Southeast Asia Health Security Scoping Mission

8 November 2018

Republic of the Union of Myanmar country report

Contents

Purpose

This independent report outlines findings and opportunities for health security investments in Republic of the Union of Myanmar (Myanmar), under Australia's Health Security Initiative for the Indo-Pacific region (2017–2021). It is complementary to the overarching *Regional Report of the Health Security Scoping Mission in Southeast Asia*, which assesses the needs and capacities of countries in the Indo-Pacific region and makes evidence-based recommendations for possible partners and areas of investment for a multi-country program to strengthen health systems and improve health security in Southeast Asia.

Background

Australia's Health Security Initiative contributes to avoiding and containing infectious disease threats with the potential to cause social and economic harms on a national, regional or global scale. With funding of $300 million over five years, the Health Security Initiative is strengthening health security in our region through targeted, multi-country and regional investments. The Indo-Pacific Centre for Health Security in the Australian Government Department of Foreign Affairs and Trade (DFAT) is implementing this initiative.

In April and June 2018, an independent, high level scoping team visited seven Southeast Asian countries on behalf of the Indo-Pacific Centre for Health Security. The team met with senior government officials and health program managers in the sectors dealing with the prevention, detection and response to health security risks.

Based on these consultations, the report provides high level recommendations for regional support through the Indo-Pacific Centre for Health Security that reflects country needs, maximises opportunities to leverage other investments by donors and development partners in the region and utilises Australia's comparative advantage. This report will be followed by a series of more detailed designs in the five priority areas recommended, to identify appropriate international and Australian partners and support implementation.

Current situation

Introduction

Since Myanmar transitioned to a civilian government in March 2011, the country has been one of Asia's fastest-growing economies. Health indicators have begun to improve as government has increased the percentage of Gross Domestic Product on health care expenditures.[1] However, Myanmar's development challenges are still significant. Gross Domestic Product per capita is the second lowest in Southeast Asia. Increasing urbanisation and migration to Thailand, China and elsewhere have led to rapid social change. Myanmar also faces protracted civil conflict and frequent natural disasters.

[1] Myanmar: WHO Health SDG profile, 2017, http://www.searo.who.int/entity/health_situation_trends/countryprofile_mmr.pdf

As of June 2018, Myanmar counted more than 600,000 internally displaced people who receive assistance from the United Nations Health Cluster,[2] and the regions along the country's borders hold the largest refugee population in Southeast Asia.

Disease burden

While Myanmar has made considerable progress in combatting HIV, tuberculosis (TB) and malaria, the country remains in the global top 30 for TB burden, TB and HIV coinfection and multidrug-resistant TB (MDR-TB). Nevertheless, mortality due to TB has decreased from 133/100,000 in 1990 to 53/100,000 in 2014. Treatment success rates have remained relatively stable at 87 per cent since 2013, and at the end of 2014 reached 80 per cent among patients with MDR-TB. A short-course treatment for MDR-TB is being piloted, which is expected to improve future treatment success rates.[3]

Malaria also comprises a significant disease burden. However, in 2017 there was a 64 per cent decline in malaria cases, and a significant decline in malaria-related deaths. The country is making progress towards malaria elimination by 2030 but the spread of Artemisinin resistance of *Plasmodium falciparum* across most of the country constitutes a serious threat to long-term malaria control in Myanmar and the region.

Disease outbreaks, including food-born outbreaks, cholera and outbreaks of vaccine preventable diseases such as measles and diphtheria are thought to be under-reported due to insufficient surveillance and limited capacity for timely epidemiological investigation and laboratory diagnosis, especially in rural areas and areas under conflict. Emerging and re-emerging infectious disease outbreaks are common, notably zoonoses such as avian influenza (for instance, the H1N1 outbreak in 2017), rabies, Japanese encephalitis and an increasing frequency of dengue outbreaks, including dengue haemorrhagic fever.

Zoonoses burden

Rabies, zoonotic Influenza, TB, Anthrax and Japanese Encephalitis have been identified as the five priority zoonotic diseases in Myanmar[4]. The threat of zoonotic disease outbreaks is expected to increase in light of expansion of the livestock sector, intensive production methods, climate change and potential for transboundary transmission, especially in the growing cross-border trade with China. High impact influenza viruses (H5N1 HPAI, H1N1 Pandemic, H7N9 and H5N6), foot and mouth disease, porcine reproductive and respiratory syndrome and antimicrobial resistance have the potential to emerge and spread in this setting.

[2] Health Cluster, Myanmar, http://www.who.int/health-cluster/countries/myanmar/en/
[3] Audit Report: Global Fund Grants in the Republic of the Union of Myanmar, GF-OIG-18-013, August 2018
[4] The Joint external evaluation of IHR core capacities of the Republic of the Union of Myanmar Mission report, 2017

Antimicrobial resistance

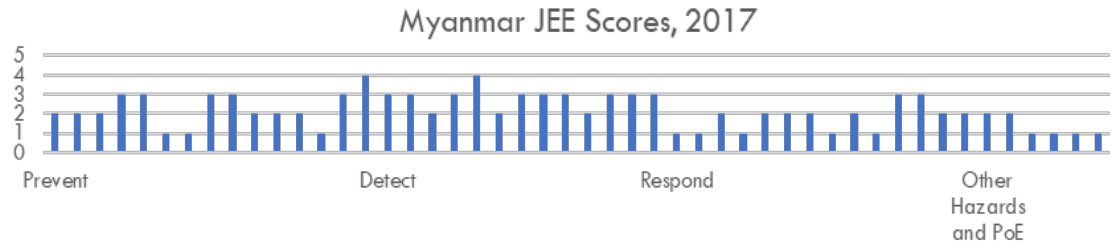
Antimicrobial resistance (AMR) in bacterial diseases is another important concern with, for instance, *Pseudomonas* species, *Acinetobacter* species and *Enterobacteriaceae* found to be resistant to Carbapenem (27 per cent, 21 per cent and 14 per cent respectively) in 2016, according to the National Health Laboratory. The extent of AMR occurrence across the country is hard to determine due to lack of surveillance data. Combatting the threat of AMR is considered a joint priority of both public health and the food and agriculture sector. The potential impact of AMR in agriculture is particularly important in light of the sector's contribution to the national economy (almost 40% of the Gross Domestic Product).

Capacity to respond

International Health Regulations—assessment of core capacities

The World Health Organization (WHO) International Health Regulations 2005 (IHR) mandates the core capacities required for countries to report and respond to public health emergencies of international concern. The Monitoring and Evaluation Framework for the IHR includes the option of a voluntary Joint External Evaluation (JEE). This involves countries undertaking both self-assessment and external evaluation of 19 core capacities, and developing national plans to address identified gaps. The JEE also draws on the results of the World Organisation for Animal Health (OIE) evaluation of countries 'Performance of Veterinary Services'(PVS) Pathway, in assessing countries' capacity for zoonoses control and cross-sectoral responses.

In May 2017 Myanmar undertook a JEE,[5] conducted by a multi-sectoral international team, to assess Myanmar's capacity in relation to IHR requirements. The outcome highlighted important gaps in all areas, particularly in critical functions including the prevention of antimicrobial resistance, biosafety and biosecurity, emergency preparedness, emergency response procedures and operations, medical countermeasures and risk communication.



Source: World Bank, complied from the national JEE reports. (PoE = points of entry)

[5] JEE Myanmar, May 2017, http://apps.who.int/iris/bitstream/handle/10665/260524/WHO-WHE-CPI-REP-2018.5-eng.pdf?sequence=1

In September 2017, following the JEE, a National Action Plan for Health Security was developed and is currently being costed. It will be integrated in the Government's National Health Plan 2017–2021. The latter aligns all plans to Universal Health Coverage (UHC) with a focus on areas under conflict (border areas including the States of Rakhine, Kachin, Chin, Shan), vulnerable populations, and human resources for health.

Myanmar undertook a PVS Evaluation Mission in October 2009, a PVS Gap Analysis in December 2010 and a PVS Follow-up Mission in January 2015. However, these have not yet been published. They have also undertaken a PVS Laboratory Mission in March-April 2016 and, in March 2018, a VLSP Veterinary Legislation Identification Mission.

Health system

The Myanmar health system comprises a mix of public and private financing and service provision. The public health system in Myanmar has a vertical structure, which includes central, provincial and district hospitals and primary health care facilities. The Department of Health, one of the seven departments of the Ministry of Health and Sports, is responsible for service provision, regulation of health-care providers, pharmaceuticals, medical devices and aids, and capital investment.

The Myanmar Government has committed to achieving UHC by 2030.[6] As part of a phased approach to achieving UHC, the Ministry of Health and Sports launched the five-year National Health Plan 2017–21 in December 2016. The major goals are to ensure access to a basic essential package of health services for the whole population by 2020, and to increase financial risk protection.[7] Government health-sector investment has increased over the past decade while out-of-pocket health expenditure as a proportion of total health expenditure has decreased (79 per cent in 2011 and 51 per cent in 2014). However, out-of-pocket payments remain high and Myanmar's 2016–17 Budget Policy Statement identifies increasing the allocation to health as a fiscal policy objective.[8] The role of the private sector is growing and benefiting from the opening up of Myanmar's economy. However, many gaps remain, particularly in rural hospitals due to shortage of well-trained, skilled personnel including doctors and paramedical staff, as well as poor facilities, poor infection control and limited access to essential medicines, clean water and sanitation.

Over past years, weaknesses in government health systems and conflict have resulted in a number of non-state actors taking on the task of providing or supporting health services. These include Ethnic Health Organisations, which are the main health service provider in

[6] Myanmar Ministry of Health and Sport, Myanmar National Health Plan (2017–2021).
[7] DOI: 10.1016/S2214-109X(18)30318-8 accessed at https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30318-8/fulltext
[8] World Bank, 2017, *Moving toward UHC: Myanmar—national initiatives, key challenges, and the role of collaborative activities (English)*, Moving toward UHC. Washington, D.C., World Bank Group, http://documents.worldbank.org/curated/en/991991513148339321/Moving-toward-UHC-Myanmar-national-initiatives-key-challenges-and-the-role-of-collaborative-activities

non-government controlled areas, including the mountainous northern regions of Kachin State, Shan State in the East, Rakhine State in the West, and Kayah and Kayin States in the South. In areas where public health and health care facilities are affected by conflict, disease surveillance and reporting can be patchy or lacking.

International non-governmental organisations, such as the International Committee of the Red Cross, are active in refugee areas across borders. Save the Children Fund also works closely with Ethnic Health Organisations, under the 3MDG Fund, and Médecins Sans Frontiers provides care for HIV, TB and vaccine-preventable diseases. Myanmar Medical Society and the Myanmar Red Cross are long-established national non-government organisations (NGOs) that have supported government health systems at the local level, including with natural disaster relief (cyclones, storms).

In 2006 the Myanmar Government relocated the capital city to Nay Pyi Taw. However, most national health facilities remain in Yangon, including the National Health Laboratory, the Yangon General hospital, the Women's hospital, Children's hospital, the Eye hospital, two military hospitals and some private health facilities.

The national health system has no or limited connections with the animal health system described below (see *One Health* below). There is a lack of systematic information exchange and joint operations between the two systems.

The Minister of Health expressed a strong commitment to improving Myanmar health system resilience and health security. Strengthening the health system and the capacity for health emergency preparedness and response are priorities of the Country Cooperation Strategy with WHO.[9] The Minister highlighted the need to strengthen zoonotic disease surveillance and control, to build a national alert and response system through the promotion of public health laboratories, and to improve infection prevention and control, particularly in laboratories. The Minister also mentioned plans to establish a national Centre for Disease Prevention and Control (CDC) in the capital Nay Pyi Taw, with infrastructure support from China and technical collaboration with the United States Centers for Disease Control and Prevention (US CDC).

The Minister noted additional priorities including the use of digital technology tablet communications tool for vaccine preventable disease surveillance; improving biosafety in reference labs in Mandalay and Nay Pyi Taw, revision of the National Communicable Diseases law to include IHR obligations, and strengthening antibiotic use guidelines in both human and animal sectors to better control AMR. During his meeting with the scoping team,

[9] WHO Country Cooperation Strategy, Myanmar, updated May 2018. http://apps.who.int/iris/bitstream/handle/10665/136952/ccsbrief_mmr_en.pdf;jsessionid=C1EFF8867E8BDB6031059A0B4B2AE4DF?sequence=1

the Minister identified a range of challenges and explicitly welcomed external advice and technical support from Australia, including for data analysis.

Immunisation

The Expanded Program on Immunization (EPI), another major control program, supported by WHO, United Nations Children's Fund (UNICEF) and Gavi, the Vaccine Alliance, is overseen by a national committee on immunisation practice. All 330 districts have updated routine immunisation micro-plans, and the program benefits from a comprehensive multi-year plan for immunisation, covering 2017–2021. However, the reality remains challenging since control programs are constrained by the legacy of past inattention common across much of the country, resulting in insufficient or below-standards health delivery, inadequate organisational management and coordination, and limited skilled human resources.

One Health

In March 2016 the Emergency Centre for Transboundary Animal Diseases (ECTAD) Myanmar Programme, with funding from United States Agency for International Development (USAID), organised a One Health Strategy Workshop in Nay Pyi Taw. WHO, the Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE) participated in the workshop to develop a One Health Strategy for Myanmar. The workshop highlighted antimicrobial resistance and six priority zoonoses including rabies, zoonotic influenza, tuberculosis, food-borne diseases, anthrax and Japanese encephalitis. However, intersectoral coordination between public health and agriculture sectors is not systematic and remains minimal. Myanmar is not an active participant of the *One Health Network, South East Asia*,[10] but USAID supports some initial network building activities and training of nationals in One Health workshops in the region. Of note, the PREDICT project, also funded by USAID, conducts virological surveillance of wildlife, livestock and humans, and had recently discovered a new coronavirus in a species of bat in Myanmar.[11]

Other initiatives for zoonotic diseases

Other disease-specific initiatives in Myanmar include the Alliance for Rabies Control (MARC). MARC is made up of non-profit and animal health care professionals from Myanmar and, with the support of WHO, recommends increasing access to the much safer tissue cell-culture vaccines (TCVs) and the discontinuation of nerve-tissue vaccines (NTVs) still produced and used in Myanmar.[12]

[10] The One Health Network, South East Asia is a collaborative platform funded by the European Union to facilitate sharing, networking, close cooperation and exchange within and across One Health research projects in the region.

[11] Smithsonian Conservation Biology Institute's Global Health Program. 3 July 2018 https://nationalzoo.si.edu/news/new-virus-discovered-myanmar-smithsonian-conservation-biology-institutes-global-health-program

[12] There are three main types of rabies vaccine, nerve tissue vaccines, cell culture vaccines, and embryonated egg vaccines. Cell culture vaccines and embryonated egg vaccines have replaced nerve tissue vaccines in

The OIE and the New Zealand Aid Programme jointly support a five-year pilot project in Myanmar and Laos, strengthening Foot and Mouth Disease (FMD) control to improve dairy production. This builds on *Stop Trans-boundary Animal Diseases and Zoonoses* a previous DFAT-funded regional FMD control program in partnership with OIE. The project in Myanmar involves the establishment of two FMD-free zones through vaccination of 80 per cent of cattle in those areas.

FAO projects in Myanmar, conducted with the Ministry of Agriculture, Livestock and Irrigation and the Ministry of Natural Resources and Environmental Conservation, include emergencies, crop production, post-harvest, co-management of natural resources, livestock, prevention and control of transboundary animal diseases, and food security and nutrition. Myanmar is also one of four Greater Mekong Sub-Region countries included in the US/DFAT-funded Live Animal Marketing and Production value chain investment, which focuses on improving infection control in live bird markets and educating traders and producers.

External donors

The Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) commenced support to Myanmar in 2003. For the 2017–2019 allocation period, the Global Fund allocated USD206 million for HIV and TB interventions and for health systems building in Myanmar. The United Nations Office for Project Services (UNOPS) and Save the Children Fund are the Principal Recipients for the Global Fund, and the Ministry of Health and Sports implements the grants as sub-recipients under UNOPS. The grants managed include the *Regional Artemisinin-Resistance Initiative Towards Elimination of Malaria* as well as HIV and TB grants.

Global Fund investments were terminated for a period in 2005 due to restricted access to grant implementation areas, but resumed in 2011. To fill the gap, six donors—Australia, Denmark, the European Commission, the Netherlands, Norway, Sweden and the United Kingdom—established the *Three Diseases Fund* (3DF) with UNOPS as fund manager. 3DF was successful in achieving wide coverage for vertical programs, including in conflict-affected areas. After 2011, the 3DF continued to operate concurrently with the Global Fund as the *3MDG Fund* with a broader brief including maternal child health and health system strengthening. At the end of 2018, 3MDG will be succeeded by *Access to Health* (2019-23), funded by the United Kingdom, Sweden, Switzerland and the United States and again, managed by UNOPS. The *Access to Health* Fund will focus exclusively on conflict-affected areas.

industrialised countries and are the ones recommended for use by WHO. They are considered safe and well tolerated. In comparison, nerve tissue vaccines can induce severe adverse reactions including a potential risk of rabies from incomplete virus inactivation and are less immunogenic. They are still used in a limited and decreasing number of developing countries.
http://www.who.int/vaccine_safety/initiative/tools/Rabies_Vaccine_rates_information_sheet.pdf

In addition to the support from WHO, FAO, OIE, and USAID mentioned above, other major international organisations supporting health in Myanmar include the Asian Development Bank (ADB) focusing on building human resources and capacity, and the Japan International Cooperation Agency, which supports relief operations, hospital infrastructure and the control of malaria, HIV/AIDS and tuberculosis. The United Kingdom (UK) Department for International Development in Myanmar, through the Burma UK Health Partnership Programme, supports access to clean water and sanitation, nutrition for children and women, and family planning, particularly in ethnic/border states.

There is currently no health component in the bilateral cooperation with Australia (the main Australian investment is in education) but Australia invests in health in Myanmar through contributions to a range of regional and global programs, including through the Global Fund, Gavi, Bloomberg's Data For Health program, and the World Bank on immunisation and health security financing. There are also connections between Myanmar health professionals and Australian institutions, such as the links between the Myanmar Medical Association, the Australian Medical Association and the Royal Australasian College of Surgeons, and between the Myanmar University of Public Health, the University of Adelaide and the University of Sydney.

Priority areas for DFAT support

The scoping team identified five key areas for DFAT investment support to strengthen health security:

1. surveillance, alert and response activities and scope
2. health workforce components
3. health facilities including laboratories
4. community resilience
5. health policy and regulation of drugs, vaccines and diagnostics.

This Myanmar report proposes activities that require technical support, aligned with the activities proposed in the regional scoping mission report, so that they maximise Australia's comparative advantage for utilising relevant institutional experience and options for twinning with relevant Australian institutions.

1. Surveillance, alert and response

Situation analysis

Myanmar's disease surveillance system includes the Central Epidemiology Unit (CEU), vertical control programs (HIV/AIDS, TB, malaria, and the EPI, which conducts surveillance for measles, acute flaccid paralysis, tetanus, diphtheria and whooping cough). Other diseases formally under national surveillance include diarrhoea, dysentery, food poisoning, typhoid and paratyphoid and other epidemic-prone infectious diseases (severe diarrhoea,

cholera, dengue and dengue haemorrhagic fever, and plague). However, due to lack of full access to conflict areas, poor surveillance infrastructure including laboratories, and shortage of skilled personnel including field epidemiologists, disease surveillance data are often incomplete, patchy, dated and not quality-checked. Although Myanmar set up its first Early Warning Reporting System in 2008 for timely detection and reporting of outbreaks in cyclone-affected areas, the country does not yet have a systematic and nation-wide event-based surveillance system. Such a system should include a well-functioning Emergency Operations Centre (EOC) to ensure surveillance coordination, routine data collection and timely data analysis to allow for early warning, investigation and response.

Myanmar is a member of the Mekong Basin Disease Surveillance (MBDS) consortium, which aims to facilitate regional disease surveillance through cross-border cooperation. Although MBDS is still a valuable regional platform for exchange and capacity building, it no longer includes site-specific regular cross-border reporting activities. Similarly, the only notification to WHO from Myanmar's National IHR Focal Point, in the Department of Public Health, Ministry of Health and Sports, was in December 2015 about two cases of circulating vaccine-derived poliovirus type 2. This unique report contrasts with the numerous notifications to WHO from neighbouring Thailand (for example, in relation to Severe acute respiratory syndrome (SARS), avian influenza, botulism, and Middle East respiratory syndrome (MERS).

Notification by the Ministry of Agriculture, Livestock and Irrigation to OIE's World Animal Health Information System is more frequent (for example, highly pathogenic avian influenza and white tail disease, a viral infection of freshwater prawns, in 2017; FMD and anthrax in 2018). This increased notification is probably stimulated by the OIE Stop Trans-Boundary Animal Diseases and Zoonoses Programme, 2011–2017, established with support from DFAT). Entomological surveillance relies on State Vector Borne Disease Control teams but is weak in urban centres and frequently non-existent in rural areas.

Scoping team analysis and priorities identified

Despite current effort, increased health budget and a clear vision by the Minister of Health, the existing public health surveillance activities in Myanmar, remain insufficient and variable, and not coordinated with the animal and environment sectors.

Priorities should be to:

- continue and coordinate existing surveillance activities in human, animal and environment sectors, through promotion of the One Health approach, including national human/animal health bridging workshops and the development of mechanisms to systematically share information, data and samples between human and animal health
- focus on key public health threats such as:

  - avian influenza through surveillance in poultry/birds (live bird markets) and surveillance of acute respiratory infections (SARI) in humans
  - elimination programmes (malaria, measles, rabies)
  - diseases of heavy public health burden (TB, HIV/AIDS)
  - antimicrobial resistance (MDR-TB, others)
  - emerging threats such as dengue (entomological surveillance of *Aedes* mosquito species, particularly in urban settings)
- improve/create an effective EOC for real-time analysis and timely risk assessment with input from all relevant sectors
- develop/revise standard operating procedures for all programs involved in surveillance, to ensure rapid information sharing with the CEU and the EOC to ensure coordination and timely response
- establish a country-wide event-based surveillance system, building on communities and local NGOs (for example, Red Cross, women's associations), private practitioners and easy reporting system (for example, telephone hotline).

Longer-term priorities should be to:

- improve/develop the necessary infrastructure (for example, IT and information systems, laboratories, transport facilities) across the whole country (addressed below in *3. Health facilities including laboratories*)
- the training of skilled personnel, specifically field epidemiologists (medical and veterinarians), laboratory technicians, entomologists and IT specialists (addressed below in *2. Health workforce components*).

Desired outcomes of DFAT investment related to surveillance, alert and response

1. Prevention and/or earlier detection, joint risk assessment and timely and adapted response to human and animal infectious disease outbreaks.
2. Better understanding of the prevalence of epidemic-prone infectious diseases as well as of antimicrobial-resistant organisms in humans and animals and in their environments, which improves patient management, provides a baseline for assessing future interventions, and provides for evidence-based advocacy among government officials.
3. More rational antimicrobial prescribing and dispensing in the human, animal and aquaculture sectors.

4. Stronger risk assessment and forecasting of outbreaks of vector-borne infections, and baselines for measuring the impact of vector control interventions.
5. Involvement of communities in disease surveillance (for example, telephone hotline).

Opportunities for DFAT support for surveillance, alert and response

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support to rationalise and coordinate existing surveillance systems in both human and animal sectors, support national bridging workshops and fill surveillance gaps (for example, SARI, dengue vectors)	1, 2	ADB USAID	WHO OIE FAO CDC Wildlife Health Australia	High
Technical support to set up a country-wide event-based surveillance system inclusive of communities and public and private sectors	1, 2	ADB USAID Ending Pandemics Organization	WHO CDC SAFETYNET (TEPHINET) ECDC	High
Technical support to EOC for routine data collection, data analysis and regular One Health risk assessment	1, 2, 4	USAID US CDC ADB USAID Ending Pandemics Organization	WHO FAO OIE CDC SAFETYNET (TEPHINET)	High
Technical support for continued development of national antimicrobial resistance surveillance plan in animal, human and aquaculture sectors and integrating public and private sectors	2, 3	Fleming Fund USAID US CDC	WHO FAO OIE	High

Technical support for stronger entomological surveillance and community-led vector control	4	Gates Foundation	WHO Pasteur Institutes CDC Monash University	Medium

2. Health workforce components

Situation analysis

Myanmar faces multiple health work force challenges. As in many countries in the region, the tertiary educated health workforce is concentrated in urban areas. Despite the efforts of the University of Public Health, founded in 2007 in Yangon, which includes a department of epidemiology and a department of public health laboratory science, the numbers of skilled medical personnel, including laboratory scientists, are currently insufficient to build and maintain an efficient surveillance and response system. There are also only a small number of skilled veterinary personnel. Myanmar needs experienced field epidemiologists able to rapidly collect and analyse data, to conduct field investigation and lead rapid response teams. The country's Field Epidemiology Training Program (FETP), created in 2007, offers short courses and workshops rather than the standard two-year training program. A few students are selected to attend regional FETP training (such as FETP Thailand). Eight veterinarians have completed the FETP training for veterinarians in Thailand and two are currently completing FETP training with the Myanmar Ministry of Health and Sports. Six veterinarians have received training in veterinary epidemiology via Massey University with support from New Zealand Agency for International Development (NZAID).

The Myanmar Medical Association (MMA), which counts 20,000 members (half public and half private) including in districts and rural areas, is involved with the Ministry of Health and Sports in some surveillance and reporting activities (malaria, TB). The MMA is a member of Myanmar's Red Cross Central Committee and is interested in field epidemiological training. It reported a close relationship with the Australian Medical Association and the University of Adelaide for the development of curriculum. The current Health Minister was an MMA member and is keen to use the skills and expertise of MMA members.

Similarly, nurses and veterinary associations, and traditional medicine associations, which are present up to township level, constitute potential entry points for specific training and workforce development.

The Myanmar Red Cross is closely linked to the government and township medical officers oversee the local Red Cross, which works mainly in response to natural disasters (cyclones, floods, earthquake). It can facilitate communities' involvement in some surveillance and reporting activities. The international Committee of the Red Cross is active in refugee areas across borders.

Scoping team analysis and priorities identified

Experience in many countries indicates that FETP programs are central to the development of a skilled workforce for disease surveillance and response, involving medical and veterinarian professionals—a point that should trigger a review of the Myanmar FETP.[13] A full two-year program—aligned with the standards of the Training Programs in Epidemiology and Public Health Interventions Network (TEPHINET) and its regional branch, the South Asia Field Epidemiology and Technology Network (SAFETYNET)— would complement the current workshops and short courses. During the scoping team mission, the Minister of Health formally welcomed a review of the Myanmar's FETP, and supported a One Health approach to the training program.

Workforce development for health security should include regular simulation exercises and after-action review with all stakeholders, following health emergency response. In July 2017 the Ministry of Health and WHO conducted an after-action review following a cholera outbreak response. Such reviews are valuable and could be more systematically carried out.

Technical support to Myanmar University of Public Health, for improved curriculum, and potential twinning programs, can be considered through strengthening collaboration with regional public health universities including Australian universities. Revised curriculum should adopt the One Health approach and have strong program management and administration components.

Workforce development can also use the training opportunities already offered by national disease control programmes (for example, EPI, HIV/AIDS, malaria, TB) to further develop skills in epidemiological surveillance, entomological surveillance and laboratory testing capacity.

The potential role of the Myanmar Medical Association in providing the health workforce with specific training/information in relation to disease surveillance, health emergencies and outbreak response should be explored. Similarly, the veterinarians' association, the nurses' association, the Red Cross and traditional medicine associations, should be assessed for their possible role in prevention, surveillance, reporting and emergency response activities. The Red Cross could play a valuable role in involving the community.

Using regional capacity for training in field epidemiology (for example, FETP Thailand) and laboratory diagnostic techniques (for example, Pasteur Institutes in Cambodia and Laos) must be considered particularly in the short-term. This already exists and can be scaled up.

[13] Frontline field epidemiology training programs as strategy to improve disease surveillance and response. *Emerging Infectious Disease 2017, 23,* https://wwwnc.cdc.gov/eid/article/23/13/17-0803_article

Similarly, the secondment of Australian professionals to key Myanmar institutions, such as recently initiated with the National Virology Laboratory in Yangon, could be further developed.

Scholarship for selected young public health and veterinarian professionals to receive advanced training in institutions like US CDC and Australian universities/institutions, could also be part of a workforce development plan.

Desired outcomes of DFAT investment in health workforce components

1. Stronger cadre of public health and veterinary professionals with skills in epidemiological surveillance, risk assessment, alert and outbreak response.
2. Understanding best length and curricula for FETP and FETP for veterinarians (FETP/V) training.
3. More equal distribution of epidemiological skills in regions and districts providing earlier detection and response, and greater health system resilience.
4. Up-to-date medical and paramedical and veterinary and paraveterinary training, and in-service training materials for earlier outbreak detection and stronger response.

Opportunities for DFAT support for health workforce components

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support to review Myanmar FETP/V, develop and implement a new plan for a national FETP, open to both medical and veterinarian professionals and accredited by TEPHINET	1, 2	DTRA CDC USAID	WHO FAO SAFETYNET CDC	High
Technical support for mapping training opportunities in surveillance and response through existing disease control programs and relevant national associations (MMA, Vet Assoc., Red Cross etc.)	3, 4	USAID Gates Foundation	WHO FAO UNICEF IFRC US CDC	High

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support for curriculum assessment and updating of Myanmar University of Public Health	1	USAID Gates Foundation	WHO FAO World Federation of Schools of Public Health IANPHI SAFETYNET US CDC	Medium/ High
Technical support for the development of simulation exercises and after-action reviews to improve outbreak detection, investigation, and response	1, 3, 4	DTRA	WHO FAO GOARN US CDC TEPHINET	Medium
Financial support for scholarships to allow selected Myanmar graduates to join regional training or advanced education in foreign institutions/universities	1	USAID France AFD	FETP in other countries of the region Pasteur institutes US CDC Australian universities	Medium

3. Health facilities including laboratories

Situation analysis

Hospital clinical laboratories, an essential component of laboratory-based surveillance, are often in need of better infrastructure, better management and quality assurance.

Myanmar has a National Health Laboratory in Yangon, under the Ministry of Health and Sports, which conducts routine laboratory investigation as well as training, research and quality assurance activities. A new national laboratory is planned in the capital Nay Pyi Taw but the national reference laboratories, including the National Influenza Centre, will remain in Yangon where most of the laboratory capacity of the country is concentrated. The Ministry of Health and Sports is also planning to establish a Myanmar Centre for Disease Control in Nay Pyi Taw, on the US model, with advanced technical capacities and are in funding discussions with donors, including China.

Currently, all samples are sent to the National Health Laboratory for confirmation, and genetic sequencing is done in a regional reference laboratory (that is, H1N1 influenza samples are sent to the WHO reference laboratory in Japan).

A laboratory strategic plan is part of the National Action Plan for Health Security that followed the JEE in 2017, which highlighted major gaps in biosafety and biosecurity.

In partnership with the National Health Laboratory (NHL), the US CDC is supporting the National AIDS Program to strengthen surveillance and laboratory systems. The US CDC also supports the NHL to obtain diagnostic reagents and detect infections of global concern, as well as supporting activities to improve quality and biosafety in laboratories.

A Pasteur Institute is not present in Myanmar but there is collaboration with Pasteur laboratories in the region. For instance, Institut Pasteur in Cambodia conducts a project to strengthen Myanmar's National Health Laboratory for the diagnosis of viral and bacterial pathogens causing SARI. The project, supported by ECOMORE[14] and Agence Française de Développement, includes new equipment, consumables and trainings.

On the animal health side, the Livestock Department Laboratory has been largely supported by FAO, particularly for the provision of reagents for testing samples from live bird markets (H1N1 outbreak in 2006, H5N1 in 2013, H7N9 and H5N6 in 2017). The FAO-funded laboratory support includes visits two to three times a year by experts from the Australian Animal Health Laboratory.

An International Organization for Standardization (ISO) accredited laboratory is in place to support the export of aquaculture produce to the EU and US.

Many health infrastructures other than laboratories need strengthening in Myanmar, especially at state and district level. Such needs include basic infrastructure for infection prevention and control, easy access to water and sanitation, as well as IT infrastructure to allow rapid information and data sharing with the central epidemiology unit and the planned emergency operations centre.

Scoping team analysis and priorities identified

Although it would be overambitious to aim for rapidly improving all infrastructure and equipment of the health and veterinary sectors, some priority areas can be selected. It is a priority that Myanmar has the capacity, even if just in Yangon (or Nya Pyi Daw, or a few provinces), to handle a limited number of highly infectious cases (for example, Nipah and SARS) and avoid amplification within designated hospitals. Collaboration with partners could also be explored (for instance, with China for infrastructure, with large NGOs and MMA for IPC training, and with WHO for personal protective equipment (PPE) and technical standards). IT infrastructure is also important. Many laboratories' problems are associated with isolation.

[14] ECOMORE Strengthening the national capacities for diagnosis and surveillance of infectious diseases in the Republic of the Union of Myanmar: http://www.pasteur-kh.org/ecomore-myanmar/

A dedicated platform is essential not only to rapidly share surveillance data (between laboratories and epidemiology services) but also in relation to mutual support between laboratories (for example, technical advice, sharing of reagents, joint planning, shared training).

Priorities should be to:

- introduce proper EOC infrastructure, including an emergency operations room and IT and communication facilities, to allow for joint risk assessment, central coordination and command
- ensure biosafety, biosecurity infrastructure and standard operating procedures in the National Health Laboratory and major hospital laboratories
- support for the provision of test reagents for priority pathogens and for laboratory external quality assurance schemes for all major laboratory hospitals at national and state level
- support IPC in all infectious disease departments of major hospitals, in Yangon and at state level, through easy access to clean water, sanitation, and PPE, and the creation of isolation rooms where needed, including negative pressure rooms in at least one hospital in Yangon
- improve IT infrastructure for rapid information and data sharing between major laboratories, epidemiology units, CEU, and the EOC.

Desired outcomes of DFAT support for health facilities including laboratories

1. More rapid and effective outbreak response (intersectoral where appropriate) and decreased risk of international spread through reliable laboratory results and better link with epidemiological information.
2. Stronger infection control and biosafety/biosecurity in laboratories.
3. Decreased transmission of antimicrobial-resistant bacteria and other high-risk pathogens.
4. More timely and accurate identification of emerging and re-emerging infectious agents in animals and humans.

Opportunities for DFAT support for health facilities including laboratories

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical and financial support for development and implementation of IT platforms that link laboratories, and permit linkage with epidemiological services through stronger strategic planning	1, 5	USAID Ending Pandemics Organization	WHO FAO OIE InSTEDD AAHL	High
Technical and financial support for external quality assurance programs for national and state level public health and veterinary laboratories for improved animal health diagnostic capacity	1, 3	USAID DTRA	WHO FAO US CDC Public Health Laboratory Federations Pasteur Institute AAHL	Medium/ High
Technical and financial support for infrastructure and equipment supportive of IPC through availability of PPE and isolation rooms, including some negative pressure isolation rooms	1, 2	USAID DTRA	WHO FAO OIE US CDC	Medium
Technical and financial support for biosafety and biosecurity infrastructure and equipment in major laboratories	2, 3, 4	USAID	WHO FAO OIE CDC Pasteur Institute AAHL	Medium

4. Community resilience

Situation analysis

To mobilise the community more effectively in health activities, the Myanmar Government has formally established health committees at different levels down to villages, but of uncertain effectiveness. However, the country has several national associations involved in health, the largest being the Red Cross, while several community-based organisations such as women's associations, faith-based organisations and local NGOs, play varying roles in ambulatory care and community engagement in health education, disease prevention, disease surveillance and response to outbreak and natural disasters. The community is already involved in malaria surveillance in remote areas, and some Ethnic Health Organisations play a significant role in conflict-affected areas. Professional associations, such as the Myanmar Medical Association or the Veterinarian Association, have representatives in most of the country and can play an active role in health education. In addition, the longstanding internal conflict within Myanmar has resulted in the establishment of several ethnic health organisations, which have assumed responsibility for community healthcare in their respective locations.

The Myanmar Red Cross Society (MRCS) has been in existence since 1920 (initially as a branch of Indian Red Cross Society) and is affiliated to the International Committee of the Red Cross (ICRC). It is present nation-wide through 330 branches (townships) and about 250,000 volunteers. It operates in an auxiliary capacity to government services, in particular to the Ministry of Social Welfare and Resettlement and the Ministry of Health. It is active in humanitarian crises (for example, the Kachin landslide rescue operation in 2015, and population movement and flooding in Rakhine state in 2018), outbreak response (for example, H1N1 avian influenza), in building resilient communities and providing health education (for example, 2016 educational films to encourage safer health practices). For epidemic control, the MRCS uses the standard IFRC Epidemic Control for Volunteers toolkit for Pacific region,[15] which covers 13 diseases. They also routinely conduct training of trainers, such as for community-based surveillance. The MRCS has a fleet of ambulances that are mostly used to assist with road traffic accident cases. The fleet stocks PPE in strategic locations and can support government when required.

The MRCS is one of the few institutions that works at the community level to support livelihoods and work with animal health services. It has collaborations with the 3MDG Fund and Global Fund on malaria and TB prevention and control, and has worked with the Australian Red Cross in the past.

[15] See https://media.ifrc.org/ifrc/document/epidemic-control-for-volunteers-pacific-toolkit/

The Myanmar Medical Association (MMA) (established in 1949) claims more than 16,000 medical doctors and about 15,000 other medical professionals present across the country through 80 local branches (state, regional, townships). It represents another potential entry point for community health education and community engagement.

A 2011 review of community-based interventions for emerging zoonotic infectious diseases in Association of South East Asian Nations (ASEAN) countries including Myanmar,[16] supported by AusAID, highlighted the positive impact of community engagement, particularly in reducing dengue incidence through vector control following environmental clean-up and education campaigns, and in improving reporting of dengue haemorrhagic fever. This was effective and sustainable in both rural and urban communities. Surveillance interventions were also mostly successful for reporting highly pathogenic avian influenza (HPAI) in backyard poultry. However, community engagement was less effective in rabies control. Community-based surveillance and control interventions were found to be influenced by many factors including the sensitivity to local context and the community perceptions to diseases.

Scoping team analysis and priorities identified

Active involvement of the community in Myanmar, particularly in rural areas, must be considered for the detection, reporting and control of epidemic-prone infectious diseases. This can be particularly relevant for the control of dengue/dengue haemorrhagic fever, but also for the detection of HPAI in poultry and reporting of any event with significant health consequences in humans or in animals. This could be achieved by building on the work of the MRCS and on other community-based organisations, and control programs already involving the community (for example, malaria, maternal health), including in conflict-affected areas. The role of the Myanmar Medical Association and the Myanmar Veterinary Association in providing technical support to the community should be explored. Identifying the best models will require pilot projects in different settings (urban, rural, areas under conflict). The following activities could be considered:

- A pilot project in selected rural and urban areas, for community-based interventions, including prevention, surveillance and control, using volunteers of the Myanmar Red Cross Society and/or women's associations, with possible support from the medical and veterinary associations. The focus will be on selected epidemic-prone diseases:
    - Dengue—community-based vector control for preventing or reducing the impact of dengue outbreaks and reporting of dengue haemorrhagic fever (*Aedes* mosquito species; identification and, as much as possible, elimination of mosquito breeding sites)

[16] Kate Halton at al. A systematic review of community-based interventions for emerging zoonotic infectious diseases in Southeast Asia. DFAT/AusAID – Community-based interventions in SE Asia: Grant no. 59615 https://dfat.gov.au/about-us/publications/Documents/interventions-for-emerging-zoonotic-diseases.pdf

    - Avian influenza—identification and reporting of HPAI in poultry and detection and reporting of SARI in humans.

- The pilot project could be coordinated with the activities previously mentioned to strengthen disease surveillance (for example, establishment of a countrywide event-based surveillance system, telephone hotline).
- Countrywide training of Red Cross volunteers in infection prevention and control (IPC) and outbreak response (for example, contact tracing, risk communication). This will increase community resilience and may include the participation of the Myanmar medical and veterinary associations.

Myanmar presents a complex situation in relation to health security and there are a number of donors with longstanding engagements in the country. One area where this new Australian initiative may be of assistance relates to technical support to enable awareness of AMR to be raised through Myanmar Red Cross branches.

Desired outcomes of DFAT support for community resilience

1. Better use of volunteers in community outbreak detection and response in animal and human populations.
2. Prevention of outbreaks of mosquito-borne infections, especially diseases transmitted by *Aedes* mosquito species currently spreading in the region (dengue, Zika) or with a potential of introduction in Southeast Asia (Chikungunya, yellow fever).
3. Earlier and stronger community involvement in outbreak response and decreased risk of spread.
4. Increased health seeking behaviour and demand for prevention services including vaccination.
5. Decreased demand and unregulated purchase of antibiotics at community level.

Opportunities for DFAT support for community resilience

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support for development of more up-to-date training materials for community volunteers in first response, social mobilisation, vector control and risk communication	1, 3	IFRC USAID	IFRC WHO FAO OIE US CDC	High
Technical and financial support to MRCS to train community volunteers in IPC, vector control and outbreak response	1, 3	IFRC USAID	IFRC/ MRCS MMA WHO FAO UNICEF OIE US CDC	High
Technical and financial support for a large pilot project for community-based interventions, including prevention, surveillance and control targeting dengue/DHF and avian influenza/SARI	1, 2, 3	IFRC USAID	IFRC/MRCS WHO FAO OIE UNICEF	Medium

5. Health policy and regulation of drugs, vaccines and diagnostics

Situation analysis

Health policies are developed by the Ministry of Health and Sports, in close collaboration with WHO through its Regional Office for South-East Asia. In relation to standards in health security, Myanmar health policies follow the WHO Asia Pacific strategy for emerging diseases and public health emergencies (APSED III). Myanmar has also endorsed the legally binding IHR (2005) requirements for core capacity for surveillance and response. Myanmar has participated in an OIE PVS evaluation mission in 2009, a WHO JEE in 2017, and is hosting a PVS follow-up mission in November 2018. As a follow-up to the JEE process, the country has developed, and is costing, a National Action Plan for Health Security.

The Health Minister has expressed full support for the plan and welcomes bilateral cooperation with Australia. The plan is intersectoral and involves the Ministry of Agriculture, Forestry and Fisheries, closely supported by FAO and OIE.

The tripartite agreement between WHO, FAO and OIE facilitates the development of joined policy at country level and cooperation between the two sectors, particularly in rabies control, avian influenza and AMR. An analysis is required to assess if and how these areas would need new/revised regulations in relation to the use of vaccines and drugs (for example, use of OIE Regional Vaccine Bank for Asia for FMD and rabies, use of rabies tissue cell-culture vaccines in humans, discontinuation of rabies nerve-tissue vaccines, and legislation in relation to antibiotic use in human and animal sectors).

Scoping team analysis and priorities identified

Working closely with the government, a comprehensive mapping of health policies and related regulations (for drugs, vaccines, and other pharmaceuticals) is needed, in relation to health security, including AMR, particularly infectious disease prevention, surveillance and control. It must involve the human, animal and environmental health sectors. It must also involve other sectors that play a role in, and are particularly vulnerable to, disease spread, such as travel, trade and tourism. Involvement of major stakeholders from the private sector (for example, vaccine producers, private hospitals, clinical laboratories, pharmacies) is required to develop proposals for new/revised policies/regulations in the relevant sectors.

Priority should be given to technical areas that are particularly dependent on policy and regulations, such as laboratory management and vaccine production, licencing and use. The review of regulations for good laboratory practices across the country is proposed as a priority. The enforcement of good laboratory practices regulations, adapted to the situation in Myanmar, will directly contribute to more reliable laboratory tests, including the identification of antibiotic-resistant organisms. It will increase disease surveillance and AMR surveillance, as well as biosafety and biosecurity.

Regarding Myanmar national regulatory authorities, a review of the regulations that oversee vaccines produced, licensed and used in the country is also seen as a priority. This is particularly important with the introduction of new vaccines, including possible clinical trials in Myanmar. For instance, the national regulatory authorities could be supported for the development of regulatory strategies to assess criteria to respond to license application, vaccine production and clinical trials in Myanmar.

Desired outcomes of DFAT support for health policy and regulation of drugs, vaccines and diagnostics

1. Standardisation of national procedures in surveillance, reporting, and laboratory diagnosis, including testing for antibiotic-resistant organisms.
2. Improved regulations for vaccine production, licencing and use.

Opportunities for DFAT support for health policy and regulation of drugs, vaccines and diagnostics

Myanmar-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support to the national regulatory authorities for a review of existing regulations in relation to vaccine production, licencing and use in human and animals	1, 2	DTRA USAID ADB WB	WHO FAO OIE US CDC	High
Technical support for the development and enforcement of evidence-based policies and regulations for good laboratory practices, to improve laboratory surveillance of pathogens, including for AMR, and strengthen biosafety and biosecurity	2, 3	Fleming Fund USAID DTRA	WHO FAO OIE	High
Technical support for standardisation of existing policies for disease prevention, surveillance and response	1	DTRA	WHO FAO OIE US CDC	Medium

Annex 1: Myanmar scoping mission meeting schedule

Indo Pacific Health Security Initiative High Level Scoping Mission

Yangon, 4–7 June 2018

Mission team:

- Dr Guneal Rodier, former Director of the Department of Global Capacities, Alert and Response within the Outbreaks and Health Emergencies Cluster at the World Health Organization (WHO)
- Dr Claudia Surjadjaja, epidemiology/public health specialist
- Prof Robyn Alders, animal health specialist
- Mr Robin Davies, Head of the Indo-Pacific Centre for Health Security18:15
- Ms Prudence Borthwick, Assistant Director, Indo-Pacific Centre for Health Security

Yangoon, 4–7 June 2018	
Time	**Activity**
4 June 2018	
14:00 – 15:00	DFAT briefing about Indo-Pacific Health Security Initiative
15:00 – 16:00	Meet with Dr Meg McKeown, Australian Embassy Medical Counsellor
17:15 –18:15	Meet with Dr Stephan Paul Jost, WHO Representative to Myanmar
5 June 2018	
9:30 – 10 :30	Meet with FAO: Dr Wantanee Kalpravidh, Regional Manager, ECTAD Dr Ohn Kyaw, National Consultant Advocacy and Risk Communication Expert, ECTAD
10:30-11:30	Meet with Australian Ambassador, Nicholas Coppel
12:30 – 14:00	Attend official lunch with the main health sector actors: Dr Stephan Paul Jost , Country Representative, WHO Mr Oren Ginzburg, Fund Director, 3MDG Dr Attila Molnar, Fund Director, Global Fund Dr Helenlouise Taylor, Health and Nutrition Advisor, Save the Children Mr Andrea Berloffa, Acting Country Representative, FOA Ambassador Nicholas Coppel
14:45 –15:45	Meet with Myanmar Red Cross: Dr Amaya Maw Naing (Ms), Executive Member, Focal Person for International Relations and Health Prof Dr Aye Aung, Vice President Myanmar Medical Association
16:00 – 17:00	Meet with Burnett Institute: Dr Phone Myint Win, Country Director Dr Kyu Kyu Than
18:00 – 20:00	Meet with: Frank Smithius, Medical Action Myanmar, Dr Aung Pyae Phyo, Mahidol-Oxford Tropical Medicine Research Unit Dr Aung Myint Thu, Mahidol-Oxford Tropical Medicine Research Unit

Yangoon, 4–7 June 2018	
Time	**Activity**
6 June 2018	
9:00 – 10:00	Meet with: Dr Attila Molnar, Global Fund Director, UNOPS (UNOPS manages 3MDG) Dr Thet Aung, Health Systems Strengthening Team Leader, 3MDG Dr Phyu Phyu Thin, Team Leader of the Southeast and Ethnic Health Organisations, 3MDG Dr Helenlouise Taylor, Save the Children
10:00-11:00	Meet with USAID and United Kingdom Department for International Development (DFID) Dr Feliciano Monti, Senior Malaria Advisor, US President's Malaria Initiative Robin Martz, From USAID Bangkok Dr Nu Nu Khin (Ms) , Health Security Team Dr Wai Lwin, Health Adviser, DFID
12:30 – 13:45	Meet with World Bank: Dr Hnin Hnin Pyne, Senior Health Specialist Ms Tanya Constantino, health security volunteer, Medical Laboratory Technologist (Hep B & C, Measles and Flu), National Health Laboratory
7 June 2018	
08:30 –10:30	Meet with Ministry of Health and Sports officials: Dr Myint Htwe, Minister Prof Dr Thet Khine Win, Permanent Secretary Dr Than Tun Aung, Deputy Director General, Department of Public Health (Disaster and Public Health Emergency) Dr Thaung Hlaing, Deputy Director General, Department of Public Health (Public Health) Dr Thida Hla, Deputy Director General, Department of Medical Care Dr Kyaw Khaing, Assistant Permanent Secretary, International Health Division
15:30 –16:30	Meet with Ministry of Agriculture, Livestock and Irrigation: Dr Khin Zaw, Permanent Secretary (Livestock) Dr Ye Tun Win, Director General, Livestock Breeding and Veterinary Department Dr Tun Lwin, Assistant Permanent Secretary

Acronyms

AAHL	Australian Animal Health Laboratory
ADB	Asian Development Bank
AFD	Agence Française de Développement
AMR	Antimicrobial resistance
APVMA	Australian Pesticides and Veterinary Medicines Authority
ASEAN	Association of South East Asian Nations
CBHI	Community-based Health Insurance
CDC	Centers for Disease Control (USA)
CEU	Central Epidemiology Unit
CHW	Community Health Worker
CHV	Community Health Volunteers
CIRAD	French Agricultural Research Organization
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DFAT	Department of Foreign Affairs and Trade (Australia)
DGHT	Division of Global HIV and TB
DTRA	Defence Threat Reduction Agency
ECTAD	Emergency Centre for Transboundary Animal Diseases
ECDC	European Centre for Disease Prevention and Control
EID	Emerging Infectious Disease
EOC	Emergency Operations Centre
EPHS	Essential Package of Health Services
EU	European Union
FAO	Food and Agriculture Organization
FETP	Field Epidemiology Training Program
FETP/V	FETP for veterinarians
GDP	Gross Domestic Product
GFATM	Global Fund to Fight Aids, Tuberculosis and Malaria
HPAI	Highly pathogenic avian influenza
HCV	Hepatitis C
IANPHI	International Association of National Public Health Institutes
IFRC	International Federation of Red Cross and Red Crescent Societies
IHR	International Health Regulations
InSTEDD	Innovative Support to Emergencies Diseases and Disasters
IPC	Infection Prevention and Control
ISO	International Organization for Standardization
JEE	Joint External Evaluation
MARC	Myanmar Alliance for Rabies Control
MBDS	Mekong Basin Disease Surveillance
MDR-TB	Multidrug-resistant tuberculosis
MERs- Cov	Middle Eastern Respiratory Syndrome -coronavirus
MMA	Myanmar Medical Association
MRCS	Myanmar Red Cross Society
MSF	Médecins sans frontiers

NGO	non-government organisation
NHL	National Health Laboratory
NTVs	nerve-tissue vaccines
NZAID	New Zealand Agency for International Development
OIE	World Organisation for Animal Health
PEPFAR	President's Emergency Plan for AIDS Relief
PVS	Performance of Veterinary Services
RAI	Regional Artemisinin-resistance Initiative
SHS	Specialist Health Service
SAFETYNET	South Asia Field Epidemiology and Technology Network
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
TB	Tuberculosis
TCVs	Tissue cell-culture vaccines
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
TGA	Therapeutic Drug Administration
UHC	Universal Health Coverage
UNOPS	United Nations Office for Project Services
USAID	United States Agency for International Development
UK	United Kingdom
US CDC	United States Centers for Disease Control and Prevention
UNICEF	United Nations Children's Fund
UNOPS	United Nations Office for Project Services
WB	World Bank
WHO	World Health Organization
3DF	3-disease fund