JOINT EXTERNAL EVALUATION OF IHR CORE CAPACITIES

of the

REPUBLIC OF MAURITIUS

Mission report:
29 October-2 November 2018

World Health Organization

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Contents

ACKNOWLEDGEMENTS

Acronyms and abbreviations

AMR	Antimicrobial resistance
AU-IBAR	African Union Inter-African Bureau for Animal Resources
BSC	Biosafety cabinet
BSL	Biosafety level
CDC	Centers for Disease Control and Prevention, USA
CDCU	Communicable Disease Control Unit
CLSI	Clinical and Laboratory Standards Institute, USA
COMMESA	Common Market for Eastern & Southern Africa
CSD	Central Store Division
DCCB	Dangerous Chemicals Control Bill
EBS	Event-based surveillance
EOC	Emergency operations centre
EPA	Environment Protection Act
EPI	Expanded Programme on Immunization
EQA	External quality assessment
EQAAS	External quality assurance assessment scheme
FAO	Food and Agriculture Organization of the United Nations
FELTP	Field Epidemiology and Laboratory Training Program
FETP	Field epidemiology training programme
FSL	Forensic Scientific Laboratory
GAD	Government Analyst Division
GIS	Geographic information system
GLASS	Global Antimicrobial Resistance Surveillance System (WHO)
HAZMAT	Hazardous materials
HCAI	Healthcare-associated infections
HIEC	Health information education and communication
HR	Human Resources
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IDSR	Integrated Disease Surveillance and Response
IEC	Information education and communication
IHR	International Health Regulations
ILI	Influenza-like illness
ILO	International Labour Organization
IMS	Incident Management System
IIPCS	International Programme on Chemical Safety
INFOSAN	International Food Safety Authorities Network

IOC/COI	Indian Ocean Commission / Commission de l'Océan Indien
IPC	Infection prevention and control
ISO	International Organization for Standardization
JEE	Joint external evaluation
MAURITAS	Mauritius Accreditation Service
MOAIFS	Ministry of Agro Industry and Food Security
MOHQL	Ministry of Health and Quality of Life
MOL	Ministry of Labour
MOU	Memorandum of understanding
MPH	Master of Public Health
NAP	National Action Plan
NDRRM	National Disaster Risk Reduction and Management
NDRRMC	National Disaster Risk Reduction and Management Centre
NDS	National Disasters Scheme
NEL	National Environmental Laboratory
NEOC	National Emergency Operations Command
NFP	National IHR Focal Point
NIC	National Influenza Centre
NREPRP	National Radiological Emergency Preparedness and Response Plan
OIE	World Organisation for Animal Health
OSHA	Occupational Safety and Health Act
PEP	Post-exposure prophylaxis
PHE	Public health emergency
PHEIC	Public health emergency of international concern
PHFSI	Public Health and Food Safety Inspectorate
PMO	Prime Minister's Office
POE	Points of entry
PPE	Personal protective equipment
PVS	Performance of Veterinary Services
RPA	Radiation Protection Authority
RRT	Rapid response team
SADC	Southern African Development Community
SAICM	Strategic Approach to International Chemicals Management
SARI	Severe acute respiratory infection
SLIPTA	Stepwise Laboratory Improvement Process Towards Accreditation
SOPs	Standard operating procedures
TORs	Terms of Reference
URTI	Upper respiratory tract infection
WHO	World Health Organization

Executive summary

The Republic of Mauritius is to be commended for volunteering to host a Joint External Evaluation (JEE). This demonstrates strong commitment, foresight, leadership and confidence in the process on the part of the government.

The national team should also be congratulated for convening so many participants, including key programme managers and technical experts from a variety of organizations and departments, to contribute to the self-assessment and the external evaluation. Their contributions greatly enriched the preparation and delivery of the JEE mission.

Mauritius is also to be commended for the plethora of high-quality human, veterinary and environmental health services that it delivers to its people completely free of charge, through its own domestic financial resources. Furthermore, it has maintained a strong record of being able to respond rapidly and effectively to a multiplicity of public health threats in the past. A committed and technically qualified cadre of health professionals, a highly literate population, and the unique socioeconomic and sociocultural context of this island nation has ensured a high level of public trust and confidence in the public health system of Mauritius. This must be sustained and further advanced by fully leveraging the IHR (2005) to strengthen core capacities for responding effectively to both known and unknown public health threats in the future.

Towards this, and based on the findings of the mission and the recommended priority actions for each of the 19 technical areas, five overarching thematic areas have emerged, which require strong and high-level commitment.

1. **Conduct a further review of national legislation, regulations and procedures that are implicated across all the 19 technical areas of the JEE tool, and develop relevant policy, regulations and guidance to facilitate implementation of IHR (2005).**
   Mauritius has been successfully using several formal and ad hoc multisectoral mechanisms, under the rubric of the broader National Disaster Risk Reduction and Management Act (2016) and the updated Public Health and Quarantine Acts, to respond to public health emergencies for many years. However, the emergency preparedness and response mechanisms, as described under the IHR (2005) and within the framework of One Health, can be made more effective by fast tracking the updating of relevant legislation and policies, and developing new ones where needed. A review exercise such as this would also facilitate identification of methods and means for closer collaboration, for example, between the public health and security authorities.

2. **Consolidate and further strengthen multistakeholder engagement through relevant and appropriate SOPs, MOUs and agreements for advancing a robust One Health agenda.**
   While Mauritius has made concerted efforts, both nationally and internationally, such as through the Indian Ocean Commission (IOC), to advance a genuine One Health agenda, this can be further strengthened by empowering the current coordination and implementation mechanisms by formalizing many of the arrangements through appropriate MOUs, SOPs and guidelines where needed.

   Strengthen the surveillance systems including data collection, analysis and information sharing, across human, animal and environmental health, as well as the public and private sectors, with integration and interoperability as the core underlying principles.

   Mauritius has articulated and demonstrated a strong commitment to build and maintain robust surveillance and laboratory systems for priority diseases in the human, animal and environmental health sectors. Furthermore, decentralized and integrated systems are being planned, for example, to track antimicrobial resistance in both human and animal health domains. Laboratory capacities for

diagnostic and susceptibility testing exist and it is anticipated that their scope will also be expanded. However, many of the data gathering and surveillance systems currently use paper-based systems. To respond more effectively and rapidly to public health threats in the future, Mauritius will need to facilitate and invest in:

- Expansion, integration and interoperability of electronic methods for data collection, transmission, analysis and information sharing, across sectors and down to the grassroots level.

- Generating and sharing real-time data and information, including from the private healthcare and livestock sectors, to support decision-making and rapid response.

3. **Establish procedures and processes that facilitate rigorous documentation and a culture of continuous learning from every emergency response event**.
Mauritius has acquired rich and varied expertise in responding to disease outbreaks and other public health threats, through both real-world experience and simulation exercises. While lessons from such experiences can provide invaluable insight, they need to be much more systematically and rigorously documented for future generations or nations in the region to derive benefit from them. Formalizing some of the key aspects of analysis and documentation of such disease outbreaks and other public health events, will inform future preparedness and response strategies.

4. **Take the long view and keep the goal of sustainability centre-stage, by front loading strategic advocacy and a plan for predictable financing.**
Mauritius has substantive achievements on its pathway to the full implementation of IHR (2005). It is quite evident from the JEE indicators scores that in almost all the technical areas, Mauritius is poised to achieve a very high level of implementation in the very short term, but for the availability of early and predictable funding alongside a dedicated budget line for implementation activities. It is commendable that the Government of Mauritius has always made funds available when required from domestic sources. A bold and ambitious investment plan with a dedicated budget line for IHR (2005) implementation would see Mauritius fully capacitated to respond to any public health threat in the future. This would require a strategic resource mobilization plan, which needs to be debated and developed among key stakeholders and partners implementing IHR (2005).

The above overarching thematic findings, considered along with the recommended priority actions described in the next section, would likely result in Mauritius achieving its core capacity strengthening objectives in the very near future.

Republic of Mauritius scores

Technical areas	Indicators	Score
1. National legislation, policy and financing	P.1.1 Legislation, laws, regulations, administrative requirements, policies or other government instruments in place are sufficient for implementation of IHR (2005)	3
	P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with IHR (2005)	2
2. IHR coordination, communication and advocacy	P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR	4
3. Antimicrobial resistance	P.3.1 Antimicrobial resistance detection	3
	P.3.2 Surveillance of infections caused by antimicrobial-resistant pathogens	2
	P.3.3 Healthcare-associated infection (HCAI) prevention and control programmes	3
	P.3.4 Antimicrobial stewardship activities	1
4. Zoonotic diseases	P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens	3
	P.4.2 Veterinary or animal health workforce	3
	P.4.3 Mechanisms for responding to infectious and potential zoonotic diseases are established and functional	3
5. Food safety	P.5.1 Mechanisms for multisectoral collaboration are established to ensure rapid response to food-safety emergencies and outbreaks of foodborne diseases	4
6. Biosafety and biosecurity	P.6.1 Whole-of-government biosafety and biosecurity system is in place for human, animal and agricultural facilities	2
	P.6.2 Biosafety and biosecurity training and practices	1
7. Immunization	P.7.1 Vaccine coverage (measles) as part of national programme	3
	P.7.2 National vaccine access and delivery	3
8. National laboratory system	D.1.1 Laboratory testing for detection of priority diseases	4
	D.1.2 Specimen referral and transport system	4
	D.1.3 Effective modern point-of-care and laboratory-based diagnostics	3
	D.1.4 Laboratory quality system	3
9. Real-time surveillance	D.2.1 Indicator- and event-based surveillance systems	3
	D.2.2 Interoperable, interconnected, electronic real-time reporting system	1
	D.2.3 Integration and analysis of surveillance data	3
	D.2.4 Syndromic surveillance systems	4
10. Reporting	D.3.1 System for efficient reporting to FAO, OIE and WHO	3
	D.3.2 Reporting network and protocols in country	2
11. Workforce development	D.4.1 Human resources available to implement IHR core capacity requirements	3
	D.4.2 FETP[1] or other applied epidemiology training programme in place	5
	D.4.3 Workforce strategy	1

Technical areas	Indicators	Score
12. Preparedness	R.1.1 National multi-hazard public health emergency preparedness and response plan is developed and implemented	4
	R.1.2 Priority public health risks and resources are mapped and utilized	1
13. Emergency response operations	R.2.1 Capacity to activate emergency operations	3
	R.2.2 EOC operating procedures and plans	3
	R.2.3 Emergency operations programme	4
	R.2.4 Case management procedures implemented for IHR-relevant hazards	4
14. Linking public health and security authorities	R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) are linked during a suspect or confirmed biological event	4
15. Medical countermeasures and personnel deployment	R.4.1 System in place for sending and receiving medical countermeasures during a public health emergency	2
	R.4.2 System in place for sending and receiving health personnel during a public health emergency	1
16. Risk communication	R.5.1 Risk communication systems (plans, mechanisms, etc.)	1
	R.5.2 Internal and partner communication and coordination	4
	R.5.3 Public communication	4
	R.5.4 Communication engagement with affected communities	4
	R.5.5 Dynamic listening and rumour management	4
17. Points of entry	PoE.1 Routine capacities established at points of entry	5
	PoE.2 Effective public health response at points of entry	3
18. Chemical events	CE.1 Mechanisms established and functioning for detecting and responding to chemical events or emergencies	4
	CE.2 Enabling environment in place for management of chemical events	4
19. Radiation emergencies	RE.1 Mechanisms established and functioning for detecting and responding to radiological and nuclear emergencies	3
	RE.2 Enabling environment in place for management of radiation emergencies	2

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1   FETP: Field epidemiology training programme

PREVENT

National legislation, policy and financing

Introduction

The International Health Regulations (IHR) (2005) provides obligations and rights for States Parties. In some States Parties, implementation of the IHR (2005) may require new or modified legislation. Even if a new or revised legislation may not be specifically required, states may still choose to revise some regulations or other instruments in order to facilitate IHR implementation and maintenance in a more effective manner. Implementing legislation could serve to institutionalize and strengthen the role of IHR (2005) and operations within the State Party. It can also facilitate coordination among the different entities involved in their implementation. See detailed guidance on IHR (2005) implementation in national legislation at http://www.who.int/ihr/legal_issues/legislation/en/index.html. In addition, policies that identify national structures and responsibilities as well as the allocation of adequate financial resources are also important.

Target

Adequate legal framework for States Parties to support and enable the implementation of all their obligations, and rights to comply with and implement the IHR (2005). New or modified legislation in some States Parties for implementation of the IHR (2005). Where new or revised legislation may not be specifically required under the State Party's legal system, States may revise some legislation, regulations or other instruments in order to facilitate their implementation and maintenance in a more efficient, effective or beneficial manner. States Parties ensure provision of adequate funding for IHR implementation through the national budget or other mechanism.

Mauritius level of capabilities

In order to meet the requirements of the IHR (2005), Mauritius has amended the existing laws relevant to public health emergencies. The most relevant are: (1) the Quarantine Act of 1953 and its regulations, which provide for points of entry surveillance and quarantine; and (2) the National Public Health Act of 1925 and its regulations, which make provision for notifiable diseases. In 2007 the Quarantine Act was amended to include the definition of the National Focal Point and to maintain surveillance at the ports.

The country also has cross-border agreements, protocols and MOUs on public health emergencies with neighbouring countries. Mauritius is a member of the IOC and has signed a charter for the weekly sharing of data on epidemic-prone diseases occurring within the Indian Ocean islands of the Comoros, Madagascar, Mauritius, Reunion and Seychelles. The country is also required to share data with the Africa Centres for Disease Control and Prevention (Africa CDC) via the Zoom Platform.

In a bid to bring the laws into conformity with the provisions of the IHR (2005), Mauritius has conducted rapid assessments of its human and animal health laws. The rapid assessment for core capacities in human health was conducted in 2011. The assessment of legislation pertaining to animal health is still ongoing.

The report on the rapid assessment for human health noted that the Quarantine Act of 1925 and the National Public Health Act of 1982 form a basis for the implementation of the IHR (2005), particularly with regard to points of entry (POE). In the area of policy and financing, it noted that there was a need for further work and progress. The rapid assessment culminated in the amendment of the Quarantine Act to include the designation of the National IHR Focal Point (NFP).

The recommendations of the rapid assessment included the need for:

1. Formulation of a policy to clearly define the roles of all stakeholders in the implementation of the IHR (2005);

2. Defining the terms of reference (TORs) for the NFP in the policy; and

3. Establishment of funds and a budget for the implementation of the IHR (2005).

The recommendations of the assessment report have been partially implemented, though the country has still not established a budget for implementation of the IHR. It was also noted that the assessment of legislation related to human health was not comprehensive. It did not cover the extensive set of laws within the Ministry of Health, but instead mainly focused on the Quarantine Act and the Public Health Act.

The assessment of legislation pertaining to animal health is still ongoing, which means that laws, legislation, policies and administrative arrangements related to animal health have not yet been brought into line with the IHR (2005).

Recommendations for priority actions

- Constitute a multidisciplinary team (including public health and legal experts) and conduct a comprehensive assessment of all human and animal health policies and legislation, including all government instruments guiding IHR (2005) recommendations within the framework of One Health.

- Update all relevant former laws and legal instruments to bring them into conformity with IHR (2005).

- Establish a dedicated budget line within the Ministries of Health and Quality of Life (MOHQL) and Agro Industry and Food Security (MOAIFS) to facilitate implementation of IHR (2005).

- Formalize and align all communications and coordination protocols and standard operating procedures (SOPs) formulated in the draft Multihazard Plan, with the IHR (2005).

- Finalize the assessment of animal health legislation.

Indicators and scores

P.1.1 Legislation, laws, regulations, administrative requirements, policies or other government instruments in place are sufficient for implementation of IHR (2005) – Score 3

Strengths/best practices
- A rapid assessment of human health legislation has been conducted.

- An assessment of animal health legislation has been initiated.

- An NFP has been designated, and focal points for IHR implementation in various other relevant ministries have also been designated. The TORs for the NFP are in place.

Areas that need strengthening/challenges
- Mauritius has legislation relevant to IHR (2005) implementation. A comprehensive assessment needs to be conducted to evaluate the adequacy of these laws.

- Cross-border agreements, protocols and MOUs with neighbouring IOC countries need to be further strengthened and sustained.

- Communications between the NFP and other national bodies responsible for the implementation of the IHR (2005) needs to be strengthened.

P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies and administrative arrangements to enable compliance with the IHR (2005) – Score 2

Strengths/best practices

- The country has initiated an assessment of its animal health legislation.
- A multisectoral collaboration mechanism is in place.

Areas that need strengthening/challenges

- The laws relevant for IHR implementation need to be assessed holistically and gaps identified for alignment with the requirements of IHR (2005).

IHR coordination, communication and advocacy

Introduction

The effective implementation of the IHR requires multisectoral/multidisciplinary approaches through national partnerships for efficient and alert response systems. Coordination of nationwide resources, including the designation of a national IHR focal point, which is a national centre for IHR communications, is a key requisite for IHR implementation.

Target

Multisectoral/multidisciplinary approaches through national partnerships that allow efficient, alert and responsive systems for effective implementation of the IHR (2005). Coordinate nationwide resources, including sustainable functioning of a national IHR focal point – a national centre for IHR (2005) communications which is a key requisite for IHR (2005) implementation – that is accessible at all times. States Parties provide WHO with contact details of national IHR focal points, continuously update and annually confirm them.

Mauritius level of capabilities

Mauritius has established an intersectoral collaboration mechanism for IHR (2005), comprising the MOHQL, MOAIFS, Home Affairs (Police), Environment, Labour and Education; the Customs and Port Authorities; the business sector; and community participants (Force Vives). The Intersectoral Committee for IHR (2005) is chaired by the Minister of Health. The country has designated the office of the Director of Health Services as the NFP and there are designated focal points in each of the various relevant ministries. TORs are in place for the NFP and the specific focal points in each of the relevant sectors of government. The Committee normally meets whenever there is a national or international health event of significance.

While the WHO was formally informed of the NFP and the other focal points from the various relevant ministries, there is no national instrument appointing the NFP and the other focal points.

The country has a draft multihazard plan which incorporates SOPs for communicating with relevant stakeholders during a disease outbreak or other public health emergency. Key stakeholders include the MOHQL; MOAIFS; Industry; Environment; Labour; Education; Utilities (for radiation protection); and the Port Authority. However, the plan is yet to be formally endorsed by the competent authorities. There also exists a functional mechanism for intersectoral collaboration between animal and human health surveillance and laboratory services.

The SOPs of the National Disaster Risk Reduction Management Centre (NDRRMC) include IHR-related public health events and risks, which are often triggered by disasters. All relevant sectors are included in the SOPs.

While the country has demonstrated, to some extent, effective multisectoral coordination and communication during public health emergencies, this collaboration has not yet been fully systematized and adequately incorporated into preparedness planning and response to public health emergencies of international concern (PHEIC). This could be attributed to the absence of SOPs for communication and collaboration as envisaged under the IHR (2005).

Recommendations for priority actions

- Evaluate the function of the NFP for compliance with the IHR (2005).

- Fully operationalize the NFP through official appointment of all relevant members, definition of their roles and responsibilities, training on their functions and upgrading of their logistics.

- Finalize/endorse the SOPs for coordinating communication between the NFP and other relevant sectors within the One Health context.

Indicators and scores

P.2.1. A functional mechanism established for the coordination and integration of relevant sectors in the implementation of IHR – Score 4

Strengths/best practices

- An intersectoral committee is in place for IHR coordination, communication and advocacy for the implementation of IHR (2005).

- The country has a designated NFP and other focal points in the relevant ministries responsible for the implementation of IHR (2005).

- The multidisciplinary communication and coordination mechanism was tested during the influenza (H1N1) pandemic of 2009, and more recently during the 2014–2016 Ebola and Middle East respiratory syndrome coronavirus (MERS-CoV) outbreaks in other countries.

Areas that need strengthening/challenges

- There is a need to harmonize the administrative procedures for reporting within each of the relevant ministries, for example the MOHQL, the MOAIFS and the Ministry of Environment.

- Time frames for obtaining clearances and approvals for action from relevant authorities during emergencies need to be further improved.

- There is a need to further improve the SOPs for intra-ministry and inter-ministry communication.

- The effectiveness of the communication SOPs needs to be tested and evaluated through simulation exercises.

PREVENT

Antimicrobial resistance

Introduction

Bacteria and other microbes evolve in response to their environment and inevitably develop mechanisms to resist being killed by antimicrobial agents. For many decades, the problem was manageable as the growth of resistance was slow and the pharmaceutical industry continued to create new antibiotics.

Over the past decade, however, this problem has become a crisis. Antimicrobial resistance (AMR) is evolving at an alarming rate and is outpacing the development of new countermeasures capable of thwarting infections in humans. This situation threatens patient care, economic growth, public health, agriculture, economic security and national security.

Target

Support work coordinated by FAO, the World Organisation for Animal Health (OIE) and WHO to develop an integrated global package of activities to combat antimicrobial resistance, spanning human, animal, agricultural, food and environmental aspects (i.e. a One Health approach). This would include: (i) having a comprehensive plan for each country to combat AMR; (ii) strengthening surveillance and laboratory capacity at the national and international levels following agreed international standards developed in the framework of the Global Action Plan; and (iii) improving conservation of existing treatments and collaboration to support the sustainable development of new antibiotics, alternative treatments, preventive measures and rapid point-of-care diagnostics with systems to preserve new antibiotics.

Mauritius level of capabilities

Mauritius has an approved National Action Plan (2017–2021) for the detection, surveillance and reporting of infections caused by priority AMR pathogens.

Despite not having accredited laboratories, Mauritius has laboratories that conduct AMR detection using antibiotic susceptibility testing (AST). In the human health sector, AST is done at the Victoria Hospital (National Reference Laboratory) and Jeetoo Hospital, under the supervision of a consultant microbiologist. Samples for AST are received from health centres and hospitals across the country. For the animal health sector, AST is done at the Animal Health Laboratory under the supervision of a scientific officer.

Surveillance of AMR pathogens is done in an organized manner. However, AMR surveillance in Mauritius still uses a paper-based system. There is also a lack of data originating from the private healthcare sector.

The Pharmaceutical Board monitors and regulates the importation of all antibiotics in Mauritius. Furthermore, a Pharmacy Act is in place that makes prescriptions mandatory for the use of antibiotics. However, better enforcement of this Act is required in the private sector since antibiotics continue to be sold over the counter.

Although Mauritius does not have a national plan for antimicrobial stewardship, certain hospitals have protocols in place for prescribing and rational use of antimicrobials.

Recommendations for priority actions

- Develop and implement a national plan for antimicrobial stewardship, using the One Health approach.
- Set up an electronic surveillance system in human and animal bacteriology laboratories.
- Develop and implement infection prevention and control (IPC) guidelines for the animal health sector.
- Revise the IPC manual to incorporate hospital-acquired infections.
- Incorporate the private healthcare sector in AMR surveillance, by ensuring that they are reporting the detection of AMR pathogens to the national system.

Indicators and scores

P.3.1 Antimicrobial resistance detection – Score 3

Strengths/best practices

- Approved National Action Plan for detection, surveillance and reporting of infections caused by priority AMR pathogens.
- Designated laboratories conduct tests for AMR pathogens.
- Technical staff are qualified.

Areas that need strengthening/challenges

- The bacteriology laboratory is not yet formally accredited.

P.3.2 Surveillance of infections caused by antimicrobial-resistant pathogens – Score 2

Strengths/best practices

- Surveillance of AMR pathogens is incorporated in the approved AMR National Action Plan (2017–2021).
- AST is carried out in both human and animal health sectors.
- The Central Health Laboratory is enrolled in the Global Antimicrobial Resistance Surveillance System.
- The Central Health Laboratory at Victoria Hospital is designated as the National Reference Laboratories.
- Antibiotic residue monitoring conducted in fish exported to the European Union (EU).

Areas that need strengthening/challenges

- Surveillance system is still paper-based.
- There is no data reporting or samples sent from the private healthcare sector.

P.3.3 Healthcare-associated infection (HCAI) prevention and control programmes – Score 3

Strengths/best practices

- Healthcare-associated IPC is incorporated in the approved AMR National Action Plan (2017–2021).
- Some healthcare facilities in the human health sector are implementing healthcare-associated infection (HCAI) prevention programmes, though only to a limited extent.

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Areas that need strengthening/challenges

- There is no specific national plan on HCAI.

- Not all internationally-recommended HCAI programmes are being conducted.

- No surveillance system is in place for HCAI.

- There is a lack of trained full-time IPC personnel.

P.3.4 Antimicrobial stewardship activities – Score 1

Strengths/best practices

- There are antimicrobial protocols in place in different departments of health centres in the human health sector.

- A Competent Authority Seafood protocol is available for aquaculture.

- Importation of antimicrobials is regulated and subject to international quality standards.

Areas that need strengthening/challenges

- There is no national plan for antimicrobial stewardship.

- There are no designated centres for conducting antimicrobial stewardship practices.

Zoonotic diseases

Introduction

Zoonotic diseases are communicable diseases that can spread between animals and humans. These diseases are caused by viruses, bacteria, parasites and fungi carried by animals, insects or inanimate vectors that aid in its transmission. Approximately 75% of recently emerging infectious diseases affecting humans is of animal origin; and approximately 60% of all human pathogens are zoonotic.

Target
Adopted measured behaviors, policies and/or practices that minimize the transmission of zoonotic diseases from animals into human populations.

Mauritius level of capabilities

Mauritius has legislation, official policies and directives for the control of zoonotic diseases and which support the One Health principle, including but not limited to: the Animal Disease Act (1925), the Food Act (2000), a draft veterinary policy, and the Animal Welfare Act (2013). In accordance with these, the MOHQL and the MOAIFS call for each case of suspected/detected zoonotic disease to be rapidly and jointly investigated by the medical and veterinary services through emergency notification.

Antemortem and postmortem inspection is performed at slaughterhouses by government veterinarians. The animal health services conduct regular surveillance to monitor for zoonotic disease. Government veterinary services are in place and offer a free 24/7 service to farmers. Any disease outbreak or suspected event is immediately reported to the headquarters of the Division of Veterinary Services (DVS), or to the Animal Health Laboratory for investigation and further action.

Zoonotic diseases of high concern in Mauritius include: salmonellosis, bovine tuberculosis (TB), brucellosis and avian influenza. Avian influenza is the only disease which has an established intersectoral committee. No zoonotic disease outbreak has occurred in Mauritius over the past two years. However, regular meetings are held by the Avian Influenza Committee and information about other diseases is informally shared during these meetings. A Contingency Plan for Avian Influenza was developed by the MOHQL and the MOAIFS in 2006. Regular surveillance and testing take place for salmonellosis, TB and brucellosis. Regular sampling and testing is performed on migratory birds and local flocks for avian influenza, but to date the disease has not been confirmed in Mauritius.

Information on zoonoses is shared through direct communication. There is no formal policy or SOPs to define the linkage between animal and human health surveillance for pathogens. However, at the national level, joint investigations and control measures take place during outbreaks. For avian influenza, mechanisms have been established for a coordinated response to any outbreak. Stakeholders and the authorities concerned are also expected to collaborate when responding to outbreaks of other zoonotic diseases. Short training courses have been carried out for the veterinary workforce by international organizations such as the Southern Africa Development Community (SADC), the Common Market for Eastern and Southern Africa, the IOC, the African Union – Inter-African Bureau for Animal Resources (AU-IBAR) and the FAO.

Recommendations for priority actions

- Formulate a zoonotic disease control strategy which incorporates surveillance systems, information sharing between stakeholders and a contingency plan for all relevant zoonotic diseases.

- Upgrade the Animal Health Laboratory to provide more effective diagnosis and confirmation of animal health diseases and improved occupational safety in laboratories.

- Develop a needs assessment and training plan for staff capacity building.

- Operationalize a national One Health platform through regular coordination and collaboration.

- Develop and implement SOPs for responding to zoonotic disease events within the framework of One Health.

Indicators and scores

P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens – Score 3

Strengths/best practices

- The human and animal health sectors have jointly developed a list of zoonotic diseases of priority importance to public health, including salmonellosis, bovine TB, brucellosis and avian influenza.

- A surveillance system is in place for both human and animal diseases, including zoonotic diseases. The veterinary surveillance system is linked to the human disease surveillance system.

- The medical and veterinary laboratories are sufficiently well equipped with diagnostic tools and reagents; and can confirm outbreaks and share monthly reports in a timely manner.

- Slaughterhouse inspection is performed only by government veterinarians.

- The One Health concept is well understood, and Mauritius is following international standards and guidelines.

- Veterinarians are present at all levels, country-wide.

Areas that need strengthening/challenges

- There is no established procedure for the exchange of biological samples between the public health and veterinary laboratories. Any such exchanges require formal coordination and procedures involving higher ministerial levels.

- Although the sharing of surveillance data between the MOHQL and MOAIFS (and other relevant departments) is mandatory for zoonotic diseases, there is a need for further improvement.

- Currently, only four zoonotic diseases have been designated by Mauritius to be of importance to public health. Of these, only avian influenza has a contingency plan and an intersectoral committee in place. This should be further strengthened, replicated and scaled-up, to include the other priority zoonotic diseases.

- The livestock identification and tracking system is yet to be fully established. The use of microchip implants has been suggested to resolve some of the technical problems.

- Inadequate funding is the constraining factor for most of the challenges identified above.

P.4.2 Veterinary or animal health workforce – Score 3

Strengths/best practices

- The Veterinary Services in Mauritius has more than 75 staff members at all levels, and across the public and private sectors. This veterinary workforce has a presence throughout the country.

- The epidemiology and laboratory training of veterinarians in Mauritius meets international standards.

- The Veterinary Services in Mauritius provides a free 24/7 service to small-scale farmers.

Areas that need strengthening/challenges

- Despite the optimal number of veterinary staff at all levels, there is a singular lack of veterinary epidemiologists at the DVS.

- While training workshops on the control of zoonotic diseases are organized for medical and veterinary professionals, there is need for a field epidemiology training programme (FETP) for epidemiologists and field epidemiologists.

- At the MOHQL, there is need for more public health specialists and a greater level of collaboration between the MOHQL and MOAIFS.

- The Animal Health Laboratory needs to be modernized; and staff technical capacity enhanced by recruitment of a veterinary virologist, a veterinary microbiologist and a veterinary pathologist.

- The plan to conduct animal population censuses using microchips in all livestock needs to be implemented.

P.4.3 Mechanisms for responding to infectious and potential zoonotic diseases established and functional – Score 3

Strengths/best practices

- A national contingency plan, agreed by all stakeholders, is in place for avian influenza. Regular intersectoral committee meetings are organized with the various stakeholders.

- Zoonotic diseases are part of the national disease surveillance list and emergency funds are made available rapidly in case of an emergency.

Areas that need strengthening/challenges

- There is need to update the list of zoonotic diseases and formulate national contingency plans for these diseases. This should be followed by simulation exercises to test the plans.

- A lag in the flow of information and data between the animal and human health sectors has been identified, which calls for greater collaboration between the MOHQL and MOAIFS.

- Constraints in the workforce, logistics and consumables have been identified as major challenges. These need to be strengthened through recruitment of qualified staff in specialized areas (laboratory and epidemiology) accompanied by upgrades in equipment and supplies.

- As national funds may be insufficient to address these challenges, support from development partners is needed.

Food safety

Introduction

Food- and water-borne diarrhoeal diseases are leading causes of illness and death, particularly in less developed countries. The rapid globalization of food production and trade has increased the potential likelihood of international incidents involving contaminated food. The identification of the source of an outbreak and its containment is critical for control. Risk management capacity with regard to control throughout the food-chain continuum must be developed. If epidemiological analysis identifies food as the source of an event, based on a risk assessment, suitable risk management options that ensure the prevention of human cases (or further cases) need to be put in place.

Target

Surveillance and response capacity among States Parties for food- and water-borne disease risks or events by strengthening effective communication and collaboration among the sectors responsible for food safety, and safe water and sanitation.

Mauritius level of capabilities

Since the year 2000, the Government of Mauritius has developed and enforced robust food legislation, which is in line with IHR (2005). Furthermore, Mauritius is in the process of updating and amending its food legislation to align it with the present food environment. These laws regulate food safety at all stages including production, importation, distribution and sale. At the national level, there is a food control system in place to prevent the risk of occurrence, and to efficiently manage, any food-related incident.

The core responsibility for ensuring safe food in the market rests with the Public Health and Food Safety Inspectorate (PHFSI) of the MOHQL, in collaboration with the MOAIFS and other stakeholders. There are a total of 164 inspectors of different grades, posted across the 14 regional health offices, the food import unit and the airport health office. Food legislation in force consists of the Food Act (1998) and ensuing regulations (1999). The activities of the PHFSI consist of ensuring food safety and an environment with reduced risk of health hazards. With regard to food safety, some of the activities include enforcing food legislation, investigating food complaints, inspecting food premises, training food handlers, procuring food samples, seizing unsafe food and prosecuting offences. Activities related to environmental health include enforcing public health legislation, investigating environmental health complaints, detecting and abating nuisances, detecting and eliminating mosquito breeding sites, supervising larviciding and fogging operations, educating the public in environmental health issues, and prosecuting offences.

Several stakeholders are involved in ensuring food safety, including the administration of the MOHQL, medical and paramedical staff of the MOHQL, the Central Health Laboratory at Candos, the Government Analyst Division, other ministries (e.g. the MOAIFS, Fisheries, Local Government and Outer Islands), private medical staff, food importers/manufacturers/sellers/handlers, NGOs working in health, the media, the general public, WHO, FAO, the International Food Safety Authorities Network, the EU and the IOC.

Recommendations for priority actions

- Establish a Food Safety Division with specialized units and separated from Environmental Health.

- Strengthen capacity for food-safety services through upgrade of infrastructure, recruitment and training of human resources.

- Strengthen capacity for microbiological testing through procurement of reagents and modern equipment for rapid analyses.

- Develop SOPs and guidelines to strengthen collaboration between units involved in food safety, to facilitate rapid exchange of information during investigations of suspected foodborne disease outbreaks.

Indicators and scores

P.5.1 Mechanisms for multi-sectoral collaboration established to ensure rapid response to food safety emergencies and outbreaks of foodborne diseases – Score 4

Strengths/best practices

- The Food Act (1998) and ensuing regulations (1999) are presently being updated. Legal tools are available for empowering officers to implement food-safety measures.

- PHFSI has a pool of qualified officers posted in regional offices, making the service available closer to the population.

- Laboratories for testing food samples are in place for routinely assessing the safety of food on the market and in the case of outbreaks.

- The high level of literacy among the population (estimated at 93.16%) facilitates public understanding of the basic principles of food safety.

- There is a good channel of communication whereby information can be easily disseminated to the population through the media, which is accessible everywhere in the country. Furthermore, the designated focal point for food safety under the IHR (2005) facilitates exchange of information among the various stakeholders.

Areas that need strengthening/challenges

- The PHFSI is involved in both environmental health and food-safety activities. This often results in sacrificing food-safety activities during epidemics because PHFSI staff are called on to prioritize enforcement of environmental health measures to eliminate disease. For example, in 2006, 2007, 2014 and 2015 food inspection was reduced by 37%, 39%, 19% and 15% respectively, due to outbreaks of mosquito-borne diseases.

- There is an absence of specialized units, resulting in PHFSI staff having to carry out different types of activities, which reduce their efficiency.

- There is a lack of training opportunities, both at local and international levels, for PHFSI staff. More opportunities to update their knowledge and skills to meet the current challenges to food safety need to be put in place.

- The efficiency of laboratories for testing food samples needs to be improved. Turnaround time for results from laboratories currently ranges from one to eight weeks, resulting in the continued consumption of contaminated food, in the meantime, by the public.

- There is need for further strengthening control measures for foodborne diseases of national concern. There is a lack of comprehensive guidance and a mechanism for effective reduction of risk associated

with salmonellosis and campylobacteriosis.

Biosafety and biosecurity

Introduction

It is vital to work with pathogens in the laboratory to ensure that the global community possesses a robust set of tools – such as drugs, diagnostics and vaccines – to counter the ever-evolving threat of infectious diseases.

Research with infectious agents is critical for the development and availability of public health and medical tools that are needed to detect, diagnose, recognize and respond to outbreaks of infectious diseases of both natural and deliberate origin. At the same time, the expansion of infrastructure and resources dedicated to work with infectious agents have raised concerns regarding the need to ensure proper biosafety and biosecurity to protect researchers and the community. Biosecurity is important in order to secure infectious agents against those who would deliberately misuse them to harm people, animals, plants or the environment.

Target

A whole-of-government national biosafety and biosecurity system with especially dangerous pathogens identified, held, secured and monitored in a minimal number of facilities according to best practices; biological risk management training and educational outreach conducted to promote a shared culture of responsibility, reduce dual-use risks, mitigate biological proliferation and deliberate use threats, and ensure safe transfer of biological agents; and country-specific biosafety and biosecurity legislation, laboratory licensing and pathogen control measures in place as appropriate.

Mauritius level of capabilities

Prior to the detection of the first case of HIV in Mauritius in 1987, hazardous practices were common at the Central Health Laboratory (mouth pipetting, no gloves, etc.) and laboratory personnel were at high-risk of accidental exposure to biological agents. After 1987, there was more awareness among laboratory personnel about biosafety precautions to minimize exposure to potentially hazardous biological agents, and measures were introduced to minimize these risks (e.g. disposal of sharps and laboratory waste, vaccination against hepatitis B, etc.).

Furthermore, world events demonstrated the very real potential threat of bioterrorism and the importance of enhancing biosecurity in the laboratory. Consequently, the Biological and Toxin Weapons Convention Act was passed in 2004. This Act elaborates the prohibitions related to biological and toxin weapons; the authorizations available to law enforcement officials for search, detention and forfeiture; and the associated offences and penalties. This applies to both human and animal health sectors.

However, biosafety and biosecurity risks in Mauritius have not been systematically assessed and categorized, and a standard mechanism for oversight and enforcement of biosafety and biosecurity legislation, regulations and/or guidelines is not yet in place.

Although not documented in a formal action plan, Mauritius has put in place pathogen control measures, which include standards for physical containment and operational practices, and a reporting system for the containment and failure to contain dangerous pathogens and toxins.

A Biosafety Level 3 (BSL-3) laboratory capable of handling priority events such as disease outbreaks is

currently being established. The Central Health Laboratory conducts audits of private laboratories while external bodies (WHO, SADC, the East, Central and Southern Africa Health Community, etc.,) conduct audits of government laboratories. Laboratory personnel are generally well-trained in basic biosafety, and training is provided to all new staff. However, not all staff at facilities that handle dangerous pathogens and toxins have been fully trained.

Biological safety cabinets and refrigerators with controlled temperature are available in most laboratories (virology, TB and general bacteriology), with controlled and restricted access given only to authorized personnel.

Stakeholders are expected to have an inventory of stored hazardous organisms to ensure they are kept safely to prevent loss, theft and misuse. Dangerous pathogens and toxins have been consolidated centrally. However, a systematic process of developing and monitoring the inventory of pathogens within facilities that store or process dangerous pathogens and toxins is not yet in place.

Several stakeholders are involved in the implementation of biosafety and biosecurity in Mauritius and for enforcing national legislation and applicable regulations including: the MOHQL, the Procurement Division (Central Laboratory Store), the Health and Safety Unit and the Ministry of Public Infrastructure.

Recommendations for priority actions

- Conduct a comprehensive training needs assessment towards developing and implementing a training plan for biosafety and biosecurity for all health facilities (including private facilities) that store and process dangerous pathogens and toxins, within the context of One Health.

- Establish a documented inventory of pathogens within facilities that store or process dangerous pathogens and toxins, in the context of One Health.

- Develop SOPs for storage or processing of dangerous pathogens and toxins.

- Develop comprehensive biosafety and biosecurity supervision checklists for all facilities that store or process dangerous pathogens and toxins, in the context of One Health.

- Strengthen the capacity of the Central Laboratory to achieve and sustain BSL-3.

Indicators and scores

P.6.1 Whole-of-government biosafety and biosecurity system in place for human, animal and agricultural facilities – Score 2

Strengths/best practices

- Equipment is new and vetted by the hospital biomedical engineer and the Energy Services Division (ESD).

- A fire safety manual exists, and yearly fire drills are conducted by the regional Health and Safety Officer.

- Long-term storage of dangerous organisms and specimens under lock and key; restricted access to virology and TB laboratories.

- Biosafety cabinet BSL-2 in virology, bacteriology and TB laboratories.

- Biosafety measures in place include collection of blood using Vacutainer tubes; availability of disposable syringes and sharps containers; biohazard labelling; colour-coded bags for waste disposal; and international shipment of specimens carried out under International Air Transport Association regulations.

- Electrical system regularly checked by the ESD.

- Biological and Toxin Weapons Convention Act passed in 2004 in line with the Biological Weapons Convention.

Areas that need strengthening/challenges

- Laboratories are overcrowded. A new laboratory for the National Health Laboratory Services is required.

- A BSL-3 laboratory is required. Currently there is no government laboratory at this level.

- Request forms are typically wrapped around specimen containers, which is risky. Instead, there should be provision for two-pouched bags.

- Waste disposal needs to be further improved, e.g. autoclaving prior to removal from laboratories.

- Personnel with access to key to stored organisms should be limited.

- Lack of functioning incinerator at some hospitals.

P.6.2 Biosafety and biosecurity training and practices – Score 1

Strengths/best practices

- Basic biosafety training provided to all new laboratory staff.

- Hazardous practices such as mouth pipetting have been abandoned. Instead, automatic pipettes and, more recently, 'walk-away' apparatus are being used.

- Biological Safety Cabinets (BSC-2) are available and used routinely in the virology and TB laboratories.

- One BSC-3 cabinet is available in the virology laboratory.

- Biosafety manuals are available in the virology (partially) and TB laboratory.

- Induction programmes in place for new staff at the virology and TB laboratories.

Areas that need strengthening/challenges

- National campaign on awareness of biosafety and biosecurity required.

- Biosafety and biosecurity need to be included in the curricula of all healthcare workers.

- A technologist with training in health and safety should be appointed as a full-time Health and Safety Officer for the laboratory.

- Training of laboratory staff on biosafety should be systematically evaluated and documented.

- The biological safety cabinet is checked by the local supplier annually but not "certified".

- Simulation exercises should be conducted for laboratory personnel, e.g. fire and exposure to hazardous organisms.

- No specific funding available for biosafety and biosecurity activities.

Immunization

Introduction

Immunizations are estimated to prevent more than two million deaths a year globally. Immunization is one of the most successful global health interventions and cost-effective ways to save lives and prevent disease.

> ### *Target*
> *A national vaccine delivery system – with nationwide reach, effective distributions, access for marginalized populations, adequate cold chain and ongoing quality control – that is able to respond to new disease threats.*

Mauritius level of capabilities

The Government of Mauritius has demonstrated strong political commitment to the provision of vaccines, and procures all vaccines used within the country through its own resources. The Expanded Programme on Immunization (EPI) in the Republic of Mauritius includes provision of vaccines against polio, TB, measles, mumps, rubella, diphtheria, pertussis, tetanus, meningitis, pneumococcal disease, rotavirus, human papillomavirus, haemophilus influenza type B and hepatitis B. There is an international programme that offers vaccines for travellers including yellow fever, meningococcal meningitis, hepatitis A and typhoid fever.

It is estimated that 81% of the country's 12-month-old population has received at least one dose of measles vaccine, with the coverage rate for other vaccines being within 70–87%. Inactivated polio vaccine has been successfully introduced in Mauritius.

Mauritius conducted a Comprehensive National Immunization Programme Review in June 2018 and intends to use the findings to guide the development of a comprehensive multi-year plan. A major finding from the review, which is consistent with the findings of the JEE, is that there is limited documentation on EPI activities. Although an electronic data collection system is being introduced, health facilities use notebooks to record activities conducted, which do not allow for adequate documentation and analysis. Vaccine stock outs have not been reported in Mauritius; however there is no systematic monitoring of vaccine use.

Recommendations for priority actions

- Finalize, disseminate and implement the EPI multi-year plan.

- Improve immunization coverage by developing and implementing strategies such as integrated supportive supervision for routine immunization; and special immunization activities such as outreach and National Immunization Days.

- Develop and implement a capacity building plan for EPI staff which includes training, mentoring and supportive supervision.

- Develop and implement strategies to improve EPI data through deployment of tools such as the District Vaccine Data Management Tool and Data Quality Audit.

- Strengthen logistics for the EPI cold chain through the provision of generators for each region.

PREVENT

Indicators and scores

P.7.1 Vaccine coverage (measles) as part of national programme – Score 3

Strengths/best practices

- There is strong political commitment for the provision of vaccines.

- There is good collaboration between the EPI programme and UN agencies (WHO and the United Nations Children's Fund).

Areas that need strengthening/challenges

- There is a need for systematic data collection for EPI activities using standardized data collection tools.

- There is need to develop an EPI multi-year plan to include activities that will increase vaccine coverage.

- Mauritius may consider reviewing the schedule for measles vaccination to begin at 9 months rather than at 12 months as is currently practiced.

- Strengthen the capacity of the EPI programme to collaborate with private healthcare providers.

- Develop and implement advocacy, communications and social mobilization plans for the EPI programme.

P.7.2 National vaccine access and delivery – Score 3

Strengths/best practices

- There is good infrastructure for the storage and distribution of vaccines.

- Adequate storage space for vaccines is available at the central warehouse.

Areas that need strengthening/challenges

- Systematic quantification, forecasting and documentation of vaccine utilization should be institutionalized.

- Improve capacity for cold chain management at national and regional levels, through the development of SOPs for cold chain management and provision of generators for adequate power supply.

DETECT

National laboratory system

Introduction

Public health laboratories provide essential services including disease and outbreak detection, emergency response, environmental monitoring and disease surveillance. State and local public health laboratories can serve as a focal point for a national system, through their core functions for human, veterinary and food safety including disease prevention, control and surveillance; integrated data management; reference and specialized testing; laboratory oversight; emergency response; public health research; training and education; and partnerships and communication.

> **Target**
>
> *Real-time bio surveillance with a national laboratory system and effective modern point-of-care and laboratory-based diagnostics.*

Mauritius level of capabilities

The laboratory system of the MOHQL in Mauritius consists of one Central Health Laboratory (CHL) at Victoria Hospital (Candos), four regional hospital laboratories, four "branch laboratories" in district or specialized hospitals, and several mediclinic laboratories. Mauritius has a free healthcare system, which includes free laboratory tests for all patients attending government healthcare institutions. The laboratories in Mauritius typically provide all essential services for diagnostics, surveillance of infectious diseases and outbreak investigation.

The laboratory system in Mauritius has the capacity to perform a wide range of tests. The country has well-equipped laboratories with the latest technology (e.g. real-time polymerase chain reaction (PCR), gene sequencer, matrix-assisted laser desorption/ionization (MALDI)) and a national body in charge of laboratory licensing with a standardized checklist.

There are clinical microbiology diagnostic laboratories for bacteriology, mycology, virology, serology, molecular biology and parasitology (for malaria, helminths, intestinal protozoa) tests. Virology, microbiological testing and malaria laboratory activities are centralized at CHL, while TB services are centralized at the TB laboratory. The country has the capability to conduct core tests at the national level for eight out of ten identified priority diseases (excluding polio and leptospirosis).

Maintenance and repair of the modern laboratory equipment is a challenge due to lack of qualified local personnel. The country also does not yet have a laboratory information management system (LIMS) in place. Laboratory records are still paper-based, and laboratory results are dispatched by vehicles or by post. There is also no registration of kits and reagents.

Though a specimen transportation system exists, there are no standardized SOPs in place for specimen collection, packaging and transport. Additionally, while laboratories participate in external quality assessment, the accreditation of laboratories and harmonization of quality assurance methods need strengthening. Guidelines and protocols for quality management systems are not enforced and in use by public and animal health laboratories. Furthermore, while intersectoral collaboration exists between human and animal health laboratories, formal exchange of information is very limited.

DETECT

As a result of its World Bank's classification as an upper middle-income country, Mauritius is not eligible for funding from various international multilateral sources such as Gavi: the Vaccine Alliance and the Global Fund to Fight AIDS, Tuberculosis and Malaria. Furthermore, Mauritius is also not eligible for discounts on some laboratory reagents or registration fees for scientific conferences. Local laboratory staff are also often not eligible for invitations to training programmes designed for developing countries. This lack of access to financial and technical resources and opportunities constrains the pace of implementation of plans and capacity development in Mauritius.

Recommendations for priority actions

- Develop guidelines and protocols for implementing a laboratory quality management system and external quality assessments.

- Develop SOPs for specimen collection, packaging, storage and transport.

- Develop and implement SOPs for laboratory information sharing and collaboration among all relevant sectors, in the context of One Health.

- Establish a functional LIMS.

Indicators and scores

D.1.1 Laboratory testing for detection of priority diseases – Score 4

Strengths/best practices
- Free diagnostic tests for all patients attending public-sector health facilities.

- Capability to perform eight out of ten core tests for identified priority pathogens.

- High workload helps to ensure proficiency and the centralization of laboratory services facilitates easy data collection for laboratory-based surveillance.

- The virology laboratory is a WHO-designated National Influenza Centre.

- MOHQL's Food Microbiology Laboratory is embedded in the same section as bacteriology, facilitating the correlation of results and the sharing of experiences.

- Some tests of public health importance are also free for patients using the private healthcare sector (e.g. TB, malaria and HIV).

Areas that need strengthening/challenges
- Strong need for the establishment of a new national laboratory services facility. Infrastructure at the TB laboratory is also ageing.

- Training of staff at international centres of excellence or by international experts for the diagnosis of some infections and pathogens.

- Need for establishment of leptospirosis diagnosis capabilities and services.

- The virology and main bacteriology laboratories are overcrowded as per a recent health and safety report.

- No dedicated public health laboratory for infectious diseases. The bacteriology and virology laboratories are part of several sections of the main laboratory which also includes biochemistry, histopathology, etc. Neither are there separate budget streams or management structures for each of the various sections.

- Loss of skilled staff due to retirement, emigration, poor health and transfers to other sections or to a branch laboratory.

- Insufficient staff to cope with increased workload, especially during epidemics and for new time-consuming tests, e.g. leptospirosis.

D.1.2 Specimen referral and transport system – Score 4

Strengths/best practices

- Well-established system in place for the transportation of specimens from health centres and peripheral hospitals to the reference laboratories.

- Arrangements established with Pasteur Madagascar for sending stool samples for polio culture through DHL courier services.

Areas that need strengthening/challenges

- SOPs for transport of specimens are available for TB but not for all specimens.

- Insufficient number of staff trained in packaging of hazardous specimens in bacteriology unit.

- Vehicles collect samples only once a day from health facilities. Any additional or urgent samples that miss the scheduled collection are transported only the next day.

D.1.3 Effective modern point-of-care and laboratory-based diagnostics – Score 3

Strengths/best practices

- More than 90% of the laboratory system and diagnostics services are funded directly by the MOHQL through domestic resources.

- Staff are well-trained, with all technicians holding at least a diploma, most have a B.Sc. and some an M.Sc. degree. Some staff have also been trained abroad.

- Available equipment is mostly adequate and includes new technologies such as Next Generation Sequencing and MALDI. Modern molecular and serology techniques have been in use for several years.

- There is a national system for sample referral in place.

- Maintenance contracts for new equipment are in place.

- Due to diligent monitoring of stocks, bridging purchases and buffer stocks, no stock out of reagents have been reported.

- Good quality reagents are consistently used by the laboratories. Cheap reagents of poor quality are rejected by CHL if they fail sample evaluation or an evaluation at delivery.

Areas that need strengthening/challenges

- Establishment of a LIMS is a priority and an imperative.

- Procedures for ordering consumables should be further streamlined and rendered more efficient.

- Computerization of stores for stock monitoring is currently a work-in-progress and must remain a priority.

- Diagnosis of leptospirosis by PCR and either Immunoglobulin M (IgM) or microscopic agglutination test is needed (instead of by the complement fixation test that is currently the practice).

- Repair of new equipment is done by a technician from the supplier with limited training and experience, as there are only one or two units installed in the country.

- Audit queries regarding overstocking and expired reagents for confirmation of rare or non-existent diseases in Mauritius (e.g. cholera, brucellosis, diphtheria) may require review and rationalization of plans and policies.

D.1.4 Laboratory quality system – Score 3

Strengths/best practices

- Some MOHQL laboratories (e.g. influenza, HIV and TB) have a quality manual to guide quality assurance.

- Mandatory licensing for private laboratories to operate.

- MOHQL laboratories participate in several external quality assessment (EQA) programmes, often with an impressive 100% annual score.

Areas that need strengthening/challenges

- All laboratories should have a dedicated quality manual to guide quality assurance.

- SOPs not available for many of the tests.

- Except for the National Influenza Centre, none of the laboratories are formally accredited.

- Only the TB laboratory has initiated the Stepwise Laboratory Improvement Process Towards Accreditation (SLIPTA) process.

- National EQA programmes for some tests need to be organized.

- Currently there is no national regulatory authority for registration of laboratory reagents.

Real-time surveillance

Introduction

The purpose of real-time surveillance is to advance the safety, security and resilience of the nation by leading an integrated biosurveillance effort that facilitates early warning and situational awareness of biological events.

Target

Strengthened foundational indicator- and event-based surveillance systems that are able to detect events of significance for public health, animal health and health security; improved communication and collaboration across sectors and between sub-national, national and international levels of authority regarding surveillance of events of public health significance; improved country and intermediate level regional capacity to analyse and link data from and between strengthened, real-time surveillance systems, including interoperable, interconnected electronic reporting systems. This would include epidemiologic, clinical, laboratory, environmental testing, product safety and quality and bioinformatics data; and advancement in fulfilling the core capacity requirements for surveillance in accordance with the IHR and OIE standards.

Mauritius level of capabilities

The List of Notifiable Diseases is enacted by the Public Health Act, and Mauritius updated the List of Priority Diseases in June 2017 for its Integrated Disease Surveillance and Response (IDSR) programme. There is an SOP for surveillance articulated by the MOHQL in June 2015, which includes case definitions for all nationally important diseases and syndromes.

The Communicable Disease Control Unit (CDCU) serves as the primary agency for the control and prevention of communicable diseases through surveillance and response. The unit assists in data collection, management and analysis. It also holds weekly teleconferences with the IOC and the Africa CDC.

Syndromic surveillance is carried out for upper respiratory tract infections (URTI) and conjunctivitis at nine sentinel sites and gastroenteritis at eight sentinel sites. Sentinel surveillance for influenza-like illness (ILI) and severe acute respiratory infections (SARI) is conducted at five sentinel sites, and for acute flaccid paralysis at 29 sentinel sites.

Event-based surveillance (EBS) is conducted in collaboration with the Ministry of Education and Human Resources, Tertiary Education and Scientific Research. EBS has been set up to monitor absenteeism at school. Two secondary schools have been selected on a pilot basis. School absenteeism forms were distributed in each secondary school. Completed forms are sent by fax to CDCU for analysis. Further collaboration with other ministries and the private sector is envisaged. Training has been carried out for strengthening integrated disease and EBS.

URTI, conjunctivitis, gastroenteritis and measles surveillance data are analysed in terms of person, place and time. GIS-based disease-mapping capabilities are in place for data visualization. Data for vector- and foodborne diseases are entered and analysed on Epi-Info. There is also a case-based form for IDSR which will be used to input data for the priority diseases and analysed on Epi-Info.

For the syndromic surveillance system, a weekly report is prepared by the MOHQL's Health Records Division for URTI, gastroenteritis and conjunctivitis. A weekly report for influenza is provided by the National

Influenza Centre. These are also available as spreadsheets for further analysis at CDCU and shared on a weekly basis through a teleconference with member countries of the IOC.

With regard to an interoperable, interconnected, electronic real-time reporting system, the case-based form for IDSR and Epi-Info are used for notification of priority diseases. These forms are sent from the area health centres and the mediclinic level to the central level via fax or email. However, there is no interoperability in this system.

There is a strong need in Mauritius for the implementation of an interoperable, interconnected, electronic real-time reporting system i.e. a health information management system such as the District Health Information System Version 2.

The MOAIFS has an electronic-reporting system called Voozanoo, developed in collaboration with the IOC. However, a real-time reporting/surveillance system with interoperability between the human and animal health sectors currently does not exist in Mauritius.

Data quality assurance and validation (monitoring and evaluation) will be carried out through an intergovernmental agreement with the Government of India on an e-Health project which is expected to help resolve challenges associated with data quality and validation.

Recommendations for priority actions

- Strengthen capacity for data analysis and reporting through training, equipment and coordination support at all levels.

- Set up an interoperable, interconnected and electronic-reporting system across all levels in the context of One Health.

- Adapt and roll out the 3rd edition of AFRO IDSR.

- Scale up EBS at national and subnational levels in collaboration with relevant sectors.

- Develop and implement integrated SOPs for collaboration, coordination and information sharing between human, animal and environmental health sectors.

Indicators and scores

D.2.1 Indicator- and event-based surveillance systems – Score 3

Strengths/best practices

- The list of priority diseases, conditions and events was updated in 2017.

- There is strong collaboration between the MOHQL and the Ministry of Education and Human Resources, Tertiary Education and Scientific Research for the initiation of EBS on a pilot phase in schools.

- At the airport, data collected from all passengers through the health declaration form are analysed through intersectoral collaboration.

- Regional and cross-border collaboration have been established with the Indian Ocean islands.

- IDSR is implemented at the periphery level (area health centres and mediclinics).

- Regular teleconferences are held with all participating countries of the IOC and the East Africa Regional Collaborating Centre (through the Kenya Zoom Platform).

Areas that need strengthening/challenges

- IDSR implementation is to be extended to the periphery (i.e. to community health centres) but there is need for additional human resources, capacity building and improved collaboration with different ministries and sectors to strengthen EBS at the national and subnational level.

- The e-IDSR platform will be established for reporting and analysis in health facilities at all levels. Further investment is needed to improve IT infrastructure and training for real-time surveillance.

D.2.2 Interoperable, interconnected, electronic real-time reporting system – Score 1

Strengths/best practices

- The country has relatively good Internet and intranet connectivity

- A GIS unit has recently been established in June 2018.

Areas that need strengthening/challenges

- There is a need to integrate the IDSR reporting system with other health sector platforms and make it interoperable.

- Greater collaboration between the MOHQL and the MOAIFS is needed for better information sharing via an electronic-reporting system.

- Staff training programmes need to be established for effective and efficient electronic disease surveillance.

D.2.3 Integration and analysis of surveillance data – Score 3

Strengths/best practices

- GIS-based disease-mapping capabilities are in place

- Production of GIS shape files for analysis and reporting.

- Standardized IDSR case-based form that includes a laboratory component will be produced on Epi-Info to facilitate analysis.

Areas that need strengthening/challenges

- Capacity to conduct data analysis at regional and peripheral levels needs to be improved. To fully operationalize systematic data collection and analysis, there is need for the recruitment of a dedicated data manager and a health statistician.

- There is lack of an interoperable, interconnected, electronic real-time reporting system connecting the Central Laboratory and the CDCU.

D.2.4 Syndromic surveillance system – Score 4

Strengths/best practices

- Various syndromes and pathogens are detected and reported, including URTIs, conjunctivitis and gastroenteritis. Positive cases are reported weekly by the National Influenza Centre and Central Health Records.

- Surveillance for ILI and SARI has been implemented. Staff have been trained by WHO to use the average curve method in this context.

Areas that need strengthening/challenges

- Issues of data quality assurance and validation (monitoring and evaluation) will be addressed through an intergovernmental agreement for technical support with the Government of India.

DETECT

Reporting

Introduction

Health threats at the human–animal–ecosystem interface have increased over the past decades, as pathogens continue to evolve and adapt to new hosts and environments, imposing a burden on human and animal health systems. Collaborative multidisciplinary reporting on the health of humans, animals and ecosystems reduces the risk of diseases at the interfaces between them.

Target

Timely and accurate disease reporting according to WHO requirements and consistent coordination with FAO and OIE.

Mauritius level of capabilities

Mauritius is a member of both WHO and OIE. The country has appointed National Focal Persons for reporting to WHO and OIE. These people have received training in IHR through national dissemination workshops and WHO and FAO regional workshops.

The MOHQL has a form in place outlining the procedure to be followed for reporting a potential PHEIC to WHO. Any potential PHEIC is assessed technically and cleared by the administrative authorities before being reported. However, these procedures have not yet been tested.

In the animal health sector, routine data from quarantine stations, slaughterhouses and government and private veterinarians in the field, are sent to the national OIE focal point through an online system. From there, the focal point directly reports to the OIE. During an outbreak, the information goes through the Permanent Secretary, followed by the cabinet, before being reported to OIE.

While the country has not suffered any major PHEIC in recent years, it has maintained a good relationship with UN agencies, evidenced by the collaborative discussions and workshops. Future opportunities for testing the reporting capacity could be done through simulation exercises on detection, approvals and reporting of potential PHEIC, which involves all relevant sectors.

Recommendations for priority actions

- Develop and implement SOPs for approvals and reporting on PHEIC to WHO, FAO and OIE.
- Conduct simulation exercises for approvals and reporting on PHEIC to WHO, FAO and OIE.
- Fast-track the approval of policies relevant for reporting on PHEIC to WHO, FAO and OIE.
- Conduct continuous training for the NFPs and OIE Focal Person(s) for improved reporting on PHEIC and zoonotic events.

Indicators and scores

D.3.1 System for efficient reporting to WHO, FAO, and OIE - Score 3

Strengths/best practices

- NFPs for reporting events that may constitute a PHEIC to WHO and OIE have been identified.

- NFPs have received training on IHR (2005).

- There are procedures in place for reporting of events that may constitute a PHEIC to WHO and OIE.

- NFPs also participate in notification to the IOC regional network on a weekly basis.

Areas that need strengthening/challenges

- The procedures for reporting on PHEIC to WHO, FAO and OIE have not yet been tested.

D.3.2 Reporting network and protocols in country - Score 2

Strengths/best practices

- There is a draft policy for reporting emergencies to relevant international organizations.

Areas that need strengthening/challenges

- There are no approved SOPs for reporting on PHEIC to WHO, FAO and OIE.

- The draft policy for reporting emergencies has not yet been approved.

Workforce development

Introduction

Workforce development is important in order to develop a sustainable public health system over time by developing and maintaining a highly qualified public health workforce with appropriate technical training, scientific skills and subject-matter expertise.

Target

States Parties with skilled and competent health personnel for sustainable and functional public health surveillance and response at all levels of the health system and the effective implementation of the IHR (2005).

Mauritius level of capabilities

Mauritius has a multidisciplinary professional workforce including physicians, laboratory technicians, epidemiologists and veterinarians. But given its size and status as a small island developing state (SIDS), the number of these professionals is limited in the country.

For the human health sector, the country has a well-established structure at both national and subnational levels, where epidemiologists are present at all levels. There is coordination among all units and a scheme for continuous training in epidemiology. However, the situation is not the same for veterinary medicine, as veterinarians are stationed only at the central level. But this does not pose a major problem, as distances are short and road connectivity is good in this small island nation. Providing veterinary services to all parts of the country from the central level is not hampered by a lack of staff at the subnational levels.

Although veterinarians are equipped with strong epidemiological skills, there is no veterinarian with a formal specialization in epidemiology. An advanced training programme (a Master's degree in epidemiology) is available at the University of Mauritius and the Open University of Mauritius, where both veterinarians and physicians can be enrolled. Additionally, veterinarians receive basic training in field epidemiology within the framework of the continuing education programmes put in place by the IOC.

Recommendations for priority actions

- Conduct a comprehensive needs assessment for national public health workforce development (at national and subnational levels), under the One Health approach.
- Develop a national public health workforce strategy that covers all relevant sectors.
- Recruit, train and deploy public health workforce at all levels, as needed.
- Build capacity in the workforce in zoonotic epidemiology.

Indicators and scores

D.4.1 Human resources available to implement IHR core capacity requirements – Score 3

Strengths/best practices

- The country can rapidly deploy a multidisciplinary team nationally during emergencies.
- There are trained rapid response teams (RRTs) in place.
- Veterinary services are free of charge and available 24 hours a day.

Areas that need strengthening/challenges

- Limited human resources in the veterinary services.
- Limited qualified personnel in laboratory services.

D.4.2 FETP or other applied epidemiology training programme in place – Score 5

Strengths/best practices

- Personnel trained in field epidemiology are available in both animal and human health sectors.
- There is ongoing training in epidemiology for veterinarians in the animal health sector.

Areas that need strengthening/challenges

- More FETP graduates are required.
- FETP still being conducted outside of Mauritius.

D.4.3 Workforce strategy – Score 1

Strengths/best practices

- A workforce strategy for Mauritius is under development.

Areas that need strengthening/challenges

- Currently, there is no national health workforce strategy in place.
- There is no workforce strategy for the other sectors at the subnational level.

DETECT

RESPOND

Preparedness

Introduction

Preparedness includes the development and maintenance of national, intermediate and community/ primary response level public health emergency response plans for relevant biological, chemical, radiological and nuclear hazards. Other components of preparedness include mapping of potential hazards, the identification and maintenance of available resources, including national stockpiles and the capacity to support operations at the intermediate and community/primary response levels during a public health emergency.

Target

Development and maintenance of national, intermediate (district) and local/primary level public health emergency response plans for relevant biological, chemical, radiological and nuclear hazards. This covers mapping of potential hazards, identification and maintenance of available resources, including national stockpiles and the capacity to support operations at the intermediate and local/primary levels during a public health emergency.

Mauritius level of capabilities

Emergency preparedness in the Republic of Mauritius is coordinated by a multisectoral committee comprising the NFP, the MOHQL, the MOAIFS and the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development. Other stakeholders are involved as needed. There is good communication with the political leadership, and direct communication with the Office of the Prime Minister to ensure a strong level of preparedness for emergencies.

Documents guiding preparedness include the following:

- Draft Multisectoral Plan of Action
- National Disaster Scheme
- Public Health Emergency Plan
- Hazard Incident Contingency Plan
- Disease-specific operational plans for H1N1 pandemic influenza, chikungunya, dengue fever, Ebola virus disease, MERS-CoV and Zika virus fever.

Mauritius has a limited stockpile of personal protective equipment and no stockpiles to manage other IHR-related hazards. There are no arrangements with manufacturers or suppliers of relevant commodities.

Risk assessment and resource mapping for Mauritius are yet to be conducted.

Recommendations for priority actions

- Review and update existing multihazard plans to incorporate other IHR-relevant hazards such as zoonoses, chemicals, radiation and POE.

- Conduct and document annual simulation exercises to test the country's emergency preparedness and response plan, and update the plan as required.

- Conduct and document national risk assessment and resource mapping.

- Undertake provision of stockpiles for all IHR-relevant hazards.

- Develop an operational manual for cross-referencing all relevant plans.

Indicators and scores

R.1.1 National multi-hazard public health emergency preparedness and response plan developed and implemented – Score 4

Strengths/best practices

- A draft multisectoral preparedness plan has been developed.

- Mauritius has trained RRTs in place.

- Stockpiles of personal protective equipment exist.

- There is direct involvement of top political leadership in emergency preparedness.

Areas that need strengthening/challenges

- The multisectoral preparedness plan needs to be finalized, disseminated and implemented.

- There is a need to build country capacity for conducting simulation exercises to test plans.

R.1.2 Priority public health risks and resources mapped and utilized – Score 1

Strengths/best practices

- There is the political will to conduct risk assessment and resource mapping.

- There is good collaboration between the government and UN agencies that can build country capacity on risk assessment and resource mapping.

- The Government of Mauritius is committed to allocating resources for emergency preparedness.

Areas that need strengthening/challenges

- Capacity building in planning is required for coordinators of emergency preparedness at national and regional levels.

- Institutionalization of risk and resource mapping is required.

RESPOND

Emergency response operations

Introduction

A public health emergency operations centre is a central location for coordinating operational information and resources for strategic management of public health emergencies and emergency exercises. Emergency operations centres provide communication and information tools and services, and a management system during a response to an emergency or emergency exercise. They also provide other essential functions to support decision-making and implementation, coordination and collaboration.

Target

Country with public health emergency operations centre (EOC) functioning according to minimum common standards; maintaining trained, functioning, multisectoral rapid response teams and "real-time" bio surveillance laboratory networks and information systems; as well as trained EOC staff capable of activating a coordinated emergency response within 120 minutes of the identification of a public health emergency.

Mauritius level of capabilities

The MOHQL's CDCU was identified to serve as the PHEOC. This decision was made as part of the government's effort to strengthen the country's capacities for preparedness and response to public health emergencies, following the outbreak of chikungunya that occurred in Mauritius in 2009.

The PHEOC is activated in times of need to address public health emergencies through an incident management system with defined command and control functions. In the case of an emergency, the Director General of Health Services is the designated focal person for activation of the PHEOC, in consultation with technical and administrative staff.

The PHEOC consists of two rooms located at MOHQL headquarters. The CDCU personnel double up for PHEOC staff positions, as the need arises. This highlights the need to develop and implement a training plan for PHEOC personnel.

RRTs are available at national and regional levels. National-level RRTs can be rapidly deployed countrywide within a reasonably short time, given the relatively small size of the country. An appropriate training programme for multidisciplinary RRTs is required to increase response capacity at all levels. There are existing hotlines which enable members of the public to report medical emergencies and public health events that affect both human and animal health. A comprehensive simulation exercise to test the country's readiness in terms of emergency response operations will enable the identification of areas that need strengthening and take appropriate measures for improvement as necessary.

Recommendations for priority actions

- Strengthen the capacity of the PHEOC by expanding office space, recruitment and training of staff, and funding.
- Develop and implement a PHEOC SOPs for emergency response operations.
- Conduct and document an annual simulation exercise on public health emergency response.
- Strengthen logistics capacity for patient referral and transportation at the regional level, through the procurement of dedicated ambulances and development of appropriate SOPs.
- Conduct a training needs assessment, and develop and implement a training plan for PHEOC staff according to international standards.

Indicators and scores

R.2.1 Capacity to activate emergency operations – Score 3

Strengths/best practices

- The country has a dedicated PHEOC with identified staff to support its functions.

- The PHEOC is operational 24/7.

- There is a designated person for activation of the PHEOC in case of emergencies.

Areas that need strengthening/challenges

- The PHEOC staff have received only on-the-job training in emergency management and coordination.

- There is no training plan for PHEOC staff and the RRTs.

R.2.2 EOC operating procedures and plans – Score 3

Strengths/best practices

- Draft procedures exist for decision-making involving key stakeholders in an emergency response.

- The Director General of Health Services has been designated as the key person for decision-making during public health emergencies.

Areas that need strengthening/challenges

- Plans and procedures for the PHEOC are limited in scope.

R.2.3 Emergency operations programme – Score 4

Strengths/best practices

- A table-top exercise based on an Ebola virus disease outbreak scenario was conducted in 2014.

- Emergency operations were activated in response to an outbreak of seasonal influenza in humans in 2017.

- There is a strong political commitment to addressing public health emergencies.

Areas that need strengthening/challenges

- There is inadequate reporting following responses to public health emergencies.

- There is lack of systematic documentation of table-top exercises, which could enable necessary adjustments to be made to emergency preparedness and response plans.

R.2.4 Case management procedures implemented for IHR relevant hazards – Score 4

Strengths/best practices

- Case management guidelines are available for priority diseases such as Ebola, influenza, dengue, chikungunya, malaria and MERS-CoV diseases

- A patient referral system and a means of transportation with adequate ambulances are in place at the national level.

Areas that need strengthening/challenges

- There are insufficient management guidelines for other IHR-related hazards such as radiation emergencies.

- There is no earmarked and dedicated transport system exclusively for public health emergencies for patient transfers at the regional level.

RESPOND

Linking public health and security authorities

Introduction

Public health emergencies pose special challenges for law enforcement, whether the threat is manmade (e.g. the anthrax terrorist attacks) or naturally occurring (e.g. flu pandemics). In a public health emergency, law enforcement will need to quickly coordinate its response with public health and medical officials.

Target

Country conducts a rapid, multisectoral response in case of a biological event of suspected or confirmed deliberate origin, including the capacity to link public health and law enforcement, and to provide and/or request effective and timely international assistance, such as to investigate alleged use events.

Mauritius level of capabilities

Mauritius has not experienced any suspected or confirmed biological event of deliberate origin. That being the case, the country does not have any specific agreement with the security authorities, linking public health with law enforcement. Neither has the country conducted any simulation exercise to test the linkage between public health and security authorities, in relation to public health emergencies triggered by a biological event.

Although the country does not have any specific agreement between the public health and security authorities; in the event of public health emergencies, the country relies on the NDRRMC which is enabled by the National Disaster Risk Reduction and Management Act 2016, to attend to all national disasters including chemical and radionuclear events. The Act defines disaster as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts which exceed the ability of the affected community or society to cope using its own resources".

The NDRRMC is made up of representation from various government entities including the MOAIFS and the MOHQL, together with the Ministries of Defence, Foreign Affairs, Civil Defence, Customs and Border Control and the Food Inspectorate. In the event of a disaster, the Act provides for the establishment of a National Crisis Committee which supervises the conduct of disaster response operations. The membership of this committee is multisectoral. The Act further provides for a National Emergency Operations Command (NEOC) which is headed by the Commissioner of Police and leads the response operations in the event of a disaster, with the assistance of the NDRRMC.

The Republic of Mauritius is a Party to the Biological and Toxin Weapons Convention. In 2004, the country passed the Biological and Toxin Weapons Act which aimed to give effect to the convention. The Act prohibits the development, production and stockpiling of bacteriological and toxin weapons.

The country has only one microbiologist who has received limited training in bioterrorism.

Although the country has these measures in place to deal with disaster situations of a biological nature, there is a need for specific agreements and/or protocols between public health and security authorities to facilitate rapid and effective coordination of the response between law enforcement and public health and medical officials.

Recommendations for priority actions

- Provide training to enhance the capacity of security authorities in dealing with public health emergencies and disease outbreaks.

- Develop an MOU or an appropriate agreement, between the public health and security authorities in order to formalize collaboration for greater accountability, and a clear definition of roles and responsibilities during crisis situations.

- Conduct and document simulation exercises to evaluate collaboration between public health and security authorities during public health emergencies.

Indicators and scores

R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) linked during a suspect or confirmed biological event – Score 4

Strengths/best practices

- The country has not experienced a scenario of a suspected or confirmed biological event.

- Collaboration and coordination between public health and security authorities exist, for example, during the H1N1 pandemic and at the National Drug Observatory.

Areas that need strengthening/challenges

- Planning for biological or other events that may have a deliberate motive.

- Training of public health experts in bioterrorism emergency response.

- Training in joint investigation by public health and law enforcement authorities.

- Formal agreements and/or protocols between public health and law enforcement.

RESPOND

Medical countermeasures and personnel deployment

Introduction

Medical countermeasures are vital to national security and protect nations from potentially catastrophic infectious disease threats. Investments in medical countermeasures create opportunities to improve overall public health. In addition, it is important to have trained personnel who can be deployed in case of a public health emergency for response.

Target

National framework for transferring (sending and receiving) medical countermeasures, and public health and medical personnel from international partners during public health emergencies.

Mauritius level of capabilities

Mauritius, as a SIDS, faces unique challenges related to its geographical isolation and small population size, when it comes to sending or receiving medical countermeasures and personnel in response to a public health emergency. These challenges are further exacerbated due to limited human resources and the relatively high cost of medicines in Mauritius, as they are procured in small quantities given the size of the population.

There is no national framework for the deployment of medical countermeasures and personnel, though contingency plans are in place for the stockpiling of medical countermeasures.

Some monitoring of stockpiles is done through a paper-based system. The Central Store Division at Plaine Lauzun in Port Louis is the central warehouse where all pharmaceuticals, vaccines, personal protective equipment and other consumables for the Ministry of Health are stored and distributed, following receipt from the airport and seaport.

Despite the challenges, the procurement of medical supplies is financed by the government, supporting its sustainability. Mauritius does, however, receive ad hoc donations during public health emergencies. The two main international partners are WHO and IOC.

Mauritius has relevant training programmes available through its universities to develop human resource capacity.

Recommendations for priority actions

- Develop a legal framework for sending and receiving medical countermeasures, and the deployment of personnel during public health emergencies.

- Develop and implement a plan for sending and receiving medical countermeasures during public health emergencies.

- Develop and implement a plan for sending and receiving deployed personnel during public health emergencies.

- Establish an agreement with manufacturers and distributors to procure medical countermeasures during public health emergencies.

- Conduct and document annual simulation exercises on sending and receiving medical countermeasures and personnel during public health emergencies.

Indicators and scores

R.4.1 System is in place for sending and receiving medical countermeasures during a public health emergency –Score 2

Strengths/best practices

- The country's health system is funded through domestic resources.

- There is a contingency plan for stockpiling of medical countermeasures.

- There is good collaboration between the Government of Mauritius and international partners such as WHO and IOC.

Areas that need strengthening/challenges

- There is no legal framework for sending and receiving medical countermeasures.

- There is no specific plan in place for sending and receiving medical countermeasures.

R.4.2 System is in place for sending and receiving health personnel during a public health emergency – Score 1

Strengths/best practices

- There is a good collaboration between Mauritius and international partners such as WHO and IOC.

- There are training opportunities in place to strengthen the human resources in public health.

Areas that need strengthening/challenges

- No plan exists for sending and receiving deployed personnel during public health emergencies.

Risk communication

Introduction

Risk communications should be a multilevel and multifaceted process which aims at helping stakeholders define risks, identify hazards, assess vulnerabilities and promote community resilience, thereby promoting the capacity to cope with an unfolding public health emergency. An essential part of risk communication is the dissemination of information to the public about health risks and events, such as disease outbreaks. For any communication about risk caused by a specific event to be effective, the social, religious, cultural, political and economic aspects associated with the event should be taken into account, including the voice of the affected population.

Communications of this kind promote the establishment of appropriate prevention and control action through community-based interventions at individual, family and community levels. Disseminating the information through appropriate channels is essential. Communication partners and stakeholders in the country need to be identified, and functional coordination and communication mechanisms should be established. In addition, the timely release of information and transparency in decision-making are essential for building trust between authorities, populations and partners. Emergency communication plans should be tested and updated as needed.

Target

State Parties use multilevel and multifaceted risk communication capacity. Real-time exchange of information, advice and opinions between experts and officials or people who face a threat or hazard (health or economic or social wellbeing) to their survival, so that informed decisions can be made to mitigate the effects of the threat or hazard and protective and preventive action can be taken. This includes a mix of communication and engagement strategies, such as media and social media communications, mass awareness campaigns, health promotion, social mobilization, stakeholder engagement and community engagement.

Mauritius level of capabilities

The Mauritius Health Information, Education and Communication (HIEC) Unit is responsible for risk communications during public health emergencies. This unit is also represented in the multisectoral coordination team during an outbreak or event.

Despite not having a national risk communications plan in place, Mauritius ensures a multisectoral approach to risk communications. Firstly, the HIEC Unit is represented in the coordination team during all public health events. Secondly, all relevant partners and stakeholders are involved in disseminating information to the community.

During public health events, multiple media outlets are used to communicate with the community. There is a health hotline to facilitate public access to information, which is answered by workers at the CDCU. Information education and communication (IEC) materials are developed swiftly, using relevant local languages.

Some of the identified spokespersons from the health sector have a communications background. These spokespersons make a concerted effort to use platforms that allow for two-way communication (e.g. television programmes with audience participation).

Risk communications capacity in Mauritius is quite exemplary but requires certain formalization of its system.

Recommendations for priority actions

- Develop a national multihazard risk communications plan, incorporating a One Health approach.
- Establish a platform to develop guidelines for risk communications, engaging all relevant stakeholders.
- Conduct a training needs assessment and develop a risk communications training plan for relevant personnel.
- Develop and design a monitoring and evaluation framework to monitor the impact of risk communications during and after an outbreak.

Indicators and scores

R.5.1 Risk communication systems (plans, mechanisms, etc.) - Score 1

Strengths/best practices

- The roles of different stakeholders to support awareness campaigns during outbreaks are outlined in some disease-specific response plans.
- The HIEC Unit functions as the core team responsible for risk communications and includes personnel with a communications background.
- There is a multisectoral and multidisciplinary approach to risk communications in Mauritius, involving a range of relevant stakeholders and partners.

Areas that need strengthening/challenges

- There is lack of a national multihazard risk communications plan.

R.5.2 Internal and partner communication and coordination – Score 4

Strengths/best practices

- Members of the HIEC Unit are represented in the response coordination team during an outbreak.
- There is involvement of multiple stakeholders and partners in information dissemination.
- Health officers are posted at national and regional levels to disseminate information during outbreaks.

Areas that need strengthening/challenges

- Roles of relevant stakeholders and partners need to be more clearly defined.

R.5.3 Public communication – Score 4

Strengths/best practices

- The HIEC Unit acts as the central locus for public education, with involvement of the CDCU for answering public queries on the hotline.
- Some spokespersons have both a health and communications background.
- Use of live television programmes, which allows for two-way communication with communities, is extensively used during outbreaks.
- Different local languages are used to disseminate information through IEC materials and the mass media.
- Civil society and intersectoral groups are involved in helping disseminate information and key messages during public health events.

RESPOND

Areas that need strengthening/challenges

- There is limited involvement of social media for public outreach.

- The HIEC Unit requires adequate access to the Internet for rapid information dissemination.

R.5.4 Communication engagement with affected communities – Score 4

Strengths/best practices

- There is close engagement with communities and civil society to effectively reach affected populations.

- IEC materials are developed relatively quickly during public health events, in all relevant local languages.

Areas that need strengthening/challenges

- There is no monitoring and evaluation system in place to evaluate the effectiveness of the risk communications interventions.

R.5.5 Dynamic listening and rumour management – Score 4

Strengths/best practices

- Rumours are tracked through monitoring the emergency public hotline at the CDCU.

- Rumours and misinformation are dealt with in a systematic and stepwise manner.

Areas that need strengthening/challenges

- Not all relevant platforms are being used to monitor rumours (e.g. social media).

OTHER IHR-RELATED HAZARDS AND POINTS OF ENTRY

Points of entry

Introduction

All core capacities and potential hazards apply to "points of entry" and thus enable the effective application of health measures to prevent international spread of diseases. States Parties are required to maintain core capacities at designated international airports and ports (and where justified for public health reasons, a State Party may designate ground crossings), which will implement specific public health measures required to manage a variety of public health risks.

> **Target**
>
> *States Parties designate and maintain core capacities at international airports and ports (and where justified for public health reasons, a State Party may designate ground crossings) that implement specific public health measures required to manage a variety of public health risks.*

Mauritius level of capabilities

As the economy of Mauritius is heavily reliant on the tourism industry, the government has deployed considerable resources and efforts to strengthening the country's capacities for prevention, preparedness and response to public health emergencies at POE. Mauritius has a Quarantine Act dating back to 1953 which was reviewed in 2007 with a focus on POE to facilitate IHR implementation. Inbound aircraft and sea vessels are regularly inspected by competent staff to ensure compliance with safety standards as required by the IHR (2005).

At the international airport, several core services are offered in the areas of public health, food safety and healthcare by 30 dedicated government staff. This includes the inspection and verification of aircraft health declarations using appropriate tools. The airport also has a fully equipped and functional health centre which is run by qualified personnel. Furthermore, an isolation facility was identified to accommodate travellers suspected of suffering from an infectious disease, condition or event. An ambulance is also readily available for the referral and transportation of patients who require further attention. A public health emergency preparedness and response plan for the airport was developed and tested through a simulation exercise for Ebola virus disease.

The port health office also has 11 dedicated staff that are responsible for public health and food safety, as well as rodent control and insecticide spraying. The following port health services are provided at the seaport: verification of maritime declarations of health, and ship sanitation control certification or ship sanitation control exemption certificate, as applicable. There is also a plan to establish a health centre at the seaport in the near future. Unlike the airport, the seaport does not have a public health emergency preparedness and response plan.

At the regional level, 14 offices provide decentralized port health services which include public health and food-safety inspection, public health surveillance, rodent control and insecticide spraying.

OTHER

Recommendations for priority actions

- Finalize the establishment of a comprehensive medical centre at the seaport.

- Conduct a training needs assessment. Develop and implement a refresher training plan for all relevant POE personnel on preparedness and response to public health emergencies.

- Develop and implement an integrated public health emergency preparedness and response plan for the airport and the seaport, in the context of One Health.

- Conduct and document an annual simulation exercise on preparedness and response to public health emergencies at the airport and seaport, in the context of One Health.

Indicators and scores

PoE.1 Routine capacities established at points of entry – Score 5

Strengths/best practices

- Appropriate medical services, with diagnostic facilities for the prompt assessment and care of ill travellers are available at the airport, with adequate staff, equipment and premises.

- There are a dedicated ambulances and trained personnel for the transport of ill travellers to an appropriate medical facility.

- There is a routine inspection programme at the airport and seaport to ensure a safe environment.

- Vector and reservoir control programmes have been established at the airport and seaport.

- There are trained personnel for the inspection of conveyances at the airport and seaport.

Areas that need strengthening/challenges

- There is no infrastructure facility at the seaport though facilities are available in terms of human resources (medical and paramedical staff) to take care of ill travellers and to transfer them either to the regional hospital or to a private clinic.

PoE.2 Effective public health response at points of entry – Score 3

Strengths/best practices

- There is a public health emergency preparedness and response plan for the airport.

- A simulation exercise on Ebola was conducted in 2014 at the airport.

Areas that need strengthening/challenges

- A public health emergency preparedness and response plan exists for the seaport but it should be aligned in the context of One Health.

- Inadequate documentation of the Ebola outbreak simulation exercise.

- Yellow fever vaccination card is not mandatory for entry into Mauritius since the vector is not presently found in the country.

Chemical events

Introduction

Timely detection and effective response of potential chemical risks and/or events require collaboration with other sectors responsible for chemical safety, industries, transportation and safe disposal. This would entail that State Parties need to have surveillance and response capacity to manage chemical risk or events and effective communication and collaboration among the sectors responsible for safety.

Target

States Parties with surveillance and response capacity for chemical risks or events. This requires effective communication and collaboration among the sectors responsible for chemical safety, industries, transportation and safe disposal.

Mauritius level of capabilities

Mauritius makes substantial use of chemicals (particularly in the agro-pastoral, health and domestic sectors and with some restricted use in industry). Local primary production of chemicals is practically non-existent (apart from ethanol) and the country depends on imported chemicals which arrive by maritime transport. Petroleum products represent more than 80% of these imports by weight, and about 70% of the monetary value for all clusters. Users of chemicals are scattered around the island necessitating road transportation for distribution and storage, except for those chemicals used in the outer islands.

Approximately 16 800 t and 252 m3 of hazardous waste is estimated to be generated annually and local disposal is done in accordance with the provision of the Basel Convention. Since April 2007, an Interim Hazardous Waste Storage Facility at La Chaumière collects chemical waste from generators, conducts analyses and repackages, labels and ships it to licensed recovery/disposal facilities. The use of chemicals and the generation of hazardous wastes have a severe impact on the environment and on human health, as well as on society. Water pollution and air pollution from the use of chemicals remain the highest environmental concerns. Food contamination from chemicals or their residues and exposure to chemicals, especially in the workplace, are the main health concerns. In addition, there is misuse of chemicals through suicides or abuse, such as in the case of illicit drugs. In 2011, there were 89 recorded deaths due to chemicals. In 2012, about 42 million Mauritian rupees (MUR) were paid by the Ministry of Social Security in compensation for industrial accidents. This can be compared to about MUR 23 million in 2003.

Several serious chemical incidents have occurred during the last five years including leakage of industrial chlorine gas, heavy oil spills from a shipwreck, ammonia leakage, pesticide spills and acid spills. Evacuations and hospitalization of affected persons have characterized many of these incidents.

The Dangerous Chemicals Control Act 2014 is the principal legislation dealing with the management of chemicals in Mauritius. Additionally, there are: the Environment Protection Act 2002 (amended 2008), the Occupational Safety and Health Act 2005, the Mauritius Fire and Rescue Services Act 2013, and the National Disaster Risk Reduction and Management Act 2016. In 2015, Mauritius also developed a National Hazmat (hazardous materials) Incident Contingency Plan to cater for chemical events. While national policies and a legal framework are in place, there remain gaps in implementation. There also remains a need for proper labelling and adequate measures need to be taken in the context of the retail trade in chemicals and management practices concerning chemical wastes.

In 2014, a national chemicals profile was published that provides an administrative infrastructure for the management of chemicals and an inventory of chemicals used in the country. National implementation plans for the Strategic Approach to International Chemicals Management and some multilateral environmental agreements (MEAs) have been ratified: the Basel, Minamata, Rotterdam and Stockholm Conventions. Mauritius participates in the Intergovernmental Committee on Chemicals Management, is a signatory to the Organization for the Prohibition of Chemical Weapons and participates in regional activities. The Globally Harmonized System for Classification and Labelling of Chemicals is not yet implemented; and the International Labour Organization conventions 170 and 174 are not yet in force.

The MOHQL is responsible for enforcing regulations to protect the general public; the Ministry of Labour, Industrial Relations and Employment for the occupational health and safety of workers; the Ministry of Environment for the protection of the environment, hazardous wastes and national disasters; the Fire and Rescue Services for interventions related to fire, protection of property and other incidents; and the police for onsite security.

Several functional mechanisms for multisectoral collaboration and response are in place, including: the Disaster Management Committee, Dangerous Chemicals Control Advisory Council, Advisory Council for Occupational Safety and Health, etc. However, there remains a need to improve enforcement. In addition to government institutions, civil society provides training in the management of chemicals and awareness raising. The University of Mauritius is a good example, representing academia and research groups through its responsibilities as a tertiary education and contractual services. The NGO PANeM (Pesticide Action Network of Mauritius) is actively involved in raising awareness about chemicals. Similarly, a few industry groups, such as CropLife Mauritius, have been active in promoting advocacy and best practices. However, it is notable that private sector initiatives through umbrella organizations, like the Mauritius Chamber of Commerce and Industry and l'Association des consommateurs de l'île Maurice, seem to be lacking in this sector.

Some guides and procedures for the sound management of chemicals have been developed, but these are not fully implemented. Capacity building is needed to ensure the implementation of the MEAs. There is some access to international databases relating to chemicals. Capacity is available to monitor the chemical contamination of food, and Mauritius is a member of the Codex Alimentarius Commission. The MOHQL's capacity for monitoring exposure to chemicals is limited.

Awareness of chemical risks and events remains poor, with little general appreciation of the implications for response at decision-maker levels. Coordination with other IHR sectors is partial, and communication of chemical risks needs strengthening. Public education on chemical risks should be improved through programmes on identifying chemicals, minimizing risks and the actions that are available to respond to emergencies.

Further training and capacity building of human resources in chemicals risk assessment and communication is desirable, as is the strengthening of existing training in the response to chemical events for first responders and medics (medical professionals currently often have inadequate knowledge of the diagnosis and management of diseases with a chemical etiology). The issue of ensuring access to pharmaceuticals and medical supplies for chemical emergency response is only partially addressed.

Analytical toxicology services are provided by the MOHQL's Government Analyst Division (GAD), which also cooperates with the Forensic Scientific Laboratory, and both are well equipped for toxicology analyses. Toxicology samples are sent from all regions of the country, but there are no specified cold chain provisions for sample transport. SOPs are applied and maintenance of equipment monitored. Plans are in hand for ensuring that GAD follows the guidelines of the International Organization for Standardization. Hard copy record-keeping could be augmented by computerized data collection and analysis.

Ambient air quality is regularly measured and monitored by the National Environmental Laboratory which is well equipped with fixed and mobile instruments. During emergencies, a portable gas analyser is available

for screening of ambient air near residential areas. The portable gas analyser can screen up to 20 toxic gases simultaneously.

Responsibilities for environmental monitoring, chemical contamination and surveillance of inland waters, effluents, coastal waters/sediments, air, drinking water and soils, are well-distributed across several ministries.

Emergency services are available in the event of a serious chemical disaster and can provide helicopter and other rapid transport facilities for transferring patients for treatment and samples for analysis. Hospitals are not, however, equipped with facilities for decontaminating people exposed to chemicals.

Mauritius has a partially operating poisons information centre at one hospital, but it does not cover the whole country and there is no national centre for toxicovigilance and pharmacovigilance, which would be an important component for 24/7 identification and surveillance of chemical risks (particularly acute exposures), and which could perform systematic collection of case data. Urgent consideration should be given to whether existing capacity should be expanded for these functions.

There is a need to develop capacity for the identification and surveillance of chemical risks from chronic exposure. Capacity exists for identifying chemical risks associated with contamination of food. While the health sector cooperates with the emergency services, there remain important gaps in systematic harmonized data collection and information exchange on chemical events. There is incomplete analysis of the information collected and epidemiological follow-up with a view to learning from past experience.

Financial resources are only partially available for chemical event responses and follow-up.

Recommendations for priority actions

- Make the Poisons Information Service fully operational in all five regions.
- Review and strengthen, as appropriate, the existing institutional framework for chemicals management.
- Promote capacity building (infrastructure, technical capabilities and trained human resources) of competent bodies for effective surveillance and enforcement of relevant chemicals management regulations.
- Establish a systematic process for communication of chemical hazards and risks to the public through developing and disseminating key messages and evaluating their impact.
- Establish an occupational hygiene laboratory and strengthen capacity for providing analytical toxicology services to the public and the occupational health sectors.

Indicators and scores

CE.1 Mechanisms are established and functioning for detecting and responding to chemical events or emergencies – Score 3

Strengths/best practices
- Protocols exist for responding to chemical emergencies.
- Policies, guidelines and legislation for dealing with chemicals and chemical events are in place.
- Trained and dedicated human resources exist.
- Good facilities for rapid communication exist.
- Laboratory services for surveillance and analysis (pre-, during and post-event) exist.
- Hotline exists for recording complaints, including chemical incidents.

- Strong mechanisms and guidance for multisectoral collaboration exist.

- An appropriate emergency medical service is available.

- Facilities for evacuation and sheltering of affected populations are available.

- Decontamination campaigns conducted with the involvement of the private sector, including risk assessment and emergency plans of employers.

Areas that need strengthening/challenges

- Improve communication of chemical hazards and risks to the general public. Enhance capacity and capability to deal with pre-, during and post-event scenarios.

- Ensure provision of adequate information to workers and people at risk.

- Develop media tools for ensuring population coverage.

- Improve technical/operational capabilities by appropriate training at all levels.

- Scale up the Poisons Information Centre to service all regions.

CE.2 Enabling environment is in place for management of chemical events – Score 4

Strengths/best practices

- Institutional framework is in place for the management of chemicals (licensing, inspection).

- An Emergency Response Plan and Risk Assessment of chemical events by stakeholders exist.

- An inventory of all major hazardous sites has been undertaken.

- Functional mechanism is in place for interagency collaboration at national and international level.

- Licensing mechanism is in place for setting up of any chemical-related facility.

- Regular drills are undertaken for responding to chemical spills/leakage.

- Health surveillance system is in place for personnel handling chemicals.

- Environmental surveillance is in place whereby several environmental media are monitored.

Areas that need strengthening/challenges

- Consolidate and improve the existing institutional framework.

- Emergency response plan needs to be tested regularly.

- Build greater consensus and improve capacity of relevant stakeholders in identifying and managing hazards and risks related to chemical events.

- Currently there is no capacity for monitoring of occupational health contaminants.

- Collaboration of all stakeholders (public and private) and provision of dedicated trained personnel by the private sector for managing chemical events.

- There is a need for fully trained and qualified experts for managing chemical events.

- An occupational hygiene laboratory needs to be established.

Radiation emergencies

Introduction

To counter radiological and nuclear emergencies, timely detection and an effective response towards potential radiological and nuclear hazards/events/emergencies are required in collaboration with sectors responsible for radiation emergency management.

Target

States Parties with surveillance and response capacity for radiological and nuclear hazards/events/ emergencies. This requires effective communication and collaboration among the sectors responsible for radiological and nuclear emergency management.

Mauritius level of capabilities

The Radiation Protection Authority (RPA) is the sole national regulatory body in Mauritius with the main objective of regulating all practices involving the use of ionizing radiation. The RPA was established in September 2006, under the Radiation Protection Act 2003, as a government department under the aegis of the Ministry of Energy and Public Utilities. The Radiation Protection Act provides for, inter alia, the protection of people and the environment, both now and in the future, against the harmful effects of ionizing radiation. The Act also provides for the RPA to promote measures for the prevention of radiological emergencies and initiate, recommend or provide support on emergency response interventions.

To exercise strict controls over all radiation sources, the RPA has established an effective system for regulating the use of radiation sources. The RPA has also established formal cooperation with the Customs Department for control over the importation of radiation sources into the country. This strict control enables the RPA to maintain an updated inventory of radiation sources.

Mauritius is a non-nuclear state but has a wide range of application of sources of ionizing radiation. The main sources of ionizing radiation in the country are:

- Radiotherapy: Co-60 teletherapy; linear accelerator; Cs-137 brachytherapy.

- Nuclear medicine: technetium Tc-99m; iodine I-131.

- Diagnostic radiology: computerized tomography scanners; angiography machine; dental X-ray equipment.

- Industry and research: irradiators (Cs-137, Co-60); gamma radiography (Ir-192); moisture density gauge (Cs-137. Am-241/Be); baggage/cargo scanners.

With the correct use of such radiation sources the risk of exposure is low. However, some risks remain, associated with misuse; criminal diversion; uncontrolled disposal of obsolete equipment; and radioactive materials that might be dumped illegally or released through a natural disaster (e.g. seismic activity or flooding).

Mauritius has also been a Member State of the International Atomic Energy Agency (IAEA) since 1974. The country benefits from the assistance of the IAEA in the development of national capabilities and competence for effective response to radiation emergencies. The country is currently participating in the IAEA Technical Cooperation Project RAF9055 on emergency preparedness and response. Support from other laboratories, in cases of emergencies, can also be made available as and when required through the IAEA or through the country's direct cooperation with regulatory bodies in the African Region.

OTHER

In its endeavour to further strengthen the national regulatory infrastructure for radiation safety, the Government of Mauritius has introduced a new bill in Parliament, which will encompass radiation safety, nuclear security and safeguards. This new bill, the Radiation Safety and Nuclear Security Bill 2018, will give leverage for Mauritius to further progress and fully meet its international obligations in the field of radiation safety and nuclear security, through the domestication of various international legal instruments, including: the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. It will also make better provision for an effective response to radiological emergencies, and it will specifically provide for the development of a National Radiological Emergency Preparedness and Response Plan (NREPRP); the new authority to be the point of contact for assistance regarding nuclear or radiological emergencies under the terms of relevant international instruments, including conventions; and the establishment of a mechanism for the notification of nuclear or radiological emergencies that could spread beyond the boundaries of Mauritius. To further strengthen national capability in response to radiation emergencies, a new set of regulations is also being developed for effective response to any radiation emergencies to be in line with the new IAEA safety standards, the new legislation on radiation safety and nuclear security and the IHR (2005).

Key stakeholders in the prevention, preparedness and response to radionuclear emergencies in Mauritius are: the Ministry of Energy and Public Utilities; the MOHQL; Mauritius Police Force; Mauritius Fire and Rescue Service; Ministry of Environment, Sustainable Development & Disasters and Beach Management; the NDRRMC; and the Mauritius Revenue Authority. The roles and responsibilities of each of these stakeholders have been clearly defined.

A national Hazmat incident contingency plan has been developed, which defines specific actions and information for responding to events related to hazardous materials. The plan caters for response to radiological emergencies and considers the range of functions required in a crisis. It also provides for coordination and cooperation between the relevant stakeholders, including the NFP, for effective response to radiological emergencies.

The NEOC, a multiagency body, is activated in a Hazmat incident which may have serious consequences and require the coordination of a major response involving multiple jurisdictions. The NEOC is the main coordinating body during response and recovery phases of a Hazmat incident and comprises representatives of relevant ministries, departments and authorities. The NEOC is based at the NDRRMC and is led by the Commissioner of Police. However, in the event of a Hazmat incident the Chief Fire Officer of Mauritius Fire and Rescue Service will be in command.

The NREPRP, also currently being developed, will be a comprehensive plan developed in line with the existing Hazmat Incident Contingency Plan and other established emergency plans. The NREPRP will explicitly cover preparedness and response strategies and measures for effective response to radiation emergencies.

Monitoring of foodstuffs and consumer products for radioactive contamination is being undertaken. Detection of the presence of radionuclides in foodstuffs and other commodities is conducted by the RPA using a NAI gamma spectrometry system. The RPA is planning to acquire a new gamma spectroscopy system using an HPGe detector for food and environmental monitoring.

Recommendations for priority actions

- Develop an NREPRP with associated technical guidelines and SOPs for its implementation.
- Conduct radiation safety assessment for radiation practices that use high-risk radioactive sources.
- Establish systematic information exchange between the RPA and other relevant stakeholders.

- Establish a functional coordination and communication mechanism between the RPA and other relevant stakeholders for effective response to radiological emergencies.

- Build capacity through technical and operational training of staff of the RPA, NDRRMC and other stakeholders for effective response to radiological emergencies.

Indicators and scores

RE.1 Mechanisms are established and functioning for detecting and responding to radiological and nuclear emergencies – Score 3

Strengths/best practices

- The RPA established as the national contact point for radiological emergencies.

- Laboratory available for systematic analysis of radioactivity in foodstuffs. .

- System established for control of foodstuffs to detect radionuclides through radioactivity analysis.

Areas that need strengthening/challenges

There is need for the development of national regulations and a plan for radiological emergency preparedness and response.

- There is need for developing and establishing a specialized facility to deal with radiological emergencies.

- The RPA currently lacks adequate human resources and capacity to effectively carry out its regulatory functions and respond to radiological emergencies.

- Currently there is a lack of adequately trained medical doctors and other personnel to respond to healthcare treatment related radiological emergencies.

RE.2 Enabling environment in place for management of radiation emergencies – Score 2

When the new legislation (the Radiation Safety and Nuclear Security Bill 2018) is adopted a higher score will be justified.

Strengths/best practices

- A national coordinating body has been established to respond to radiological and nuclear emergencies.

- A national Hazmat Incident Contingency Plan has been developed and is being implemented.

- Formal cooperation has been established with the IAEA for support and assistance in the event of a nuclear accident or radiological emergency.

- Formal cooperation with Customs is in place for the control of the import and export of radioactive materials.

- Notification mechanism is in place – through IAEA's Unified System for Information Exchange in Incidents and Emergencies – for early notification of a nuclear accident to the IAEA.

- Mechanism in place – through IAEA's Incident and Trafficking Database – to combat illicit nuclear trafficking and to strengthen nuclear security.

Areas that need strengthening/challenges

Further strengthening of the capabilities and competence of the RPA, the NDRRMC and other relevant stakeholders is required, to effectively respond to radiological and nuclear events.

- Currently, there is a lack of adequately trained staff for responding effectively to radiological emergencies.

Appendix 1: JEE background

Mission place and dates

Flic-en-Flac, Republic of Mauritius

29 October–1 November 2018

Mission team members

- Dr Anderson Latt, WHO Regional Office for Africa (Team Lead)
- Dr Naomi Adeline, Seychelles, Ministry of Health (Team Co-lead)
- Dr Denis Ako-Arrey, Cameroon, Global Health Systems Solutions (GHSS)
- Dr Elisha A. Andebutop, Nigeria, Federal Capital Territory Administration (FCTA)
- Ms Zandile Dhlamini, Kingdom of Eswatini, Ministry of Health
- Dr John Haines, Switzerland, United Nation Institute for Training and Research (UNITAR)
- Dr Olivier Kamana, Rwanda, University of Rwanda
- Dr Felix Njeumi, Italy, Food and Agriculture Organization of the United Nations (FAO)
- Mr Satyajit Sarkar, India, WHO headquarters, Consultant (Writer/Editor)

Objective

To assess the capacities and capabilities of the Republic of Mauritius relevant to the 19 technical areas of the JEE tool for providing baseline data to support Mauritius's efforts to reform and improve their public health security.

The JEE process

The JEE process is a peer-to-peer review. The entire external evaluation, including discussions around the scores, the strengths, the areas that need strengthening, best practices, challenges and the priority actions should be collaborative, with JEE team members and host-country experts seeking full agreement on all aspects of the final report findings and recommendations.

Should there be significant and irreconcilable disagreement between the external team members and the host-country experts, or among the external or among the host-country experts, the JEE team lead will decide the outcome; this will be noted in the final report along with the justification for each party's position.

Limitations and assumptions

- The evaluation was limited to a week, which limited the amount and depth of information that could be managed.
- It is assumed that the results of this evaluation will be publicly available.
- The evaluation is not just an audit. Information provided by Mauritius will not be independently verified but will be discussed and the evaluation rating mutually agreed to by the host country and the evaluation team. This is a peer-to-peer review.

Key host-country participants and institutions

Name	Institutions
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Mr A. Bakeerally	Ag. Deputy Director Food & Safety Inspector, Public Health & Food Safety Department
Mr N. Bedassur	Chief HIEC Officer – Health Information, Education Communication Unit
Mr S. Beegoo	Station Officer, Fire Services
Mrs H Bhunjun-Kassee	Analyst/Senior Analyst, Health Economics Division
Mr P. Boolaky	Principal Public Health & Food Safety Inspector, Food Import Unit
Dr D. Caussy	Advisor Epidemiologist, CDCU-Ministry of Health & Quality of Life
Mr Y. Cheddy	Head Specialist Support Services, Ministry of Labour, Industrial Relations, Employment and Training
Mr G. Daby	Ag Principal Clinical Scientist, Central Health Laboratory
Mr G. Deepchand	Airport Terminal Operations Ltd (ATOL)
Mr B. Doorgakant	Ag Deputy Director Public Health & Food Safety Inspector, Port Health Office, Public Health & Food Safety Department
Mr D. Ellayah	Police Inspector, Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (Environment Division)
Mr Y. Gaungoo	Senior Public Health & Food Safety Inspector, Public Health & Food Safety Department
Dr R. Goorah	Occupational Health Physician, Registrar Dangerous Chemical Control Board, Occupational Health Unit
Dr V. Gujadhur	Director, Health Services, Ministry of Health & Quality of Life
Ms K. Guriah	Project Officer/Senior Project Officer, Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (Solid Waste Management Division)
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Mr Chabeeraj Hurry	Team Leader – Mauritius Revenue Authority
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Name	Institutions
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Mr S. Venkatasami	Senior Public Health & Food Safety Inspector, Public Health & Food Safety Department
Mr R.D Vithilingum	Environment Officer, Ministry of Social Security, National Solidarity, and Environment and Sustainable Development (Environment Division)

Supporting documentation provided by host country

1. National legislation, policy and financing

- Quarantine Act (1954)
- Quarantine Regulations of 1953, modified in 2007
- Public Health Act (1925)
- List of Notifiable Diseases
- Food Act (1998)
- EPA Act (1991)
- Radiation Protection Act (2003)
- National Disaster Risk Reduction and Management Act (2016)
- Report on Rapid Assessment of Core Capacities for IHR
- Cabinet Decision CDCU
- Plan for upgrading of CDCU
- Various internal official communiques related to IHR intersectoral meetings

2. IHR coordination, communication and advocacy

- Multisectoral draft plan
- Intersectoral Committee – membership
- Record of meetings of Intersectoral Committee meetings

3. Antimicrobial resistance

- National Action Plan on Antimicrobial Resistance 2017–2021.
- Guidelines for Infection Prevention and Control (2014)
- General guidelines for antibiotic prescription (2016)

4. Zoonotic disease

- WHO/OIE/FAO tripartite agreement
- Annual Reports of Animal Health Laboratory and DVS
- Animal Disease Act 1925 – Mauritius
- Contingency Plan for Avian Influenza
- Food Act
- Draft Veterinary policy
- Animal Welfare Act 2013

5. Food safety

- Food Act 1998 and Food Regulations 1999
- Public Health Act 1925

- National Food Safety Response Plan (undated)

- Ajlouni and Gaungoo (2018)

- Statistics Mauritius (2011)

- UNESCO Institute of Statistics (2018): http://uis.unesco.org/country/MU

- Website of MOHQL (2018): http://health.govmu.org/English/Pages/default.aspx

6. Biosafety and biosecurity

- Biological and Toxin weapons Convention Act 2004
  http://www.commonlii.org/mu/legis/num_act/batwca2004396/
  https://www.nti.org/media/pdfs/mauritius-1540-initial-report.pdf

- Biosafety manual TB lab

- Biosafety manual Virology lab

- Biological safety cabinet manual

7. Immunization

- Draft EPI Annual Work Plan

- Weekly EPI Bulletin

8. National laboratory system

- TB Lab Quality Management documents

- HIV Lab Quality Management documents

- EQA participation certificate for HIV, Influenza, TB, bacterial ID (typhoid), malaria

- Maintenance contract of recently purchased equipment e.g. EVOLIS, automated Western Blot, MALDI, and BacT/Alert

- Report from ECSA of TB lab visit and SLIPTA assessment

- Private Health Institution Act
  http://attorneygeneral.govmu.org/English/Documents/A-Z%20Acts/P/Page%201/ PRIVATE%20
  HEALTH%20INSTITUTIONS%20ACT.pdf

- MAURITAS-accredited laboratories: http://www.mauritas.org/entities.php

- National Policy for the Health Laboratory Services 2012

- Laboratory safety manual

- Central Health Laboratory SOPs for detection of malaria parasites

- SOPs for Ziehl Neelsen staining microscopy technique

- Checklist on technical requirements for licence to operate private laboratories in Mauritius

- SOPs for safety in Virology laboratory

- SOPs for sample conditions and transport for culture procedure

- External lab assessment report completed by the Ugandan NTRL external quality assessment programme

9. Real-time surveillance

- Report on Integrated Disease and Event-Based Surveillance in Mauritius

- Proposed Case Definitions of Nationally Notifiable Diseases for Mauritius

- List of Notifiable Diseases

- EBS Ministry of Health and Quality of Life absenteeism form

- Event-Based Surveillance Circular Letter for implementation of EBS at Schools

- List of Priority Disease

- Reporting Form

- Weekly Epi Bulletin

- Lab Influenza Weekly Report

- Setting up ILISARI Surveillance Circular Letter

- Weekly report for URTI GE CONJ

10. Reporting

- IHR decision-making instrument for assessment and reporting of event that may constitute a PHEIC

- Appointment letter of the Director of Health Services as the lead of NFP

- Evidence of notification to the Indian Ocean Commission regional network on a weekly basis.

11. Workforce development

- University of Mauritius:
  http://www.uom.ac.mu/index.php/study-at-uom/programme-details/postgraduate/90-study-at-uom/270-full-list-postgraduate-programmes-2017-2018

- Open University of Mauritius:
  http://www.open.ac.mu/wp-content/uploads/2017/11/ mph_syllabus_21_june_16.pdf

12. Preparedness

- Draft multisectoral plan of action

- National Disaster Scheme

- Disease-specific action plans

13. Emergency response operations

- Draft procedures for emergency response

- Case management guidelines for Ebola virus disease

- Case management guidelines for dengue fever

- Case management guidelines for chikungunya

14. Linking public health and security authorities

- The National Disaster Risk Reduction and Management Act of 2016
- The Quarantine Act of 1953, as amended in 2007
- National Disaster Scheme Plan
- The Biological and Toxin Weapons Act of 2004
- HAZMAT 23-01-2017

15. Medical countermeasures and personnel deployment

- IOC Charter
- Contingency plan for stockpiling of medical countermeasures.

16. Risk communication

- Operational plan for the prevention and control of Chikungunya and Dengue in the Republic of Mauritius (2009).

17. Points of entry

- Public health emergency preparedness and response plan for the airport
- Maritime Declaration of Health
- Ship Sanitation Control Certificate
- General Declaration (ICAO Annex 9)
- Health Declaration Form (MOHQL)
- Entomological Survey Report (MOHQL).

18. Chemical events

- HAZMAT 23.01.2017
- EPA Act of 1991
- OSHA 2005
- National Chemicals Profile of the Republic of Mauritius 2014

19. Radiation emergencies

- Radiation Protection Act 2003
- Draft Radiation Safety and Nuclear Security Bill
- Radiation Protection (Conventions) Regulations 2013
- Radiation Protection (Safe Transport of Radioactive Material) Regulations 2016
- National Hazmat Incident Contingency Plan 23.01.2017
- National Disaster Scheme 15.10.2015