The Philippine Action Plan to Combat Antimicrobial Resistance: One Health Approach

THE PHILIPPINE ACTION PLAN TO COMBAT ANTIMICROBIAL RESISTANCE: ONE HEALTH APPROACH

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FOREWORD:

MALACAÑAN PALACE
MANILA

MESSAGE

My warmest greetings to the **Department of Health** and the **Inter-agency Committee on Antimicrobial Resistance (ICAMR)** as you hold your **First Philippine AMR Summit.**

We are faced with the serious threat of antimicrobial resistance (AMR), a condition that may lead to an even greater number of people falling into severe and prolonged illnesses, resulting to an increased mortality rate and healthcare costs for our people. Its damage extends to animal health and impends economic development and global security.

The World Health Organization has issued the call for a more proactive stance against the advent of highly-resistant pathogens; the Philippines, through the creation of the ICAMR led by the Department of Health and the Department of Agriculture, has joined global efforts to fight AMR, in partnership with the Department of Science and Technology, Department of Trade and Industry, and the Department of Interior and Local Government.

This summit is the first step in crafting the "Philippine Action Plan to Combat AMR: One Health Approach," which highlights the urgency to strengthen the surveillance system for AMR, and delve deeper into the advancement of its detection and treatment processes. With your stakeholders present at this gathering, may you continue to lay out plans and strategies to ensure the accessibility and availability of effective antimicrobial medicines and safeguard the rational use of antibiotics on people and animals alike; may we always remain vanguards of the Filipino people's interest and welfare as, together, we build an empowered, more productive Philippines.

We look forward to the success of this event yielding a more vibrant and dynamic synergy among our agencies.

BENIGNO S. AQUINO III
President

DEPARTMENT OF HEALTH
OFFICE OF THE SECRETARY

MESSAGE

Antibiotics have been useful in fighting infectious diseases in our country for decades, but because of the overuse and misuse of these agents, an increasing number of organisms are now resistant to them. The Philippines, like other Southeast Asian countries, has already been encountering the many challenges of antimicrobial resistance (AMR) which include increasing social and economic costs and rising patient mortality. Although considered a global threat, it is already an emerging local health concern which calls for an urgent collaboration among different sectors to provide solutions addressing this growing problem.

To address this issue, all responsible agencies are expected to exert political commitment and leadership in taking initiatives to protect our nation from the threat of AMR. There is a need to implement rational use of antimicrobials in both human medicine and animal husbandry, provide incentives for research and development of both new antimicrobials and vaccines, strengthen our country's monitoring and surveillance of AMR, strengthen infection prevention and control programs, and develop additional or more complex measures to hinder the further spread of this phenomenon. This is an attainable endeavor with the help of both international and local partners working towards a common goal.

The Department of Health, together with the Department of Agriculture, Department of Science and Technology, Department of Trade and Industry, and the Department of the Interior and Local Government, spearheaded the creation of the Philippine Action Plan to Combat AMR, following the Six-Point Policy Package by the World Health Organization as part of our commitment to the global health agenda against AMR. This is a multifaceted and holistic strategy to consolidate the fragmented efforts and systems in the country by enabling different stakeholders such as health professionals, policy makers and other government systems to use it as a platform for national campaigns on prudent antibiotic use. This is an initiative to sustain concrete actions that will help curb AMR for our future generations.

AMR in the Philippines is a national priority. We are enjoining everyone to take part in battling one of the most pressing concerns in the health of our country today.

JANETTE P. LORETO-GARIN, MD, MBA-H
Secretary of Health

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY

MESSAGE

The use of antimicrobials in animals is essential to combat economically important animal diseases, thus, contributing to the general animal welfare and livestock trade. Alongside with this, it is important that prudent and judicious use of antimicrobials in animals must be put into practice in order not to pose a risk of developing antimicrobial resistance and emergence of antibiotic-resistant bacteria both in the primary animal production and post-harvest of animal products such as, meat from livestock, poultry and fish, eggs and milk. The resistant bacteria may contaminate the food that come from those animals and may cause the development of antibiotic-resistant infections to those individual who consume these foods.

The issue of antimicrobial resistance in animal health is a multi-sectoral concern that may start from animal production rearing and persists up to the post-harvest of animal products. Stakeholders of the animal industry must all be involved in order to address the issue of the public health risk of AMR. There is a need to have a collaborative effort in order to combat antimicrobial resistance in the country.

The Department of Agriculture has already expressed and extended its active participation to support and enact the strategic actions that the Inter-Agency Committee on Antimicrobial Resistance has drafted in order to have a unified approach and policy to address the issue of AMR in the country. With guidance coming from international organizations such as the WHO, ASEAN, FAO and OIE, this issue on AMR must be taken seriously and of utmost priority so that we may secure public health safety and welfare. We need to move the scientific findings and translate it to concrete government policies and programs to assure that we are indeed protected from the threat of AMR in future generations.

With this, we hope that everyone who is participating in this endeavor may continuously strive to uphold our goals, vision and mission to combat AMR in the Philippines.

Thank you and more power!

PROCESO J. ALCALA
Secretary of Agriculture

LIST OF ABBREVIATIONS:

AMR – Antimicrobial Resistance
ANSORP – Asian Network for Surveillance of Resistant Pathogens
APEC – Asia- Pacific Economic Cooperation
ARSP – Antimicrobial Resistance Surveillance Program
ARSC – Antimicrobial Resistance Surveillance Committee
ARSRL – Antimicrobial Resistance Surveillance Reference Laboratory
CPE – Continuing Professional Education
CSA – Country Situation Analysis
DTC – Drug and Therapeutics Committee
DA– Department of Agriculture
DOST– Department of Science and Technology
EFSA -- European Food Safety Authority
FDA – Food and Drug Administration
FEU – Far Eastern University
GMPs – Good Manufacturing Practices
ICAMR – Inter-Agency Committee on AMR
ICU – Intensive Care Unit
IEC – Information, Education and Communication
IPC – Infection Prevention and Control
LCP – Lung Center of the Philippines
LOS – Length of Stay
MeTA – Medicines Transparency Alliance
MTb – Mycobacterium Tuberculosis
NKI – National Kidney Institute
PGH – Philippine General Hospital
PhilPSP – Philippine Practice Standards for Pharmacists
PNDP – Philippine National Drug Policy
RITM – Research Institute for Tropical Medicine
SLH – San Lazaro Hospital
STGs– Standard Treatment Guidelines
STU – Sto. Tomas University Hospital
TWG– Technical Working Group
UST – University of Santo Tomas
UPM – University of the Philippines Manila
WHO – World Health Organization
WHA – World Health Assembly

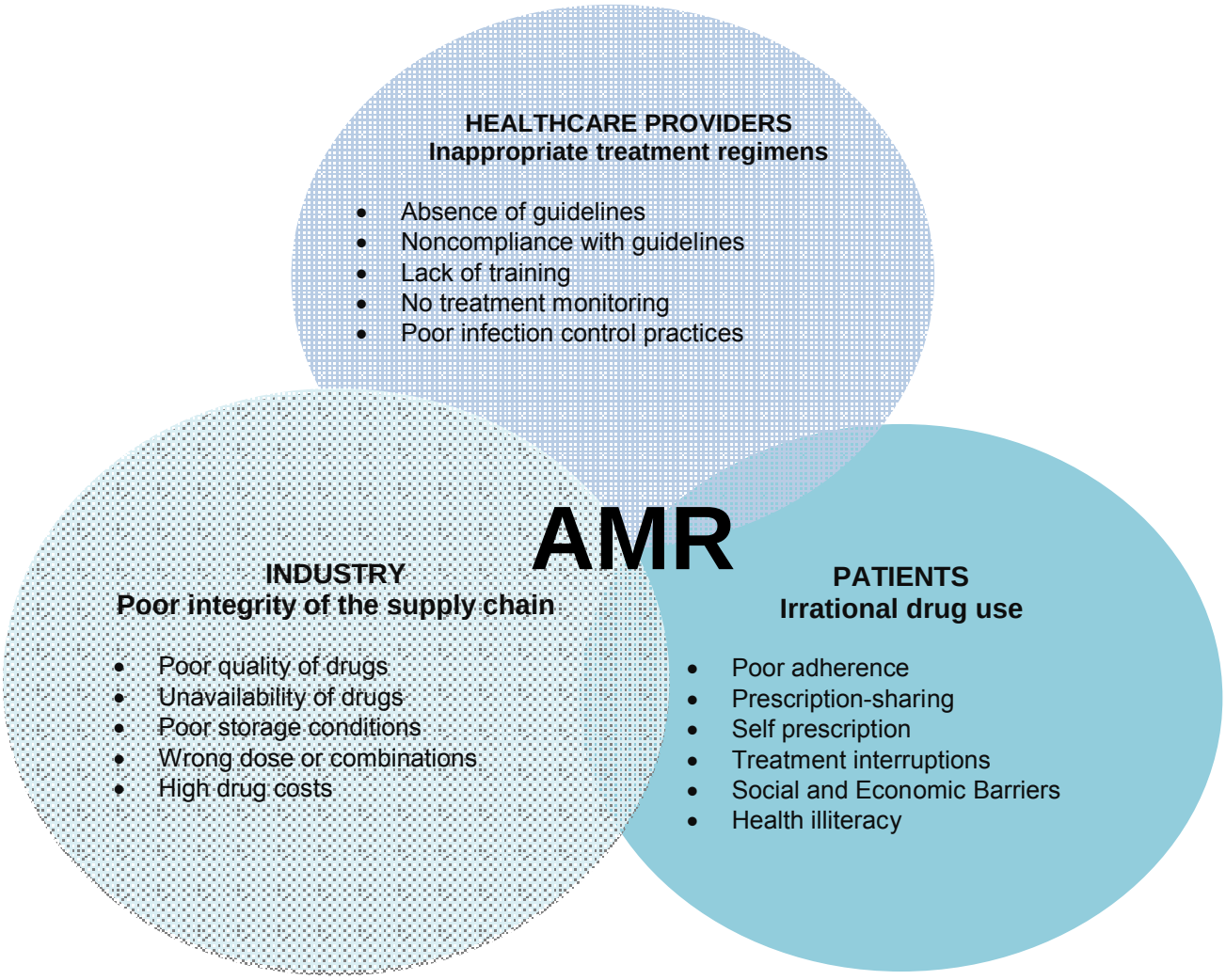
CHAPTER 1: The Emergence of Antimicrobial Resistance

1.1 The Phenomenon of Drug Resistance

The introduction of antimicrobials in the 1940's transformed the field of public health and medicine. The discovery of penicillin and other antibiotics has been regarded as a therapeutic revolution giving cure to lethal infectious diseases such as pneumonia, sepsis and meningitis as well as disabling infections of the bones and joint stretching the boundaries of science in solving man's greatest afflictions. Today however, the miracle cure provided by antibiotics for common infections is being eroded by the emergence of drug resistance leading to prolonged and more expensive treatment as well as diminishing therapeutic choices among patients and healthcare providers.

Antimicrobial resistance (AMR) is defined as the ability of microbes, such as bacteria, viruses, parasites or fungi to grow despite the presence of antimicrobials that would normally kill or inhibit their growth rendering antibiotics ineffective against previously treatable infections. The development of drug resistance can be due to the inherent resistant characteristics of microorganisms or through the acquisition of genes from other organisms that can be passed both horizontally and vertically to their progeny. However, this phenomenon is aggravated by many human factors largely through the misuse and abuse of antibiotics leading to the loss of their efficacy and the spread of drug resistant pathogens in the community (see Figure 1).

Figure 1.*Factors that contribute to AMR in the human sector*



1.2 The Global Problem of AMR

AMR is a rampantly growing public health concern worldwide. The World Health Organization (WHO) and countries around the world are beginning to be threatened by the possibility of reaching a post-antibiotic era, where the most common infectious diseases can kill millions of lives. According to the *2014 AMR Global Report on Surveillance* of the WHO, there are already very high rates of resistance in bacteria that cause common health-care associated and community-acquired infections in all the WHO regions. In summary, some of the drug resistant pathogens worldwide are the following:

***Table 1**. Bacteria commonly causing infections in hospitals and in the community*

Name of Bacterium / Resistance	Examples of typical diseases	No. out of 194 Member States Providing Data	No. of WHO Regions with National Reports of 50% Resistance or More
Escherichia coli	Urinary tract infections, blood stream infections		
Vs. 3rd gen. cephalosporins		86	5/6
Vs. fluoroquinolones		92	5/6
Klebsiella pneumoniae	Pneumonia, blood stream infections, urinary tract infections		
Vs. 3rd gen. cephalosporins		87	6/6
Vs. carbapenems		71	2/6
Staphylococcus aureus	Wound infections, blood stream infections		
Vs. methicillin "MRSA"		85	5/6

***Table 2**. Bacteria mainly causing infections in the community*

Name of Bacterium / Resistance	Examples of typical diseases	No. out of 194 Member States Providing Data	No. of WHO Regions with National Reports of 50% Resistance or More
Streptococcus pneumoniae Non-susceptible or resistant to penicillin	Pneumonia, meningitis, otitis	67	6/6
Nontyphoidal Salmonella Vs. fluoroquinolones	Foodborne diarrhea, blood stream infections	68	3/6
Shigella species Vs. fluoroquinolones	Diarrhea ("bacillary dysenteria")	35	2/6
Neisseria gonorrheae Vs. 3rd gen. cephalosporins	Gonorrhea	42	3/6

1.3 The Health and Economic Burden of AMR

When first-line drugs no longer work for the patients, the health providers need to resort to second-line antimicrobials, which are not only more expensive, but also necessitate closer monitoring. Possible health

implications resulting from AMR are increased mortality rates, prolonged hospital stay, admission to the intensive care unit (ICU), and the spread of resistant microorganisms to other patients. Consequently, AMR can also translate to increased costs due to prolonged illness and hospitalization. Patients, then, become more at risk of nosocomial infections, which are even more difficult to treat. Further, the death rate of patients, who are treated in hospitals and have serious infections caused by resistant microbes, is estimated to be twice thanthat of patients with infections caused by non-resistant bacteria.

In a paper entitled "*Antimicrobial Resistance: Tackling A Crisis for the Health and Wealth of Nations,*" the threat of AMR is projected to intensify till 2050 leading to 10 million deaths annually and global economic losses approximating 100 trillion US dollars or a reduction in the world's Gross Domestic Product (GDP) by 2-3.5 per year (O'Neill, 2014). Moreover, countries such as the Philippines that currently have high malaria, HIV and TB cases, along with AMR, are expected to suffer more. Microorganisms in animals may cause financial losses to farmers and consumers, and affect the confidence of the public on food safety, thereby reducing the demand on these food products.

1.4 AMR Strategies at the Global and National Levels

The **"One Health Approach"** recognizes the interdependence of the human, animal, environmental and economic sectors in determining the health impacts and considerations of a country, and it is only through this integrated approach that AMR can be solved. During the 2011 World Health Assembly, the WHO endorsed the 6-point policy package as part of its Global Action on AMR to which the Philippines committed to during the regional committee meeting in the same year. It contains the following key strategies adhering to the One Health Approach:

1. Committing to a comprehensive, financed national plan with accountability and civic society engagement
2. Strengthening of surveillance and laboratory capacity
3. Ensuring the uninterrupted access to essential medicines of assured quality
4. Regulation and promotion of rational use of medicines, including in animal husbandry, and ensuring proper patient care
5. Enhancing infection prevention and control
6. Fostering innovations and research and development for new tools

In support of this agenda, the World Health Organization-Western Pacific Regional Office (WHO-WPRO) granted technical support to the DOH to undertake a Country Situation Analysis on AMR in 2012 in the areas of policy and planning; surveillance and laboratory capacity; access to safe and quality antimicrobials; rational use of antimicrobials; infection prevention and control; and, research and development. Completion of the study in December 2012 enabled the Department of Health (DOH) to highlight essential findings and gaps on addressing AMR and heightened the formulation of an executive policy to implement a national control strategy.

In April 10, 2014, President Benigno Aquino III created the *Interagency Committee on AMR (ICAMR)* through A*dministrative Order (A.O.) No. 42* directing member government agencies from the health, agriculture, trade, research and local government sectors to formulate and implement a national action plan that can rationalize and streamline government efforts to combat the AMR problem. In the *Sixty-Eighth World Health Assembly (WHA)* last May 2015, the WHO urged its Member States to implement their proposed plans and actions, and to have in place by the Seventieth WHA, their own national action plans on AMR. In view thereof, the DOH took lead in the finalization of a National Action Plan on AMR through the *ICAMR.*

INTERNATIONAL COLLABORATION

With support from WHO-WPRO the Philippines was able to conduct a Country Situation Analysis (CSA) on AMR and developed policies to address this problem. This partnership was further strengthened with the country being chosen in the Western Pacific Region as one of the pilot sites on the implementation of antimicrobial stewardship (AMS) program in hospitals.

There are also research initiatives among the Association of the Southeast Asian Nations (ASEAN) member states wherein the Philippines is actively collaborating with the Ministry of Health Malaysia in the conduct of a rapid assessment for regulatory measures to combat AMR.

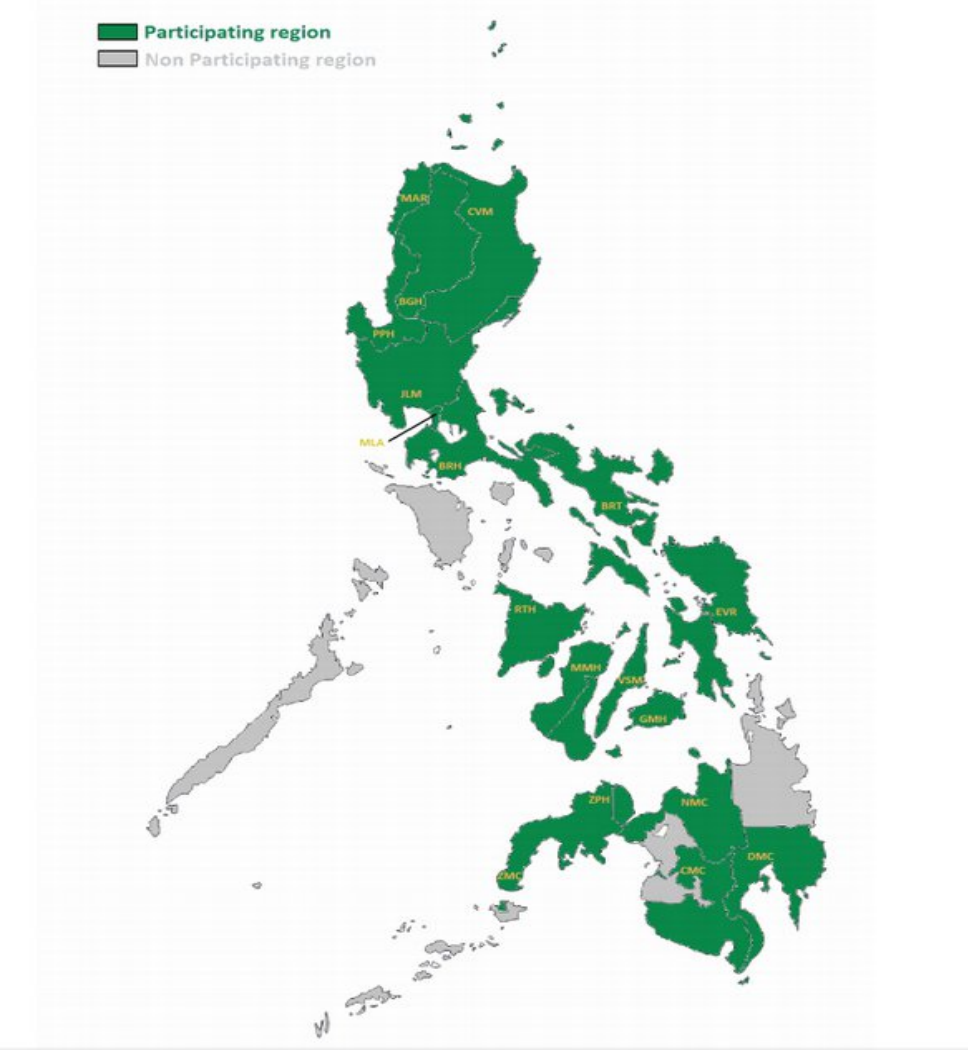
The Philippines is also part of the Asian Network for Surveillance of Resistant Pathogens (ANSORP), which is a study group involving different countries in Asia in relation to AMR. Currently, the Asia Pacific-Economic Cooperation (APEC) is actively supporting this international symposium through funding and organizing its meetings to design creative solutions and policies for the surveillance and monitoring of AMR in the Asia Pacific Region. This partnership enabled the creation of an international campaign aimed to raise awareness on AMR and promote appropriate antibiotic use. The Philippines, together with Korea, Thailand and Vietnam, are the pilot sites for these strategies to be followed by future implementation in other countries.

CHAPTER 2: The Threat of Antimicrobial Resistance in the Philippines

2.1 The ARSP 2014 Annual Report

Surveillance is an important key strategy in addressing the AMR issue through providing evidence on emerging resistant pathogens in the country and guiding the selection of appropriate antimicrobial treatments based on resistance patterns. In the Philippines, this is accomplished through the *Antimicrobial Resistance Surveillance Program (ARSP)*, which was established in 1988 by the DOH through the *Research Institute for Tropical Medicine (RITM*), which serves as the reference laboratory and central coordinating center conducting annual external quality assessment scheme (EQAS) for 23 sentinel sites in 14 regions of the country. The sentinel sites are mandated to implement standards for culture and susceptibility, and unusual test results or patterns are sent to the Antimicrobial Resistance Surveillance Reference Laboratory (ARSRL) monthly.

***Figure 2**. The ARSP Program and its 23 Sentinel Sites*



The current twenty-three ARSP sentinel laboratories according to region are as follows:

***Table 3**. ARSP Sentinel Sites by Region, 2014*

Region	ARSP Sentinel Site
NCR	Lung Center of the Philippines (LCP) National Kidney Institute (NKI) Rizal Medical Center (RMC) San Lazaro Hospital (SLH) Philippine General Hospital (PGH) Research Institute for Tropical Medicine (RITM) Sto. Tomas University Hospital (STU) Far Eastern University Hospital (FEU)
CAR	Baguio General Hospital (BGH)
Region 1	Mariano Marcos Memorial Medical Center (MAR)
Region 2	Cagayan Valley Medical Center (CVM)
Region 3	Jose B. Lingad Memorial General Hospital (JLM)
Region 4A	Batangas Regional Hospital (BRH)
Region 5	Bicol Regional Training and Teaching Hospital (BRT)
Region 6	Corazon Locsin Montelibano Memorial Hospital (MMH)
Region 7	Gov. Celestino Gallares Regional Hospital (GMH) Vicente Sotto Memorial Medical Center (VSM)
Region 8	Eastern Visayas Regional Medical Center (EVR)
Region 9	Zamboanga City Medical Center (ZMC) Zamboanga del Norte Provincial Hospital (ZPH)
Region 10	Northern Mindanao Medical Center (NMC)
Region 11	Southern Philippine Medical Center (DMC)
Region 12	Cotabato Medical Center (CMC)

The data provided by the ARSP list most of the bacterial pathogens that contribute to seven out of the ten leading causes of morbidity. It can be observed from the 5-year average (from 2004-2009 and 2010) of the ten leading causes of mortality in the country that infectious diseases are still rampant in the country, but they can be treated with the use of appropriate antimicrobials.

***Table 4**. Ten Leading Causes of Morbidity in the Philippines, 2010; Number and Rate/100,000 Population*

Cause	Number	Rate
1. Acute Respiratory Infection	**1,289,168**	**1,371.3**
2. Acute Lower Respiratory Tract Infection and Pneumonia	**586,186**	**623.5**
3. **Bronchitis / Bronchiolitis**	351,126	373.5
4. Hypertension	345,412	367.4
5. **Acute Water Diarrhea**	326,551	347.3
6. **Influenza**	272,001	289.3
7. Urinary Tract Infection	83,569	88.9
8. TB Respiratory	72,516	77.1
9. Injuries	51,201	54.5
10. Diseases of the Heart	37,589	40.0

Table 5. *Ten Leading Causes of Mortality in the Philippines; Number and Rate/100,000 Population; 5-Year Average (2005-2009) and 2010*

	5-Year Average (2004-2009)		2010*	
Cause	**Number**	**Rate**	**Number**	**Rate**
1. Diseases of the Heart	88,299	99.4	102,936	109.5
2. Diseases of the vascular system	58,761	66.2	68,553	72.9
3. Malignant neoplasms	44,627	50.3	49,817	53.0
4**. Pneumonia**	37,865	42.6	45,591	48.5
5. Accidents**	35,005	39.5	36,329	38.6
6. **Tuberculosis, all forms**	25,296	28.6	24,714	26.3
7. Chronic lower respiratory diseases	21,586	24.4	22,877	24.3
8. Diabetes mellitus	20,964	23.6	21,512	22.9
9. Nephritis, nephrotic syndrome and nephrosis	12,321	13.9	14,048	14.9
10. Certain conditions originating in the perinatal period	12,257	13.8	12,086	12.9

Note: Excludes ill-defined and unknown causes of mortality; n=12,132; 10th rank
**Reference year*
***External causes of Mortality*

According to the ARSP 2014 Annual Report, about 4,256 isolates were received by the ARSRL for phenotypic and genotypic confirmatory testing, and a total of 47,280 isolates were analyzed for resistance data. The most recent Clinical Laboratory Standards Institute (CLSI) references were used to classify the isolate as resistant (R). The analysis was restricted to the first isolate received per patient in the calendar year, and the data are expressed as a cumulative resistance percentage. Table 6 below summarizes their annual results from 2013-2014:

***Table 6**. ARSP 2013 and 2014 Annual Report Executive Summary*

Organisms/ Antimicrobials	Percent Resistance		Other Findings (2014)
	2013	2014	
Streptococcus pneumoniae 1. Penicillin	5%	7%*(*using meningitis breakpoint)*	• 10.3% penicillin resistance among invasive isolates • 0.5% penicillin resistance among non-invasive isolates • 1 confirmed report of levofloxacin-resistant *S. pneumoniae* • No confirmed ceftriaxone-resistant *S. pnuemoniae* • The most common invasive serotypes were 5, 1, 4 and 6 • The most common non-invasive serotypes were 3, 19 and 7
Haemophilus influenzae 1. Co-Trimoxazole 2. Chloramphenicol 3. Ampicillin 4. Amoxicillin-Clavulanic Acid	 34% 6.6% 17% 10.5%	 42.9% 13.4% 12% 4.1%	• All ampicillin-resistant isolates tested were positive for beta-lactamase production • No reports of levofloxacin-resistant *H. influenzae*
Salmonella enterica serotype Typhi 1. Cotrimoxazole 2. Nalidixic Acid	 <2% 4%	 6.7% 8.9%	• Isolates have remained susceptible to first line antibiotics: ampicillin (2.9% R) and chloramphenicol (no resistant isolate) • No ciprofloxacin resistance reported
Nontyphoidal *Salmonella* 1. Ciprofloxacin 2. Chloramphenicol 3. Ampicillin 4. Cotrimoxazole	 18% 16% 56% 34%	 21.6% 20% 40% 30%	• One isolate from a sentinel site in Mindanao was confirmed as ceftriaxone-resistant, but it was negative for extended-spectrum β-lactamase (ESBL) production. It was identified as *S. enterica* serotype Lexington • The most common serovars identified were *S. enterica* serotype Typhimurium and *S. enterica* serotype Enteritidis
Shigella species 1. Ampicillin 2. Chloramphenicol 3. Cotrimoxazole 4. Nalidixic Acid 5. Ciprofloxacin	 67% 49% 67% 13% 15%	(2011-2014)* 62.7% 43.5% 60.7% 15% 13.8%	*Since there were few isolates for 2014, data from 2011-2014 were combined to obtain a reasonable statistical estimate for the resistance of the species
Vibrio cholerae			• Isolates have remained susceptible to first line agents such as chloramphenicol, cotrimoxazole and tetracycline with no reported resistance for the past 2 years

Neisseria gonorrhoeae 1. Penicillin 2. Tetracycline 3. Ciprofloxacin	 80% 55% 74%	(2011-2014)* 89.1% 55.3% 84.8%	*Since there were few isolates for 2014, data from 2011-2014 were combined to obtain a reasonable statistical estimate for the resistance of the species • No report on resistance against streptomycin, ceftriaxone and cefixime from 2011-2014
Staphylococcus aureus 1. Oxacillin 2. Cotrimoxazole 3. Penicillin *Methicillin-Resistant Staphylococcus aureus* 1. MRSA rate 2. Rifampicin 3. Ciprofloxacin 4. Cotrimoxazole 5. Clindamycin 6. Tetracycline	 55% 14% 95.5% 53.2% 4% 7% 18% 12% 8%	 60.3% 22% 95.5% 60.3% 6% 10.4% 26.1% 14.6% 10.9%	• MRSA isolates' resistance rates against erythromycin, linezolid and vancomycin did not differ significantly from the results obtained in 2013
Staphylococcus epidermidis 1. Penicillin 2. Oxacillin 3. Cotrimoxazole 4. Ciprofloxacin	 95% 75% 50% 33%	 95.8% 78.9% 53.7% 31.5%	• No confirmed reports of vancomycin or linezolid resistance
Enterococcus species 1. Ampicillin resistance among *E. faecalis* 2. Ampicillin resistance among *E. faecium*	 8% 69%	 8.8% 72.7%	• High-level gentamicin (15.3%) and streptomycin (20.5%) resistance among *E. faecalis* • High-level gentamicin (48.6%) and streptomycin (27.3%) resistance among *E. faecium* • No confirmed reports of vancomycin resistance
Escherichia coli 1. Ampicillin 2. Ampicillin-Sulbactam 3. Cefuroxime 4. Ceftriaxone 5. Cotrimoxazole 6. Ciprofloxacin 7. Amikacin 8. Imipenem	 82% 32% 29% 31% 66% 43% 4% 2%	 81.4% 24.8% 32% 32.2% 67.7% 41% 3.9% 2.1%	• Resistance rates against ertapenem (2.8%) and meropenem (2.3%) are seen • *E. coli* ESBL suspect rates is at 25% • Urinary E. coli from outpatients are still susceptible to nitrofurantoin (6.6% R), but urinary *E. coli* from hospitalized patients show variability with resistance rates from 2.8-38.2% against ceftriaxone
Klebsiella species 1. Amoxicillin-Clavulanic Acid 2. Cefuroxime 3. Ceftriaxone 4. Amikacin 5. Ciprofloxacin 6. Imipenem 7. Meropenem	 28% 46% 40% 7% 28% 6% 7%	 31.4% 45.7% 39.4% 6.1% 26.3% 7.6% 8.8%	

Pseudomonas aeruginosa 1. Ciprofloxacin 2. Ceftazidime 3. Amikacin 4. Imipenem 5. Meropenem	 17% 16% 10% 20% 17%	 15.6% 15.6% 9.5% 17.5% 15.8%	
Acinetobacter baumanii 1. Amipicillin-Sulbactam 2. Amikacin 3. Gentamicin 4. Imipenem	 42% 39% 39% 40%	 39.2% 40% 36.9% 45.3%	
Multidrug-resistant Pseudomonas aeruginosa and *Acinetobacter baumanii* 1. *P. aeruginosa* MDR rates 2. *P. aeruginosa* XDR rates 3. *A. baumanii* MDR rates 4. *A. baumanii* XDR rates	 22% 13% 54% 34%	 23% 18% 61% 46%	

In the 2014 ARSP report, the *Antimicrobial Resistance Surveillance Committee (ARSC)* recommended the following action points:

- Infections secondary to *Streptococcus pneumoniae* can still be covered with penicillin or one of the anti-pneumococcal macrolides, although there is a need to closely monitor the changing trends of resistance among pneumococci.
- Ampicillin is no longer recommended for empiric therapy for infections secondary to *H. influenzae*. For suspected infections, beta-lactam-beta-lactamase inhibitor combinations, extended spectrum oral cephalosporins and newer macrolides are to be used
- Empiric treatment for suspected uncomplicated typhoid fever could still consist of chloramphenicol, cotrimoxazole, amoxicillin or ampicillin. Nalidixic acid and ciprofloxacin resistance may result to treatment failures.
- Clinicians must be wary in using ciprofloxacin against Salmonella gastroenteritis since this is a self-limited disease
- More vigilant surveillance of the resistance pattern of Shigella to the quinolones
- Tetracycline, chloramphenicol and cotrimoxazole are still good treatment options for cholera
- Ceftriaxone remains as empiric antibiotic for gonococcal infections, and it is highly recommended for clinicians to send specimens to improve the limited data known about *Neisseria gonorrhoeae*
- There may be an indication to shift empiric treatment of suspected staphylococcal infections from oxacillin to alternative agents like co-trimoxazole, doxycycline, clindamycin, linezolid or vancomycin.
- Hospitals should base their treatment recommendations for the Enterobacteriaceae on their institution's prevailing resistance patterns due to their variability.
- Prudent use of antimicrobials and comprehensive infection control measures must be implemented

2.2 AMR in Animal Health

Livestock and aquaculture production in the Philippines had intensified due to high demands for food protein sources parallel to the continuous growth of human population. The use of antimicrobials in animals is important to control the morbidity and mortality due to pathogen associated diseases in livestock. Agricultural and aquacultural practices have improved and increased animal production, but also resulted in the increase of antibiotic resistant pathogens which poses threat to both human and animal health. Inappropriate use of amount of antimicrobials resulted to antimicrobial resistance.

There are three (3) government agencies involved in the regulation of veterinary drugs particularly antimicrobials, in the country. These are the Bureau of Animal Industry (BAI) and Bureau of Fisheries and Aquatic Resources (BFAR) of the Department of Agriculture (DA) and the Food and Drug Administration (FDA) of the Department of Health (DOH).

The FDA, pursuant to *Republic Act No. 9711* or the "*Food and Drug Administration Act of 2009*", is mandated to regulate and monitor establishments and products including veterinary drugs and other health-related products. By virtue of the *Joint DA-DOH Administrative Order No. 2013-0026, "Rules on the Regulation of Veterinary Drugs and Products, Veterinary Biological Products, and Veterinary Drugs Establishments",* FDA shall continue to register veterinary drugs in pharmaceutical dosage forms except those intended for feeds and issue license to establishments for the manufacture, distribution, importation, exportation and sale of the same. The BAI, on the other hand, shall continue to register veterinary drugs and products, veterinary biological products intended solely for animal use and issue license to establishments for the manufacture, distribution, importation, exportation and sale of the same.

RA 10611 or the "*Food Safety Act of 2013",* mandates DA Food Safety Regulatory Agencies namely the Bureau of Animal Industry (BAI), National Meat Inspection Service (NMIS), Bureau of Fisheries and Aquatic Resources (BFAR) and National Dairy Authority (NDA), to be responsible for the health of animals from where food is derived and the effects of feeds and other production inputs on otherwise healthy animals.

Other initiatives on the livestock and aquaculture sector related to AMR include the current effort of the government in improving trade and competitiveness and its participation to the World Trade Organization. This movement in the government is driving the authorities to put in place programs not only in addressing AMR but also international standards to comply with the Sanitary and Phytosanitary Measures. Global practices such as the Good Animal Husbandry Practices (GAHP) and Good Aquaculture Practice (GAqP) are some of the international guidelines that are now being adapted in the country. The standards and its certification programs set out the minimum requirements for animal food production farms including traceability and documentation of veterinary drugs used. The Philippines, as a member country of Codex, participates in the meetings of several Codex Committees where AMR is being discussed.

There are limited studies conducted by the universities and research agencies on AMR in veterinary sector. A study conducted by the College of Veterinary Medicine, University of the Philippines - Los Baños (UPLB), LosBaños, Laguna revealed antimicrobial resistance patterns in livestock and farm environmental/wildlife animals as indicators of the use of antibiotics in Philippine agricultural practices. In this study, the common antibiotics used in each livestock commodity were determined. The different bacteria were isolated and evaluated for susceptibility and/or resistance to antimicrobial drugs.

In swine, the leading choices of antibiotic medication were oxytetracycline (10.9%), tiamulin (10%), penicillin (9.7%), amoxicillin (9.4%) norfloxacin (9.4%) and tylosin (8.8%). In bacterial isolation, *Pasteurellamultocida, Enterococcus faecalis, Streptococcus suis* and *Bordetella bronchiseptica* were among the bacteria isolated. The antibiotic sensitivity testing showed resistance to several antibiotics namely Tylosin, Oxytetracycline and Sulfamethoxazole at 56%, 65% and 100% respectively on *the P. multocida* isolates. Both *S. suis* and *E. feaecalis* were sensitive to Ampicillin, but resistant to all tested antibiotics. *B. bronchiseptica* showed sensitivity to Norfloxacin, Colistin, Ampicillin, Gentamycin and Oxytetracycline; and intermediate sensitivity to Doxycycline. However, the isolated organism showed resistance to Penicillin, Tylosin, Cephalotin, Erythromycin, Trimethoprim and Sulfamethoxazole. This study revealed that all of the isolated organisms were resistant to Tylosin and Sulfamethoxazole, while 66.7% were resistant to Oxytetracycline.

The AMR among cattle was also studied especially in animals with mastitis. Bacterial isolation revealed 3 major groups of bacteria namely Enterobacteriacea (*E.coli* and *K. pneumonia*), Gram negative (*Brevundimonas diminuta, Flavimonasoryzi habitans, Acinetobacter baumanii, Vibrio metschnikovii* and *Pantoea agglomerans*) and Gram positive cocci/rods. Antibiotic sensitivity results showed that most resistant isolates belong to Enterobacteriacea and other Gram negative group. Narrow spectrum beta-lactam antibiotics were found ineffective on majority of the isolates while consistent sensitivity were seen from Fluoroquinolone. The most multi-resistant isolates were *B. diminuta* (resistant to 75% of antibiotics), *K. pneumonia* (resistant to 25-75% of antibiotics) and *A. baumanii* (resistant to 58.33% of antibiotics). A separate analysis was also conducted to evaluate the resistance and/or susceptibility to antimicrobial drugs among bacteria isolated from the cattle in the university farms (UPLB). The *Staphylococcus spp.* and *Bacillus cereus* showed the highest resistance and the majority of isolates were resistant to Cefaclor (46.7%). The *B. cereus* showed 71.4% resistance to Cefaclor and showed highest resistance to TMPS at 64.3% and Amoxicillin at 92.9%. Majority of the isolates from mastitis cases were resistant to Penicillin and Ampicillin at 57.6% and 59.8%, respectively while only 50% were susceptible to TMPS.

The use of antibiotic as growth promoters has also been reflected in isolated *Campylobacter jejuni* from the Philippine broilers. The isolates showed multi resistance to more than 7 antibiotics tested, presenting at least 8 multiple resistance patterns. Lowest level of resistance was observed for erythromycin at 33.3%. Resistance to all antibiotics was observed for two isolates from chickens of commercial producers.

Another study was conducted by Sison et al. (2014) to determine the prevalence and to semi-quantify the *Campylobacter spp.* on chicken meat samples collected at 4 local wet markets in Nueva Ecija, and to determine the AMR patterns of the *Campylobacter* isolates. This study revealed 77.3% resistance to Ampicillin, followed by Ciprofloxacin (70.4%), Tetracycline (54.6%), Erythromycin (20.2%) and Gentamycin (11.4%).

A study conducted at Philippine Carabao Center (PCC) together with College of Veterinary Medicine and Science of the Central Luzon State University (CLSU) detected the presence of plasmids or genes (Sul 1 and Tet M) in isolated bacteria causing resistance to Sulfonamide and Tetracycline, respectively. These bacteria were isolated from the respiratory tract of the animals.

Based on the literature review of the 2013 CSA-AMR report, research studies examining the presence of AMR from live and slaughtered pigs, chickens, eggs and milk of cattle from 1998-2012, revealed that 100% of the isolates are resistant to tetracycline. Other alarming antimicrobials include trimethoprim-sulfamethoxazole, penicillin, ampicillin and chloramphenicol*. E. coli* has excessive resistance to antimicrobials, while more than 90% isolates exhibited multiple drug resistance.

A study conducted by Ciceron et al. in 2005, concluded that the high resistance rates of isolates were attributed to the use of antibiotics in feeds in the farm. Morales in 2000 also revealed that antibiotic residues in animals increased AMR and allergic reactions to antibiotics in humans.

Current research at the College of Veterinary Medicine and Science of the Central Luzon State University(CLSU)aims to identify the antimicrobial classes/families to which pathogens in swine and poultry have developed resistance, identify AMR causing genes from bacterial pathogens, determine the prevalence of AMR, and assess the risk associated with AMR. This research is being funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD).

From these, much work is still needed in elucidating the level and status of AMR in the country. Different activities and researches regarding AMR on animal are currently conducted in line with the WHO/FAO/OIE action against AMR. The current developments in the government and collaborations with international organizations will help in pursuing the needed steps in improving the work on AMR in the veterinary sector.

CHAPTER 3: The Inter-Agency Committee on Antimicrobial Resistance (ICAMR): Roles and Mandate

The readiness of a country to overcome the AMR challenge is reflected through three important factors: (1) the availability of a comprehensive and sustainable national action plan; (2) the presence of an established national coordinating body; and, (3) the existence of policies that serve as guides for frameworks of action.

Cognizant of the public health threats of AMR to both humankind and animal health, with consequences affecting various sectors, President Benigno Aquino III, in 2014, passed the A.O. 42,which orders the creation of a multisectoral body focused on establishing the mechanisms to integrate all initiatives into a single concerted action plan called as the **Inter-Agency Committee on AMR (ICAMR)**.

ADMINISTRATIVE ORDER NO. 42

CREATING AN INTER-AGENCY COMMITTEE FOR THE FORMULATION AND IMPLEMENTATION OF A NATIONAL PLAN TO COMBAT ANTIMICROBIAL RESISTANCE IN THE PHILIPPINES

WHEREAS, antimicrobial resistance (AMR) has been identified by the World Health Organization (WHO) and the World Organization on Animal Health, as well as other policy-makers, scientists, professionals, and civil society groups, as a global threat to humankind and animal health because it reduces the effectiveness of antimicrobial medicines;

WHEREAS, AMR has serious health and economic consequences, such as increased mortality, prolonged illness, increased cost of health care, and adverse impact on trade and foreign affairs;

WHEREAS, there is a need to ensure efficient government response to control AMR through the formulation, adoption, and implementation of a comprehensive national plan that would integrate, coordinate, and develop sustainable and collaborative systems and mechanisms to combat AMR in the Philippines;

WHEREAS, the creation of an inter-agency committee to formulate and implement the plan can rationalize, harmonize, streamline, integrate, and unify the efforts of government agencies to address the AMR problem; and

WHEREAS, the Philippines has committed to the WHO Six-Point Health Policy Agenda as a response to the efforts to control and prevent AMR.

NOW, THEREFORE, I, BENIGNO S. AQUINO III, President of the Philippines, by virtue of the powers vested in me by law, do hereby order:

SECTION 1. Creation and Composition. The Inter-Agency Committee (hereinafter referred to as the Committee) is hereby created, to be composed of representatives from the following:

Co-Chairs:	Department of Health (DOH) Department of Agriculture (DA)
Members:	Department of Science and Technology (DOST) Department of the Interior and Local Government (DILG) Department of Trade and Industry (DTI)

DOH shall provide secretariat support to the Committee.

The Committee may call upon any department, bureau, office, agency, or instrumentality of the government, and request the local government units and private sector for assistance as the circumstances and exigencies may require.

The duly authorized representatives of the member-agencies of the Committee shall have a rank not lower than Assistant Secretary.

SECTION 2. Functions. The Committee shall have the following functions:

a) Formulate, develop and implement and oversee the national plan for the prevention and control of AMR;
b) Collaborate and coordinate with other agencies of the Executive branch and private and non-government sectors;
c) Promulgate guidelines, rules and regulations, as well as possible penalties and sanctions for violations in accordance with existing laws, as may be necessary, related, incidental, or consistent with the purpose, intent, and objective of this Order;
d) Submit to the office of the President regular status reports on the implementation of the national plan; and
e) Perform such other functions and activities as may be necessary to carry out the provisions of this Order, or as the President may direct.

SECTION 3. Development of the National Plan. A comprehensive and sustainable plan to combat AMR in the country shall be developed which will include, but not be limited to the following:

a) Establishment of short and long term programs to address the different aspects of response to AMR, including advocacy, management of AMR and the regulation of antimicrobial use;
b) Strengthening the surveillance system and laboratory detection capacity for AMR and its use in humans and animals;
c) Ensuring accessibility, affordability, availability, and quality of antimicrobial drugs for humans, as well as their rational use in humans, food producing animals and aquaculture;
d) Guaranteeing that antimicrobial agents are prescribed, dispensed, promoted, advertised and used according to the licensed indication;
e) Development of relevant and utilizable essential medicines list for human and veterinary use;
f) Institutionalization of infection prevention and control in healthcare and veterinary facilities and the community through training and education; and
g) Conduct of research towards the development of new antimicrobials and innovative technologies to improve diagnosis and treatment

SECTION 4. Funding. The member-agencies of the Committee are authorized to charge against their current appropriations such amounts as may be necessary for the implementation of this Order, subject to the budgetary, accounting and auditing rules and regulations. Subsequent funding requirements shall be incorporated in the annual budget proposals of the respective member-agencies through the General Appropriations Act (GAA). Additional funds and possible fund sources as may be necessary for the implementation of this Order shall be identified and provided by the DBM.

Section 5. Separability Clause. Should any provision of this Order be declared invalid or unconstitutional, the other provisions unaffected thereby shall remain valid and subsisting.

Section 6. Repealing Clause. All orders, proclamations, rules, regulations or parts thereof, which are inconsistent with any of the provisions of this Order are hereby repealed or modified accordingly.

Section 7. Effectivity. This Order shall take effect immediately.

DONE, in the City of Manila, this 10th day of April, in the year of Our Lord, Two Thousand and Fourteen.

By the President:

PAQUITO N. OCHOA, JR.
Executive Secretary

As the lead national agencies, the DOH and DA are delegated as Co-Chairs of the ICAMR. The DOH primarily functions to provide technical secretariat support to the committee. Together with the DA, they are both responsible in establishing policies that address AMR, and to ensure that antimicrobials of quality are accessible and affordable for Filipinos. They are also tasked to regulate these agents in the market, and to create essential medicines lists, treatment guidelines, systems, platforms, risk communication plans and IEC materials for both human and veterinary use. With regards to monitoring and evaluation functions, these two agencies are also mandated to establish AMR and antimicrobial use surveillance programs.

The DOST, DILG and the DTI are concurrently mandated to participate as members of the ICAMR. The main participation of the DTI is in the strengthening of the surveillance systems and laboratory detection capacity for AMR and its use in humans and animals by ensuring that facilities conform to international standards. The DOST functions to take lead in the prioritization of AMR in health agendas and researches aimed to develop new antimicrobials and innovative technologies to improve diagnosis and treatment. On the other hand, the DILG is responsible for the coordination and implementation of AMR policies to the local governments to ensure that strategies to address AMR reach communities and household level.

CHAPTER 4: The Philippine Action Plan to Combat AMR: One Health Approach

The complex issue on AMR warrants a multi-sectoral intervention not only to contain the increasing drug resistance of bacterial pathogens as provided by the ARSP data, but more importantly, to assure the safety of both humans and animals in the country. The **"Philippine Action Plan to Combat AMR"** serves as the country roadmap towards containing, controlling and preventing AMR which provides an intervention strategy in order to facilitate the mechanisms of combating the growing problem of AMR as one nation through political commitment and leadership, institutionalizing integrated surveillance systems, regulating access to quality antimicrobials, rational use of antimicrobials, establishing measures to prevent and control further spread of AMR, and strengthening research and development initiatives. This comprehensive plan emphasizes the **"One Health Approach"** as it recognizes that the causation of AMR is inter-related and inter-sectoral thereby requiring collaborative multidisciplinary work at local, national, and global levels to attain optimal health for humans, animals and the environment.

Vision

A nation protected against the threats of antimicrobial resistance

Mission

To implement an integrated, comprehensive and sustainable national program to combat AMR geared towards safeguarding human and animal health while preventing interference in the agricultural, food, trade, communication and environmental sectors

Philippine Targets to Combat Antimicrobial Resistance

By 2020, the Philippines will:

1. Reduce by 30% carbapenem-resistant Enterobacteriaceae (E. coli and Klebsiella) infections acquired during hospitalization
2. Maintain the prevalence of ceftriaxone-resistant Neisseria gonorrhoeae to 0%
3. Reduce by at least 30% overall methicillin resistance in Staphylococcus aureus bloodstream infections compared to rates in 2014
4. Reduce by 30% multidrug-resistant Pseudomonas spp infections acquired during hospitalization compared to estimates in 2014
5. Reduce by 25% ciprofloxacin-resistant non-typhoidal salmonella infections compared to 2014

Key Strategy 01: Commit to a comprehensive, financed national plan with accountability and civic society engagement

Human Health

The critical role of the Philippine government is to lead and consolidate the fragmented efforts by individual programs or institutions through the creation of a National Action Plan and by providing policies and a legal framework towards the main goal of combating AMR in the country. The recognition of this problem is not only expected from the different government departments, but also from the private and non-governmental sectors. A commitment from all these stakeholders would allow for various targets to be reached simultaneously, and for more resources to be generated. In order for this to be possible, an effective assessment of costs and potential savings from the reduction of AMR must also be in place. Moreover, the government needs to collaborate with the civil societies to raise awareness and disseminate information about the rising AMR issue to the public properly.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To forge a joint action plan and agreement among national agencies	Convening of ICAMR to consolidate the AMR plans from concerned agencies	2014 – Q3	National Action Plan on AMR	DOH (PD)	250,000
	Briefing of DOH Execom members of concerned agencies on AMU and AMR issues	2015	Briefer and presentation	DOH (PD), ICAMR	
To generate resources and enhance internal and external networking	Submission of project proposals to international organizations or relevant funding agencies	2015 onwards	Approved project; grant; funding agreement	ICAMR	None
	Lobbying for budget (GAA, Sin Tax, International Partners, WHO)	2014-2015	Approved GAA; MOA/ MOU	ICAMR member agencies	

Animal Health

Following the One Health Strategy, the animal sector, likewise, must play a role in the judicious use of antimicrobials. The transmission of AMR in both domestic and wild animals across different environments and geographic distances warrants a continuous collaboration with the Department of Agriculture. The ecology of AMR has long been present in both the soil and water microbiomes, such that streamlining efforts with other partner-agencies not only enables increased mobilization of resources, but also a better foundation to address knowledge gaps about AMR, especially in the veterinary health sector.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To forge a joint action plan and agreement among national agencies	Information dissemination on A.O. No. 42 among concerned DA agencies	2014 – Q2	DA Memorandum	DA (OSEC)	150,000.00
	Identification of official and alternate representatives for the ICAMR	2014-Q3	Endorsement Letter from DA-OSEC to DOH	DA (OSEC)	
	Approval of Special Order for the creation of DA TWG to consolidate the AMR plan	2014-Q3	Approved Special Order; Endorsement of AMR plan	DA (ASEC on Livestock; NMIS as Secretariat)	
To generate resources and enhance internal and external networking	Submission of project proposals to international organizations/relevant funding agencies	2015-onwards	Approved project; grant; funding agreement	ICAMR	None
	Lobbying for budget (GAA, Sin Tax, International Partners, WHO)	2014-2015	Approved GAA; MOA/ MOU	ICAMR member agencies	
	Budget proposal for continuous appropriations in GAA	2015 onwards	Approval of GAA for DA	DA member agencies	
	Submission of project proposals to international organizations/relevant funding agencies	2015	Approved project; grant; funding agreement	DA member agencies	

Key Strategy 02:Strengthen surveillance and laboratory capacity

Human Health

Establishing surveillance systems on monitoring resistant pathogens as well as the consumption of antimicrobials plays a very significant role in developing evidence-based policies to control/ limit overuse of antimicrobials which was identified as a major contributory factor to the emergence of AMR, in designing effective guidelines for feedback and control mechanisms on addressing AMR outbreaks in the country. Empowering and increasing the skills set of health professionals and laboratories that take part in the process of surveillance enable reliable and robust diagnostic testing and proper data to be reported. With proper information and sharing of surveillance studies across borders, targeted approaches and treatment strategies may be developed to limit the spread and emergence of pathogens with AMR.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To improve the surveillance capacity of health personnel, hospitals and laboratories	Assessment and inventory of resources for monitoring, surveillance and testing (Including Price Reference of Laboratory supplies and equipment)	2015	A design for the upgrading of laboratories for AMR and drug residue testing and manual for biosafety and biosecurity harmonized to DOH guidelines	DOH (FDA) and DTI	None
	Foreign and local training of technical personnel on monitoring, surveillance and testing methods and the operation of laboratories, including compliance to accreditation standards (PNS ISO/IEC 17025, PNS ISO 15189, PNS ISO/IEC 17020, Codex)	2015	Technical personnel abled and qualified to handle surveillance, monitoring and testing of samples for AMR; A manual of policies and procedures for the design/ implementation/ upgrading of surveillance and monitoring programs	DOH and DTI	50,000,000
	Management of the National Health Laboratory Referral Network (DOH A.O. No. 2012-0021)	2015-2016	Government and private laboratories licensed by DOH (starting with levels 2 and 3 hospitals) apply and qualify for membership to the National Health Laboratory	DOH (HFDB) The role of HFDBis to advocate for and help establish Regional Laboratory Networks/Councils (A.O. No. 2014-0006). It is the Reg. Lab. Network Council	800,000

			Network through the Regional Laboratory Network Councils. Membership at the moment voluntary.	which sets the priority goals and activities in their region with the technical assistance of the NHLN.	
	Strengthen the implementation of Hospital-Acquired Infection (HAI) surveillance in hospitals thru conduct of trainings of ICC chairs and nurses	2015	A system of notification and alert for HAI thru NEC; Protocols for centralized reporting and feedback; Training manuals for reporting system; Protocols for centralized reporting and feedback; Training manuals for reporting system	DOH (HFDB, HFSRB and EB)	5,000,000
	Expansion of ARSP to DOH-retained hospitals	2016	Number of sentinel sites	DOH (RITM)	30,000,000
To develop programs and systems for surveillance and monitoring of AMR	Development of a surveillance system for antimicrobial use (AMU)	2015	Annual AMU report	DOH (PD)	7,000,000
	Development of an integrated system for AMR, AMU and HAI	2015-2016	Annual integrated report on AMU, AMR and HAI	DOH (PD, RITM, EB, HFSRB and HFDB)	
	Development of an IT platform to communicate data on AMR to stakeholders	2015-2016	AMR Dashboard	DOH (RITM, PD, and EB)	

Animal Health

The impact of AMR in the agricultural sector is not yet well comprehended, and this substantiates the need for an improvement in the current state and evolution of AMR trends in animal health. It is known that the judicious use of antimicrobials in food-producing animals is a critical step in lessening the AMR patterns seen in human medicine, so it is essential for an effective monitoring system to be in place from the point of slaughter to processing of animals, as well as the implementation of surveillance systems focusing on AMR mitigation strategies in animals.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To improve the capacities of health personnel, hospitals and laboratories	Identification of DA national and regional laboratories that for AMR surveillance and monitoring	2015 onwards	Designated AMR laboratories	DA (BAI)	60,000,000.00
	Assessment and inventory of resources for monitoring, surveillance and testing	2015	A design for the upgrading of AMR laboratories	DA (BAI) and DTI	
	Hiring of additional personnel	2015	Approved Job Order; Contract for hired JO	DA	
	Foreign and local training of technical personnel on monitoring, surveillance and testing methods and the operation of laboratories including compliance to accreditation standards (PNS ISO/IEC 17025, PNS ISO 15189, PNS ISO/IEC 17020, Codex)	2015	Technical personnel abled and qualified to handle surveillance, monitoring and testing of samples for AMR	DA and DTI	
	Improvement of facilities and purchase of necessary equipment and laboratory supplies, glassware, culture media, reagents or test kits, etc. for AMR laboratories	2015-2016	Upgraded laboratories with required equipment	DA	

To develop programs and systems for surveillance and monitoring of AMR	Development of surveillance and monitoring system for AMR and AMU in food-producing animals	2015 onwards	Manual of procedures and harmonized standards; AMR/AMU reports in animal species; Protocols for reporting system and feedback system	DA (BAI and BFAR)	5,000,000.00
	Data collection/sampling/testing/ analysis of Drug Residue in animals (focus on AMR) - for clarification of DA	2015 onwards	Data collected / samples tested / analyzed and results reviewed. A report on the occurrence of AMR in animal species and on production practices relevant to the emergence of AMR	DA (BAI and BFAR)	25,000,000.00
	Sampling and testing analysis for antibiotic susceptibility testing based on internationally accepted standards	2015 onwards	Reports on AMR in animal species	DA (BAI and BFAR)	
	Monitoring of AMR and AMU trends in food-producing animals	2015 onwards	Regular dissemination of reports on AMR in animal species	DA (BAI and BFAR)	

Key Strategy 03:Ensure uninterrupted access to essential medicines of assured quality

Human Health

Taking substandard or counterfeit antimicrobials containing less than the specified amount of the active ingredient, or consuming suboptimal dosage due to lack of supply or limited accessibility to antimicrobials contributes to the overall AMR problem because infections persist and resistant microbes are able to grow and survive the treatment. Ensuring sustainable access to quality essential antimicrobials is therefore, integral in successfully hampering the development of AMR. This is made possible primarily by strengthening the regulatory measures, tools and activities of the national drug regulatory agency in ensuring the safety, efficacy and quality of medicines from market authorization to post-marketing surveillance. Efforts must also focus on sustaining an efficient supply chain system towards ensuring the availability or accessibility of quality medicines to all patients at all times, with emphasis on completing the course of treatment.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To improve the registration, marketing authorization and post-marketing surveillance of antimicrobials	Monitoring the quality of registered antimicrobials in the market	2015 onwards	PMS report on the quality of registered antimicrobials and the presence of unregistered antimicrobials	DOH (FDA)	None
	Process streamlining of review and release of marketing authorization of new antibiotics that address priority infectious diseases in the country	2014 onwards	Protocols for facilitated processes of review and marketing authorization of new antibiotics available in websites; issuance of certificate of product registration, license to operate for antimicrobials and importation clearance	DOH (FDA) and DA (BAI, BFAR and OPP)	8,000,000.00
	Forging an agreement on regulatory control over drugs used in aquaculture	2015	Approved joint AO including sanctions on products with positive antibiotic residues	DOH (FDA) and DA (BFAR)	None
	Rationalization and harmonization of regulatory control over the manufacture and use of antibiotics in animals	2015	Agreed policy between DA and DOH; Enactment of Animal Industry and Veterinary Services Act (AIVSA)	DOH (FDA) and DA (BFAR)	

To ensure access to essential medicines	Forging of partnership with healthcare professionals, organization, and consumer groups	2015-2016	MOA/MOU	DOH (FDA and PD)	None
	Review of issuances related to access to antimicrobials, especially in the distribution and sale in drug outlets	2015-2016	Reports; Minutes of the Meeting	DOH (FDA and PD)	
	Strict enforcement of regulations on antibiotic prescription, dispensing and use	2014 onwards	Monitoring reports	DOH (FDA)	
	Mainstreaming of complete treatment regimen thru reimbursement schemes	2015	PHIC reimbursement package	DOH (FDA, PHIC and PD)	

Animal Health

The local demand for safe food products such as milk, meat, fish and eggs, is currently dependent on antimicrobial agents, such that micro-organisms are not acquired by people, who consume them. Regulatory agencies, therefore, must be able to implement quality control mechanisms, and have them in place so that AMR is not worsened.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To improve the registration, marketing authorization and post-marketing surveillance of antimicrobials	Process streamlining of review and release of marketing authorization of new antibiotics that address priority infectious diseases in the country	2014 onwards	Protocols for facilitated processes of review and marketing authorization of new antibiotics available in websites; issuance of certificate of product registration, license to operate for antimicrobials and importation clearance	DOH (FDA) and DA (BAI, BFAR and OPP)	8,000,000.00
	Development of a database of registered antimicrobials, including quantitative production and importation	2015 onwards	Database available in websites	DA (BAI and BFAR) and DOH (FDA)	2,000,000.00
	Quality monitoring of veterinary drugs	2015 onwards	Quality Reports	DA (BAI and BFAR) and DOH (FDA)	
	Monitoring of use of unregistered antimicrobials in animals	2015 onwards	Monitoring reports on use of unregistered antimicrobials	DA (BAI and BFAR) and DOH (FDA) DA (BAI and BFAR) and DOH (FDA)	
	Forging an agreement on regulatory control over drugs used in aquaculture	2015	Approved joint AO including sanctions on products with positive antibiotic residues	DOH (FDA) and DA (BFAR)	None
	Rationalization and harmonization of regulatory control over the manufacture and use of antibiotics in animals.	2015	Agreed policy between DA and DOH; Enactment of Animal Industry and Veterinary Services Act (AIVSA)	DOH (FDA) and DA (BFAR)	
To ensure access to essential	Forging of partnership with healthcare professionals,	2015-2016	MOA/MOU	DA (BAI and BFAR)	None

medicines	organization, and consumer groups				
	Review of issuances related to access to antimicrobials, especially in the distribution and sale in drug outlets	2015-2016	Reports; Minutes of the Meeting	DA (BAI and BFAR)	
	Strict enforcement of regulations on antibiotic prescription, dispensing and use	2015 onwards	Monitoring reports	DA (BAI and BFAR)	

Key Strategy 04: Regulate and promote the rational use of medicines in the human and animal health sectors

Human Health

While AMR is a natural phenomenon in microbes that happen as an adaptation to external threats, humans have definitely hastened it. The WHO has identified irrational use or misuse of antimicrobial medicines as a major driver of AMR, which is associated with a variety of management and healthcare provider concerns. Misinformation, lack of information dissemination and existence of proper guidelines and training of health care providers all lead to improper dispensing, prescription and treatment. Advertisements and other tools being used to promote drugs merely for profit without taking into considering its ill-side effects further lead to worsening AMR consequences. Community purchases are often times made without prescriptions. There is significant relationship between the unit cost of drugs and patient compliance, proving that the socioeconomic status of the patient remains to be a cause of therapy problem. Cognizant of the above pervasive inappropriate and irresponsible practices contributing to the over-all burden of AMR, it is therefore imperative that concerted actions must be focused on institutionalizing rational use of antimicrobials among the healthcare providers and the patients.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To foster an enabling environment for the rational use of medicines	Strict regulation of promotion and marketing of antimicrobials for human and veterinary use	2015 onwards	Public advisories, advertisements, policies and standards	DOH (FDA and PD) and DA (BAI)	16,500,000.00
	Institutionalization of Philippine Practice Standards for Pharmacists (PhilPSP) in relation to Rational Dispensing of Antimicrobials	2015	Training manuals and conduct of trainings for pharmacists on rational dispensing of antimicrobials	DOH (FDA and PD)	
	Development of National Antibiotic Guidelines for hospitals and primary health	2015-2016	National Antibiotic Guidelines disseminated to health facilities	DOH (PD)	

	care facilities				
	Development of Antimicrobial Stewardship Program (AMS) in hospitals	2015-2016	Development of policy for AMS implementation in hospitals; Training materials for implementing ASP; Conduct of pilot implementation in 8 hospitals	DOH (PD, DPCB and HFDB)	
	Inclusion of RUM principles in health education components of school curricula and adult education programs and in the Continuing Professional Education (CPE) of health professionals	2015-2016	RUM modules integrated in primary, secondary and tertiary education	ICAMR	
	Development/updating treatment guidelines for specific diseases	2015	National Treatment Guidelines developed	DOH (DPCB and PD)	
	Training/Dissemination of the National Treatment Guidelines	2015	Number of trained personnel	DOH (DPCB and PD)	
	Conduct of coordination meetings and workshops for implementation of policies with local governments	2015 onwards	Minutes of Meeting; agreements	DA (BAI,BFAR and OPP), DOH and DILG	Incorporated in the Key Strategy 04 of Animal Health

Animal Health

The existing regulatory frameworks concerning the use of antimicrobials in the animals are lacking and not properly enforced. These systems need to be strengthened to potentially create an impact on the resistance levels in the country. Immense quantities of antibiotics are consistently used for growth promotion and disease prevention in animals, and have significantly higher values compared to usage of humans for various illnesses. It is necessary to have a rational use of antimicrobials in place so that wastes containing drug residues from large-

scale animal farms and aquaculture are minimized. These are potential sources for AMR genes and antibiotic pollution in the environment, and are considered to be major factors in the heightened AMR found in the animal sector.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To fosteran enabling environment for the rational use of medicines	Review of existing regulations and regulatory controls for registration, advertising, importation and end use	2015 onwards	Status report on the strengthening of various regulations for veterinary drugs; compendium of relevant laws, AOs and circulars	DA (BAI, BFAR and OPP)	5,000,000.00
	Continuous monitoring of banned antimicrobials	2015 onwards	Publication of banned drugs; status reports	DA (BAI)	
	Improved implementation of Policy on Prescribing and Dispensing of Veterinary Drugs (VDO)	2015 onwards	Compliance report	DA (BAI, BFAR and OPP)	
	Conduct of dialogue/meeting with clients, stakeholders, industry	2015 onwards	Minutes of Meeting; agreements	DA and DOH (FDA)	
	Training on international standards of consumer products	2015 onwards	Number of trained personnel	DA and DOH (FDA)	
	Creation of a “Veterinary Formulary Executive Council”	2015 onwards	Issued Special Order	DA and DOH (FDA)	
	Institutionalization of Philippine Practice Standards for Veterinarians in relation to Rational Dispensing of Antimicrobials	2015	Training manuals and conduct of trainings for pharmacists on rational dispensing of antimicrobials	DA	
	Development of National Antibiotic Guidelines for animal health	2015-2016	National Antibiotic Guidelines disseminated to veterinarians	DA	
	Development of antimicrobial stewardship program (ASP) in	2015 onwards	Training materials for implementing ASP	DA	

	animal husbandry				
	Conduct of coordination meetings and workshops for implementation of policies with local governments	2015 onwards	Minutes of Meeting; agreements	DA (BAI,BFAR and OPP), DOH and DILG	

Key Strategy 05:Enhance infection prevention and control across all settings

Human Health

Because AMR reduces the effectiveness of the antimicrobial treatment thereby prolonging patient illnesses and increasing the risk of spreading resistant microorganisms to others, establishing Infection Prevention and Control (IPC) interventions in healthcare settings iscrucial.IPC practices and guidelines not only ensure containment of infection and minimization of the occurrences of outbreaks, but also enable the reduction of diseases that require further use of antimicrobials. Ultimately, patient outcomes improve and overall treatment costs are reduced. IPC practices include basic hand hygiene, aseptic practices, environmental and waste management and the proper placement of patients with known or suspected diseases in their respective emergency, inpatient, ambulatory, medical, surgical or outpatient settings. Drug resistance does not only occur in the healthcare settings, but also at the household level. IPC, with proper training of health personnel and education in the community level, is therefore needed to combat AMR.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To improve the capacities of the health personnel and community	Development of National Policy on IPC	2015	Approval and implementation of a National Policy on IPC	DOH (HPCS, PD), DILG	None
	Conduct of activities on IPC promotion and education in the community level	2016	DOH (HFDB, HPCS, PD), DILG	DOH (HFDB)	2,000,000
	Conduct of training for hospital personnel on IPC implementation	2016	Training manuals; number of hospital personnel trained	DOH (PD, HFDB)	None
To implement programs on IPC	Strengthen implementation of IPC measures in hospitals	2015 onwards	IPC Monitoring reports from all hospitals	DOH (HFDB and HFSRB)	None

Animal Health

It has been found by the European Food Safety Authority (EFSA) that some resistant strains found in human diseases, such as Campylobacter and Salmonella bacteria, actually originate from farm animals.

Increasing the implementation and instilling standard practices in the agricultural sector enables a broader and faster application of strategies to not only combat AMR, but also to minimize its development and impacts.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To implement programs on IPC	Implementation of Good Animal Husbandry Practices (GAHP) and Good Aquaculture Practices (GAqP) as Philippine National Standards	2015 onwards	Training sessions conducted; number of farms registered with GAHP and GAqP; Validation of codes of good practice (audits and renewal)	DA (BAI, BFAR)	10,000,000.00
	Strengthen animal health system capacity	2015 onwards	Workshops conducted/info materials disseminated on the implementation of relevant policies on proper use of antimicrobials		

Key Strategy 06:Foster innovation, research, and development

Human Health

The problem of AMR causing the deterioration of the effectiveness of antimicrobials is coupled with the shrinking pipeline of new antimicrobials. With the decline of antibiotic discovery for the last decade, the WHO has emphasized that we are in race against time to develop new antibiotics. While there are several option interventions to prevent the emergence and spread of resistant infections, AMR as a natural phenomenon is inevitable; thus, new medicines and other tools to control infections will still be needed in the future. As the trend of AMR continue to rise, so should the effort in developing new health technologies escalate as well. Developing rapid diagnostic tests are important as well to better guide physicians on prescribing the appropriate antimicrobial treatment for the patients.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To prioritize AMR in fields of research	Inclusion of AMR detection, prevention and control in the National Unified Health Research Agenda (NUHRA) and unified IT program on AMR to the eHealth Development Plan	2015	Mention of AMR in NUHRA and e-health development plan	DOST	None

	Engaging academic and other research institutions	2016	MOA/MOU, research contracts; technical reports and products	ICAMR	
	Develop AMR research Agenda for human health	2015	AMR Research Agenda	DOH	23,000,000.00
	Provide incentive and research funding for innovators	2016	Funded research projects	DOH and DOST	
To disseminate scientific information relevant to AMR	Inventory of AMR-related researches on humans	2015	Database on local researches	ICAMR	3,000,000.00

Animal Health

The causes, effects and impacts of AMR in the animal sector entail a better and deeper knowledge of the phenomena's complexity. Veterinary antimicrobial consumption needs be further assessed in order to determine the correlation of AMR in both animal and human health in the country. Moreover, toxicological studies need to be performed to establish the safety of veterinary drug residues in the human diet, as well in the human intestinal flora. Researches are needed to enhance the development of effective strategies and alternatives to combat AMR in food-producing animals.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To prioritize AMR in fields of research	Inclusion of AMR detection, prevention and control in the National Unified Health Research Agenda (NUHRA) and unified IT program on AMR to the eHealth Development Plan	2015	Mention of AMR in NUHRA and e-health development plan	DOST	None
	Engaging academic and other research institutions	2016	MOA/MOU, research contracts; technical reports and products	ICAMR	
	Develop AMR research Agenda for animal health	2015	AMR Research Agenda	DA (PCC)	5,000,000.00
To disseminate scientific information relevant to AMR	Inventory of AMR-related researches on animals	2015	Database on local researches	ICAMR	3,000,000.00
	Upgrade existing IT system	2016	Upgraded IT system	ICAMR	

Key Strategy 07:Development of a Risk Communication Plan to combat AMR

Human Health

The success and sustainability of all actions and commitments by various stakeholders in overcoming AMR necessitates good and effective communication in all levels from planning, implementation, monitoring and evaluation. A risk communication plan not only signifies infection control measures. It is also being able to provide relevant scientific information that is accessible to all and is effectively understood by all relevant stakeholders with strong emphasis on the role of every Filipino in the overall cause-and-effect picture of the AMR problem.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To develop a targeted risk communication plan for AMR	Development of a risk communication plan and IEC materials	2015 onwards	Risk Communication Plan and IEC materials	DOH (PD and HPCS)	3,500,000.00
	Production and distribution of IEC materials	2014-2016	IEC materials	DOH (PD and HPCS)	
	Conduct of advocacy meetings with stakeholders (targeted)	2015-2016	Minutes of the meeting	ICAMR	
	Development of AO for the AMR Awareness Month	2015	AO on AMR Awareness Month issued	DOH (PD)	

Animal Health

The development of standard treatment guidelines must be in line with proper training and education of farmers and veterinarians in the industry. The improvement of animal health constitutes that the professionals working in the sector are well-informed of the risks of their actions, and that information on antibiotics, AMR and animal health are well-disseminated. This tool is important in assessing the risks of AMR in animal health, and in determining the appropriate strategies to mitigate these challenges.

Objectives	Activities	Timeline	Measurement	Responsible Agency	Budget (PhP)
To develop a targeted risk communication for AMR	Launch of AMR pledge in veterinary sector	2014	Number of Pledges	DA	5,000,000.00
	Conduct of KAP study for the farmers, stakeholders on prudent antimicrobial use/ impact of uncontrolled use of antimicrobials	2015 onwards	Technical reports	DA	
	Development of risk communication plan specifically anchored to Good Veterinary	2015 onwards	Risk Communication Plan and IEC materials	DA (NMIS)	

	Practices targeting veterinarians and IEC plan				
	Production and distribution of IEC materials	2015 onwards	IEC materials	DA	
	Conduct of advocacy meetings with stakeholders	2015 onwards	Minutes of the meeting	DA	

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