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Department:
Health
REPUBLIC OF SOUTH AFRICA

IMPLEMENTATION PLAN FOR THE ANTIMICROBIAL RESISTANCE STRATEGY FRAMEWORK IN SOUTH AFRICA: 2014–2019

September 2015

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ACRONYMS AND ABBREVIATIONS

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
DAFF	Department of Agriculture, Forestry and Fisheries
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
DST	Department of Science and Technology
DTI	Department of Trade and Industry
DWS	Department of Water and Sanitation
HAI	Hospital Acquired Infections
HRD	Human Resources Development
IPC	Infection Prevention and Control
MAC	National Ministerial Advisory Committee
M&E	Monitoring and Evaluation
NCS	National Core Standards
NDOH	National Department of Health
NHLS	National Health Laboratory Services
OHSC	Office of Health Standards Compliance
NICD	National Institute of Communicable Diseases
PHC	Primary Health Care
PTC	Pharmaceutical and therapeutic committee
TRH & HRD	Tertiary Health Services & Human Resource Development Branch
WISN	Workload Indicators of Staffing Needs

STATEMENT OF COLLECTIVE COMMITMENT

The Minister of Health launched the National Antimicrobial Resistance Strategy Framework on the 16th October 2014. This strategy articulates the vision, mission, and goals for improving the appropriate use of antimicrobials over the next five years. We recognise that for the strategy to achieve its goals, national government must lead, support, and guide its implementation.

This implementation plan sets out the activities and tasks that we, as heads of the different branches, have agreed to within the National Department of Health. We commit to working with each other and non-governmental partners to support the implementation of the strategy. We will endeavour to coordinate our actions, programmes and efforts to achieve the goals of the strategy in an efficient and cost effective manner.

We call on our counterparts in provincial and local governments to join us on this journey by aligning their implementation plans to this one. Over time, our joint and collective efforts will ensure we have an arsenal of antimicrobials to use for future infections and help reduce the risk of acquiring multidrug resistant organisms in our health establishments.

INTRODUCTION AND BACKGROUND

Antibiotics play a vital role in the management of bacterial infections by reducing morbidity and preventing mortality. They are estimated to increase life expectancy by 20 years. However, the extensive use of antibiotics has resulted in drug resistance that threatens to reverse the life-saving power of these medicines. Antibiotic resistance affects the human health sector the most and has a direct impact on the economy of each country. A tipping point has been reached for the international community as we find ourselves on the brink of a "post-antibiotic era."

Antimicrobial resistance (AMR), or the ability of a microorganism to withstand treatment with an antimicrobial drug, is a significant and multifaceted public health problem and a direct threat to patient safety and the continued use of available antimicrobials. The societal and financial costs of treating antimicrobial resistant infections place a significant human and economic burden on society.

The national AMR Strategy Framework[1] has been developed to manage antimicrobial resistance and limit further increases in resistant microbial infections, and improve patient outcomes.

Vision: To ensure the appropriate use of antimicrobials by health care professionals in all health establishments in South Africa to conserve the efficacy of antibiotics for the optimal management of infections in human and animal health.

Mission: To coordinate and harness the collective efforts of stakeholders in human, animal, and environmental health to advance evidence-based strategies for the prevention and containment of antibiotic resistance in the "One Health" context which recognises the connection between the health of animals and the environment and humans' health.

Strategy Goals

- To define the principles and short- to medium-term interventions needed to preserve the effectiveness of antimicrobials for future generations
- To improve the appropriate use of antibiotics in human and animal health
- To improve the management of antibiotic resistant organisms and to prevent their transmission
- To create an enabling environment for the successful and sustainable implementation of the strategic objectives

Scope of the Strategy

The interventions included in the AMR strategy apply equally to antibiotics as they do to drug resistance in tuberculosis, HIV, and antifungals. National implementation plans for monitoring and evaluation of drug resistance in tuberculosis and HIV are already the subjects

[1] *Antimicrobial Resistance National Strategy Framework, 2014 – 2024;* NDOH, 2015

of relatively strong international and national programs, but little attention has being paid to the common infections and low-cost first-line antibiotics and antifungals, which are the mainstays of infectious disease treatment. Therefore, this implementation plan seeks to address some of the gaps relating to all antimicrobials from an overarching, national perspective.

Strategic Objectives

This AMS Implementation Plan consists of five strategic objectives that are underpinned by four key enablers as described in figure 1 below. The strategic objectives are:

1. Strengthen, coordinate and institutionalize interdisciplinary efforts through national, provincial and health establishment level governance structures

2. Improve the appropriate use of diagnostics to identify pathogens and guide treatment by promoting appropriate and timely selection and collection of specimens, accurate and timely testing, accurate and timely reporting of results

3. Optimise surveillance and early detection of AMR for reporting local, regional, and national resistance patterns to optimise empiric and targeted antibiotic choice

4. Enhance infection prevention and control of the spread of resistant microbes to patients in health care settings, focusing on improvement in hand hygiene and the identification and isolation of patients with resistant organisms. Prevent infections through wide-reaching vaccination programmes.

5. Promote appropriate use of antimicrobials in human and animal health through antimicrobial stewardship.

The key enablers of these strategic objectives are:

1. Legislative and policy reform for health systems strengthening to support the country and to enable control antimicrobials overprescribing in the animal and human health sector

2. Education at all levels of health providers in human health and agriculture in the critical concepts of antimicrobial stewardship, infection control, infectious diseases, microbiology, and pharmacology

3. Communication to educate the public, create awareness, and enhance patient advocacy of the dangers of inappropriate antimicrobial use and appropriate community measures to prevent infections

4. Research into novel diagnostics such as point-of-care testing and clinical trials of treatment duration, antimicrobial consumption plus new antimicrobials.

Strategic objectives

Governance

National Intersectoral Ministerial Advisory Committee

Health Establishment and District Antimicrobial Stewardship committees and teams

Diagnostic Stewardship	Surveillance	Prevention Control	Antimicrobial Stewardship (AMS)–Policies and Guidelines:
• Appropriate selection of microbial investigations and specimens • Accuracy and timely testing by laboratories • Accurate and timely reporting of results	National surveillance system for animal and human health for— • Resistant bacteria • Antimicrobial usage • Medication error reporting structures	Infection prevention and control activities in health facilities	• Formulary restrictions • Pre-authorisation • Antimicrobial prescription forms • National prescribing guidelines
		Immunisation against preventable infections	AMS–at point-of-care: • Diagnosis of infection • Appropriate antibiotic choice • Dose optimization, de-escalation and discontinuation

Strategic enablers

Legislative and policy reform for health systems strengthening

- Ensure access to quality antimicrobials
- Control of use and prescribing of antimicrobials in animal and human health
- Minimum standards and norms for health care quality systems and process (National Core Standards)

Education

- Incorporate AMR strategies into medical, nursing and allied health student curricula
- AMR/AMS CPD programmes for health care professions

Communication

- Sustained public health campaigns on prevention of spread of diseases and social determinants of disease management
- Public awareness of appropriate antibiotic use
- Patient advocacy as part of a patient-centered care approach

Research

- Infection Prevention and Control (IPC), AMS interventions, diagnostics

Figure 1. Strategic framework for the AMR national strategy

IMPLEMENTATION PLAN

This implementation plan gives effect to the AMR Strategic Framework and the commitments made by all stakeholders on the 16th October, 2014, at the AMR Summit (annex A). The implementation plan has three specific aims—

1. Translate the antimicrobial resistance strategic framework, goals and objectives into activities that will have measurable outputs that can be monitored and evaluated
2. Ensure that all parties who have a stake in implementing AMR strategies understand how the strategy will be implemented and what their responsibilities are to be in relation to implementation
3. Clarify how the implementation of the strategy will affect other programmes, managers, and stakeholders

Given the diverse range of stakeholders and strategic objectives, it is critical to clearly spell out responsibilities for each activity (see Monitoring and Evaluation section).

Strategic Objective 1. Strengthen, coordinate, and institutionalise inter-disciplinary efforts through national and health establishment level governance structures

The Context

The first strategic goal focuses on establishing a governance and oversight structure at national, provincial, and health establishment level to coordinate and implement AMS activities.

The National Governance Structure

The primary national governance structure is the National Ministerial Advisory Committee (MAC) for Antimicrobial Resistance that has multi-disciplinary and intersectoral members. The MAC will report to the Minister of Health and be funded by the National Department of Health (NDOH). To implement the framework, the MAC is mandated to coordinate efforts, advocate for a national stewardship role, and increase awareness of AMR issues as well as monitor and evaluate the framework effort. MAC will also engage with other sectors of government including the Departments of Agriculture, Forestry and Fisheries (DAFF), Trade and Industry, Science and Technology (DST), Basic Education, Higher Education and Training, Water and Sanitation (DWS), Mining, Justice, and Correctional Services, and Transport.

The membership of the MAC will include the public and private sectors, academic experts from both human and animal health, as well as key staff from other departments. Additional stakeholders include relevant clinical societies, regulatory and professional bodies, laboratory networks, the pharmaceutical and diagnostics industry, military, medical aids, legal, and civil society.

Roles and Responsibility of the MAC

The role of the Ministerial Advisory Committee on Antimicrobial Resistance is described in the *Antimicrobial Resistance National Strategy Framework.* According to the strategy, the Ministerial Advisory Committee on Antimicrobial Resistance may make recommendations to the Minister on—

- The institutionalisation of effective systems of AMS at national, provincial, and institutional levels in both the public and private sectors using the "one health" approach
- Structured national surveillance and reporting systems for antimicrobial use and resistance in the human health and agriculture sectors for the detection of newly emerged resistance
- The selection of antimicrobial agents on the Essential Medicine List (EML) based on trends and patterns of resistance
- Progress towards achieving compliance to the standards within the National Core Standards in all health establishments
- The phased rationalisation or elimination of the use of antimicrobials in agriculture or as growth promoters in food animals
- The prevention strategies focusing on infection prevention and control and enhanced vaccination programmes
- Core curricula on AMR for health and veterinary professionals
- National community advocacy, awareness and education campaigns to reduce inappropriate use of antimicrobials in humans and animals
- Rapid and point-of-care diagnostics
- Research into molecular mechanisms of resistance, dissemination of information on resistance, new drugs and diagnostics

Until the MAC nomination process is completed, the AMR working group, constituted in 2013, is to continue dealing with operational and any high-priority issues in the interim.

Communication of MAC with Other Committees Involved in Medicine and AMR Management

The MAC on Antimicrobial Resistance shall establish a communication framework to ensure that all issues related to AMR management are communicated timeously and effectively to internal and external stakeholders. The MAC will link with HIV, TB, and malaria and other such existing committees involved with drug resistance and also with adult and paediatrics expert groups including National Essential Medicines List Advisory Committee (NEMLAC).

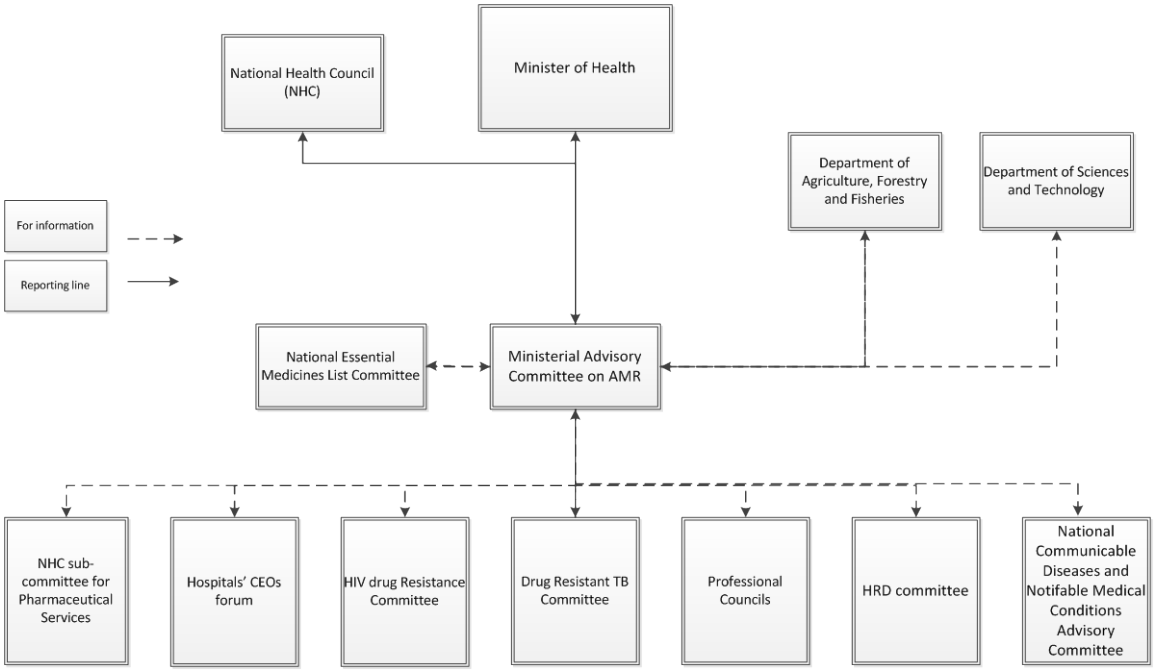

Figure 2. Communication channels for AMR ministerial advisory committee

Health Establishment Governance Structure

Governance structures at operational level fall within the clinical leadership capabilities of the provincial and district offices in the public sector. Three critical functions are to be performed—Pharmaceutical and Therapeutics, AMS, and Infection Prevention and Control. The nature of the structures will depend on the resources and capabilities in each province and district

Risks

- The national governance structure must align with existing structures of governance within the NDOH to limit duplication of effort and resources.
- HIV and TB drug resistance issues should be incorporated in the broader context of AMR and considered in the future to improve efficient use of resources and the alignment of activities.
- Lack of intergovernmental involvement within antimicrobial resistance will limit the full extent of implementation efforts to address animal and human health issues. Therefore representatives of DAFF and DST, veterinary societies, and other groups must be established members of the MAC. Also, a memorandum of understanding between government organisations needs to be established.
- Operationally, managers may interpret the requirements of this strategy as additional structures and committees rather than as additional functions that existing structures would be able to fulfil. Clear guidance is needed to avoid the unnecessary duplication of structures at provincial and district level.

The outputs and activities described in the tables below support the implementation of this strategic objective.

Table 1. Goal 1—Strengthen, Coordinate, and Institutionalise Inter-Disciplinary Efforts through National and Health Establishment Level Governance Structures Implementation Plan

Output	Activity	Responsibility		Time-frame
		Lead	Supporting	
Functional representative national AMR MAC	Develop draft terms of reference for MAC	Directorate of Affordable Medicines	Implementation partners*	End Feb 2015
	Engage with DAFF, DST, Basic Education, DWS on their representation on MAC	Directorate of Affordable Medicines		Aug 2015
	Appointment of MAC	Directorate of Affordable Medicines		Aug 2015
Guidance developed to establish governance structures at operational level	Development of guidelines on the governance roles and functions of the governance structures within provincial, district, and health establishment (links with SO 4)	Directorate of Affordable Medicines	Branch: Hospitals Tertiary Health Services and Human Resources Development(TRH & HRD/PHC) Implementation partners	Mid- July 2016
	Capacitation of provincial district offices to establish AMR activities	Branch: TRH & HRD/ PHC	Implementation partners	Mid- July 2016
	Establish functional AMR structures at province, district and health establishment level	Head of Health Provinces	Implementation partners	2016–2019

*Implementation partners include nongovernmental organizations and clinician societies who are involved in the implementation of operational activities related to this plan

Strategic Objective 2. Improve the Appropriate Use of Diagnostics to Identify Pathogens and Guide Patient Treatment and Management

This strategic objective has been added since the publication of the AMR Strategy Framework because of the integral part that appropriate microbial diagnostics play in pathogen identification and further guidance for treatment. Diagnostic stewardship is defined as the "coordinated intervention to improve and measure the appropriate use of microbial diagnostics to identify pathogens and guide therapeutic decision by promoting appropriate and timely selection and collection of specimens, accurate and timely testing, accurate and timely reporting of results."[2] Diagnostic stewardship extends beyond the patient's bedside into the laboratory and relies on the skills, expertise, and capacity of the laboratory and its staff to accurately test and report on specimens it receives and guide patient management.

Diagnostic stewardship includes the following:

- Clinician awareness of the microbiology laboratory role in supporting patient management

[2] WHO, Draft Implementation Manual On Global Surveillance of Antimicrobial Resistance (GLASS) June 2015

- Clinician knowledge of correct specimen taking practices, transportation, and appropriate utilization of the laboratory testing methods for different specimen types as well as rejection of samples that are unsuitable or inappropriate. Involvement of clinical microbiologists defining in the development of diagnostic algorithms; in particular the laboratory component of diagnostic algorithms which may include other pathology investigations to support patient management and further follow-up.

- The provision of accurate, consistent and reliable results through the implementation of laboratory quality management systems.

- Appropriate interpretation of laboratory results by clinical microbiologists, and provision of guidance on appropriate therapy and management including enforcing infection control practices based on these results.

The potential benefits of diagnostic stewardship from the point of view of the patients include—

- Early diagnosis of infection and identification of outbreaks

- Reduction in collection of unnecessary and inappropriate specimens

- Identification of aetiological agents (including multidrug (MDR) resistant agents), leading to timeous initiation of appropriate therapy

- Identification of MDR resistant pathogens in other patients, which may allow for early implementation of appropriate infection control precautions

- Introduction of principles and practice of pharmacokinetics and pharmacodynamics into treatment plans, in combination with clinical pharmacology or other specialist disciplines

The outputs and activities described in the tables below support the implementation of this strategic objective.

Table 2. Goal 2—Improve the Appropriate Use of Diagnostics to Identify Pathogens and Guide Treatment Implementation Plan

		Responsibility		
Output	**Activity**	**Lead**	**Supporting**	**Timeframe**
Improved clinician awareness of correct microbial specimens and timing	National guidelines on diagnostic algorithms and appropriate microbial specimens and timing	National Health Laboratory Systems (NHLS)	Implementation partners	June 2016
Laboratory quality management systems implemented	Implementation of a quality management systems at all laboratories–private	NHLS	Implementation partners	June 2016

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
	and public			
	All laboratories accredited with ISO 15189	NHLS	Implementation partners	June 2016
Improving laboratory capacity	Determine the cost benefit of implementing rapid diagnostic tests as well as technology allowing for improved turn-around times	NHLS	Implementation partners	June 2016

Strategic Objective 3. Optimise Surveillance and Early Detection of AMR

The purpose of optimising surveillance is to enable reporting of organism resistant patterns at the local, provincial, and national levels and detect trends in resistance early to optimise empiric and targeted antibiotic choice.

There are two main components to surveillance:

- Strengthen passive and active surveillance of local and national AMR patterns and antimicrobial use through the on-going, systematic collection, analysis and interpretation of antimicrobial resistance and antimicrobial use data. This is important for both animal and human health. Integrated human and animal national surveillance systems will be established through collaboration between NDOH, National Institute of Communicable Diseases (NICD), Veterinary Society, and DAFF. This will inform policy and planning functions of the AMR governance structures and essential medicine list decisions. In the future it will assist with evaluation of impact of policy decisions and serve to track resistance progression and impact of interventions.

Clearly defining and implementing surveillance and reporting standards for human and animal health are included in this activity. This would include a defined set of surveillance data elements. Re-establishing a surveillance system for animal health that allows the reporting of organism resistance rates in feed and companion animals will be developed in partnership with DAFF.

- Develop an early warning system to report sentinel organisms in humans that can serve as an alert for MDR organisms and interventions for AMS, and, in future, act as an outbreak warning system.

The outputs and activities described in the tables below support the implementation of this strategic objective

Table 3. Goal 3—Optimise Surveillance and Early Detection of AMR Implementation Plan

Output	Activity	Responsibility		Time-frame
		Lead	Supporting	
Develop National Surveillance System				
A baseline consolidated national surveillance report on AMR and hospital acquired infections (HAI) for South Africa for human health	Consolidation of existing data from public and private sectors on AMR as resistance maps available to public on web	NICD	Implementation partner	June 2016
	Utilise trends from AMR, Resistance Maps and antimicrobial consumption data to advise NDOH on EML and formularies	MAC	Directorate of Affordable Medicines	Ongoing
Establish national surveillance and reporting process at National NDOH for human health	Establish reporting system and data warehouse repository for surveillance data of AMR and HAI's	NICD	Implementation partner	July 2016
	Determine the definitions and standards for reporting HAI's at health establishment level	NICD	Implementation partners	Jan 2016
	Capacitate health establishments to implement quality assurance for reporting of HAI data	Head of health provinces	Implementation partners	June 2016
	Publish national surveillance reports on HAI and AMR	NICD	Implementation partner	Ongoing
	Health establishment utilise trends from AMR, resistance maps, and antimicrobial consumption data to support prudent use of antimicrobials at facility level	Head of health provinces/ CEOs of hospitals	Implementation partners	2016 - 2019
A consolidated national surveillance report on AMR for South Africa for animal health	Engage with DAFF to reintroduce national longitudinal antimicrobial surveillance in animals	Veterinary laboratories/DAFF	MAC	March 2016
Medication error reporting system	Establish medication error definitions and reporting process	Directorate of Affordable Medicines	Pharmaceutical and therapeutic committees	March 2016
	Health establishments report medication errors	Head of health provinces/ CEOs of hospitals	Pharmaceutical and therapeutic committees	2016-2019
Develop Early Warning System				
Develop sentinel organisms early warning systems	Regulate prescribed reporting of sentinel organisms through Notifiable Diseases regulations	NICD		Jan 2016
	Determine standards for EWS reporting	NICD		Jan 2016
	Laboratories to report against EWS organisms	NHLS/ South African Society for Clinical Microbiology	Implementation partners	2016 - 2019

Risks

Sustainability of funding to support and maintain a consolidated database of AMR information for animal and human health therefore collaboration between NDOH, NICD, DAFF, and veterinary societies is needed to facilitate this.

Strategic Objective 4. Enhance Infection Prevention and Control

Prevention of infection is a key step in reducing the need for antibiotic use. Therefore preventing and controlling the spread of resistant microorganisms would include a focus on:

- Preventing new infections through an effective immunisation campaign as part of Extended Programme for Immunisation (EPI) and seasonal prevention strategies
- Preventing and control the spread of resistant organisms at health facility level through:
    - Improving basic infection control techniques such as hand hygiene and use of personal protective equipment
    - Ensuring that there are a sufficient number of IPC practitioners who are sufficiently qualified to perform their functions according to the standards required
    - Improving the availability of cleaning and IPC supplies
    - Improving planning of health establishments infection control infrastructure needs

The outputs and activities described in the tables below support the implementation of this strategic objective

Table 4. Goal 4—Enhance Infection Control and Prevention Implementation Plan

		Responsibility		
Output	**Activity**	**Lead**	**Supporting**	**Timeframe**
Improved immunisation uptake	Determine interventions to address gaps and promote appropriate immunisation uptake	Directorate of EPI	Implementation partners	June–Dec 2015
	Improve seasonal vaccine uptake	Directorate of Health Promotion	Implementation partners	June–Dec 2015
Availability of IPC supplies and equipment	Update the list of non-negotiable IPC supplies and cleaning supplies	Directorate of Affordable Medicines	Implementation partners	Ongoing
	Improve the availability at health establishment level of non-negotiable IPC supplies	Directorate of Affordable Medicines	Implementation partners	Ongoing
IPC that meets standards at health establishment level	Appoint central national specialist for infection prevention and control	Directorate of Communicative Diseases	Implementation partner	Dec 2015
	Evaluate the IPC gaps in standards to determine interventions required	Directorate of Communicative Diseases	Implementation partners	April 2016
	Strengthen the implementation of the core standards for IPC through	Directorate of Communicative	Implementation partners/ NICD	Jan–Dec 2016

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
	the reinforcement of the infection control assessment tool manual and infection prevention and control guidelines and quality improvement methodology	Diseases		
	Improve hand hygiene through awareness days and national campaign	Directorate of Communicative Diseases	Implementation partners	May–Dec 2014
	Ensure staffing norms for IPC practitioners are put in place in health establishments and/or districts	Head of health provinces/ CEOs of hospitals	Branch: TRH&HRD/ PHC Implementation partners	2016– 2019

Risks

- Delay in appointing a specialist in the post for Infection Prevention and Control at national level will hamper the implementation and sustainability of many of the initiatives around this strategic goal. Therefore ensuring an IPC representative on MAC, available funds for the post, and the correct candidate is appointed is critical.
- Deficiencies in funding, budgeting. and planning for resources both human and IPC supplies and equipment will result in staff being unable to practice effective IPC.

Strategic Objective 5. Promote Appropriate Use of Antimicrobials in Human and Animal Health

Promoting appropriate use of antimicrobials (AMS) requires safe and effective medicines to be available in the country and systems and processes at health establishment and community level to ensure their appropriate use. This strategic goal involves three key objectives:

- Ensure access to safe, effective, and affordable antimicrobials through quality control registration processes and pharmacovigilance systems of antimicrobials in the country
- Institutionalise antimicrobial stewardship to correct inappropriate use within health establishments and community prescribers through protocols, structures, diagnostics and interventions at point of care
- Address the use of antimicrobials in animal health in a similar fashion with interventions to help correct inappropriate use in animal feeds and animal husbandry

The outputs and activities described in the tables below support the implementation of this strategic objective.

Table 5. Goal 5's Promote appropriate use of antimicrobials in human and animal health Implementation Plan

		Responsibility		
Output	**Activity**	**Lead**	**Supporting**	**Timeframe**
Access to safe medicines				
Access to safe, effective and affordable antimicrobials	Improve the fast track registration process of Antimicrobials	Medicines Control Council (MCC)	NDOH	Jan –Dec 2015
	Improve the process for accessibility to specific antimicrobials for second and third line therapy (section 21)	MCC	NDOH	August 2016
	Set up collaborative alternative mechanisms to registration of antimicrobials	MCC	Pharmaceutical companies, Southern African Regional Programme on Access to Medicines and Diagnostics	Dec 2016
Antimicrobials as per the EML available in each health establishment	Identify most appropriate Procurement strategies to ensure availability of antimicrobials	Directorate of Affordable Medicines	Implementation partners	Dec 2015
	Align selection of antimicrobial with the resistance maps and trends by province	Directorate of Affordable Medicines	Implementation partners	Dec 2015
Institutionalise AMS in humans				
AMS norms and standard implemented at health establishment level	Develop guidelines on implementation of standards for Antimicrobial Stewardship activities	Directorate of Affordable Medicines	Implementation partners/ Office of Health Standards Compliance	June 2016
	Develop job description for key positions involved in AMS as guidance to health establishments	Directorate of HRD	Implementation partners	May 2016
	Proposal for national training centre to conduct health care prescribers antimicrobial stewardship training	Directorate of HRD	Implementation partners	May 2015
	Health establishments to implement appointments of key positions and implement operational guidelines	Head of Health and HRD: Provinces/ CEOs of hospitals	Implementation partners	2016–2019

Risks

- Lack of a defined champion for IPC at national level will hamper the implementation and sustainability of many of the initiatives around this strategic goal. Therefore ensuring IPC representative on MAC is critical at NDOH level.
- Deficiencies in funding, budgeting, and planning for resources both human and IPC supplies and equipment will result in staff being unable to practice effective IPC
- Ensure non-negotiable IPC supplies and equipment are budgeted for.
- Older health establishments with poor infection control facilities and infrastructure that limits the practice of good infection control procedures.

Strategic Enabler 1. Legislative and Policy Reform for Health Systems Strengthening

Supporting the implementation of AMR interventions are some key legislative and policy reforms within the human and animal health sectors including:

- Formulation of norms and standards for AMS and IPC to be incorporated into the National Health Act as prescribed in the National Core Standards for health establishments by the Office of Health Standards Compliance (OHSC)
- Various improvements to animal health legislation including:
  - A comprehensive review of Stock Remedies Act 36 of 1947 regulating the use of antimicrobials for animal growth promotion and prevention of diseases in animal husbandry
  - Alignment of the use of antimicrobials in food production with international norms and standards, with prescribed timelines for removing antimicrobials used in agriculture
  - Changes to the scope of practice of some para-veterinary professionals relating to prescribing privileges
  - Requirements for annual reporting of antimicrobial use through applications under Acts 36 and 101.

Table 6. Strategic Enabler 1. Legislative and Policy Reform for Health Systems Strengthening Implementation Plan

		Responsibility		
Output	**Activity**	**Lead**	**Supporting**	**Timeframe**
Norms and standards for AMS and IPC in human health				
Reviewed Norms and Standards for AMS and IPC in human health	Review and submit opinion on proposed standards to be prescribed as part of public comment period	Implementation partners		May 2015
	Provide input into proposed inspectors measurement tools for prescribed standards	MAC	Implementation partners	August 2015
Regulations for antimicrobial use in human health				
Improve the registration of the active pharmaceutical ingredients for AM in the country	Review legislation and policy to determine a mechanisms to register the API's imported into South Africa	Directorate of Affordable Medicines	SARS	2016–2019
Regulations for antimicrobial use in animal health				
Improved regulation of the use of antimicrobials in animal health	Engage with DAFF to review policy for prescribing and use of antimicrobials in animal health and any legislative reforms needed in animal health	DAFF	MAC	2016–2017

Strategic Enabler 2. Education and Workforce Development

Building the expertise in AMR through education, continuous training, and resource capacity is a key enabler for AMS. Two key objectives of this enabler are to:

- Build expertise by incorporating AMR training into undergraduate and post graduate curriculums and continuous training
- Develop the health establishments' workforce by having designated, experienced, and competent IPC and AMS practitioners in provide the necessary support and guidance to implement the AMS requirements

Table 7. Strategic Enabler 2. Education and Workforce Development Implementation Plan

		Responsibility		
Output	**Activity**	**Lead**	**Supporting**	**Timeframe**
Building expertise in AMS				
Widespread knowledge and expertise in AMS	Conduct feasibility study and develop business plan for national training centres for prescribers in central hospitals	Directorate of Human Resources Development (HRD)	Implementation partners	August 2015
	Facilitate integrated collaborative curricula for Antimicrobial Stewardship with professional bodies	Directorate of Affordable Medicines	Professional regulatory bodies	Dec 2015
Improve infectious disease support in central hospitals	Conduct feasibility study and develop a plan for establishment of Infectious diseases units in each Central hospital.	HRD: provinces/ CEOs of hospitals	Colleges of medicines/ Health Professionals Council of South Africa, Federation of Infectious Diseases Societies of Southern Africa	April 2016
	Establish access to infectious disease expertise in all health establishments	HRD: provinces/ CEOs of hospitals	Colleges of medicine/ Health Professionals Council of South Africa, Federation of Infectious Diseases Societies of Southern Africa	2016–2019
Workforce development				
Recognition of AMS practitioners as a cadre of staff	Facilitate the recognition of Clinical pharmacist by SAPC	Directorate of Affordable Medicines	SAPC	March 2016
	Establishment of staffing norms for Infectious Diseases experts, clinical pharmacists through the Workload Indicators of staffing	Directorate of HRD	Implementation partners	March 2016

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
	needs process in hospitals			
Recognition of IPC practitioners as a cadre of staff	Collaborate with South African Nursing Council (SANC) to determine standard Infection Prevention & Control practitioner qualifications and recognition in terms of the previous Occupational Specific Dispensation (OSD)	Directorate of HRD	SANC	Dec 2015
	Clearly define the roles and responsibilities and competencies of the IPC practitioner in the health establishment	Directorate of HDR	SANC	Dec 2015
	Assess the availability and competencies of IPC practitioners at health establishment and district level against norm	Directorate of HDR		Dec 2015
	Develop a HRD strategy to address gaps in competency and number of IPC practitioners	Directorate of HRD		March 2016
	Establish IPC practitioners in all health establishment as per norms agreed	Head of health, HRD: provinces/ CEOs	Implementation partners	2016–2019

Strategic Enabler 3. Communication

Targeted communication of the public and health care prescribers is necessary to build awareness of the impact of inappropriate antimicrobial use and basic IPC techniques. The communication campaign has two key target audiences:

- Community and public—this includes commuters, schools, parents
- Health care professionals in the public and private sectors including general practitioners

Whilst creating awareness around matters of public health is a NDOH role, implementation partners and civil organisations can play a key function in targeting people in the community and at the point-of-care in a more effective manner.

Table 8. Communication Implementation Plan

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
AMR awareness to health care professionals	Develop a communication strategy, determine funding and methods to target health care professionals	Directorate of Affordable Medicines	Partners and civil organisations	March 2015
	Establish South African antibiotic resistance week and awareness activities around this	Directorate of Affordable Medicines/ Health	Partners and civil organisations	Oct 2015

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
		Promotion/ Communicable Diseases		
	Implement a hand hygiene and cough etiquette national communication campaign for Health care workers	Directorate of Health Promotion	Implementation partners	Jan–Dec 2015
AMR awareness to the community	Develop a communication strategy, determine funding and methods to target the community	Directorate of Environmental Health	Partners and civil organisations	August 2015
	Implement a campaign for the public on AMS, hand hygiene and cough etiquette including schools health programmes	Directorate of Health Promotions/ Environmental Health	Partners and civil organisations	May–Dec 2015

Strategic Enabler 4. Research

Various types of research will be needed to support the AMR strategic framework and some legislative changes. Most of the research is required to support animal health legislative changes. However, there are a number of research opportunities for assessing the impact and implementation of IPC and antimicrobial stewardship processes.

Table 9. Research Implementation Plan

Output	Activity	Responsibility		Timeframe
		Lead	Supporting	
Develop a research strategy and plan	Map out all research institutions and create a database of current university based research activities	Medical Research Council (MRC)	Implementation partners	April 2016
	Define research opportunities in Infection Prevention & Control tools, Antimicrobial Stewardship outcome studies and animal health	MRC	Implementation partners	April 2016
	Collaborate with international governments on their investigation into novel diagnostics and other research projects	MRC	Implementation partners	2016–2017
	Determine funding sources for research opportunities	MRC	Donor organization	Dec 2015
	Develop a platform to post potential research questions to support undergraduate and postgraduate students with ideas/topics	MRC	Implementation partners	2016–2017

MONITORING AND EVALUATION

Monitoring and evaluation aims to assess the extent to which the desired strategic objectives of the AMR National Strategic Framework have been achieved. In this implementation plan, an indicator for each strategic objective has been set out in addition to short-, medium-, and long-term targets for the strategy period. Above these indicators are overarching impact indicators, which seek to evaluate the impact of the AMR strategy for specific organisms and in specific clinical circumstances.

For the strategy to achieve its intended outcomes, there is a need for significant collaboration and coordination across branches within the national department, and also across all three spheres of government. Arguably, the implementation of the strategy must be coordinated in a structured manner to increase the likelihood of good outcomes and minimise unintended negative consequences.

The responsibilities for driving the Antimicrobial Resistance Strategic Framework are a joint partnership between branches within the NDOH and the other spheres of government (provincial and district levels).

The NDOH's main focus areas will be:

- Facilitating legislative and policy reforms and implementing governance structures that support the inter-sectoral, interdisciplinary collaboration required for the AMR strategy to be implemented.
- Facilitating intergovernmental discussions around South African policy issues with the Department of Agriculture, DAFF, and DST.
- Facilitating discussions with regulatory authorities such as OHSC, SAPC, HPCSA, and SANC
- Providing guidance to health establishments on point of care implementation through, publication of clinical guidelines on antimicrobial use and the Essential Medicines List
- Ensuring the availability of safe, effective antimicrobials in all health establishments through effective procurement and contracting processes
- Facilitating through the NHLS and NICD a national surveillance and reporting system for antimicrobial resistance in the country and an infection prevention and control function which links into existing, provincial and district IPC functions.

The three spheres of government will focus on:

- Establishing the necessary governance structures at province, district, and health establishment level
- Ensuring the standardised collection and reporting of AMR organisms information to enable health establishment, district, provincial and national surveillance
- Operationalising and institutionalising the AMR guidelines at the health establishment level
- Provision of skilled, trained, and experienced staffing resources in the required norms to support AMR at health establishment level

The South African Antibiotic Stewardship Programme (clinician and implementation partners) will focus on:

- Using its membership of clinical experts to provide technical support and guidance on the practical implementation of AMS to the NDOH.
- As an arm of the strategy, supporting the clinicians in the various institutions and organisations to implement the national policies, norms and standards as set out by the NDOH, OHSC, and other governmental bodies.

NDOH Level Assignment of Responsibility

Roles and responsibilities for the activities in this plan therefore need to be clear. A matrix has been developed to elucidate these roles better:

Table 10. Responsibilities Matrix for Antimicrobial Resistance Strategy

Objectives and enablers	NDOH Directorate taking the lead	Other key stakeholders
Strategic objectives		
Strategic objective 1: Strengthen, coordinate and institutionalize interdisciplinary efforts	Cluster: Sector Wide Procurement - Directorate of Affordable Medicines	DAFF
Strategic objective 2: Improve the appropriate use of diagnostics to identify pathogens and guide treatment	Branch: Health Regulation and Compliance	NHLS/ NICD
Strategic objective 3: Optimise surveillance and early detection of antimicrobial resistances	NICD	Cluster: Communicable Diseases, Directorate of Epidemiology and Surveillance
Strategic objective 4: Enhance infection prevention and control		
4a) Prevention through vaccination	Directorate of Mother and Child Health (EPI) Directorate of Communicable Diseases Control/ Health Promotion (seasonal/outbreaks)	NICD
4b) Infection prevention and control	Cluster: Communicable Disease; Directorate of Communicable Diseases Control	OHSC South African Antibiotic Stewardship Programme (SAASP)
Strategic objective 5: Promote appropriate use of antimicrobials		
5a) Access to safe, affordable AM	MCC and Cluster: Sector wide procurement – Directorate of Affordable Medicines	
5b) Policies and guidance on AMS	Cluster: Sector Wide Procurement– Directorate of Affordable Medicines	SAASP, OHSC,
5c) AMS at point of care	Branch: THS & HRD Branch: PHC	SAASP, OHSC,
5d) Promote appropriate use of antimicrobials in animal health	Cluster: Sector Wide Procurement - Directorate of Affordable Medicines with DAFF, veterinarian society	SAASP
Strategic enablers		
Legislative and policy reform for health systems strengthening	Cluster: Sector Wide Procurement – Directorate of Affordable Medicines, DAFF	

Objectives and enablers	NDOH Directorate taking the lead	Other key stakeholders
Education	Forum of Deans of Academic Institutions Directorate of Human Resource Development	Professional bodies, SANC, HPCSA, SAPC, SAASP
Communication	Directorate of Environmental Health, Health Promotion (community awareness)	DAFF, professional societies, SAASP
	Directorate of Communicable Diseases Control (Health care professional awareness)	Professional bodies, SANC, HPCSA, SAPC, DAFF
Research	MRC, DST	

Strategic Objective Indicators

Table 10. Indicators, Baseline, and Targets

Sub-Objective	Indicator	Baseline (2013-2014)	Short-term target (2014-2015)	Medium-term target (2016-2017)	Long- term target (2018-2019)
Strategic objective 1: Strengthen, coordinate and institutionalize interdisciplinary efforts					
Establish a National MAC	Establishment of national MAC for AMR	No	Completed	Completed	Completed
	Percentage of identified AMR related issues effectively addressed by the interdisciplinary national ministerial advisory committee	0%	0%	50%	100%
Establish governance structures at operational level	Percentage of provinces having functional AMS structures	To be determined	10%	40%	90%
	Percentage of districts with functional AMS structures or outreach programs from tertiary institutions	To be determined	5%	20%	75%
Strategic objective 2. Improve the appropriate use of diagnostics to identify pathogens and guide treatment					
Improve laboratory capacity and quality control management systems	Percentage of laboratories in South Africa be accredited by the minimum standards for quality management systems	To be determined	25%	70%	100%

Sub-Objective	Indicator	Baseline (2013-2014)	Short-term target (2014-2015)	Medium-term target (2016-2017)	Long- term target (2018-2019)
Strategic objective 3. Optimise surveillance and early detection of antimicrobial resistance					
Strengthen surveillance of local and national resistance patterns and antimicrobial use	A consolidated national surveillance report on AMR for South Africa encompassing public and private data on alert MDR organisms developed	0	Aggregate data	Line item data	In line with World Health Organisation guidelines
	Standards for health establishments HAI surveillance developed	0	To be determined	Completed	Completed
	Percentage of health establishments reporting against the standards for HAI surveillance	0	To be determined	25%	75%
Develop early warning systems of sentinel organisms	Set of standard MDR organisms and specimen types for reporting developed	0	To be determined	To be determined	completed
	Percentage of labs reporting against standards	To be determined	25%	75%	100%
Strategic objective 4. Enhance infection control and prevention					
Prevent new infections	Percentage coverage of EPI immunisations through an effective District Health System	To be determined	60%	90%	90%
Prevent and control the spread of resistant microorganisms	Percentage of hospitals having one IPC practitioner per hospital as minimum	To be determined	25%	85%	100%
	Percentage of hospitals having one IPC practitioner per 250 beds	To be determined	10%	50%	75%
	Percentage of districts having at least one IPC practitioner for the district	To be determined	10%	50%	85%
	Percentage of districts having IPC structures	To be determined	10%	50%	100%
	Percentage of hospitals having IPC and antimicrobial	To be determined National core	20%	50%	100%

Sub-Objective	Indicator	Baseline (2013-2014)	Short-term target (2014-2015)	Medium-term target (2016-2017)	Long- term target (2018-2019)
	structures	standards (NCS)			
	Percentage of health establishments that have the necessary PPE and Hand hygiene supplies to practice IPC	To be determined NCS	90%	100%	100%
	Percentage health establishments that have the necessary cleaning supplies and equipment	To be determined NCS	90%	100%	100%
Strategic objective 5. Promote appropriate use of antimicrobials in human and animal health					
Ensure access to safe, effective, and affordable antimicrobials	Percentage availability of Antimicrobials according to EML in all health establishments	To be determined NCS	90%	95%	95%
Institutionalise antimicrobial stewardship	Percentage compliance with AMS standards in the NCS	N/A	N/A	75%	100%
	Percentage of central hospital having established an infectious diseases unit	To be determined	5%	30%	60%

Where possible, baseline results for some of these indicators will be sourced either from the District Health Information System or from the mock inspections conducted by the Office of Health Standards Compliance on the National Core Standards (NCS)

Impact Indicators

It is envisioned that the setting up national governance structures, policies, and strategic elements such as the national surveillance systems and processes for the AMS strategy framework will take from 2014 to 2016. Rollout to the various health establishments will then occur from 2016/2017 onward, so final evaluation of the impact of the strategy and framework will take time to manifest. Impact indicators of the AMR strategy and implementation would include:

- Percentage reduction in key resistant organisms
- Percentage reduction in national consumption of antibiotics linked to key resistant organisms
- Percentage reduction in maternal mortality from infectious diseases
- Percentage reduction in neonatal mortality from infectious diseases

Baseline Data for Impact indicators

Key AMR Organisms

Surveillance data is available in both the public and private sectors in South Africa for a wide variety of drug-bug combinations.

However, to allow for year on year comparisons to occur, it was determined that only three key resistant organisms will be tracked over time. These organisms are critical as they are common sources of infections in the community or hospital setting and are treated using commonly prescribed antibiotics or with last-line antibiotics as follows:

- *Escherichia coli*—a common cause of bacterial bladder infections (UTI's) and a common infection in the community
- *Staphylococcus aureus*—common cause of skin and soft tissue infections as well as bacteraemia in people of all ages and can be easily spread in the community through household contacts
- *Klebsiella pneumoniae*—common cause of severe infections of patients in hospitals and requires treatment with the last-line antibiotic group (carbapenems). This organism is important to track while there is a still an opportunity to intervene through antimicrobial stewardship and infection prevention and control interventions before carbapenems are completely ineffective against these infections.

As a starting point for a baseline level, available surveillance data from both the public and private sectors over the period 2012–2014[3] have been aggregated and combined to create the baseline results for the key organisms. The baseline findings are:

- All three organism-antibiotic combinations show statistically significant change over time:
    - *Staphylococcus aureus* and cloxacillin—significant decrease in resistance over three years ($p<0.001$), currently resistance is at 30%
    - *Klebsiella pneumoniae* and carbapenems— significant increase in resistance over three years ($p<0.001$) - currently resistance is at 3,2%
    - *Escherichia coli* and ciprofloxacin— no change in resistance over the three years ($p=0.83$)— currently resistance is at 27%

The current trends for these organisms will serve as baselines for the on-going monitoring of the impact of the AMR strategy implementation on the level of resistance.

Key Antimicrobials—Consumption and Use Information

In addition to monitoring resistant organisms, the amount of antibiotic consumed in the health and animal sectors will be monitored. The following sources of data will be used:

- Supplier and NDOH procurement data
- Information Management System data
- South African Revenue Services importation data

[3] Private sector data as collected by SASCM (South Africa Society of Clinical Microbiologists) and public sector data as collected through the 21 sentinel sites by the NICD (National Institute for Communicable Diseases).

Current antibiotic sales information corresponding to the resistant organisms above have been collected for the period 2000/2010 and reveal the following data in relation to the Standard Unit per 1000 inhabitants per annum:

IMS data 2000-2010				
For South Africa, IMS has data from both the private and public sector. According to their documentation, their hospital audit reflects sales into the state/government sector. Their total private market audit includes dispensing doctors, private hospitals and other non-retail pharmacy outlets, in addition to retail pharmacies.				
Class name	***Sector***	**Consumption (Standard Unit) Per 1000 Persons**	**% Total Standard Unit**	**% Total of antibiotic consumption**
All antibiotics	***Hospital***	28 186.11	76.20%	
	Retail	8 803.89	23.80%	
	Total	36 989.99		
Penicillins	***Hospital***	7 176.24	62.92%	
	Retail	4 228.76	37.08%	
	Total	11 404.99		
# Broad spectrum penicillins	***Hospital***	4 860.66	54.88%	
	Retail	3 996.10	45.12%	
	Total	8 856.77		23.94%
# Narrow spectrum penicillins	***Hospital***	2 315.57	90.87%	
	Retail	232.65	9.13%	
	Total	2 548.23		6.89%
Ratio consumption of broad-spectrum penicillin versus consumption of narrow-spectrum penicillins	***Hospital***	2.10		
	Retail	17.18		
Cephalosporins	***Hospital***	189.70	24.89%	
	Retail	572.33	75.11%	
	Total	762.04		2.06%
Macrolides	***Hospital***	2 051.39	70.19%	
	Retail	871.04	29.81%	
	Total	2 922.43		7.90%
Quinolones	***Hospital***	290.40	30.67%	
	Retail	656.47	69.33%	
	Total	946.87		2.56%
Trimethoprim	***Hospital***	17 228.01	91.50%	
	Retail	1 601.20	8.50%	
	Total	18 829.21		50.90%
Carbapenems	***Hospital***	6.55	29.09%	
	Retail	15.95	70.91%	
	Total	22.50		0.06%

APPENDIX A. ANTIMICROBIAL STEWARDSHIP SUMMIT AND COMMITMENTS MADE ON 16TH OCTOBER 2014

On the 16th October 2014 at the Minister of Health's National Antimicrobial Resistance Summit, stakeholders from various industries and organisations committed to work collaboratively to invest relevant resources and implement sound strategies and interventions to manage antimicrobial resistance in South Africa to preserve the effectiveness of antimicrobials for future generations.

The stakeholders committed to the following principles:

- To collaborate as intersectoral, interdisciplinary organisations and departments to strengthen, coordinate and institutionalise efforts to address antimicrobial resistance starting with:
    - The set up, initial meeting, and strategic plan of the National Intersectoral Ministerial Advisory Committee for Antimicrobial Resistance.
- To establish a national surveillance system to track antimicrobial resistant organisms and antimicrobial use in animals, crop and human health starting with:
    - The development of national surveillance system (NSS) for resistant bacteria in humans and animals.
    - The development of an antimicrobial resistance map for South Africa through data sharing between the private and public sector laboratory services based on electronic surveillance systems.
- To enhance the processes, structures, resources and supplies needed for effective infection prevention & control (IPC) and AMS starting by:
    - Compliance of all health establishments to the National Core Standards relating to antimicrobial resistance and IPC by 2016.
    - Ensuring the equipment and IPC resources required to practice effective hand hygiene are available at all times in all health establishments in the short term.
- To promote the appropriate use of antimicrobials in human and animal health through suitable enabling legislation and regulations starting by:
    - Ensuring availability of antimicrobials according to Essential Medicines List in all health establishments.
    - Implementing a review process of antimicrobials in feed additives.
- To build the expertise and strengthen the competency of health care professionals and veterinary professionals and improve the staffing levels of the workforce in AMR and IPC starting with:
    - A strategy and implementation plan for the integration and implementation of AMR and IPC training into the undergraduate and postgraduate medical and allied health professional, student curricula of the universities in South Africa.
- To promote research into novel diagnostics and clinical trials in IPC and AMR starting with:
    - Defining the research opportunities within AMR and IPC.
- To increase the community awareness of AMR starting with:
    - Designing an awareness campaign relating to AMR based on past successful campaigns.