resource allocation	M & E output	Yes/ No	One time	Ministry of NHSRC, Ministry of NFS&R, DOH, HEC, PHRC, MoST	Consultations	Not available
5.2.2.2 Coordination with HDPs/experts to support and finance research	Coordination mechanism established to support & finance research	M & E output	Yes/ No	On-going	Ministry of NHR&C, Ministry of S&R, DOH, HEC, PHRC, Ministry of Science & Technology, HDP	Consultations	Not available
Strategy 5.3: Focused R & D framework promoting responsible use of Antimicrobials for infection prevention							
Intervention 5.3.1: Conduct operational research on rational use of Antimicrobials							
5.3.1.1 Identification of gaps in clinical practices (prescription & usage) through research in medical and veterinary fields	No of research projects	M & E output	Yes/ No	On-going	Ministry of NHR&C, Ministry of NFS&R, DOH, HEC, PHRC, Ministry of Science & Technology (Mo ST), HDP	Consultations	Not available
5.3.1.2 Promote research and development through public private partnership on production and application of vaccines for disease prevention	No of MoUs	M & E output	Yes/ No	On-going	Ministry of NHR&C, Ministry of NFS&R, DOH, HEC, PHRC, Ministry of Science & Technology, HDP	Consultations	Not available

List of Publications & References Cited in the Document

1. World Health Organization 2014. Antimicrobial resistance: global report on surveillance 2014. (Available at http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf)
2. World Health Organization. 2015. Country Capacity Review Mission for Early Implementation of AMR Surveillance in Pakistan, November 2015
3. World Health Organization 2015. Global Action Plan for AMR. . (Available at http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_eng.pdf)
4. National Strategic Framework for AMR containment in Pakistan 2016. (In press)
5. World Health Organization 2012. The evolving threat of antimicrobial resistance: options for action. Available at http://whqlibdoc.who.int/publications/2012/9789241503181_eng.pdf
6. Diaz. Antimicrobial use in animals: Analysis of the OIE survey on monitoring of the quantities of antimicrobial agents used in animals [Internet]. 2013; Paris. Available from: http://www.oie.int/eng/A_AMR2013/Presentations/S2_4_Fran%C3%A7oisDiaz.pdf
7. Basnyat B. Antibiotic resistance needs global solutions. *Lancet Infect Dis* 2014;14(7):549–550.
8. Dutil L et al. Ceftiofur resistance in Salmonella entericaserovar Heidelberg from chicken meat and humans, Canada. *Emerging Infectious Diseases* 2010;16(1):48-54.
9. Cogliani C, Goossens H, Greko C. Restricting antimicrobial use in food animals. Lessons from Europe. *Microbe* 2011;6(6):274–279.
10. WHO 2015. World Health Assembly addresses antimicrobial resistance, immunization gaps and malnutrition. <http://www.who.int/mediacentre/news/releases/2015/wha-25-may-2015/en/>
11. HO 2016. Antimicrobial resistance: A manual for developing national action plans. Available at http://apps.who.int/iris/bitstream/10665/204470/1/9789241549530_eng;
12. WHO "Antimicrobial resistance: global report on surveillance 2014." April 2014. <http://www.who.int/drugresistance/documents/surveillancereport/en/>.
13. WHO EMRO. "Pakistan Antimicrobial Resistance Surveillance System." 2015. <http://www.emro.who.int/pdf/health-topics/drug-resistance/pakistan-antimicrobial-resistance-surveillance-system.pdf>
14. PARN- Pakistan Antimicrobial Resistance Network. Available at: <http://www.parn.org.pk/ResistanceMap.org>; Accessed April 13, 2017.
15. IMS-Health
16. Van Boeckel TP, Brower C, Gilbert M, Grenfell BT, Levin S a., Robinson TP, et al. Global trends in antimicrobial use in food animals. *Proc Nat Acad Sci*. 2015; (16):201503141–201503141.
17. National Drug Policy- Pakistan, 2003. <http://apps.who.int/medicinedocs/en/d/Js17118e/>. Accessed April 13, 2017.
18. DRAP ACT 2012. Drug Regulatory Authority of Pakistan LAWS http://www.na.gov.pk/uploads/documents/1352964021_588.pdf. Accessed April 13, 2017.
19. DRUG Act 1976. Drug Regulatory Authority of Pakistan LAWS <http://www.dra.gov.pk/drap/userfiles1/file/The%20Drugs%20Act,%201976%2011-11-15%20F.pdf>. Accessed April 13, 2017.
20. The Punjab Animals Feed Stuff and Compound Feed Act 2016. <http://punjablaws.gov.pk/laws/2675.html>. Accessed April 13, 2017.

21. Ashfaq M, Nawaz Khan K, Saif Ur Rehman M, et al. Ecological risk assessment of pharmaceuticals in the receiving environment of pharmaceutical wastewater in Pakistan. *Ecotoxicology and Environmental Safety*. 2017;136:31-39. doi:10.1016/j.ecoenv.2016.10.029.

22. Khan GA, Berglund B, Khan KM, Lindgren PE, Fick J. 2013. Occurrence and abundance of antibiotics and resistance genes in rivers, canal and near drug formulation facilities: a study in Pakistan. *PLoS ONE* 8, e62712.