

Resource mobilisation for antimicrobial resistance (AMR): Getting AMR into plans and budgets of government and development partners

Ghana country level report

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1. ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
APD	Animal Production Directorate
APHL	Association of Public Health Laboratories
BLIS	Basic Laboratory information systems
CDC	Center for Disease Control
CHAG	Christian Health Association of Ghana
CHPS	Community Based Health Planning and Service
CPD	Continuous Professional Development
DFID	Department for International Development
DTC	Drugs & Therapeutics Committee
EML	Essential Medicines List
EPA	Environmental Protection Agency
FAO	Food and Agricultural Organization
FDA	Food and Drug Authority
GAP	Global Action Plan
GDP	Gross Domestic Product
GHS	Global Health Security Agenda
GHS	Ghana Health Services
GNDP	Ghana National Drugs Programme
GLASS	Global Antimicrobial Resistance Surveillance System
GMP	Good Manufacturing Practices
GOG	Government of Ghana
HAI	Healthcare associated infections
HSMTDP	Health Sector Medium Term Development Plan
HIV	Human Immunodeficiency Virus
IPC	Infection Prevention and Control
IHR	International Health Regulations
JICA	Japanese International Cooperation Agency
KCCR	Kumasi Centre for Collaborative Research in Tropical Medicines
KABP	Knowledge, Attitudes, Beliefs and Practices
LMIC	Low Middle Income Country
MOFA	Ministry of Food and Agriculture
MOH	Ministry of Health
MOEST	Ministry of Environment, Science and Technology
MOFA	Ministry of Fisheries and Aquaculture
M&E	Monitoring and Evaluation
NPHRL	National Public Health Reference Laboratory
NAFDAC	National Agency for Food and Drug Administration and Control
NAP	National Action Plan or Ghana AMR Policy and Implementation Plan
NGO	Non-Governmental Organization
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NSHDP	National Strategic Health Development Plan
NPHCDA	National Primary Healthcare Development Agency
NVMA	Nigerian Veterinary Medical Association
NVRI	National Veterinary Research Institute
OIE	World Organisation for Animal Health
PHI	Partnership for Health Care Improvement
ReAct	Action on Antibiotic Resistance
SDG	Sustainable Development Goals

SOP	Standard operating procedures
STG	Standard Treatment Guidelines
TB	Tuberculosis
UNICEF	United Nations International Children's Emergency Fund
USAID	USAID
VSD	Veterinary Services Directorate
WASH	Water Sanitation and Hygiene
WHO	World Health Organisation
WHONET	WHONET Software
WBG	World Bank Group

2. EXECUTIVE SUMMARY

The Ghanaian Cabinet approved the antimicrobial resistance (AMR) Policy and Implementation plan (hereafter referred to as the national action plan or NAP) in December 2017, whilst the country case study was in progress. This has set in motion the implementation phase for Ghana, which is a long awaited event since the drafting of the Policy started in 2011.

This case study, whilst limited in its ability to interact with all stakeholders, has identified entry points within the operational divisions of Ghana Health Services, as potential areas where the AMR policy platform may seek to embed AMR activities.

Much work has already been done within Ghana to identify the key entry points within the various ministries and government agencies where AMR can be incorporated. These stakeholders already form part of the AMR Policy Platform which is the governance structure for AMR and have been participating actively in the development of the AMR Policy and NAP activities formulation.

The key operational divisions include family health, institutional care and public health which are divisions of the Ghana Health Services (GHS) and other agencies such as Christian Health Association of Ghana, Food and Drugs Authority and the teaching hospitals. These divisions manage the health facilities and contain the essential units that deliver the activities within education, prevention, surveillance and antimicrobial stewardship they are therefore critical in the formulation of the implementation actions. Findings suggest that some AMR-related and AMR-specific activities are already being incorporated in these operational divisions indicating that political awareness and will have been established which is an important initial step towards implementation.

A significant amount of effort has already been put into awareness and education of the public in general and the healthcare workers as to AMR issues through the media and Civil Society Organizations who are a driving force in Ghana. Prevention is being driven through the institutional care division within GHS in the form of infection prevention and control and within public health through the health promotions unit. Stewardship activities are starting out still through the Drugs and Therapeutic Committees in hospitals however much is being done on access to medicines in general through the Food and Drugs Authority, the Ghana National Drugs Programme (within GHS) and Pharmaceutical Services of the Ministry of Health.

There are a number of ministry units, agencies and development partners who are already working in or willing to work in AMR surveillance resulting in some overlap of effort and duplication of resources. Within human health surveillance public health surveillance is focused on the national reference laboratories and sentinel site surveillance for AMR and condition specific pathogen identification such as malaria, HIV and TB. Clinical diagnostics support is focused more on laboratory strengthening support to hospital laboratories. This area includes technical laboratory processes and microbiological identification and susceptibility testing, basic laboratory information systems, quality management systems and procurement of laboratory reagents and consumables.

Ghana also has a very active civil and faith-based health association in the Christian Health Association of Ghana (CHAG) which is also the second largest provider of health care besides the government. With a large presence in rural communities, CHAG has the structures in place to reach a large population and is seen as an important implementation and advocacy stakeholder for AMR.

Animal health and environment surveillance are still limited and would require significant funding to strengthen AMR efforts as government funding is not sufficient to allow for basic activities to occur or to be expanded for AMR specifics.

However, to take AMR to full scale or continue with existing programs where short-term funding is ending in the near future, additional resources should be mobilized in the following operational areas within the three Ministries or associated authorities¹:

- Infection prevention and control and health promotion divisions within Ghana Health Services to promote awareness on AMR nationally, improve infection control education and training of health care workers and the public. To this end these objectives also meet the objectives of the International Health Regulations and Global Health Security Agenda where much donor attention is focused currently.
- Food and Drugs Authority to perform pharmacovigilance, post-marketing surveillance and medicine quality testing once donor funding ends in 2018;
- Ghana National Drugs Program to scale up and ensure functional Drugs & Therapeutics Committees to perform stewardship activities at most hospitals;
- To scale up veterinary services' response to AMR including surveillance guidelines, monitoring and enforcement of appropriate antibiotic use;
- Environmental Protection Agency to expand its laboratory testing to include AMR and to increase sampling of water, waste effluent and enforcement of non-compliances;
- Key operational divisions are family health and institutional care which looks after mother and child health and laboratories. As we were unable to meet the main stakeholders in these divisions due to a meningitis outbreak, we are unable to ascertain the extent of potential entry points and this should be explored more deeply.

Ghana's health financing system has evolved over time from mainly international funds to predominantly public funds as the country achieves Low Middle Income Country (LMIC) status. This does mean that many donors and development partners are closing off programs. However, there is still an opportunity to utilize the development partners more effectively to support AMR work by framing the AMR health risk within the context of the International Health Regulations and their existing key priorities and programs. Many development partners interviewed have identified where they are interested in working in AMR and that they could be engaged on a more specific basis in this regards.

Key suggestions received on how to engage development partners further on AMR included:

- Providing them with evidence of the threat that AMR is posing to clinical care and the achievement of the Sustainable Development Goals such as maternal and child mortality. This should include how AMR is a health and a food security threat (IHR and GHSA aspects).
- Generating awareness amongst the development partners in the fora they participate in, especially the Health Sector Working Group. A case could be made for the inclusion of AMR to be part of the "aide memoire" in April 2018 to serve as an operational plan for development partner aid in Ghana.
- In addition, the Development Partners' Forums should be engaged directly to discuss AMR, improve streamlining and fill the gaps in funding for critical AMR activities relating to Joint External Evaluation (JEE) findings and Global Health Security Agenda objectives.
- Development partners should be engaged to simultaneously work in clinical diagnostics strengthening alongside the national surveillance system (this was also a key finding of the JEE) or in supporting other areas of surveillance such as antimicrobial use and animal health aspects.

¹ "Mobilizing resources" means getting more activities done that are relevant to AMR. Therefore, resource mobilization ranges from doing existing activities in a somewhat different way to attracting new resources to work on AMR.

3. AIMS OF COUNTRY CASE STUDY FOR MOBILISING RESOURCES FOR ANTIMICROBIAL RESISTANCE (AMR)

With Ghana having completed the Antimicrobial resistance (AMR) Policy and Implementation Plan (referred to as the national action plan or NAP) in 2017 the time is upon them to determine the way in which these actions will be implemented and the resources and support they will need to take these actions further. However AMR cannot be positioned as another silo program and it will be necessary to leverage resources from within existing ministerial and development partner programs, strategic plans and budgets to achieve implementation.

The overall **objectives** of the work conducted in Ghana on enhancing investment in AMR are:

1. To assist teams working on antimicrobial resistance (AMR) in Ghana to explore the scope to scale up delivery of AMR activities through existing programmes and projects and those that are under development.
2. To identify any funders with a real interest in funding AMR related work
3. To understand how development partners view efforts to mobilise resources for AMR in the country i.e. what is most likely to persuade them to engage with the AMR agenda

The methodology undertaken is described in appendix B.

As Ghana has already come a significant way towards including AMR within existing programs and divisions, this country report reflects the work undertaken and provides guidance on any additional steps that may have been missed to assist with the scaling up of activities. It also suggests approaches to respond to resource mobilization opportunities and the key funders or potential funders to engage with and next steps in relation to these.

4. CONTEXT AND BACKGROUND TO AMR IN GHANA

a. Context

Ghana is a West African low and middle income country (LMIC) with a population of around 25 million mostly young people living in urban areas. The country has a life expectancy at birth of 62 years and has made significant progress in reducing child and maternal mortality and deaths due to human immunodeficiency virus (HIV), Tuberculosis (TB) and malaria over the last few years. The commonest cause of death is still malaria; however, infectious diseases especially respiratory, neonatal sepsis and HIV still play a significant role. Immunisation coverage has been steadily increasing and is at about 90%¹.

There is a dearth of evidence on the cost, use of, as well as resistance to antibiotics. Antimicrobial resistance (AMR) is a major public health concern in Ghana. In a situational analysis² conducted in the country over the period 2013-2016 it was found that antibiotics are widely prescribed (with > 40% of outpatient prescriptions containing antibiotics) and dispensed by unauthorised persons, suggesting weak enforcement of the laws. Antibiotics were also supplied to and from unapproved medicine outlets. The Standard Treatment Guidelines (STG), Essential Medicines List (EML) and the National Health Insurance Scheme (NHIS) medicines list provide restrictions regarding levels of prescribing of antimicrobials. However, existing guidelines on antibiotic use are mostly not adhered to. There are also no standards or guidelines on veterinary use of antibiotics. Surveillance systems for consumption of antibiotics and resistance monitoring were not in place in most health facilities. However, there is an on-going national action to create awareness on bacteria resistance, strengthening knowledge through research and surveillance and development of National Action Plan (NAP) based on the Global Action Plan on Antimicrobial Resistance.

b. Background to the development of the AMR NAP in Ghana

The journey that Ghana has taken to the development of its NAP has been an interesting and collaborative process that has spent extensive time ensuring that a One Health approach is applied and that all key stakeholders have been able to participate and provide their unique inputs into the final document which was ratified by Cabinet on the 6th December 2017.

The process started in 2010/2011 with a few stakeholders in Ghana who identified AMR as an issue for the country and the catalytic technical support and funding of ReAct (Action on Antibiotic Resistance) to start developing an AMR policy. Initial meetings contained nominated stakeholders from health who had or potentially had an interest in AMR. A review was performed of the previous AMR surveillance study conducted in 2005 (ADMER study 2005 Danish funding) in which AMR surveillance had been studied in various universities in the country. This stimulated discussions on the concern and impact of AMR in Ghana. The AMR Policy Platform through order of the Minister of Health was formed to develop the AMR policy. With ReAct support they collected more data on the current status of AMR and then developed an AMR concept note. As part of the updated situation analysis they redid parts of the ADMER study in four teaching hospitals and a regional hospital and conducted a KABP (knowledge, attitudes, beliefs and practices) study with health care professionals and Civil Society Organisations. These studies showed that the AMR situation was getting worse and hence required a concerted effort to be made. This situation analysis then became the basis upon which policy statements were drafted into the first AMR policy document which was completed in 2013.

However over this time they identified that additional stakeholders were required – so veterinary services (Ministry of Food and Agriculture), environment (Ministry of Environment and Environmental Protection Agency) and fisheries (Ministry of Fisheries and Aquaculture) were included and they contributed their inputs into the document. By 2015 ReAct funding had been completed and FAO stepped in to provide support to the Policy Platform to complete the process. Food and Agricultural Organization (FAO) identified that although the four ministries were involved, a truly One Health approach had not been reflected in the document. This resulted in the redrafting

of the policy which was completed at the end of 2016. For the AMR policy to come into effect it required cabinet approval which was sought at the end of 2016, however due to the relevant cabinet ministers being involved in electioneering and the subsequent change of government and ministers, the entire document had to be reapproved by the 4 ministries. The AMR policy was finally approved by all ministers in 2017 November and received cabinet approval on the 6 December 2017.

In the interim, whilst awaiting the policy finalisation, efforts were undertaken to improve the awareness of the public on AMR issues. This was achieved through significant support from Civil Society Organizations (CSO) and the media including workshops with these organisations to educate them on AMR to increase their expertise in educating the public. These two stakeholders have been fundamental drivers of public awareness and of holding the politicians accountable for AMR policy efforts.

The media in particular is seen as a very effective “third force” to drive policy change as well as create the necessary buy in and awareness from the public.

c. Joint External Evaluation outputs and findings

Ghana recently (June 2017) had its Joint External Evaluation (JEE) of its compliance to the International Health Regulations (IHR) and the Global Security Health Agenda (GHS). The review found that at that stage the AMR policy was only drafted and not approved but had been drafted taking into account the One Health approach and was comprehensive as a policy and national action plan.

The key findings from the review included poor compliance scores on all 4 areas:

- Identification of infection – specifically lack of laboratory capacity and systems to perform identification testing and cultures with a lack of standardised methodology to susceptibility testing and lack of validation testing occurring;
- Surveillance of infections found some laboratory capacity existed to do surveillance for specific disease such as TB, HIV, malaria with Global Fund support. However laboratory capacity was not sufficient and a lack of standardisation of testing methods was identified as a gap including the collation of data for surveillance;
- Healthcare Associated Infections (HAI) – Infection Prevention and Control (IPC) policy and guidelines exist with designated IPC professionals and focal points. However the capacity needed to be strengthened including the use of the guidelines and standard operating procedure at facility level. This required an monitoring and evaluation (M&E) system to be put in place to monitor the effectiveness of IPC activities and increase the human resource capacity.
- Antimicrobial stewardship – found that training of health and veterinarian professionals on appropriate antimicrobial use needed to occur including more research into AMR and enforcing laws on antimicrobial access.

Recommendations for priority actions included approval of the AMR policy and NAP, strengthening of Laboratory services including the designation of sentinel sites for AMR and implementation of the IPC guidelines in health facilities.

d. Health sector structure for Ghana

Ministry of Health (MOH) of Ghana was restructured in the 1980’s to ensure that the political policy structures were separated from operational/technical service delivery points. This has resulted in some divisions remaining within MOH and some being placed within Ghana Health Services (GHS). The key directors relevant to AMR within the MOH are policy, planning and M&E, procurement and supplies.

Health service delivery is carried out by both government and non-governmental health facilities and agencies and is split across the levels of health:

- Community Based Health Planning and Service (CHPS) combines public health and basic clinical care within the community

- The Ghana Health Services provides public health and clinical services at primary and secondary levels
- Tertiary hospitals provide tertiary and specialist services and act as main referral centres
- Christian Health Association of Ghana provides district level primary health care especially in remote areas
- Private hospitals

Prior to the 2013 key priorities of government were to improve coverage of primary health care services with CHPS being the main strategy. Through this period there were improvements in child health mainly due to the scale up of the immunization program including the introduction of new childhood vaccines, training of community health workers in the integrated management of childhood illness and the scale up of the school health programme. However communicable diseases still remained a concern and accounted for significant deaths.

The 2014-2017 health sector goals include expansion of access to services, quality of health services and intensifying prevention and control of communicable disease to allow the country to achieve the sustainable development goals ³. Within the Sustainable Development Goals (SDG's) there is mention made to intensifying the immunisation program and the management of childhood illnesses and the scale up of the national malaria, HIV and TB control plans. They are focused on strengthening the integrated disease surveillance and response at all levels as part of the IHR. Regulation of pharmaceuticals and medical products including the regulatory authority's ability to enforce and improve surveillance and quality control of medicines in the country are also part of the strategy.

The ministry has various agencies which receive separate funding including the GHS, teaching hospitals, colleges of various health professionals, academic institutions, Food and Drugs Authority (FDA) and the National Health Insurance Authority (NHIA).

The GHS is a public service body and is an autonomous executive agency responsible for implementation of national policies under the control of the Minister for Health through its governing Council - the Ghana Health Service Council. The GHS continue to receive public funds and thus remains within the public sector. However, its employees are not part of the civil service, giving them independence to ensure they have a greater degree of managerial flexibility to carry out their responsibilities, than would be possible if they remained wholly within the civil service. GHS does not manage teaching hospitals, private and mission hospitals however.

e. Agriculture sector in Ghana

The Ghana Ministry of Food and Agriculture (MOFA) focus is on sustainable agriculture (specifically crops and cocoa) and agribusiness with a renewed emphasis on modernising the agricultural sector culminating in food security, employment opportunities and reduced poverty. Food security has remained a priority and is an underlying and crosscutting issue for the health and environmental sectors. While the MoFA's 2007 Food and Agriculture Sector Development Policy (FASDEPII) lays the frameworks for addressing food security and agribusiness issues, the Live Stock Development Policy (2004) highlights the importance of the Ghanaian farming system and its emerging threats.⁴

- Improving animal health (using community animal health workers).
- Processing and marketing of livestock, and increasing the awareness on food safety and public health.
- Facilitating the development of a livestock statistics and monitoring system.

The Livestock Development Strategy has additionally highlighted limitations within the livestock sector and has listed two issues: feed manufacturing and veterinary drugs and vaccines. The following are highlighted as general problems of veterinary drugs and vaccines:

- Poor quality drugs
- Limited distribution
- Poor storage (cold chain tends to be easily broken)
- High cost
- Repackaging difficulties
- Inadequate training of suppliers leading to poor advice on effective use of drugs

The veterinary services in the country were originally provided by public sector institutions until 1998 when the private sector was allowed to provide some of the services, including clinical treatment and distribution and sale of vaccines and drugs. The public sector Veterinary Service Division continues to dominate in the following areas: control and eradication of diseases, diagnosis and control of poultry diseases, control of endo- and ecto- parasites through use of anti-helminthics, provision of laboratory services, control of imported livestock through quarantine station in order to prevent the introduction of contagious and infectious diseases into the country. The report cites the provision of these services and others by the public sector to be mainly constrained by inadequate facilities and logistics.

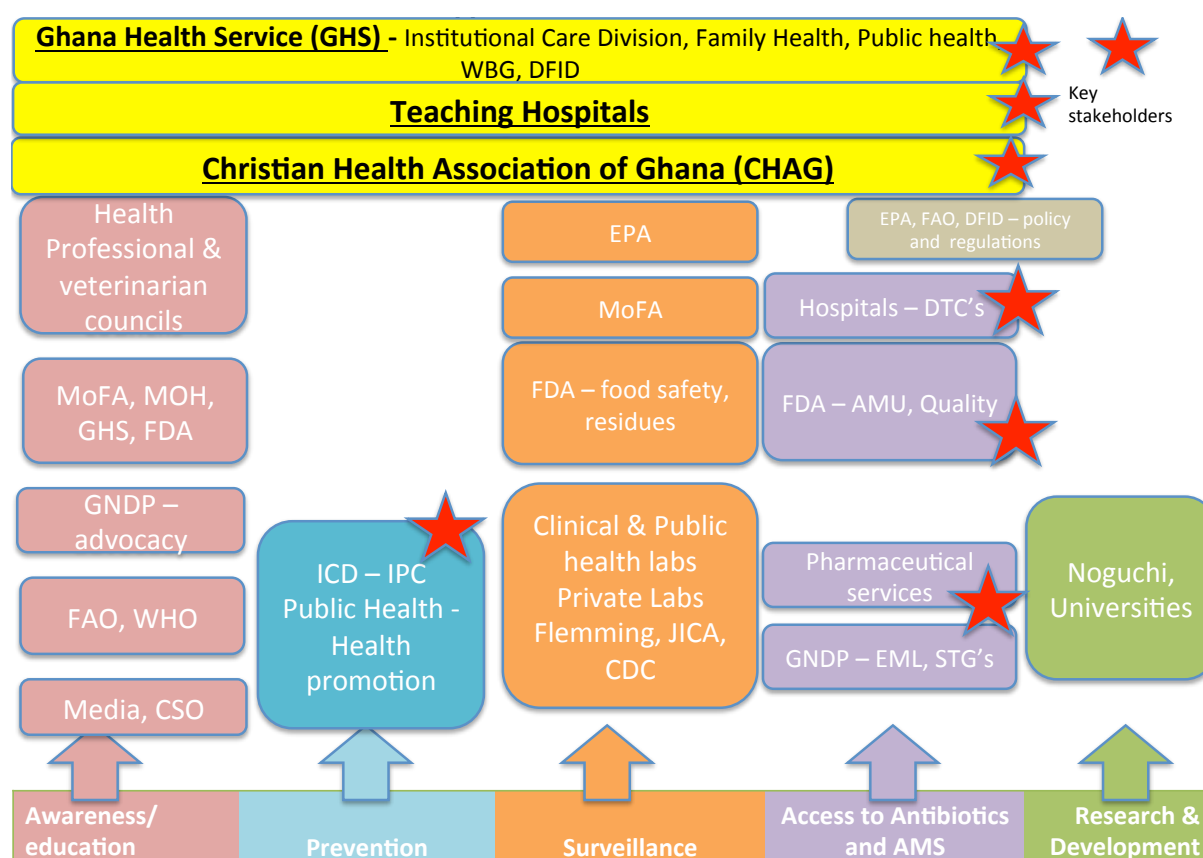
There have been a number of projects in the past that have focused on the vaccination and control of diseases within livestock populations. To date, there is only one on-going project that is focused on vaccination, specifically on poultry. This "Vaccination of Rural Poultry with V4 1 & 2 and Newcavac" was started in 1999 by the NGO RICERCA & COOPERAZIONE"⁵. It is unclear the current state of this program.

KEY FINDINGS

GETTING AMR INTO EXISTING PROGRAMS

Much work has already been done within Ghana to identify the key entry points within the various ministries and government agencies. These stakeholders already form part of the AMR Policy Platform and have been participating actively in the development of the AMR Policy and NAP activities formulation. The map below illustrates the major stakeholders interviewed and how their main activities can be mapped against the five pillars of the AMR strategy. Details of each stakeholder and development partner interviewed or researched are available in the next section of this report.

Figure 1 - Stakeholder mapping against AMR pillars



Limitation: some of the key officials in GHS were unavailable during the time of the study as they were dealing with a meningitis outbreak so details of their work is gathered through 3rd party source.

The overarching key stakeholders for AMR who have activities which fall across the majority of pillars is Ghana Health Services (GHS), Christian Health Association of Ghana (CHAG) and the teaching hospitals – as they manage the health facilities and contain the essential divisions that deliver the activities within education, prevention, surveillance and antimicrobial stewardship. These three agencies are critical in the formulation of the implementation actions.

A significant amount of effort has already been put into awareness and education of the public in general and the healthcare workers as to AMR issues through the media and Civil Society Organizations. Individuals who are passionate within the AMR Policy Platform and the agencies that they represent have driven these efforts. In fact Ghana is seen as the forerunner on media advocacy on AMR in Western Africa.

Prevention is being driven through the institutional care division within GHS in the form of infection prevention and control and within public health through the health promotions unit. Both these programs have indicated that in order to fulfill their functions more specifically for AMR additional funding will be required as these were activities that were donor funded in the past and have no government funding source currently.

And efforts are being planned to ensure access to medicines of high quality, essential medicine lists and treatment guidelines and diagnostic and therapeutics committees for antimicrobial stewardship efforts. These are driven by the pharmaceutical services, national drugs program and food and drugs authority (FDA) within the hospitals utilizing government funds and some additional external funding.

There are a number of stakeholders who are already working in or willing to work in AMR surveillance resulting in some overlap of effort and duplication of resources (see next diagram below)

Figure 2 - Mapping of key development partners in AMR surveillance

	Human health					Animal and environment health	
Public health surveillance	National reference lab (NPHRL, KCCR, Noguchi)		JICA Fleming Fund Universities			Animal health ref lab	FAO OIE Fleming Fund
	Sentinel sites						
	AMR (WHO GLASS pathogens)	Pathogen specific (enteric, respiratory)	Malaria HIV TB	VHF Yellow fever		Sentinel sites for AMR surveillance	FAO OIE Fleming Fund
	Fleming Fund	US CDC JICA (study)	USAID JICA	JICA			
Clinical diagnostics	Technical lab processes and testing methods	Basic lab information systems	Quality management systems	Procurement of reagents, consumables, equipment		Food safety labs and Residue testing	FDA (Fleming Fund)
	XXX	PHI (through USCDC, USAID funding)		XXX		Environmental testing labs	XXX

XXX – no development partners identified working within this space

** please note this is based upon the number of stakeholders interviewed and may not reflect the entire stakeholders

Figure - Development partners identified working within surveillance

Within human health surveillance the key areas of surveillance activities include:

- Public health surveillance focused on the national reference laboratories and sentinel site surveillance for AMR, condition specific pathogen identification, malaria, HIV and TB and finally yellow fever and viral haemorrhagic fevers and the like;
- Clinical diagnostics support which is focused more on Laboratory strengthening support to hospital laboratories who are providing pathogen detection, identification and susceptibility testing to allow clinical treatments to be directed by clinicians. This area includes technical Laboratory processes and microbiological identification and susceptibility testing, basic Laboratory information systems, quality management systems and procurement of Laboratory reagents and consumables.

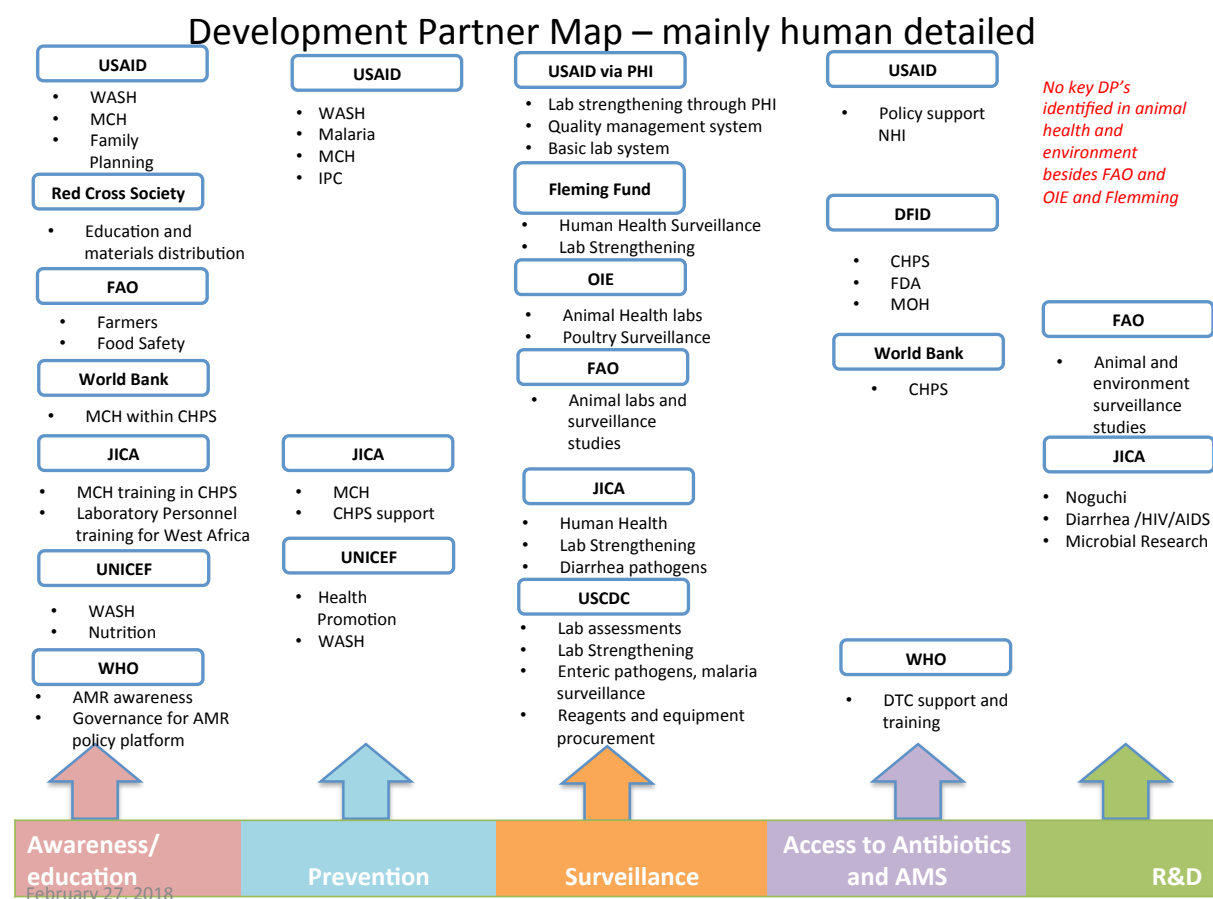
From the mapping exercise it appears that there are a number of key development partners already involved in the public health surveillance space –either through existing programs such as Japanese International Cooperation Agency (JICA's) training and enteric diseases pathogen surveillance or United States Center for Disease Control (US CDC) and Fleming Funds recent laboratory status assessment for sentinel site surveillance. There appears to be a need to better coordinate the partners and engage them in their activities in such a way that duplication and overlaps are removed and the surveillance program established meets the needs of the country whilst maximizing the resources of the donors to the best effect.

There are very few development partners involved in the clinical diagnostics support and basic Laboratory strengthening areas that form a critical base to the entire surveillance system. These clinical diagnostics are the basis upon which the clinicians will be able to perform their stewardship activities by ensuring correct antibiotics are prescribed for the organisms cultured and therefore strengthening of this level of surveillance is critical. **Development partners should be engaged to simultaneous work in clinical diagnostics strengthening alongside national surveillance (this was also a key finding of the JEE).**

In terms of the other pillars of the AMR Policy, the development partners were identified who are currently working in these spaces. The key development partners appear to be:

- USAID – programs span the entire AMR objectives/ pillars;
- World health Organisation (WHO) – specifically governance and AMS guidance and support of the diagnostic and therapeutic committees;
- World Bank as their maternal child health (CHPS) program has integration points for AMR as well as data indicator information on antimicrobial use;
- JICA as they have a very large technical capacity in laboratories as well as they provide community level and maternal health programmatic support in the field.

Figure 3 - Development partner mapping to the AMR pillars



Limitation: Our interviews allowed us to only meet with a few of the key development partners in person. Others were researched on the internet, however details on some websites are limited so they have been excluded from the mapping exercise as we were not able to verify their activities.

Suggestions received on how to engage donor partners on AMR include:

- Evidence should be provided to development partners of the threat that AMR is posing to clinical care and SDG achievements. This should include how AMR is a health threat and a health security threat.
- Generating awareness through presentations in big fora where donors participate especially the Health Sector Working Group. A presentation should be made and a case for inclusion of AMR within GHS to be part of the aid memoire in April 2018 (which determines the operational plan for the next period for all development partner work). In addition the Development Partners Forums should be engaged directly to discuss AMR and how existing projects of the DP's are overlapping and can be streamlined to meet the gaps in funding for critical AMR activities relating to the JEE findings and GHS objectives.
- Development partners should be engaged to simultaneous work in clinical diagnostics strengthening alongside national surveillance system (this was also a key finding of the JEE) or in supporting other areas of surveillance such as antimicrobial use and animal health aspects.

Funding for AMR incorporation or new activities

The following key departments and agencies have indicated that they would require specific funding to perform their work related to AMR. This is due to their not being government funding for specific AMR activities currently or where they are reliant on donors at the moment to support such activities in other programs and this funding will end in the near future:

- Infection prevention and control within the Clinical Information Services to continue with audits of health facilities, monitor compliance to the guidelines and provision of ongoing training of health care workers.
- Health Promotion within Public Health for specific national AMR campaigns to be run using media, posters and TV or radio jingles
- Food and Drugs Authority to perform pharmacovigilance and post marketing surveillance medicine quality testing (this is due to Department for International Development (DFID) funding coming to end in 2018)
- Ghana National Drug program to scale up and ensure functional DTC to perform stewardship activity at hospitals
- Significant funds are required with veterinarian services in general to scale up their response to AMR including surveillance guidelines, monitoring and enforcement of appropriate antibiotic use
- Environmental Protect Agency requires funds to expand its Laboratory testing to include AMR and to increase sampling of water, waste effluent and enforcement of non-compliances.

KEY MINISTRY DEPARTMENTS AND AGENCIES - HEALTH

a. Ghana National Drugs Programme (GNDP)

The functions of the Ghana National Drugs Programme (GNDP) include:

- Strengthening policy framework for evidence based selection and rational use of medicines including Essential Medicines List (EML) and review of Standard Treatment Guidelines (STG's).

This includes training on the use of the guidelines as well as institutionalising prescription audits for rational prescribing reviews.

- Expanding on existing policy frameworks to meet the challenges of a developing country including reviewing drug policies including a comprehensive policy in Antimicrobial resistance and standards of pharmaceutical care

The AMR policy and plan was initially driven by the GNDP within the Ministry of Health until additional stakeholders were brought on board and a pharmaceutical services division was established within the Ministry. The GNDP directorate oversees rational medicine use for the country and has developed and implemented the Essential Medicines List (EML) and Standard Treatment Guidelines (STG's) which were recently published (2017). These are being distributed to facilities along with training to clinicians and staff to understand where new evidence has changed the guidelines and how to use them as this is the biggest constraint in the country so far. Most facilities have drugs and therapeutics committees (DTC) which function to a varying degree but are responsible for the rational use of medicines in their facilities. AMR would be well placed within these committees in the future.

The GNDP also conducts audits of prescription charts to review compliance with treatment guidelines at a sample of facilities in various regions alongside the facility staff. This is done by reviewing archived prescriptions against STG. These opportunities serve to establish an understanding of the need to follow guidelines and where gaps are and AMR is a critical component of these audits. The work of the unit is critical to ensuring patient level practices are evidence based and antibiotics are used appropriately.

They also use the process of the audits to empower pharmacists to educate their patients on how and when to use medicines appropriately.

However the unit receives only limited funding from external development partners – mainly WHO to support these activities.

b. Pharmaceutical services

Pharmaceutical services is a division within Institutional Care of the GHS as well as a directorate within the MOH as chief pharmacist. The division provides advice to the minister on issues relating to medicines and their appropriate use especially as medicines are a significant part of the health budget.

Most facilities have DTCs which function to a varying degree but are responsible for the rational use of medicines in their facilities. AMR would be well placed within these committees in the future and will need to be driven by guidelines on antibiotics use and supported by training of the members of the committees in the application of these guidelines in their facilities. There is also a close link with the National Health Insurance aspects of funding for medicines and the DTCs where short funded medicines are brought to the attention of the DTCs to review compliance to treatment guidelines and improve appropriate prescribing in the facilities as to not incur a loss.

c. Laboratory and surveillance aspects for AMR resistant organisms

(From the Fleming Fund report, meetings with Dr Alex Owuso Ofori (KCCR), Prof Ellis Owuso Dabo (KCCR), Mr John Aiyase (Clinical laboratory unit within Public Health GHS) and Dr Japeth Opintan (Microbiology Laboratory at University of Ghana)

A key finding from our assessment of the laboratory and surveillance stakeholders in Ghana is that:

- the key institutions providing "reference" Laboratory level services and research involved in AMR surveillance at a national level currently are University of Ghana Medical School and Microbiology Department Laboratory, Kumasi Centre for Collaborative Research in Tropical Medicines (KCCR) and Noguchi Memorial Institute for Medical Research. Noguchi's mandate does not allow it to provide public health services as part of the GHS however.

- Teaching hospitals have their own microbiology laboratories, performing the required surveillance tests and providing diagnostic information to clinicians for patients as well as up to the reference laboratories above. They however are not all using the same testing methods or criteria and a formalized referral system of specimens is not established.
- The GHS laboratories are within the regional, district hospital and health centers and are able to provide microbiology services to their facilities. They have a clearly defined referral system for samples relating to TB, HIV and malaria which is adhered to. This mechanism can be used to extend AMR surveillance and therefore develop the AMR surveillance referral system once a reference laboratories is defined.
- There is no formally identified reference laboratory.

Current partners in the surveillance space include:

- Partnership for Health Care Improvement (PHI) (which is US CDC funded) who are running a 5 year program to bring quality management systems to all laboratories in Ghana across the surveillance spectrum and not just for AMR. They are capacitating the basic Laboratory information systems (BLIS) and processes/ protocols to ensure uniformity in the way testing is conducted using quality improvement methodologies.
- Global fund – mainly for HIV, TB and malaria testing
- USAID – mainly for HIV, TB, malaria and includes outreach training of laboratories
- Noguchi Memorial Institute for Medical Research mainly focused on TB, HIV and Malaria and samples of non-routine testing for new or unique pathogens.

Key recommendations on surveillance collated from all key informants is the following:

- Communication and collaboration between the existing laboratories needs to be established in order to determine the most suitable surveillance and diagnostic testing systems to be put in place;
- A surveillance technical coordination structure/ meeting to be set up to map out the existing resources and understand their various constraints to effectively provide onsite microbiology testing and surveillance between the various agencies, institutions and government departments;
- A set of standardized testing and reporting protocols to be developed and agreed by the coordination structures;
- A holistic view should be applied to laboratory services rather than a programmatic view in order to systematically and consistently strengthen all aspects of the Laboratory without favoring one aspect such as TB, HIV, malaria on AMR over the other;
- Laboratory scientists up skilling to perform a variety of tests in a consistent and standardized fashion – therefore training should be focused on developing this standardized skill across all laboratories;
- Procurement of Laboratory reagents and consumables to be centralized and standardized such that laboratories have reagents when needed to provide the service. (this was also a key finding of the JEE);
- Funding for all laboratory services to be consistent and ring fenced such that a dedicated fund may be established to support this work – possibly with a pay for performance incentive system to ensure that laboratory results get to the clinician treating the patient, good quality techniques are applied and appropriate specimens are sent to the reference Laboratory.
- Therefore all facilities need to be upgraded, their standard operating procedures (SOP) unified and external quality control systems established. Strong information technology support need to create a harmonized platform to all for the sharing of data - WHONET is ideal software as a minimum and simplest way to compare data. Modalities for transporting logistics/data from the laboratories to facilities and vice versa. Biosafety and security needs to be improved. Contracts for the servicing of Laboratory equipment needed.

Specific Laboratory issues as provided by Dr Japeth Opintan feedback to AMR Policy Platform meeting:

Through Fleming Fund some key laboratories have been visited – 3 teaching hospitals, 2 regional hospitals, 1 district hospitals and Medical Microbiology Laboratory as National Reference Laboratory.

Fleming Fund assessment tool was used to do a need assessment of each facility under 5 themes and the findings include:

- Clinical information - primarily clinicians make requesting tests with some patient data but no unique patient identification (results in multiple entries for the same patient) and as it is paper based systems only information on the request can be collected. Four out of seven laboratories are paper based others can do electronic capturing of some of the data. There is no link with pharmacy data for antimicrobial use. The staff are well trained with at least 1 degree each
- Laboratory infrastructure – varying degrees of renovations required with some basic equipment needed. . All laboratories submit budgets to central administration for their consumables and central procurement occurs however this has lead to shortages in essential reagents being common, resulting in Laboratory testing being halted. There is no restricted access control at laboratories so security needs to be put in place from a biosafety point of view. Laboratory waste is not decontaminated appropriately and needs equipment to do this. Equipment available has no maintenance service contracts resulting in delays in repairs to equipment as these are sourced from the hospital maintenance services.
- AMR diagnostic capabilities – basic laboratory equipment available but facilities differ in their varying needs and support. Media preparation is not done in dedicated rooms with precision. Only five of the seven laboratories have automated blood culture systems but these are not used as the blood culture bottles availability is a major limitation and halts services. Only one has pathogen identification machines whilst all others use manual identification of isolates that is very inaccurate. Several deviations in bacteriological testing occur due to there being no SOP's, guidelines not properly used/followed, no quality control strains used or correct blood plates, antibiotic disk brands are poor quality products from India. No external quality assurance occurs.

Bug versus drug matching against WHO GLASS – for most of the pathogens and antibiotics these are tested by the laboratories – six out of eight pathogens cultured and not all the antibiotics.

- Data management – looks at storing of data and sharing. As most of the laboratories use paper based systems they are unable to store or share data. Some have BLIS and these need to be harmonized in order to report and share. AMR data is not analyzed for local surveillance at the facility level either.
- User fees are paid for Laboratory testing in some laboratories – these go to the hospital and then not available to the laboratory to use to improve their procurement, equipment and services.

f. Health Promotion – within family health of GHS

There has been a repositioning of health promotion within the last 3 months in GHS to focus on a health systems approach and not a programmatic approach. There are discussions to create a MOH directorate on health promotions that will oversee the policy formulation whilst the division within GHS will develop the strategic framework to deliver the services on the ground. This upliftment of health promotions will help support the already well-established media, advocacy, and awareness activities for AMR.

The health promotions division works directly with the units requiring education and awareness activities and alongside a number of donors including United Nations International Children's Emergency Fund (UNICEF), US CDC and WHO. They are focusing more on risk communication for things such as healthy lifestyles, hygiene, and water sanitation and hygiene (WASH). Within their unit is a social mobilisation and change communication structure which formulates communication strategies with the clients and then a materials development unit that can work on print, radio and TV materials as needed.

Within the District Information Management system are some key indicators which look at health promotion effectiveness. These have however not been rolled out with any training to the staff collecting the information and therefore the data is not useful to determine impact of communication and health promotion activities as yet.

Their key distribution partner of print materials is Red Cross who help mobilise the communities and communicate the necessary messages to them as part of the various campaigns. There are health promotions staff within most facilities who are also key to dissemination of messages.

They require specific funding to do any specialised communication campaigns such as AMR and would need support to assist with the roll out and training of health staff to collect the indicators for M&E purposes.

g. Institutional Care Division

The Institutional Care Division is involved in the clinical services delivery for GHS's facilities. They oversee the implementation of health care professional services, quality assurance and mental health and clinical information and monitoring. They are also overseeing Infection Prevention and Control which includes coordinating and monitoring all IPC activities. Until the Ebola outbreak in 2016 the value of IPC was not acknowledged. This led to massive mobilisation of resources around the training of health care workers and communities in IPC practices against the recently updated IPC policy, training manual and guidelines for health facilities. They also have established rapid response teams and border control mechanisms which were shown to be effective during that outbreak.

Their key development Partner has been USAID in various programs (Assistance for Health, Maternal and Child Survival program). They assisted with the review of the IPC policy and inclusion of Ebola as a concern; they reviewed the content of the training manual and funded the train the trainer master training that occurred. These master trainers then were responsible for rolling out training to all the health care workers in their hospitals.

Recently their IPC unit started conducting audits in health facilities (over 100) to assess their continued compliance with hand hygiene, safe injection practices, waste management and general behaviour issues relating to the guidelines and policy. Monitoring was also done just after the training to measure the impact of the education. They are collecting the results currently.

Most hospitals have IPC structures as part of the IPC policy requirements. The larger hospitals will have committees but the smaller ones mainly focal persons. These IPC practitioners are not trained other than the training they received on the guidelines and do not get reimbursed for the extra work that they do.

As part of the District Information Management System, IPC indicators are being merged with WASH and a standardised collection and definition system is being established with training for staff. This process requires funding support.

They also need to develop a health care associated surveillance tool in 2018 to support the collection of HAI information.

Their key development partners included WHO, UNICEF, USAID and US CDC. They provide these donors with proposals for any new activities that they would like to undertake.

CHRISTIAN HEALTH ASSOCIATION OF GHANA

The Christian Health Association of Ghana (CHAG) is the coordination unit of over 300 faith-based health facilities around Ghana that include hospitals, schools, and training facilities. The health facilities are located mostly in rural areas and service 40%-90% of healthcare services within the rural area and about 10%-40% in cities. CHAG is the second largest healthcare provider outside of government-sponsored facilities. However it is an independent agency that can produce its own guidelines and implement its own changes as it sees fit. CHAG holds a unique position in which it engages its constituents among its hospitals, churches, schools, and social spaces to conduct AMR integration. CHAG has already begun to integrate AMR into existing programs among procurement and advocacy areas.

CHAG has identified two major areas for AMR integration - drug procurement and advocacy. Within its procurement initiative, CHAG is setting up a central procurement system to improve medicine availability and quality within health facilities. This program will be a digital monitoring system that will ensure accessibility of data for monitoring and evaluation. The procurement program will focus on drug sourcing, ensuring FDA-compliance, and limiting counterfeit antibiotics within its market. Other AMR integration points CHAG has already begun implementing are within education and training. CHAG is expanding AMR education within its health training facilities focused on nursing and midwifery audiences. CHAG plans to integrate its education and awareness among all of its facilities in the future where it conducts mother and child programs. With a large presence in rural communities, CHAG has the structures in place to reach a large population and is seen as an important implementation and advocacy stakeholder.

MINISTRY OF FOOD AND AGRICULTURE DEPARTMENTS AND AGENCIES

A. Animal Production Directorate

Animal Production Directorate (APD) is one of the technical directorates of the MoFA. The Directorate has additional mandate to oversee operations of seven National Livestock breeding stations located in various parts of the country. Its mission is to develop, promote and sustain poultry and livestock production for food security, employment creation and income generation through research, effective technical support, extension services.

The main functions of APD are:

- Promote the development of appropriate technologies on management, breeding, nutrition and housing of livestock
- Promote the development of the dairy industry in the country
- Control of animal feed quality both from local and imported sources including permit issuance
- Promote the use of crop residues and agro industrial by – products in feeding livestock and poultry
- Promote the development of processing and marketing of livestock and poultry products
- Facilitate the provision of stock water in livestock producing arrears where water resources are scarce

B. Veterinary Services Directorate

The mission of the Veterinary Services Directorate (VSD) of the Ministry of Food and Agriculture is to ensure a stable animal health situation through the provision of quality animal health care services by both public and private sector veterinary practitioners to enhance livestock, poultry and companion animals' production and productivity. The main functions of the Veterinary Directorate are:

- To ensure the timely availability of reliable and relevant data on animal health information for efficient management decision
- To strengthen institutional capacity for improved animal health management and services delivery.

- To improve farmer and public knowledge of animal disease and encourage their participation in animal disease prevention and control activities.
- To ensure protection of public health through controlling diseases communicable from animals to human beings.
- To ensure that meat and other products of animal origin are safe for human consumption
- VSD helps to regulate imports of meat and animal products by ensuring that such products come from countries certified by the World Organisation for Animal Health (OIE) to be disease-free.
- Control of movement of animals by ensuring that only healthy animals are permitted to be moved from one area to another to prevent disease transfer. And to ensure that all animal coming into the country are quarantined and only those found healthy are allowed passage into the country.
- To alleviate the suffering of animals through timely veterinary intervention and educating the population on animal welfare issues.

The VSD is also responsible for the following: planning for emergencies and reporting to international bodies, general formulation of animal health development policies, creating of an enabling environment for private sector participation in the industry, liaising with and monitoring the activities of private veterinary clinics to ensure quality animal and health care services to their clients, and facilitating wildlife surveillance.

Fleming Fund assessment of Animal health laboratories included the following findings:

The newly constructed food safety Laboratory requires equipment, reagents and media for the programme to start and needs to link into a formal regular program of surveillance and food safety testing in the country.

Laboratories assessed had issues with correct Laboratory testing and isolation including lack of quality controls and reference strains.

Plan to first strengthen the food testing Laboratory to provide stronger technical support and procurement of reference strains and training of staff on identification and characterization of organisms. A safe transportation system for specimens needs also to be implemented. A database for management, validation, analysis and reporting for AMR data is needed and training for staff to use the WHONET system for input and analysis.

The Head of Public Health within the Veterinary services was one of the first key people involved in the AMR Working Group. Since then, veterinarian services public health has focused on AMR activities that require no funding such as collection of existing data on antimicrobial use from import data in order to meet the OIE reporting requirements. This data was collected for 2015 - 2016 and additional work was done to further split out the use of antibiotics into the classes. These were compared to the available studies on AMR in the veterinary services in order to present an argument to the veterinary ministry officials of the need to curb antimicrobial use due to the link with resistance.

The public health directorate has budget for the audit and inspection of slaughterhouses. Through these inspections they collect evidence of non compliance to hygiene standards and AMR concerns and use these to generate awareness amongst the public through news and television programs and then with the politicians in the ministry. This has increased the profile of AMR in veterinary services and the political will and understanding of the need for greater interventions because of the impact on food safety and therefore their own individual health and wellbeing.

If they are to move more into the field and improve their surveillance this will need funding.

A key sector is poultry due to its large production capacity and the volume of antimicrobials consumed followed by pigs and cattle.

Donor funding for veterinarian services is limited as not many donors view the importance of veterinarian public health aspects unless the link can be made to bilateral country economic or trade agreements or demonstrate impact on human public health.

A key partner is OIE who uses its United Nations status to request data from countries thereby giving veterinary services a mandate to collect such information. OIE doesn't support with funding through. On the other hand FAO has provided funding for small studies in animal health which they fund, plan and drive themselves such as one being supported now on a poultry situational analysis with AMR surveillance and Antimicrobial supply chain and use assessments in poultry farms in one region in Ghana.

ENVIRONMENTAL SECTOR

The Environmental Protection Agency (EPA) is the leading public body for protecting and improving the environment in Ghana. The EPA was established in 1994 and acts as an independent regulatory and enforcement entity from the Ghana Ministry of Environment, Science and Technology (MOEST). The role of EPA is to set environmental standards that manage, protect and enhance the country's environment. The MOEST acts to set national policies.

The EPA's financing is heavily based on internally generated sources with additional funding from international donors on specific projects. Key donors include the Global Environmental Facility, World Bank, Government of Norway, and the United Nations Environmental Programme and other UN agencies. The types of projects vary according to funder, but most are centered around watershed management, land & water management, and oil & gas projects.

AMR is being incorporated into the EPA's five year strategic plan which is currently being drafted for the next period and the agency has already begun to adopt AMR activities that were outlined within the AMR national policy plan. There are three main integration points within the agencies strategic plan: improved and expanded surveillance, uniform laboratory policies following the One Health approach, and enhanced public awareness.

Surveillance serves as the focal point of the EPA's integration activities. Current law mandates regular environmental monitoring of effluent from health facilities, aqua cultures, and livestock farms however this is limited to detection of *E Coli*. The Ministry of Environment and EPA coordinate waste management of health care and veterinary waste. These guidelines were developed in 2002, and they do incorporate aspects of water quality testing for microbiological and chemicals and the presence of *E coli* bacilli. The EPA plans to increase monitoring to include AMR of microorganisms, antimicrobial residues, and heavy metals from health facilities. Effluent waste from health facilities can be assessed by distance to understand the hydrological movement of pharmaceutical waste through the environment. It also has implications to understand the impacts it has on local wildlife and flora.

The second AMR integration point lies within the unified policy for laboratories. The EPA plans to update its laboratory policy to align with those of animal and human health. This requires them to equip their laboratories and increase the testing methods for AMR.

The third integration point is in public awareness and donor awareness to increase their funding in AMR. A coordinated effort is needed to highlight the relationship between the environment, public health, and AMR. This can be done by utilizing existing EPA projects and framing it with a health impact lens. By bringing awareness to the intersection of these environmental health projects, the EPA can possibly elicit resources from existing or new funding partners.

Other areas where AMR is part of the EPA mandate is in plant fungicides and pesticides as EPA licenses the import, manufacture and use of these products in plant production alongside the MOFA. The EPA has listed the following as key challenges: funding, donors, departmental buy-in, and awareness of the AMR issue and its relevance to the EPA mandate.

CIVIL SOCIETY ORGANIZATIONS

Civil Society Organizations (CSOs) serve as the primary integration point for introducing AMR awareness to the public. CSOs regularly engage with communities, often in the rural areas, and act as the first contact for disseminating information. Antibiotic resistance themes can be integrated within each CSOs existing health program (health promotion, WASH, mother and child, HIV, malaria, etc.) to ensure behavioural change in the community.

CSOs are currently included within the National AMR Policy Platform and in 2013, a training program was conducted that orientated CSOs on AMR activities. The themes included antibiotics access, use and effectiveness, safety and resistance to antibiotics, perceptions of health worker and patient relationship, and practice and resistance-assessing knowledge of resistance in practice. A KABPS

cross-sectional study was conducted which utilized qualitative and quantitative structured interviews and had a total of CSO 177 respondents in four regions.

The report found that generally all CSO respondents had a fair knowledge on the issue, behaviour, and practices that could promote antibiotic resistance. However, knowledge on antibiotic use and safety and its relation to resistance was weak – and ultimately inadequate to inform attitude and behavioural change in the public. Since the publication of the report, there has been no coordinated effort or guidance to the CSOs to further integrate AMR or increase awareness activity. Some organizations, like Hope for the Future Generation (HFFG) have individually adopted AMR awareness to their existing health programs. HFFG uses its sexual and reproductive health agenda to share about antibiotic abuse. It has recommended that the use of social, print, and general have been useful for health promotion.

Key recommendations for AMR integration in CSOs are:

- Create a coordination committee among health-oriented CSOs
- Develop training guidelines based on the KABPS
- Strengthen community level education and engagement
- Utilize print, social and general media to share basic information with the public

DEVELOPMENT PARTNERS AND DONORS

a. Government Financing Of Health Services

Health Sector Medium Term Development Plan (HSMTDP), 2014–2017 provides the basis for planning within the health sector in Ghana and defines the sectors contribution to the achievement of providing affordable primary health care to all people living in Ghana and it is underpinned by the desire to attain Universal Health Coverage for basic health services in Ghana.

Ghana's health financing system has evolved from a time when the population paid fees for services in the colonial era to the full cost recovery systems of the 1990's which was unsustainable for the majority of the population, to a national health insurance scheme which has been in place since 2005⁶. The health sector in Ghana is financed by traditional sources: public funds which are Government of Ghana (GOG) revenues, private funds from companies and households for both pre-paid voluntary premiums and out-of-pocket payments, and international funds from donors/development partners. Over the same period a shift has occurred in terms of funding from international funds to more predominantly public funds as Ghana has entered LMIC status; government health expenditure was at around 12 % of total expenditure⁷. For the foreseeable future however, there is not much scope for increase in public spending on health and therefore the challenge will be to improve insurance premium and levies and developing innovative resource mobilization through public private relationships. This would mean making trade-offs between which proportion of the population is covered, the range of services and scope of benefits without impacting on out-of-pocket payments for health and being consistent with decentralised fiscal management in the health system.

In the 2016 budget, health spending increased by 10% to around GH¢3,386 million. This included allocations of 1,186 million Ghana Cedis to National Health Insurance Funds.⁸

b. World Health Organisation (WHO)

WHO in Ghana has been a key support partner to the AMR policy platform and the development of the AMR Implementation Plan. They have been actively driving the drafting of a National Action Plan in line with the Global Action Plan of the WHO alongside the AMR policy. They also support other aspects related to AMR including:

- DTC support at health facility level to monitor the use of antimicrobials through the creation and formalization of the structures and providing guidelines and training of the members of this committee to perform their role effectively. They have developed a standardized tool

for the collection of data on antimicrobial use and this is being reported into the pharmaceutical services division and formed part of the situation analysis;

- Consumer awareness on appropriate use of antimicrobials including awareness within the professional associations and media;
- Tricycle project in a region in Ghana to identify extended spectrum beta lactamase pathogens from specimens in humans, animals and the environment and strengthen the laboratories to identify the pathogens. This is being done with the tripartite structures and the National Public Health Laboratory of Ghana.

c. Fleming Fund

Fleming Fund has been actively working with Ghana as a pilot country. They have been part of the stakeholder engagement processes which have developed the AMR Policy and NAP. Bids for implementation in Ghana will be submitted early in 2018, and work will occur through an indigenous lead grantee or NGO who is not a state institution .

d. Department for International Development UK DFID

DFID has made a strategic decision in Ghana to not be involved in AMR work as the UK government already providing for this through the Flemming Fund. However they are part of the World Bank project on maternal and child care within the CHPS which as AMR component in it (£12m)(see below) and they are busy with a health systems strengthening project (finishing June 2018) which includes strengthening the Food and Drugs Authority (£3m) to perform pharmacovigilance, monitor the quality of medicines and improve local manufacturing capacity and adverse events reporting most of which have an AMR component to them. They have also provided technical assistance to the MOH for policy work that has included the support to the AMR policy platform to draft the AMR policy.

Going into their next funding cycle they will most probably not be involved in clinical care or technical assistance in relation to the above project but rather focus on health financing work.

e. World Bank

The World Bank Group (WBG's) Country Partnership Strategy's (FY2013-2018) (CPS) objective is to assist the Ghana government to sustain economic growth, accelerate poverty reduction, and enhance shared prosperity in a sustainable manner. The CPS program is based on three pillars: improving economic institutions, improving competitiveness and job creation, and protecting the poor and vulnerable. In turn, these are anchored in the Ghana Shared Growth Development Agenda pillars of competitiveness and employment, vulnerability and resilience, and governance and public sector capacity.

Ghana is WBG's 3rd largest exposure in Africa (via the International Finance Corporation's) in terms of committed investment volume. As of December 2016, it had committed \$1.81 billion of its own account in Ghana. IFC's current program in Ghana consists of 31 projects, led by investments in infrastructure (74%), followed by manufacturing, agribusiness, and services (14%), and financial institutions (11%). In advisory services, it has implemented over \$41 million worth of projects (\$6.4 million from its own funds) related to trade and competitiveness, financial markets, health, energy, and environmental and social governance.

WBG views their assistance to be health systems focused rather than programmatic focused. Therefore they work across directorates within the GHS and the MOH to ensure a comprehensive holistic project is delivered.

Active projects which may have an AMR component include:

- Maternal, child health and nutrition project (\$68m active 2014-2020) - started implementation in February 2015 and will run until 2020. Project funds are disbursed by GHS

to the regions to enable service delivery at the Community-Based Health Planning and Services (CHPS) level. The funds released have facilitated outreach services in the communities, home visits to follow up on cases, community level meetings on health-related topics, meetings of community health committees and service delivery in over 2,400 CHPS communities. The key component to the project is the institutional strengthening and capacity building through core funding of care activities with a results based pay for performance aspect directed at both the health care professionals as well as the health facility. This is supported through electronic patient records which help collect not only patient clinical information but also the indicators used to pay for performance.

The electronic records can also allow for compliance to treatment guidelines assessment at community level to occur and prescriber's practices to be evaluated.

Built into the program is the development of standardised training curriculum for the community level. Utilising the existing 8 training manuals for community health level workers within programmatic themes, a core standard curriculum has been developed which will be used by all training institutions to train staff and is part of the continuous professional development activities which the health care professionals pay for to maintain their registration.

Within the M&E component there is supportive supervision program performed by the district health staff in outreach activities to the CHPS centres for which they are reimbursed.

- National Health Insurance health financing project (2016-2020) is mainly an advisory and analytics project as the main project was finished in 2012. This however has a significant amount of data on how prescribers are using antibiotics through claims data and may be used for AMR M&E.

There is work being done on ensuring the sustainability of the maternal project by integrating it into the NHI funding project through joint sharing of the cost of activities on a 50:50 basis between NHI and WBG until such time that NHI takes it over completely.

- Fisheries program - (\$53,8m finishing 2017) - is to support the sustainable management of Ghana's fish and aquatic resources by: (i) strengthening the country's capacity to sustainably govern and manage the fisheries; (ii) reducing illegal fishing; (iii) increasing the value and profitability generated by the fish resources and the proportion of that value captured by the country; and (iv) developing aquaculture. AMR was not a feature of the project
- Sustainable land and water management (\$87m) and Rural water and sanitation project (\$45,7m credit) and Accra sanitation and water project (\$150m until 2020)
- New projects including pandemic emergency response advisory services which include cross-sectoral strengthening of the 4 key AMR ministries. This would allow for organisations systems strengthening, legal instrument gap analysis and information management system gap analysis to occur to support improved emergency responses at government level.

AMR is not a specific area of focus for the WBG however much synergy was found with the work in the maternal, child health and national health insurance project including indicators for monitoring of compliance to treatment guidelines and correct rational prescribing. The training curriculum as such does not have a rational medicine use section and this can be added before the curriculum is finalised.

f. USAID

The work of USAID Ghana spans a number of sectors and has possible integration points under their global health and water related initiatives. USAID currently supports the Ghana MOH in issues related to malaria, family planning & reproductive health, nutrition, HIV/AIDS, and health systems strengthening. Additionally, USAID works to increase access to clean drinking water and to sanitation facilities.

AMR Integration opportunities/projects include:

- As part of the President's Malaria Initiative, USAID has invested in malaria prevention and treatment measures within Ghana. USAID has purchased over five million rapid diagnostic tests and over three million artemisinin-based combination therapies for immediate distribution. In conjunction, it has trained nearly twenty thousand malaria health workers.
- USAID programming focuses on improving access, utilization, and quality of essential maternal, newborn, and child health services. Activities incorporate the integrated management of maternal services and childhood diseases, including malaria, diarrhoea, pneumonia, and malnutrition. Maternal health activities focus on delivering quality service, training, and equipment.
- Through services offered at community facilities and communication to encourage social and behaviour change, USAID is tackling an unmet need for family planning by increasing understanding about and access to a range of contraception methods. There is a possible integration point with addressing STI treatment.
- As part of the GHIS and Feed the Future Initiatives, USAID works with the Government of Ghana to improve the nutritional status of women and young children. Activities include strengthening communities to manage and prevent malnutrition; advocacy for nutrition programming; improvement of nutrition-related behaviours; promoting healthy infant feeding practices and care; and encouraging dietary diversity. USAID is also working to increase and level household income through an integrated nutrition and economic resiliency project. In 2014, USAID supported over one thousand health facilities to manage acute malnutrition and trained 1,268 health workers in child health and nutrition.
- USAID supports the strengthening of Ghana's health system through improved policy and providing assistance in leadership development, as well as through financial and management support systems at decentralized levels of the Ghana health sector. In addition, USAID is supporting the continued strengthening of the National Health Insurance Scheme. In the past, USAID has provided healthcare worker training and installed a District Health Information System within USAID-supported facilities to report timely and accurate data.
- USAID intervenes to increase access to clean drinking water and to sanitation facilities. Programs like the WASH for Health Activity also encourage individuals and communities to adopt positive water, sanitation, and hygiene practices while strengthening the community's ability to plan, manage, and sustain activities.

g. Partnership for Healthcare Improvement (PHI)

Partnership for Healthcare Improvement (PHI) is an indigenous Ghanaian organization dedicated to improving the health status of Ghanaians by working in partnership with the government, civil society and the private sector. They work with public, mission and private health facilities to improve the quality of laboratory and clinical services and provide health education to the Ghanaian public at the community level.

Recently they have focused on strengthening laboratory systems for effective clinical diagnoses, as the Ghana affiliate of Global Health Systems Solutions to implement a five-year (2010-2015) project in 16 public laboratories, including all 10 regional hospital laboratories in Ghana, to prepare them for international accreditation, with funding from the United States Centers for Disease Control and Prevention (CDC). They also have sub-agreements with US based organizations such as Association of Public Health Laboratories (APHL) and Jhpiego Corporation to implement their laboratory strengthening projects in Ghana on their behalf. In addition they are currently implementing another five-year (2015-2020) laboratory strengthening project funded by the CDC under the GHSA program where they are working in more than 30 national, regional and district level laboratories.

h. UNICEF

UNICEFs work is focused on the poorest regions of Ghana, working with the most disadvantaged communities, and advocating for national policies that enable the poorest to engage and be protected. Their programmes that relate to AMR include:

- Health and Nutrition – focused on poor children in remote areas.
- Water and Sanitation – water improvements have been achieved however sanitation access is still a concern.
- Education – to remote schools and areas

UNICEF Ghana works closely with the Government of Ghana, building national capacity to design pro-poor policies, reform and manages systems and delivers services to its citizens. At the same time, UNICEF Ghana works with communities, and especially with young people and in partnership with civil society organizations, to build mechanisms that empower communities and help to hold the government to account on delivering results.

Their key donors include:

- Canada's Department of Foreign Affairs, Trade and Development
- Korean International Cooperation Agency
- Government of Japan
- Government of Netherlands
- United Kingdom Department for International Development (DFID)
- USAID
- European Commission
- Bill and Melinda Gates Foundation
- The Vaccine Alliance (Gavi)
- Conrad N. Hilton Foundation

i. Global Fund

Ghana has a special history with the Global Fund, being the first country to sign a Global Fund grant in 2002. Since then, the country has made great progress against HIV, TB and malaria. Global Fund investments in Ghana over the past 12 years have contributed more than \$725m to strengthening of the health systems.

Their key project is HIV, TB and Malaria which includes the following targets :

- Securing antiretroviral medication
- Extending HIV prevention services to reach key affected populations
- Increasing antiretroviral coverage for pregnant women
- Supporting Ghana to attain nearly 80 percent of malaria treatment coverage for children under five by 2017 and increase household use of mosquito nets
- Intensifying TB case notification rates, nearly doubling the notification rate, reach identified drug-resistant TB patients on second-line treatment, and better integrate TB and HIV treatment and prevention in community health clinics

j. Japanese International Cooperation Agency (JICA)

The Japan International Cooperation Agency (JICA) is the government arm that focuses on human security and growth within developing nations. JICA's efforts within Ghana are primarily focused on four areas: agriculture (rice cultivation), economic infrastructure (electricity and transport), health/science/mathematics education, and capacity development in administrative and financial management. There are clear integration points among JICA's health activities, primarily under education and laboratory capacity building.

Health Activities

- JICA health activities are focused on mother and child health (MCH) at community level through, CHPS implementation, and the Noguchi Memorial Institute for Medical Research (Noguchi):
- JICA has provided resources for the GHS to improve MCH strengthening within various GHS departments, including the Policy planning and M&E, family health, and Institutional care division departments (5yrs 2017 – 2022). A key part of this program is the technical support to revitalise guidelines for care and educational materials for the CHPS staff. Part of their training does include compliance to treatment guidelines which has some AMR components in it.
- JICA's commitment to MCH is highlighted by a pilot program to merge maternal and child health record books. The program, which completes in 2020, includes the production, reproduction, and national implementation of an updated combined MCH record book which has prevention, health promotion and immunisation aspects included. A key component of this program is that it focuses on the education and training of personnel to utilise the new combined health records, which can serve as an AMR integration point.
- Within CHPS, JICA supports the development of technical guidelines and the education and training of CHPS officers to conduct home visits. This covers about 1000 centres within the upper western, eastern, and northern Ghanaian regions. The piloted CHPS training includes vaccination education and has the possibility to include other AMR topics.
- JICA has a strong relationship with the Noguchi Medical Research Institute and offers support for research and Laboratory infrastructure. One research aim is to strengthen pathogen identification and data management (2016-2021). Although Noguchi is a private institutional research laboratory and cannot be designated as a national reference laboratory, it conducts activities to support the public health surveillance activities of the MOH and GHS. Noguchi is utilized for unconventional microbial cases and HIV, TB and malaria surveillance where it is being sent samples for identification. For example, in December 2017, unknown pathogen samples were sent to Noguchi from a recent suspected meningitis outbreak in the Kumasi region.

Noguchi has funding for a research study on diarrhoeal pathogen surveillance in conjunction with the National Public Health Reference Laboratory (NPHRL) whereby both laboratories will receive biological samples and compare results to enhance the reference laboratories capabilities. There is also a mentoring program attached to this to strengthen the capacity of the staff at NPHRL.

Currently, Noguchi is implementing an 8-week training laboratory program for microbiology personnel from West Africa. This program, which will run for three years, takes four people from Ghana and train them in Noguchi on all types of surveillance and testing methods (including microbiology, serology, virology and parasitology). A second part of the program will introduce personnel from surrounding countries and train them within Noguchi.

k. United States Center for Disease Control (US CDC)

The US Center for Disease Control (USCDC) in Ghana is focused on laboratory and disease surveillance, specifically in neglected tropical diseases, influenza, malaria, and HIV/AIDS. USCDC supports health systems strengthening and Laboratory capacity building. In July 2017, US CDC

published a capabilities assessment of three public health laboratories: National Public Health Reference Laboratory, Sekondi Public Health Laboratory, and Tamale Public Health Laboratory., which it undertook to assist with the national AMR surveillance gaps identified in the JEE report in support of the establishment of a national surveillance program.

The tool used in the capabilities assessment were based on items in the Component I of the Antimicrobial Resistance Surveillance Questionnaire for Assessment of National Networks (WHO/CDS/CSR/RMD/2003.1). The emphasis of this assessment was on identification of the two key enteric pathogens on the AMR list of pathogens of concern and the performance of antimicrobial susceptibility testing for these organisms.

The assessment concluded that there were four major gaps in laboratory activities: AMR detection, surveillance, and laboratory methods and systems. Recommendations for improvement focused on increasing laboratory capacity, improved logistical coordination, standardization of Laboratory methodology, and installment of testing validation, and generation of laboratory data for national stakeholders. USCDC has identified surveillance as the priority gap to improve upon. To do so, USCDC provides an in-country contractor and laboratory support in the form of laboratory training through mentoring, sampling, procurement, and equipment.

I. Food and Agriculture Organizations (FAO)

Currently Food and Agriculture Organizations (FAO) work is focused on some aspects of AMR including awareness of public and farmers to risks of AMR, support to the regulatory processes to ensure that human health aspects are part of existing food safety regulations in Ghana and supporting a pilot to gather data on antimicrobial use in animal health and the environment. These are all being guided by the AMR Policy Platform who directs the needs for work to be done by FAO.

Appendix A

THE METHODOLOGY

The methodology followed was a stepwise approach to teasing out entry points and funders:

Stage 1. Review the NAP to identify entry points and AMR activities and whether plans are (partially) funded or not.

Few, if any, NAPs from LMICs have explicitly recognized the interrelatedness of priority activities with other programs and projects. Therefore, the first task involved determining opportunities where countries *can* integrate AMR activities with other programs and projects.

Aim: The aim of this stage is to find out which stakeholders/Ministries/development partners are involved in AMR; what AMR activities can be integrated into existing priority programs and plans; and which of these activities are funded.

Stage 2. Identify existing or potential funders.

Aim: The aim of this stage was to list (and if necessary prioritize) funders to interview. “Existing or potential funders” could included:

- Bodies (government, development partners, professional councils etc.) that already fund activities that are labelled as “AMR activities”
- Bodies that fund activities that are highly relevant to AMR but which may not have that label – these will most probably link to priority programs such as HIV, TB, malaria, Mother and Child health, surveillance, pharmaceutical supply chain strengthening
- Any organisation that has shown a firm interest in AMR but is not yet funding any activities
- Any other obvious omissions: big players that are active in areas relevant to AMR that have not been included above.

Stage 3. Discussions with (potential) funders and key entry programs and agencies.

The consultants visit Ghana from the 4- 7th December 2017 and conducted interviews and discussions with the potential funders and key stakeholders in AMR.

Aim: The aims of the meetings was to:

- To discuss the broad range of AMR activities to create awareness of the need for AMR support
- To identify what AMR specific or AMS sensitive activities are already funded and how long this is likely to last
- To establish what scope there is to adjust current activities so that they are more relevant to AMR.
- To establish how likely or not the body is to fund additional AMR activities.

Stage 4. Describing next steps and reporting back to country key stakeholders

Aim: To provide the teams working on antimicrobial resistance (AMR) in the country with feedback on how to scale up delivery of AMR activities through entry points into existing programmes and projects and how to access the necessary funds to do so from existing and potential funders.

APPENDIX B: KEY STAKEHOLDERS INTERVIEWED IN GHANA

Table below describes the key documents and stakeholders interviewed:

A full list of the people interviewed is included in the annexure A

Monday
• OIE/Vet Services
○ Dr. Kikimoto
○ boikikimoto@gmail.com
• Hope for Future Generations
○ Patricia Porekuu & Mercy Amokwandoh
○ pporekuu@hffg.org , mamokwandoh@hffg.org
• Ghana Health Services
○ John Ayavasie
○ ayivase@yahoo.com
• Fleming Fund
○ Shamwill Issah
○ Shamwill2000@yahoo.com
○ +233 (0) 249288203,
• Environmental Protection Agency
○ Carl Fiati
○ Carl.fiati@epa.gov.gh
○ +233 (0)501301527
Tuesday
• Fleming Fund
○ John Wilson
○ John.wilson@mottmac.com
• FAO
○ Kofi Afakye
○ kofiakakye@yahoo.co.uk
• University of Ghana
○ Dr. Japeth Opintan
○ jaopintan@ug.edu.gh , japh_opintan@yahoo.com
• KCCR
○ Prof Ellis Owusu Dabo
○ owusudabo@kccr.de
○ Desk: +233-3220-60512
○ Cell: +233-20-1964425
• KCCR
○ Kwame Buabeng
○ kchiefb@yahoo.co.uk
• MOH – Pharmaceutical services
○ Martha Gyansa-Lutterodt
○ maglutt@hotmail.com
Wednesday
• JICA
○ Maki Ozawa & Miyuki Tan
○ Ozawa.maki@jica.go.jp ,

miyukitan.gn@jica.go.jp
• World Bank
○ Dr. Anthony Seddoh
○ aseddoh@ifc.org
• USCDC
○ Chastity Walker
○ Aii8@cdc.gov
• DFID
○ Luisa Hanna
○ L-hanna@dfid.gov.uk
• GNDP
○ Edith Gavor
○ eegavor@yahoo.com
Thursday
• Health Promotions Department
○ Isaac Akumah
○ Isaac.akumah@ghsmail.org
○ iakumah@gmail.com
○
• GHS-Institutional Care Division
○ Gloria Ntow
○ gntowkummi@gmail.com
• WHO
○ Edith Annan
○ andrewse@who.int
○ share DP contacts
• CHAG
○ Peter Yeboah & Dr. James Duah
○ Peter.yeboah@chag.org.gh
○ james.duah@chag.org.gh

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- ⁵ Ministry of Food and Agriculture. Livestock Development in Ghana: Policies and Strategies. 2004.
- ⁶ Republic of Ghana. Ghana Health Financing Strategy, 2015
- ⁷ Republic of Ghana. Ghana Health Financing Strategy, 2015
- ⁸ Ghana budget statement 2016