Southeast Asia Health Security Scoping Mission

8 November 2018

Laos country report

Contents

Purpose

This independent report outlines findings and opportunities for health security investments in Lao People's Democratic Republic (Laos), 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

Laos has a fast-growing economy and is poised to become a major energy producer in Southeast Asia with its hydroelectric power projects. Laos transitioned from a low-income economy to a lower-middle-income economy in 2011. While the current health care system in Laos is underdeveloped, the government is improving its health care infrastructure with the help of its Asian neighbours through major investments and international aid agencies.[1] Achieving Universal Health Coverage by 2025 is a priority of the government. To address low health insurance coverage (estimated at 36 per cent in 2015) and high out-of-pocket expenditure (40 per cent), the Ministry of Health (MoH) has launched a tax-based national

[1] http://www.worldbank.org/en/country/lao/overview

health insurance scheme for the informal sector through integration of three previous schemes: Health Equity Fund, voluntary community-based health insurance, and the Free Maternal and Child Health policy. Through this combined health protection scheme, the MoH aims to increase coverage to meet the target of 80 per cent by 2020.[2]

Disease burden

Major infectious disease concerns include dengue and malaria. Dengue is the world's fastest growing vector-borne disease and Laos is among the top 30 most endemic countries in the world. In 2013, Laos encountered its worst dengue epidemic, reporting 44,171 cases including 95 deaths. In 2016 the Government of Laos developed a Dengue Action Plan. Malaria deaths have reduced dramatically in recent years although drug resistance has become a challenge. Working with the World Health Organization (WHO), the government has established a malaria elimination target of 2025 for *p. Falciparum*, and 2030 for other forms of the malaria parasite. An estimated 90 per cent of all malaria infections occurring in five southern provinces are thought to be among internal migrant workers infected in Laos, and external migrant workers from Vietnam and other neighbouring countries working in mining, forestry and the farming (banana) industries.

Other major infectious disease concerns are tuberculosis (TB). Laos has a high TB burden, with an estimated incidence in 2016 of 175 per 100,000, and a death rate of 43 per 100,000. There were 5,170 confirmed new TB notifications in 2016. The TB treatment coverage (notified/estimated incidence) was 42 per cent in 2016, leaving many case undetected and untreated.[3] Since 2003, the Global Fund on AIDS, TB and Malaria (GFATM) has provided strong support for the TB and malaria programs. In view of the relatively small HIV burden the MoH is considering merging the HIV and TB programs for a joint allocation from 2020 and beyond. Other neglected tropical diseases such as liver fluke are also prevalent in Laos.

Zoonoses burden

Highly pathogenic avian influenza (HPAI) is a major concern in the agriculture sector, and recent containment activities have been conducted for poultry outbreaks of H5N1 and H5N6 Other zoonotic infections include brucellosis, Japanese encephalitis and rabies (for which the government has set a 2020 elimination target). Pigs have also been found to act as reservoirs of Hepatitis E in Laos.[4]

[2] Lao economic monitor : challenges in promoting more inclusive growth and shared prosperity - thematic section : financing the health sector in Lao PDR (English) | The World Bank

[3] WHO 2016 Laos country TB report , accessed 13/09/2018 http://www.who.int/tb/country/data/profiles/en/

[4] http://www.pasteur.la/project-carried-on-in-the-lab-12/research-and-capacity-building-activities-on-zoonotic-viruses-in-lao-pdr/

In 2011, the World Organisation for Animal Health (OIE) reported that 95 per cent of livestock was owned by small holders. Although commercial farms are increasing in number, much of the rural population lives in close contact with poultry, pigs, goats, cattle or buffalo. In addition, hygiene and infection control in slaughter-houses and wet markets is often insufficient.

Antimicrobial resistance

Multi-drug resistant TB (MDR TB) was detected in Lao for the first time in 2010. Approximately 50 per cent of all TB specimens in Lao are tested by GenXpert tests for MDR TB at first test. In 2016 approximately five to 12 per cent of new TB cases were MDR TB.[5]

Along with other countries in the Greater Mekong Sub-region (GMS), Laos faces a growing challenge from Artemisinin resistance in treating malaria. Artemisinin-based Combination Therapy (ACT) was introduced by the Government of Laos in 2004 to combat resistance. WHO currently recommends five ACTs for use in the GMS. The 2017 World Malaria report identified Laos (and Thailand) as countries with treatment failures rates of over 10 per cent in three of these five ACTs, while in neighbouring Cambodia four out of five ACTs have failed.

The Government of Laos is taking action on AMR and a national action plan on AMR was drafted in November 2016. However, the extent of antimicrobial resistance and the factors driving it require more investigation. In July 2018 the MoH, together with the Korean International Cooperation Agency (KOICA) and WHO, launched the National Antimicrobial Resistance (AMR) Surveillance program. The program aims to build the capacity of the *National Center for Laboratory and Epidemiology* as the national Reference Laboratory and the coordinating body for the national AMR surveillance system, to improve the functioning and capacity of surveillance sites around the country.[6] Support from the Fleming Fund is also being used to assess laboratories for AMR testing capacity.

The situation of AMR in animals is not well understood, and Laos is working with OIE and Food and Agriculture Organization (FAO) to strengthen surveillance and to better understand prescribing behaviour in order to address the issue of antimicrobial stewardship.

[5] WHO 2016 Lao country report , https://extranet.who.int/sree/Reports?op=Replet&name=%2FWHO_HQ_Reports%2FG2%2FPROD%2FEXT%2FTBCountryProfile&ISO2=LA&LAN=EN&outtype=html

[6] http://www.wpro.who.int/laos/mediacentre/releases/2018/20180712-launch-of-ars-program-in-laopdr/en/

Capacity to respond

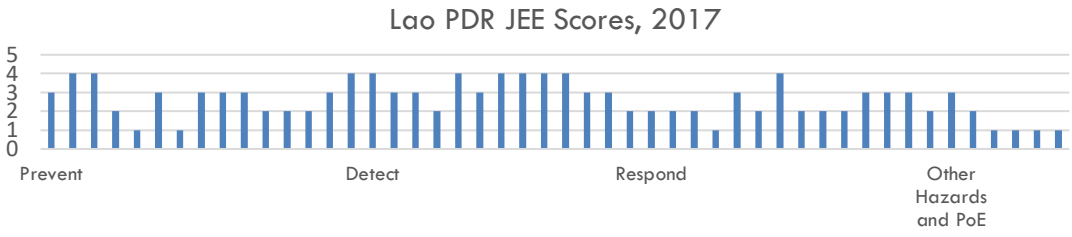
International Health Regulations—assessment of core capacities

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 OIE evaluation of countries 'Performance of Veterinary Services'(PVS) Pathway, in assessing countries' capacity for zoonoses control and cross-sectoral responses.

In Laos, the PVS Pathway evaluation was last conducted in 2007, with a subsequent follow-up mission of Laos's veterinary services undertaken in 2011. The PVS follow-up mission found that the overall score remained low, despite improvements in the quantity and quality of veterinary para-professionals and measures to increase the numbers of qualified veterinarians. The follow-up also identified challenges in the regulation of delivery of veterinary drugs and vaccines, poor hygiene in most slaughter facilities and meat processing facilities and the lack of capacity to monitor residues in animal products. The 2016 JEE for Laos showed scores for Zoonotic diseases had increased, recognising improvements to the country's capacity to prevent, detect and respond, including multi-sectoral collaboration.

Beyond animal health, the 2016 JEE identified priority needs as surveillance, field epidemiology training, and laboratory strengthening with a focus on biosecurity.

The graph below provides information on progress across JEE key areas comparing 2013 and 2016 results.[7]



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

Following the 2016 JEE evaluation, the Government of Laos produced the *National Emerging Infectious Disease, Public Health Emergencies and Health Security Workplan 2016–20,* which integrates reforms and a number of related strategic plans, and provides costing estimates for implementation. This workplan was revised to include JEE recommendations and

[7] IPCHS-IHR in SE Asian countries-Window 3 mid-year update (WB Powerpoint slides supplied by IPCHS).

finalised and approved in April 2016. It contains eight focus areas with key components for capacity building: coordination, monitoring and evaluation; surveillance, risk assessment and response; laboratory; One Health/zoonoses; food safety; risk communication; public health emergency preparedness; and AMR, infection prevention and control (IPC) and management.[8]

Health system

The health care delivery system in Laos is historically a predominantly public system, with government-owned and operated health centres and district and provincial hospitals. As well as these public facilities, much of the population has relied on out-of-pocket payments to small private after-hours clinics, and self-medication though drugs purchased from pharmacies. However, new private health care providers and facilities are emerging along with increasing demand for better services. There are officially four levels of organisation in terms of service providers: central-level providers (hospitals) managed directly by the MoH; provincial-level providers, managed by the Provincial Health Office; district level providers, managed by the District Health Offices (DHOs); and community-level providers (health centres), also managed by the DHOs. At the village level, there are village health volunteers, community health committees, and traditional birth attendants.[9] Health services at the secondary and tertiary levels are provided through four central general hospitals and three specialist hospitals in the capital city, in addition to four regional and 12 provincial hospitals. The number of hospital beds per 1,000 population is low in the country, at 0.8 (2014 estimate). Access to health services is difficult in some of rural areas, especially in the northern mountainous part of the country. Health care provided at the local level is often constrained by lack of qualified staff, inadequate infrastructure, and need for an affordable device and drug supply.

In 2015, total health care spending in Laos was $220 million, which is predicted to rise as the economy grows. The government allocates 6.8 per cent of its annual budget for health, and the MoH still depends on external funding, such as the GFATM grants and development bank loans and grants, to conduct some routine activities. According to the World Bank's Lao Economic Monitor April 2017, nearly 30 per cent of the government's spending on health was financed by external funding. For emergencies such as infectious disease outbreaks, there is no contingency fund, and the government provides funds on an ad-hoc basis.

[8] Laos National EID workplan 2016–20 (hardcopy supplied by IPCHS).
[9] WHO Laos country report 2014, http://iris.wpro.who.int/bitstream/handle/10665.1/10448/9789290616481_eng.pdf

Immunisation

Immunisation coverage has increased dramatically over the past decade. Coverage for the three-dose DPT vaccine increased from 50% to 85% in Laos from 2007 to 2017, while coverage for the first dose of measles-containing vaccine increased from 40% to 82%, according to administrative routine immunization coverage data[10]. However, successes in immunization coverage may be difficult to sustain with evidence suggesting that only around 50 percent of children are fully vaccinated by the age of one. Laos is among the 20 countries scheduled to transition from GAVI support to fully sustain its own immunisation programme by 2021.

One Health

One Health collaboration in Laos has built on the changes made as a result of the avian influenza outbreaks in 2006-7 and established a number of mechanisms for coordination. These include a Memorandum of Understanding between the Ministry of Agriculture and Forestry and the MoH on information sharing, the National Zoonotic Diseases Coordination Mechanism for the Health and Animal Sectors, and the National Emerging Infectious Diseases Control Organization (NEIDCO) that regularly brings the animal and human health sectors together to share information on HPAI and conduct joint risk assessment. There is capacity to detect priority zoonotic diseases in both humans and animals at national laboratories, and some sub-national laboratories. As well, there are surveillance systems for some priority zoonotic diseases. However, ongoing challenges include: a critical shortage of animal health professionals and para-professionals at provincial and district level; lack of systematic surveillance system for some priority zoonotic diseases; and reliance on ad hoc means of sharing information and a coordination mechanism that is not yet fully operational.

There are numbers of Village Veterinary Workers (VVWs), some of whom operate as private service providers, but they frequently lack incentive to report animal disease outbreaks, as treating diseased animals is a source of income for them. There is increasing awareness of the need for multi-sectoral collaboration to combat AMR. In 2016, the Ministry of Health and the Ministry of Agriculture and Forestry jointly organized the first Multi-sectoral Workshop on Combatting Antimicrobial Resistance in Vientiane with support from FAO, WHO and OIE.

External donors

In addition to major contributions from international donors like Gavi, the Vaccine alliance and the GFATM, and loans from the development banks, Laos has received bilateral support from the Government of China for the construction of hospital and other health facilities (including a plan to construct and maintain a private hospital for 30 years before handing

[10] https://www.unicef.org/laos/health

over to Laos), and technical collaboration in non-communicable disease control with Chinese universities.

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 Laos country 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, using relevant institutional experience and twinning options with relevant Australian institutions.

1. Surveillance, alert and response

Situation analysis

Laos has a routine disease reporting/notification system of 18 human diseases, where reports are received weekly and analysed by the national public health team. Disease reporting originates at community health centres and reports are sent to the district health centre and hospital, and then onwards to the central government. There is no civil registration system, the capacity to analyse data at all levels of government is limited, and there is no regular reporting from private sector health facilities. There is likewise no routine reporting of disease among migrant populations since they are not seen within the routine health system, and there is a lack of surveillance of insect vectors and their resistance to insecticides.

A syndromic surveillance system is being developed as an early warning outbreak response system, which will have the capacity to report on clusters of disease to enhance disease alert. However, at present there is no real time reporting system except for a hotline linked to the MoH, which was developed for avian influenza surveillance, and occasional informal reporting of clusters of disease by SMS or other electronic communication. There is also a pilot sentinel laboratory surveillance network linked to surveillance of influenza, Zika, and dengue, and AMR surveillance is being integrated into these sites. All these surveillance systems have chronic insufficiencies in workforce capacity (both quantity and quality), especially at provincial and district levels.

Laos did not report any animal diseases to the OIE World Animal Health Information Database (WAHID) Interface in 2017, one of the only Southeast Asian member countries that did not report. This was attributed to staffing gaps during the reporting period. There are livestock officers at more than 20 border posts, who report unusual events in animals on a weekly basis to the Animal Health Department, and there is environmental sampling for HPAI (H5 and H7) in live bird markets around Vientiane using pen-side Polymerase chain reaction (PCR) units. The MoH has reported that surveillance of human disease is much more comprehensive than that for animals and concludes that both are in need of training and standardisation. Except for avian influenza, routine and real time surveillance of disease and of antimicrobial resistance in both the human and animal sectors (including aquaculture) is fledgling, despite input from several external donors and the priority government has placed on surveillance. VVWs occasionally report on animal disease but, as cited in the section on One Health, they are rarely motivated to report outbreaks.

Built into the avian influenza surveillance system, there is a joint MoH and Ministry of Agriculture and Forestry weekly risk assessment for avian influenza, coordinated by the Department of Communicable Disease Control within the MoH. In addition to avian influenza, four other communicable diseases—anthrax, rabies, trichinella and leptospirosis—are included in the weekly joint risk assessment. There is a rapid response team and emergency operations centre (EOC) at the Department of Communicable Disease Control and at each province, but their capacity is limited by resources and lack of continued training and simulation exercising. The Bill and Melinda Gates Foundation is discussing the feasibility of using the EOCs for strengthening emergency preparedness and surveillance/response as support to malaria elimination.

Laos is member of Mekong Basin Disease Surveillance Committee, which provides a forum for regional collaboration and information sharing, and regularly participates in regional outbreak response simulation exercises with bordering countries of Cambodia, China (Yunnan and Guangxi Provinces), Laos, Myanmar, Thailand and Vietnam. The army conducts routine simulation exercises as well, but has not synchronized them, or its training and guidelines, within Laos or in bordering countries. Outbreak response is therefore often not coordinated.

There is no electronic link or other technology platform for consolidation of surveillance data and risk communication, due in part to limited internet coverage in rural areas. This often results in miscommunication to the media and public, especially at times of outbreaks.

The Laos National Animal Health Laboratory collaborates with the United States Centres for Disease Control (US CDC) in the north, with avian influenza surveillance (especially for H5N1 and H7N9). The National Animal Health Laboratory is also collaborating with the United States Agency for International Development (USAID) Emerging Pandemic Threats 2 (EPT-2) program on wildlife disease surveillance in the south of the country. In relation to AMR, the

National Animal Health Laboratory tests for veterinary drug residues in local and imported meat and milk and is working with the FAO on antimicrobial resistance and use.

Scoping team analysis and priorities identified

There has been much government interest and work on establishing routine disease reporting and real time alert for human infections. However, the same is not true for animal infections except for avian influenza, for which there is a real time reporting system and a regular joint risk assessment activity between the MoH and Ministry of Agriculture and Forestry. The Health EOC is common between the two ministries. It has conducted simulation exercises and is helping establish a One Health platform, but this does not include the private sector or the military. There is currently an attempt to include other zoonotic diseases in the avian influenza surveillance system but, in general, animal surveillance is much less developed than in the human sector. Surveillance of AMR is currently being established, but a void remains in understanding its prevalence in humans, animals, fish and the food chain. There is little understanding of vector breeding habits, or resistance of vectors to insecticides.

All surveillance systems—both animal and human—are plagued by chronic shortage of trained staff, and a lack of inter-system communication. There is a paucity of health workers with training in surveillance, especially at peripheral levels of the health system, and surveillance is non-standardised, not linked and fledgling. A common data sharing platform for surveillance information does not exist, limiting the power of surveillance, data analysis, outbreak response and risk communication.

Priorities therefore include technical support to the government in rationalising and coordinating existing disease surveillance systems in the animal and human sectors, and for establishing new systems for surveillance of AMR in these sectors. Also of priority is technical support for strengthening surveillance and risk assessment at the animal/human interface, and strengthening communication of infectious disease risks to politicians and the general public.

Finally, there is a need for better understanding the entomological situation through strengthened surveillance of vectors and resistance patterns to insecticides.

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

1. Well-coordinated animal and human disease reporting and real time outbreak alert.
2. Stronger and more widespread joint human/animal risk assessment.
3. Stronger risk communication for infectious disease outbreaks.
4. Better understanding of the AMR situation in humans, animals and fish/food chain.

5. Better prediction of mosquito-borne and other vector-borne outbreaks and stronger vector control.

Opportunities for DFAT support for surveillance, alert and response

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priority
Technical support for stronger entomological surveillance and community-led vector control	5		WHO Pasteur Institutes CDC	High
Technical support to rationalise surveillance and event-based reporting systems inclusive of both public and private sectors and international reporting requirements	1, 2,3,4	ADB USAID	WHO OIE FAO CDC	High
Technical support for risk communication before and during outbreaks	3			High
Technical support for continued development of national antimicrobial resistance surveillance plan in animal, human and aquaculture sectors and integrating public and private sectors	4	Fleming Fund USAID US CDC	WHO FAO OIE	High/ Medium
Technical support for regular One Health risk assessment via the national EOC platform and One Health Secretariat	2	USAID	WHO FAO OIE CDC	Medium
Technical support for behavioural research on prescribing practices in animal, aquaculture and human sectors	4	Fleming Fund	WHO FAO OIE	Medium

2. Health workforce components

Situation analysis

The MoH has a comprehensive National Strategy for Human Resources for Health 2010–2020, in response to the shortage and uneven distribution of skilled health workers across the country. The MoH is working on reintroducing the training program for medical assistants and in-service primary health care training modules, providing an incentive package for staff to work in rural areas, and negotiating for an adequate number of sanctioned posts for rural health workers. There is also a move to provide training and incentives to village health volunteers to become qualified village health workers.

Laos has an aging health workforce at all levels of the animal and human sectors. The government has recently trained approximately 1,500 health workers for disease prevention and control, management of public health systems, and preparedness/prevention activities at the community and district levels. The quality of training is varied, as are the skills among individual health workers, and training curricula requires updating. Differences in quality and skills of health workers are especially striking between the northern and southern provinces, with fewer and less well-trained health workers in the north.

To improve fiscal sustainability and reduce public wage bills, with the support of the World Bank,[11] the Government of Laos recently adopted a quota system, reducing intake of civil servants to 5,000 in 2017, in response to findings that Laos has a comparatively high total number of workers on the government payroll. This was a cause of concern in a number of sectors, including animal health, which has a high numbers of retirees and low numbers of new recruits with the necessary skills and experience.

The portion of a country's health workforce that contributes most to health security includes public health workers and those responsible for infection prevention and control, such as nurses, and community health workers or volunteers (in both human and animal health), as well as laboratory technicians, epidemiologists and veterinarians.

Field epidemiology training is a recognised approach to improve capacity for outbreak detection. Laos has a one-year professional level Field Epidemiology Training Program (FETP) that has been functioning for more than 10 years, supported by US CDC and the Defence Threat Reduction Agency (DTRA), with capacity to train eight health professionals per year. This program provides skills in epidemiology, surveillance, outbreak investigation and response, and routine disease prevention. Though the program currently enrols only medical doctors, consideration is being given to including senior nurses. Trainees have included personnel from the military, the police, and the district level. To date there have been 71 graduates deployed, resulting in two to three graduates in each province. However,

[11] World Bank Group, Lao First Programmatic Green Growth DPO, 2017,and Laotian Times, https://laotiantimes.com/2016/07/31/government-to-accept-only-5000-new-employees-in-2017/

WHO reported that many of the earlier trained cohort are starting to retire.[12] There is now a need to expand trained field epidemiologists to the district level, and to consider whether these functions could be conducted by other health professionals. The US CDC funding is expected to reduce in the near future. There is no equivalent field epidemiology training program for veterinarians or VVWs.

Rapid outbreak investigation is usually conducted by an inclusive national/province/district team, with members including FETP graduates. Simulation exercises have been conducted by these teams. More simulation exercises are needed for both the animal and human sectors so health workers can better guarantee rapid joint outbreak detection and response.

Training in infection prevention and control is also needed in most hospitals, health centres and at community level. The government is also aiming for one community health worker in each village by 2020.

The Communicable Disease Control Department within the MoH includes a One Health Section. The Director General noted that One Health case management guidelines have been established, and an MoU between the Ministry of Health and Ministry of Agriculture and Forestry signed.

Scoping team analysis and priorities identified

The health workforce in Laos can best be characterised as aging, lacking in uniformity of skills for surveillance, outbreak detection and response, and imbalanced in geographic distribution. Possible solutions to this dilemma include task shifting so that community health workers can better and more effectively participate in outbreak detection and response, and a geographic redistribution of younger health workers who have these skills. At the same time, training curricula could be re-assessed to see if they meet the needs of those to whom tasks have been shifted, and to determine whether there are innovations that could be introduced to update training and skills.

In the human health sector there is already a strong base of health workers. This would make these tasks simpler than in the animal sector where there is a lack of skilled community level workers providing support to the government's alert and response systems. Despite the large numbers of VVWs trained in the 2000s following an avian influenza outbreak, training and incentives have not been provided on a sustained or regular basis. At the same time, there is a strong field epidemiology training program for medical doctors, but none exists for veterinarians. A pilot training scheme for veterinarians could also be considered, as well as comprehensive epidemiology training for government agricultural workers.

[12] IPCHS field notes Laos Health Security scoping mission.

Priorities for DFAT support to the Government of Laos therefore include technical support for mapping of the distribution of outbreak detection and response skills, assessment of skill sets required for stronger disease detection and response among the various categories of health and agriculture worker, and restructuring/updating training curricula to meet these needs.

A further priority could be to work with the Ministry of Agriculture and Forestry to develop the skills for outbreak detection and response among all government agriculture workers, and to support mapping and redistribution as required, as well as to support the further development of simulation exercises of animal and human health workers at all levels through the EOC. Another priority could be to determine whether a pilot study of field epidemiology training for veterinarians would be feasible and of value.

On the laboratory side a curriculum review is needed, to include the identification of most up-to-date diagnostic protocols, including those to detect AMR, and all protocols should be adapted to the need at the level where testing is conducted. Development and update of training materials, including for biosafety and biosecurity, should then be supported to reflect the skills required by the updated curricula. They should also contain principals of public health management to ensure more consistent quality and reliability of laboratory services

Finally, technical support for geographic mapping of where outbreak alert and response skills exist, and for redistribution/retraining of health workers to obtain a better balance of skills between the north and south of the country are required to strengthen health security.

Desired outcomes of DFAT investment related to health workforce components

1. Better balance in geographic distribution of skills in epidemiology, disease detection and response.
2. Increased number of health workers, including laboratory workers, with surveillance/identification skills in both the animal and human sectors.
3. Up-to-date training curricula in disease surveillance and outbreak detection/response, and IPC, for all government health and agriculture workers.
4. More comprehensive simulation exercises for outbreak detection and response including all sectors including military.

5. Stronger field epidemiology skills among veterinarians and senior government livestock and aquaculture workers.

Opportunities for DFAT support for health workforce components

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priorities
Targeted technical support to veterinarians and senior government livestock and aquaculture workers in disease surveillance, outbreak detection/ response and IPC	1, 2, 4	DTRA	WHO FAO SAFETYNET CDC UNICEF	High
Technical support for a pilot field epidemiology training scheme for veterinarians and agriculture health workers	5		TEPHINET/ SAFETYNET US CDC OIE FAO	High
Technical support for mapping of distribution of health/veterinary workers with epidemiological skills	1	DTRA	WHO FAO US CDC	High
Technical support for development of curricula and training materials in disease surveillance, including laboratory diagnoses, with practical One Health simulation exercises for outbreak detection, investigation, response and control to include all sectors including military	1, 3, 4		WHO FAO GOARN US CDC	High
Feasibility study of including health workers other than medical doctors in FETP, or of a new FETP aimed at this category of health worker			WHO FAO OIE	Medium

3. Health facilities including laboratories

Situation analysis

There is a network of public health laboratories throughout Laos. At the central level, there is the National Center of Laboratory and Epidemiology (NCLE) with a BSL3 laboratory supported by the Chinese Government with capacity in virology and bacteriology. The NCLE also serves as a WHO reference lab for avian influenza, which is recognised by WHO as the 'Influenza Participating Centre'. *Institut Pasteur du Laos* (IPL),[13] Mérieux Foundation and Welcome Trust laboratories are situated in Vientiane and work collaboratively with the MoH. The latter laboratories are largely externally funded and provide high levels of diagnostic and research services as well as training to build local capacity. At provincial level, however, laboratory capacity, quality and resources are weaker. Diagnostic laboratories also exist in private hospitals, but they are not linked to the government, and their quality is not monitored by the government.

The National Animal Health Laboratory is relatively new and relatively well equipped, but it faces significant human resource shortages, further compounded by the recent call for reduction in Lao Public Service staff from 5,000 to 3,000. Older staff are retiring and, because of the reduction, they are not being replaced. This is placing an added burden on existing staff. The original laboratory plan called for 31 personnel, but there are currently 17 staff in place and no prospect for attaining the intended goal.

While some of the national public health and clinical diagnosis laboratories have quality assessment programs, the quality of laboratories is not uniform, and the National Laboratory Committee has identified biosecurity as a major problem. The Committee also considers understaffing a major problem that compromises the ability of the laboratories to fully support surveillance and alert activities. The Committee regularly meets and its long-term goal is to standardise laboratory activities by ensuring ongoing ISO 17025 accreditation, with support from WHO. The Committee has a plan to develop two additional public health laboratories, one in the south and one in the north, with satellite laboratories in the provinces.

There is a food safety laboratory, established by the Mérieux Foundation, that has the ability to detect all hazards including infectious and chemical contaminants. It is considered especially important for testing imported foods—including chicken imported from China—but its capacity requires strengthening for consistency and quality.

[13] IPL has a mandate from Lao Ministry of Health to fulfil activities of public service to undertake research and diagnostic on emerging infectious diseases and vector borne diseases; Training, Education and Capacity building; Technical assistance to National Center for Laboratory and Epidemiology (NCLE) for investigation of epidemics http://www.pasteur.la/.

The Head of the Animal Health Laboratory indicated that staff shortages have resulted in a lack of reporting of animal disease outbreaks to OIE via the World Animal Health Information Database.

The Fleming Fund, WHO and FAO are working with the laboratory to strengthen AMR surveillance and testing capacity.[14] The laboratory's performance, as measured by the FAO Lab Mapping Tool, has increased from 22.4 per cent in 2012 to 50 per cent last year.

In addition to providing diagnostic testing, the Veterinary Vaccine Laboratory produces a range of viral and bacterial vaccines: Newcastle disease (F, M and I-2 strains), infectious bronchitis, duck plague, classical swine fever, haemorrhagic septicaemia and fowl cholera. The master seed for black leg vaccine production has become inactivated, and a request was made for support to obtain a new one.

Overall there are few links between surveillance and laboratory, and no common database for sharing of surveillance information, which hinders joined up surveillance activities. Laboratory testing for AMR has not been emphasised in the past, but there is growing awareness of the need and a government desire to support surveillance activities for AMR with stronger laboratory capacity in both the animal and human health sectors, and for surveillance and research to better understand AMR prescribing practices.

Scoping team analysis and priorities identified

The public health laboratory system supporting surveillance activities and outbreak detection and response in Laos is variable in quality and in biosecurity, as well as in the timeliness of specimen analysis and reporting. Laboratories are chronically understaffed and/or lacking in staff with relevant skills, and their sustainability precarious, especially the maintenance of equipment and reagents. Laboratories in rural areas are limited in capacity, and specimens are therefore sent to more central laboratories under difficult logistical conditions delaying the time to diagnosis and at time compromising the quality of the specimen leading to inaccurate diagnosis.

The laboratory system for support to animal public health is fledgling, and although there is an up-to-date central laboratory with support from FAO this has the same sustainability and biosecurity issues as the public health laboratory system. The laboratory system has not yet reached more peripheral areas and because of a lack of outreach laboratories, specimens must be transported to the central laboratory for analysis.

There is a need for a common IT database for sharing laboratory and surveillance data to ensure best possible detection of unusual events including infectious disease outbreaks. There is also a need to ramp up AMR laboratory diagnostic capabilities, and to create the clinical/laboratory links necessary for better understanding of the AMR situation in both

[14] The Fleming Fund is supporting Laos for AMR surveillance through its global grants to WHO and FAO, https://www.flemingfund.org/countries/laos/.

humans and animals, including aquaculture. In addition, there is a need to better understand prescribing practices for antimicrobials in both the animal and human health sectors.

Finally, training of laboratory staff has also been of varied quality, and a review of laboratory capacity at central and provincial levels for both animal and human health would provide a basis for more equal distribution of skills and the diagnostic testing offered.

Priorities for DFAT in health facilities including laboratories are therefore to strengthen biosafety/biosecurity and diagnostic capability through training of laboratory technicians to work most efficiently within renovated or new laboratory infrastructure provided by other donors, and provision of up-to-date and adapted equipment/reagents for selected laboratories. This will complement the review and update of medical and paramedical curricula for training of laboratory personnel mentioned above in *2. Health workforce components*.

Also required is an IT platform that will permit better sharing of surveillance and laboratory data, and surveillance and research of prescribing patterns in both the animal and human sectors.

Desired outcomes of DFAT investment in health facilities including laboratories

1. More rational geographic coverage spread of diagnostic capacity in animal and human health.
2. Stronger biosafety/biosecurity and diagnostic capacity in health facilities including laboratories.
3. Better understanding of the AMR situation and prescribing behaviour on which to base interventions to slow the evolution of resistance.
4. Stronger surveillance and disease alert from diagnostic laboratories.

Opportunities for DFAT support for health facilities including laboratories

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priorities
Technical support for enhanced laboratory management information and common IT platforms/systems that contribute to stronger surveillance and disease alert	4	USAID DTRA	FAO AAHL	High
Technical support for enhanced development and implementation of laboratory support to AMR surveillance	3	DTRA	WHO FAO OIE US CDC Merieux Foundation Pasteur Institute	High
Technical support for assessment of laboratory testing algorithms to ensure appropriate and effective diagnostic testing at each level of laboratory	1, 4		WHO FAO AAHL	High
Technical and financial support for biosafety/biosecurity and diagnostic capacity in laboratories through training to best utilise improved infrastructure and equipment	2, 3,	USAID	WHO FAO OIE US CDC Merieux Foundation Pasteur Institute	High

4. Community resilience

Situation analysis

Laos Red Cross Volunteers work at the community level providing routine health promotion and mobilisation services and have been trained in response to natural disasters and outbreaks. They have been trained in: motivating communities for the prevention of sexually transmitted infections such as HIV, including through youth peer education; seeking

health care for communicable diseases such as HIV, TB and malaria; promoting safe water, sanitation and hygiene; and motivating maternal, newborn and child health and nutrition including vaccination seeking behaviour. Some volunteers come from within women's groups, which are strong partners in community health promotion. Vector control is not at present promoted through community volunteers, but some volunteers are also trained in animal health and report unusual animal health events through pre-established channels. The Ministry of Agriculture and Forests aims to increase volunteer recruitment and training animal health promotion and prevention.

There are 88 branches of the Laos Red Cross in 144 districts, and it is present in all 18 provinces. Staff are paid by the Laos Government, and include 15–20 staff at the provincial level and two to three staff at district level. Training in response to natural disasters and outbreak response has been conducted in the past through partnership with the Australian, Danish and Chinese Red Cross, but there is a current need for further financial support and partnership for continued volunteer recruitment and training activities. National non-governmental organisations other than the Red Cross are also active in providing support for health promotion in communities, as are some international non-governmental organisations.

The MoH also recruits and supports village health volunteers who work in communities to ensure routine disease reporting, and reporting of unusual health events. The volunteers report through district health systems that are currently being computerised so that malaria, HIV and immunisation coverage data can be efficiently reported. These health volunteers are also important in providing information about health needs of migrant populations, and support mobile teams that provide free treatment for acute infections such as malaria.

Scoping team analysis and priorities identified

Community resilience in Laos is enhanced by volunteers from organisations such as the Laos Red Cross, and by volunteers recruited and trained by the MoH. As with Vietnam, there is a major overlap between local volunteers of any kind and the members of the government supported 'Mass Organisations': the Lao Women's Union, The Lao Youth Union and the Lao Front for National Construction. This provides greater reach as their membership covers most of the country, and can be better centrally directed in the case of emergencies (allowing for difficult terrain and poor mobile reception). However, it can mean that quality is variable as people's skills and motivation differ. In addition to providing health promotion activities for endemic disease, volunteers are also trained in response to natural disasters and infectious disease outbreaks.

Red Cross volunteer recruitment has been supported by partnership with Red Cross Societies from neighbouring countries such as Australia and China, and from European countries including Denmark. Laos is currently seeking renewed or new partnerships.

Although the community volunteer system for health is extensive and well established, the same is not true in the animal health sector and there is a desire to increase recruitment and volunteers in the area of animal health promotion and prevention. Priorities for DFAT in the area of community resilience are therefore: to support volunteer recruitment and training programs in both the animal and human health sectors; and to work with the government and non-government organisations to ensure that curricula provide the best possible skills for health promotion and prevention, enhanced disease detection and response, and that training materials are up-to-date and based on these updated curricula.

Desired outcomes of DFAT investment related to community resilience

1. More rapid and timely reporting of infectious disease outbreaks in humans and animals.
2. Stronger and more robust response to infectious disease outbreaks in humans and animals.
3. Improved community level prevention of waterborne infectious disease outbreaks.
4. Increased uptake of childhood immunisations.

Opportunities for DFAT support for community resilience

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priorities
Technical support for development of revised training materials for community volunteers in first response, social mobilisation, vector control and risk communication	1, 3, 4	IFRC USAID	IFRC WHO FAO OIE US CDC	High
Technical support for development and field testing of training materials for community volunteers in safe farming and aquaculture, in vector control and in health promotion including childhood immunisations	1, 2, 3, 4	IFRC USAID	IFRC WHO FAO OIE UNICEF	High
Technical support for assessment of effectiveness of newer handheld communication technologies in outbreak detection and response	1	USAID Ending Pandemics Organization IFRC	IFRC WHO FAO US CDC PODD	Medium

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priorities
Support to Laos Red Cross to train community volunteers in first response, social mobilisation, vector control and risk communication	1, 2, 3	IFRC USAID	IFRC, WHO FAO OIE US CDC	Medium

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

Situation analysis

There are approximately 100 different laws in the Laos health sector, most of developed since 1999. Legislation most relevant to this report includes: requirements for social security schemes and UHC; hygiene and health promotion; food inspection; vaccines, medicines and medical products; price control and reporting of epidemic infectious diseases including SARS, Ebola, rabies, and cholera. There are fewer regulations in the animal health sector, and most of those that are written in law appear to be for regulation of veterinary medicines and vaccines, and food safety.

Laos conducted a Health System Review of its health legislation in the early 2000s, and from this produced a Health Sector Reform and Strategy Framework 2013–2025. This framework provided national targets to reach the health-related Millennium Development Gaols by 2015, most of which were not fully met. There is also a government target for full UHC by 2025. Additionally, the government has established specific health goals for 2020 including: infant mortality rate of 30/1000 live births; under-five mortality rate of 40/1000 live births; and a maternal mortality rate of 160/100000 live births. There is also a set of 2020 access targets: 90 per cent of the population with access to clean water, 80 per cent to latrines, and 80 per cent with insurance coverage.

To date, there has been no specific legislative framework for joint work between the animal and human health sectors on infectious disease surveillance and response, nor is there a legislative framework for stewardship and other activities in the area of AMR.

Scoping team analysis and priorities identified

There are varying policies, enshrined in law, that aim to improve population health and others aimed at regulation in the veterinary sector. Legislation has been developed at various times since the late 1990s, and is not linked through a common legislative framework. However, there are now clear attempts to develop policies and supporting laws for the many different components of UHC in order to create a UHC-facilitating

environment. Laws currently support a wide range of regulatory activity, some of which do not most effectively facilitate UHC and other government priorities such as outbreak alert and response in a way that could strengthen health security. There is also a lack of legislation to support the government's priority to strengthen antibiotic stewardship and the fight against AMR.

Legislation in the animal sector is less well developed, and is mainly regulatory in nature, causing potential delays in the introduction of new drugs, vaccines and/or diagnostic tests that have the potential to strengthen infectious disease alert and response. Laos approved a new law of Livestock in 2016, which has given more power to the Government in terms of emergency plans for 'stamping out' or culling, policy and compensation. Legislation that would facilitate a One Health approach in surveillance, disease detection and response is lacking, and this creates uncertainty in linked work, which has commenced through regular meetings for joint risk assessment for avian influenza and other zoonotic infections.

Priorities for DFAT in the area of health policy and regulation of drugs, vaccines and diagnostics are therefore to support an analysis of the various laws that underpin UHC including harmonisation of regulatory procedures for drugs, vaccine and diagnostics; and to identify gaps in this legislation, providing model legislation as required. Priorities also include technical support for the development of a legal framework for One Health activities in both the animal and human health sectors that would facilitate other government priorities in One Health, and in the fight against antimicrobial resistance.

Desired outcomes of DFAT investment related to health policy and regulation of drugs, vaccines and diagnostics

1. More rational and better-linked legislation that will facilitate the government priority of UHC.
2. A legislative framework and model legislation that will facilitate a One Health approach to surveillance, alert and response.
3. A legislative framework for antimicrobial stewardship and surveillance.
4. More rapid access to newer drugs, vaccines and diagnostics.

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

Laos-specific activity	Outcome (aligns with number above)	Potential financial contributors	Potential partners	Priorities
Technical support for review of current legislation regarding UHC, One Health, and AMR legislation in animal and human health sectors with identification of gaps	1, 2, 3	Fleming Fund	WHO FAO OIE	High
Technical support for regional harmonisation of regulatory procedures for drugs, vaccines and diagnostic tests	4	TGA	FAO WHO OIE TGA	High

Annex 1: Laos scoping mission meeting schedule

Indo Pacific Health Security Initiative High Level Scoping Mission

Vientiane, 13–15 June 2018

Mission team:

- Mr Peter Verseggi, Australia's new Ambassador for Regional Health Security, First Assistant Secretary, Development Policy Division, DFAT
- Dr Guenael Rodier, Leader of Mission, 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, Technical Specialist (Public Health –Epidemiology)
- Prof Robyn Alders AO, Technical Specialist (Animal Health)
- Ms Prudence Borthwick, Assistant Director, Indo-Pacific Centre for Health Security

Time	Activity
13 June 2018	
07:30 – 08:30	Meet with Dr Juliet Fleischel, WHO Representative, Lao PDR Office
09:00 – 09:45	Courtesy call on H.E Dr Bounkong Syhavong, Minister for Health
10:00 – 11:00	Meet with Communicable disease control, Public Health Emergency, International Health Regulation, Ministry of Health: Dr Rattanaxay Phetsouvanh, Director General of Communicable Disease Control Department
11:30 – 12:15	Meet with Lao Red Cross: Assoc Dr Sing Menorath, Vice President, Dr Bounma Xayasouk, Director of Community Health Promotion Unit Mr Phonexay Sivilay, Director of Health Emergency Division, Dr Soulany Chansy, Deputy Director LRC Health Department
13:30 – 14:30	Meet with National Centre for Laboratory and Epidemiology (NCLE): Dr Phonphadit Xangsayarath, Deputy Director of NCLE
15:00 – 15:45	Meet Centre for Malaria, Parasitology and Entomology Department, Ministry of Health Dr Viengxay Vanisaveth, Deputy Director
16:15 – 17:15	Meet with Lao Pasteur Institute: Dr Darouny Phonekeo, Deputy Director Dr Antoine Des Graviers, CFO Dr Marc Grandadam, Head of Arbovius and Emerging Viral Disease Laboratory
14 June 2018	
09:00 – 10:00	Meet with Dr Somphanh Chanphengxay, Director General of Department of Livestock and Fishery, Ministry of Agriculture and Forestry, Mr Bounlom Douangngeun, Director, National Animal Health Laboratory

Time	Activity
10:30 – 12:00	Meet with: WHO—Dr Reiko Tsuyuoka, WHE country team leader, Matt Shortus, Malaria programme and Jacques Serbert, TB programme ECTAD—Dr Chintana Chanthavisouk, ECTAD team leader FAO-Lao—Ms Dhingra Madhur, Regional Project Coordinator, Food and Agriculture Organisation Regional Office for Asia and Pacific (FAORAP in Thailand) and Ms Nguyenphuong Oanh, International Operation Specialist
13:30 – 14:30	Meet with USAID: Patrick Bowers, Deputy Country Office Director Ms Kongchay Vongsaiya, Health Specialist
15:00 – 15:45	Meet with Mr Angkansada Mouangkham, Deputy Director General of External Finance and Debt Management Department, Ministry of Finance
16:00 – 17:00	Meet with Mr Michael O'Rourke, Chief Technical Adviser, ADB GMS Health Security Project

Acronyms

AAHL	Australian Animal Health Laboratory
ADB	Asian Development Bank
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)
CHW	Community Health Worker
CHV	Community Health Volunteers
CIRAD	French Agricultural Research Organization
CILM	Center Infectiology Lao-Christophe Meriuex
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DGHT	Division of Global HIV and TB
DHO	District Health Office
DTP	Diptheria Tetanus Pertussis
DTRA	Defence Threat Reduction Agency
EID	Emerging Infectious Disease
EOC	Emergency Operations Centre
EU	European Union
EWOR	Early Warning Outbreak Response
FETP	Field Epidemiology Training Program
FAO	Food and Agriculture Organization
GFATM	Global Fund on AIDS, TB and Malaria
GMS	Greater Mekong Sub-Region
HPAI	Highly pathogenic avian influenza
IANPHI	International Association of National Public Health Institutes
IFRC	International Federation of Red Cross and Red Crescent Societies
IPL	Institut Pasteur du Lao
InSTEDD	Innovative Support to Emergencies Diseases and Disasters (supports iLab)
IPC	Infection Prevention and Control
ISO	International Organization for Standardization
KOICA	Korean International Cooperation Agency
LAMP	Live Animal Marketing Production
MDR TB	Multi-Drug Resistant Tuberculosis
MoH	Ministry of Health
NCLE	National Center of Laboratory and Epidemiology
NEIDCO	National Emerging Infectious Diseases Control Organization
NaVRI	National Veterinary Research Institute Cambodia

NHMRC CRE	National Health and Medical Research Council Centre of Research Excellence (Australia)
OIE	World Organisation for Animal Health
Lao PDR	Lao Peoples Democratic Republic
LOMWRU	Lao-Oxford-Mahosot Hospital Wellcome Trust Research Unit
PEPFAR	President's Emergency Plan for AIDS Relief
PODD	Participatory One Health Disease Detection
PVS	Performance of Veterinary Services
RAI	Regional Artemisinin-resistance Initiative
SARS	Severe Acute Respiratory Syndrome
SASS	State Authority for Social Security
SHS	Specialist Health Service
SSO	Social Security Office
TEPHINET	Training Programs in Epidemiology and Public Health Interventions Network
TGA	Therapeutic Drug Administration
TB	Tuberculosis
USAID	United States Agency for International Development
US CDC	United States Centres for Disease Control
VAHWs	Village Animal Health Workers
VIDRL	Victorian Infectious Disease Reference Laboratory
VPMA	Veterinary Practice Management Association
VVW	Village Veterinary Workers
UCSF	University of Columbia San Francisco
UNICEF	United Nations Childrens Fund
WAHIS	World Animal Health Information System
WB	World Bank
WHO	World Health Organization