WHO South-East Asia Regional Strategy for the **prevention and control of Nipah virus infection**

2023–2030

World Health Organization
REGIONAL OFFICE FOR South-East Asia

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Purpose and organization of the document

Nipah virus disease was first recognized in 1998 during an outbreak among pig farmers in Malaysia. Despite several outbreaks in recent years throughout the South-East Asia Region, WHO has not previously provided Member States with a strategy for Nipah virus prevention and control. The purpose of the Strategy is to support Member States of the South-East Asia Region, especially senior decision-makers and programme managers involved in the control of zoonotic diseases, prevent Nipah virus illness and death from 2023 to 2030.

As part of a series of initiatives by the Regional Office to strengthen health systems, the Strategy reviews what is known about Nipah virus and recommends activities for Member States to support risk assessment, spillover reduction, enhanced surveillance, early diagnosis and rapid response. The Strategy embraces a One Health approach and recommends activities that can prevent and control both Nipah virus and other high-threat zoonotic pathogens that may emerge through similar pathways as Nipah virus.

WHO South-East Asia Regional Strategy for the prevention and control of Nipah virus infection, 2023–2030

ISBN: 978-92-9021-084-9

Suggested citation. WHO South-East Asia Regional Strategy for the prevention and control of Nipah virus infection, 2023–2030. New Delhi: World Health Organization, Regional Office for South-East Asia; 2020. Licence: CC BY-NC-SA 3.0 IGO.

Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

Printed in India

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Foreword

Nipah virus (NiV) is an emerging zoonosis that causes acute respiratory distress, severe encephalitis and death in humans with a case-fatality rate of over 70%. NiV and several other members of the Henipavirus genus are primarily carried by Old World frugivorous bats (e.g. Pteropus species). Their home range extends from the South Pacific islands and Australia through Southeast and South Asia to Madagascar.

NiV is transmitted to humans either directly by bats through contamination of food with bat excreta, or to humans or via infected domestic animals. Infected humans can spread NiV infection to close contacts, but sustained human-to-human transmission has not yet been observed. No drugs or vaccines are currently licensed for NiV.

NiV was first recognized during an outbreak among pig farmers in Malaysia from 1998 to 1999, when the virus spread from pigs to humans. It was subsequently detected in Bangladesh and India in 2001. Since then, nearly annual outbreaks have been reported in Bangladesh. Infections have also been identified in the Philippines and periodically in eastern and southern India, the most recent case being in 2023 in Kerala after its emergence there in 2018.

While human cases of NiV disease have, to date, been reported in only two countries of the Region (Bangladesh and India), transmission to humans can occur wherever susceptible animals, presence of the virus, and a pathway for transmission (e.g. date palm sap) exist. Other Member countries have the most common natural reservoir (*Pteropus* bats) and an abundance of domestic animals, including pigs and horses, which have been associated with human outbreaks or are known to be susceptible, including livestock. The risk of spillover is further elevated in the Region due to high population density and multiple interfaces for bat–human and bat–animal–human contact.

WHO thus considers NiV and related henipaviruses a priority group of viruses, because of their broad geographical range, the wide range of animal species they can infect, a propensity to regularly spill over to human populations, a high case-fatality rate from infection and non-availability of specific licensed drugs or vaccines.

In the aftermath of the 2018 outbreak in Kerala, India, and in light of the above emerging public health risks, WHO accorded the highest priority to NiV as a regional threat. Under the guidance of the Regional Director, WHE SE Asia Regional Office organized an expert consultation on NiV in October 2019. The experts proposed

to translate the recommendations into a regional strategy to guide Member States and WHO in preventing and controlling NiV disease. They agreed that the strategy should align with regional policy and strategy proclamations such as the Delhi Declaration 2019 on Emergency preparedness in the South-East Asia Region, the Five-Year Regional Strategic Plan to Strengthen Public Health Preparedness and Response for 2019–2023, the Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies (APSED III). The expert group also recommended making a One Health approach central to the regional strategy so as to ensure effective multisectoral and multidisciplinary prevention, control, and response to the emerging threat of NiV in the Region.

Subsequently, the COVID-19 pandemic showed that the growing threat from emerging infectious diseases, particularly zoonotic viruses, requires utmost and sustained attention, particularly during the interepidemic periods, and coordination between the wildlife, human and livestock sectors for epidemic preparedness and response. Accordingly, the development of this regional strategy is an important action by WHO to align with and implement its Regional strategic roadmap on health security and health system resilience for emergencies, 2023–2027 developed in 2022. This calls on the Regional Office and Member States to strengthen country health security systems to reduce risk, anticipate, detect early, prevent and respond to all hazards, particularly infectious diseases. The regional NiV Strategy also advances the 2022 South-East Asia Regional Roadmap for Diagnostic Preparedness, which promotes agile and resilient laboratory policies and systems and research into new technologies, using a One Health approach to surveillance, diagnosis and control of NiV in humans, animals and wildlife. The multisectoral One Health approach to addressing zoonotic diseases detailed by the Quadripartite in the One Health Joint Action Plan and supported by the One Health High Level Expert panel has been referred to and served as an overarching reference document for the strategy.

This Regional Nipah prevention and control strategy that is now being released is well timed, given the absence of a strategic approach to NiV across all countries at risk in the Region. This Strategy aims to support Member States, especially senior decision-makers and programme managers involved in zoonotic disease control, prevent NiV illness and death. The Strategy recommends key activities and milestones for the next eight years (2023–2030) while supporting Member States to develop a multisectoral, multidisciplinary, risk-based approach to an emerging hazard. Further, this high-level document can also be used to engage with development partners, national and international nongovernmental organizations (NGOs), and other stakeholders in public health, health-care delivery, and all-hazards preparedness and response.

NiV and related henipaviruses must be viewed as a continued potential threat to livestock and human health in the Region. Also, given that it is an emerging zoonotic

pathogen associated with a high mortality rate, its prevention and control will require strong and sustained political and financial commitments at international, national and regional levels to address emerging infectious diseases. No doubt, not all Member States will implement all activities within the roadmap. Nevertheless, it is pertinent to understand the existing infrastructure, capacity and resources of different Member States for addressing zoonotic diseases and include recent investments in capacity-strengthening made as part of the COVID-19 pandemic response. WHO will work with the One Health High-Level Expert Panel and the One Health Initiative as well as the Quadripartite to advocate for multisectoral, multidisciplinary One Health approaches to NiV prevention and control in the South-East Asia Region as part of the overall high-threat pathogen prevention and control strategy.

My congratulations to the team that has prioritized this much-needed effort. We now look forward to the roll-out of this comprehensive regional approach to prevention and control, with a medium-term vision that has clear goals and an effective monitoring and evaluation framework.

Dr Poonam Khetrapal Singh
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Acknowledgements

The "WHO South-East Asia Regional Strategy for the prevention and control of Nipah virus infection, 2023–2030" was prepared by the Health Emergencies Department of the WHO Regional Office for South-East Asia, Infectious Hazards Management (IHM) Unit.

The contributions of the following are gratefully acknowledged:

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WHO country offices: All 11 country offices in the WHO's South-East Asia Region provided technical inputs and coordinated timely feedback and inputs provided by Member States.

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The Strategy draws from literature review for latest evidence on Nipah virus infection and inputs from the recent regional frameworks as well as technical inputs from a panel of global and regional experts, under the guidance of Dr Jonathan Epstein, Vice President for Science and Outreach, EcoHealth Alliance, USA.

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Illustrations

Fig. 1 and 2: Courtesy: EcoHealth Alliance, USA, 2023

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Funding

This activity was executed with internal funding support of WHO through the Assessed Countributions (AC) bearing award no. 69479.

While WHO has used best efforts in preparing this Strategy, it makes no representations or warranties with respect to the accuracy or completeness of the contents of this Strategy. The advice and strategies contained herein may have to be suitably adapted for your specific situation. You should use the existing national mechanisms where appropriate to make sure that you have adapted the appropriate strategies and activities required for the prevention and control of Nipah virus in your settings.

Acronyms and abbreviations

AES	acute encephalitis syndrome
CFR	case-fatality rate
CEPI	Coalition for Epidemic Preparedness Innovations
COVID	coronavirus disease
EID	emerging infectious disease
ELISA	enzyme-linked immunosorbent assay
ERF	Emergency Response Framework
FAO	United Nations Food and Agriculture Organization
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
ICMR	Indian Council of Medical Research
IEDCR	Institute of Epidemiology, Disease Control and Research
IHR	International Health Regulations
IPC	infection prevention and control
IPBES	Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services
JEE	joint external evaluation
JRA	joint risk assessment
M&E	monitoring and evaluation
NAPHS	national action plan for health security
NIAID	United States National Institute of Allergy and Infectious Diseases
NIH	United States National Institutes of Health
NiV	Nipah virus
NVD	Nipah virus disease
RT-PCR	reverse transcriptase-polymerase chain reaction
rRT-PCR	Real-time reverse transcriptase polymerase chain reaction
SARI	severe acute respiratory iillness
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
SE	South-East
SIS OT	Surveillance Information Sharing Operational Tool
UNEP	United Nations Environment Programme
WHO	World Health Organization
WOAH	World Organization for Animal Health

Executive summary

Nipah virus (NiV) is an emerging zoonotic virus that has caused outbreaks of severe illness and death in the South-East (SE) Asia Region. While human NiV cases have, to date, been reported only in Bangladesh and India, countries in the Region are at risk wherever there are susceptible animals, presence of the virus, and a pathway for transmission. The COVID-19 pandemic has revealed and underscored the need for systematic One Health approaches to reducing spillover of pathogens from animals into humans and preventing severe illness and death in humans, domestic animals and wildlife. Within the WHO SE Asia Region, substantial challenges remain in strengthening health systems and pandemic preparedness and response for high-threat pathogens such as NiV.

The WHO SE Asia Region Strategy for Nipah Virus Prevention and Control, 2023–2030 was developed to support Member States, especially senior decision-makers and programme managers involved in zoonotic disease control, to prevent illness and death due to NiV. The Strategy is one of several WHO initiatives in the Region to strengthen systems to prevent and control NiV, including a standard operating procedure laboratory manual, NiV disease profile to support systematic risk assessment, prevention and control at the national level, and policy briefs to enable high-level engagement.

The document describes the key components of the Strategy, priority activities for each component, milestones and timelines based on whether countries have reported human cases or not. The key components include the following:

- Improve understanding of the socioecological aspects.
- Enhance policy, strategy and regulatory capacity.
- Increase multisectoral, One Health system capacity and readiness for detection, early warning, and response to cases and outbreaks.
- Enhance risk communication and awareness to reduce spillover and spread.
- Promote research and development.
- Promote behavioural changes to reduce risk.
- Improve control of disease in domestic animals through enhanced biosecurity.
- Increase laboratory diagnostic capability in human, animal and wildlife health sectors.
- Increase surveillance and information-sharing among human, animal and wildlife health sectors.
- Improve clinical diagnosis and case management.

- Develop and improve access to medical countermeasures.
- Ensure resilience.

An eight-year timeframe (2023–2030) has been proposed for Member States in the Region to implement the Strategy, which has been adapted to suit their unique country situations and address their risks and vulnerabilities. The resources and effort allocated to the activites in this Strategy will vary by Member State. The Strategy anticipates that multiple sectors and stakeholders will contribute to activities consistent with a One Health approach. WHO and its Quadripartite partners (Food and Agriculture Organization, World Organization for Animal Health, United Nations Environment Programme) must advocate, promote and support Member States in coordinating across ministries and agencies involved in the prevention and control of zoonoses.

1 Background and context

Countries in the WHO South-East (SE) Asia Region have, until now, addressed Nipah virus (NiV) prevention and control in the context of outbreaks. The COVID-19 pandemic has raised political commitment and resources to strengthen health systems, health security, and One Health coordination to address high-threat infectious diseases, such as NiV.

Nipah virus: an emerging high-threat pathogen

The virus

NiV is an emerging zoonotic paramyxovirus of the genus *Henipavirus* that can cause acute respiratory distress, severe encephalitis and death in humans *(1,2.)* NiV and several other members of the *Henipavirus* genus, such as *Hendra* virus, are primarily carried by bats. NiV is transmitted to humans either through contamination of food with bat excreta or via infected domestic animals. Infected humans can spread NiV to close contacts, but sustained human-to-human transmission has not yet been observed. WHO considers NiV and related henipaviruses priority pathogens for pandemic preparedness and response, because of their broad geographical range, the wide range of animal species they can infect, a propensity to regularly spill over into human populations, and a high case-fatality rate (CFR) from infection *(2,3)*. While this Strategy focuses on NiV, it will also refer to henipaviruses for some activities, because other members of this genus have the potential to cause epidemics, infections in humans may arise from similar pathways as NiV, and the activities to prevent and control NiV may help with other bat-borne henipaviruses.

Natural reservoir: *Pteropus* spp. fruit bats

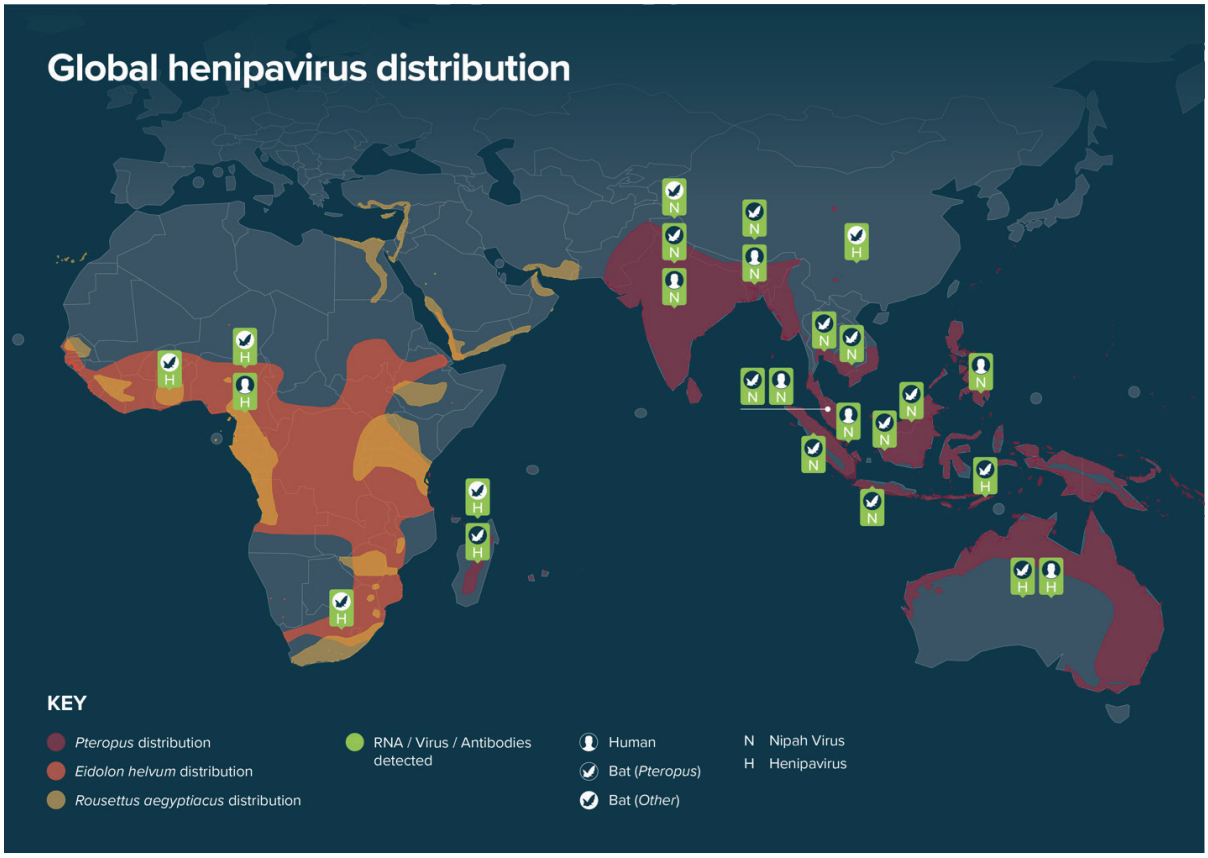
The primary natural reservoir for NiV and other henipaviruses is old-world frugivorous bats, especially those within the genus *Pteropus* (family Pteropodidae), known commonly as flying foxes or fruit bats. Their home range extends from the South Pacific islands and Australia through Southeast and South Asia to Madagascar *(4,5,6,7,8,9,10)* **(Fig. 1 Map)**. They tend to live in close association with

people and forage on a large variety of fruits or sap harvested from cultivated date palm trees, which can create opportunity for spillover into domestic animals or people. Recently, anti-NiV immunoglobulin (Ig)G antibodies were identified in *Rousettus leschenaultii* bats during an NiV investigation in Kerala, India, suggesting that this species may also play a role in henipavirus circulation *(11)*.

NiV outbreaks

NiV was first recognized during an outbreak among pig farmers in Malaysia from 1998 to1999, when the virus had spread from pigs to humans *(12)*. NiV was subsequently detected in Bangladesh and India in 2001. Nearly annual outbreaks have been reported in Bangladesh since, and infections have also been identified in the Philippines and periodically in eastern and southern India, the most recent case being in 2023 in Kerala *(4,13,14,15,16,17)*.

Fig. 1. Global henipavirus and major host distribution. The map indicates countries where Nipah virus or another henipavirus has been detected in bats and/or humans. The map also shows the home ranges for *Pteropus species, Rousettus aegyptiacus* and *Eidolon helvum*, which have broad distributions and have been associated with henipavirus infection.



Courtesy: EcoHealth Alliance, USA, 2023

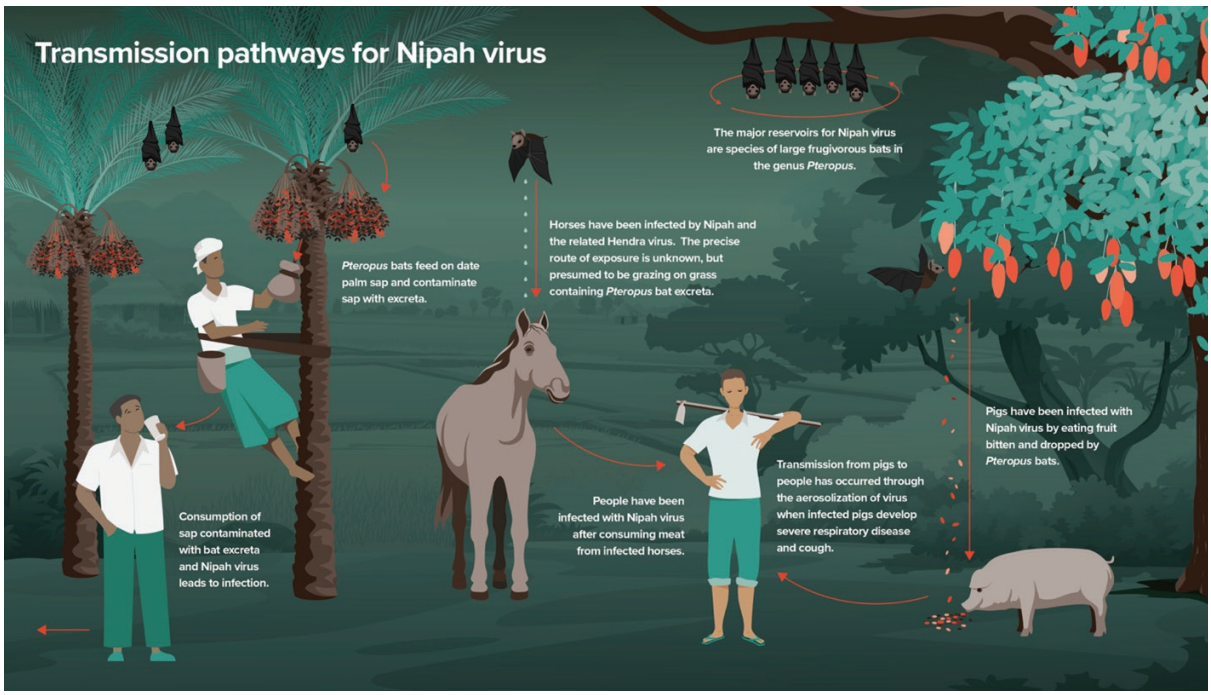
Transmission and prevention

NiV is transmitted by bodily fluids of an infected animal or person **(Fig. 2)**. To date, all documented outbreaks began with transmission from bats or domestic animals to humans. During the first recognized outbreak in Malaysia and Singapore, all reported human cases were thought to result from exposure to aerosolized particles from pigs with severe respiratory disease or from direct contact with infectious tissues or other bodily fluids during the slaughtering process *(18,19)*. In Bangladesh, excreta from bats is believed to have contaminated raw or fermented date palm sap, which then infected humans.

Humans transmit infections to other humans through close contact with bodily fluids, such as saliva, urine, and feces, particularly in health-care settings *(16,20,21)*. In one analysis, men over the age of 45 years with severe respiratory illness were more likely to transmit NiV to other humans than other cases *(22)*.

Human NiV infections can be prevented by changing how individuals and communities interact with bats, other susceptible animals, and food sources at risk for NiV contamination, as shown in Figure 2. Enhanced biosecurity measures on farms that raise pigs, horses, and cattle also reduce the risk of animal NiV outbreaks and spillover into humans.

Fig. 2. Transmission pathways of NiV between natural hosts and susceptible species



Courtesy: EcoHealth Alliance, USA, 2023

Signs and symptoms

Infected humans usually develop symptoms 4–14 days after exposure to an infected human, animal or food source. Initial symptoms may include fever, headache, sore throat, vomiting and myalgia. Pulmonary infection results in cough and difficulty in breathing, with infiltrates suggestive of atypical pneumonia on chest X-ray. Neurological infection may result in encephalitis, including dizziness, drowsiness, altered consciousness, seizures and, in some cases, coma. The CFR is estimated to be between 40% and 75%, and has been 100% in some outbreaks *(2)*. The wide variability in fatality rate is likely related to the availability and quality of mechanical ventilation, haemodynamic support and other critical care services.

Diagnosis

Because the clinical presentation of NiV infection is non-specific, diagnosis depends on epidemiology or laboratory testing. NiV infection can be presumptively diagnosed in patients with atypical pneumonia and/or encephalitis who also report exposure to a confirmed NiV case, infected animal, or known source. Definitive diagnosis depends on laboratory testing, including:

1. real-time reverse transcriptase polymerase chain reaction (rRT-PCR) or reverse transcriptase polymerase chain reaction (RT-PCR) from blood, urine, tissue samples and cerebrospinal fluid (CSF) *or*
2. IgM antibody detection in serum via enzyme-linked immunosorbent assay (ELISA) *or*
3. virus isolation by cell culture (under biosafety level 4 laboratory conditions).

As of 2022, these assays are available only in a small number of laboratories in the Region.

Case management, vaccines and therapeutics

Patients with NiV are primarily managed through supportive therapy for respiratory, neurological, haemodynamic and other complications. No therapeutics or vaccines are currently licensed for NiV. In 2019, WHO listed NiV as a priority pathogen for the development of vaccines and therapeutics, which has led to a substantial increase in research and development. Ribavirin, a nucleoside inhibitor, has been studied using in vitro and in vivo experiments, and was used to treat patients in one outbreak *(23,24,25,26,27,28,29,30)*. Remdesivir has been studied as post-exposure prophylaxis in non-human primates *(31)*. Research is ongoing into the effectiveness of fusion inhibitory peptides, monoclonal antibodies and next-generation antibodies derived from a peptide display library *(32,33,34,35,36,37)*.

Situation of NiV in WHO's South-East Asia Region

While human cases of NiV disease have, to date, been reported in only two Member countries (Bangladesh, India), transmission to humans can occur wherever there are susceptible animals, presence of the virus and a pathway for transmission (e.g. date palm sap). Other countries of the SE Asia Region have the most common natural reservoir (*Pteropus* bats) and an abundance of domestic animals, including pigs, horses and livestock, which have been associated with human outbreaks or are known to be susceptible. The risk of spillover increases with high population density and interfaces for bat–human and bat–animal–human contact, including commercial trade.

Context for the development of the Regional Nipah virus prevention and control strategy

In the aftermath of the 2018 outbreak in Kerala, India, WHO accorded the highest priority to NiV as a regional threat. Under the guidance of the Regional Director, the Regional Office organized an expert consultation on NiV in October 2019. Twenty-four experts from India, Bangladesh, Malaysia, Thailand, the United States of America, and the United Kingdom attended the meeting and identified a range of priorities and recommendations across 10 thematic areas.

The experts proposed to translate the recommendations into a regional strategy to guide Member States and WHO in preventing and controlling NiV disease. The experts also agreed that the strategy should align with regional policy and strategy proclamations, such as the Delhi Declaration 2019 on Emergency preparedness in the South-East Asia Region, the Five-Year Regional Strategic Plan to Strengthen Public Health Preparedness and Response for 2019–2023, the Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies (APSED III) and the National Action Plans for Health Security (NAPHS) approach that is consistent with the International Health Regulations (IHR) 2005 *(38,39)*. Notably, the development of this Regional Strategy is an important action by WHO to implement its Regional Strategic Roadmap on health security and health system resilience for emergencies, 2023–2027 developed in 2022 *(40)*. That roadmap called on the Regional Office and Member States to strengthen country health security systems to reduce risk, anticipate, detect early, prevent and respond to all hazards, particularly infectious diseases. In developing a strategy for NiV prevention and control, the Regional Office is supporting Member States to develop a multisectoral, multidisciplinary, risk-based approach to an emerging hazard. Given that there are no licensed therapeutics or vaccines, outbreak prevention and control depend on early detection and response and ongoing efforts by WHO, Member States and nongovernmental organizations (NGOs) to strengthen One Health partnerships, health-care systems, laboratory capacity and epidemic preparedness.

The COVID-19 pandemic has shown that the growing threat from emerging infectious diseases (EIDs), particularly zoonotic viruses, requires utmost and sustained attention, particularly during interepidemic periods, and coordination between the wildlife, human and livestock sectors for epidemic preparedness and response *(41)*. The multisectoral One Health approach to addressing zoonotic diseases detailed by the Quadripartite in the One Health Joint Action Plan and supported by the One Health High Level Expert panel has been referred to and served as an overarching reference document for the strategy *(42)*. The Regional NiV Strategy also advances the 2022 South-East Asia Regional Roadmap for diagnostic preparedness, integrated laboratory networking and genomic surveillance (2023–2027) by promoting agile and resilient laboratory policies and systems and research into new technologies, including genomics, using a One Health approach to surveillance, diagnosis, and control of NiV in humans, animals, and wildlife *(43)*.

The NiV prevention and control strategy is well timed, given the absence of a strategic approach to NiV across all countries at risk in the SE Asia Region. In the two countries with recurrent outbreaks, the approach has primarily focused on managing acute events rather than a comprehensive prevention and control strategy. In other Member States, NiV surveillance has been limited, making it difficult to assess and therefore mitigate risk comprehensively. The proposed strategy recommends key activities for the next eight years (2023–2030) which, while specifically aimed at addressing the NiV threat, will be successful only if they are accompanied by more fundamental strengthening of health and pandemic preparedness systems.

One important technical and scientific consideration has been whether the scope of this strategy should encompass all henipaviruses or stay restricted to NiV. The argument in favour of a broader approach is that prior global initiatives that were focused on single agents, e.g. Ebola, severe acute respiratory syndrome (SARS), could have better enhanced pandemic preparedness by focusing on groups of related pathogens for the development of diagnostics, therapeutics and vaccines. The argument opposing such an approach is that NiV is the only henipavirus known to have caused recurrent severe illness and death in humans, and governments must prioritize resources for known hazards over potential hazards. This strategy, therefore, focuses on NiV, but references a broader approach to henipaviruses in specific areas, such as surveillance, diagnosis, vaccines and therapeutics.

Outlining the vision and strategy

Vision

To prevent NiV illness and death within human populations in the South-East Asia Region by 2030

Strategy

- Improve understanding of the socioecological aspects.
- Enhance policy, strategy and regulatory capacity.
- Increase multisectoral, One Health system capacity and readiness for detection, early warning and response to cases and outbreaks.
- Enhance risk communication and awareness to reduce spillover and spread.
- Promote research and development.
- Promote behavioural changes to reduce risk.
- Improve control of disease in domestic animals through enhanced biosecurity.
- Increase laboratory diagnostic capability in the human, animal and wildlife health sectors.
- Increase surveillance and information-sharing among human, animal and wildlife health sectors.
- Improve clinical diagnosis and case management.
- Develop and improve access to medical countermeasures.
- Ensure resilience.

2 Overview of the NiV regional prevention and control strategy

Purpose of the strategy

The purpose of the Strategy is to support Member States of the WHO SE Asia Region, especially senior decision-makers and programme managers involved in zoonotic disease control, in preventing NiV illness and death from 2023 to 2030. This high-level document can also be used to engage with development partners, national and international NGOs, and other stakeholders in public health, health-care delivery, and all-hazards preparedness and response. The Strategy is one of several regional initiatives to strengthen systems to prevent and control NiV, including a standard operating procedure (SOP) laboratory manual, NiV disease profile to support systematic risk assessment, prevention and control at the national level, and policy briefs to enable high-level engagement.

The document describes the key components of the Strategy, priority activities for each component, milestones and timelines based on whether countries have reported human cases or not. A monitoring and evaluation (M&E) section describes indicators to assess progress for the Region in achieving the Strategy. Using a One Health approach, the document may also help programme managers develop strategies to prevent and control other zoonotic pathogens.

Guiding principles

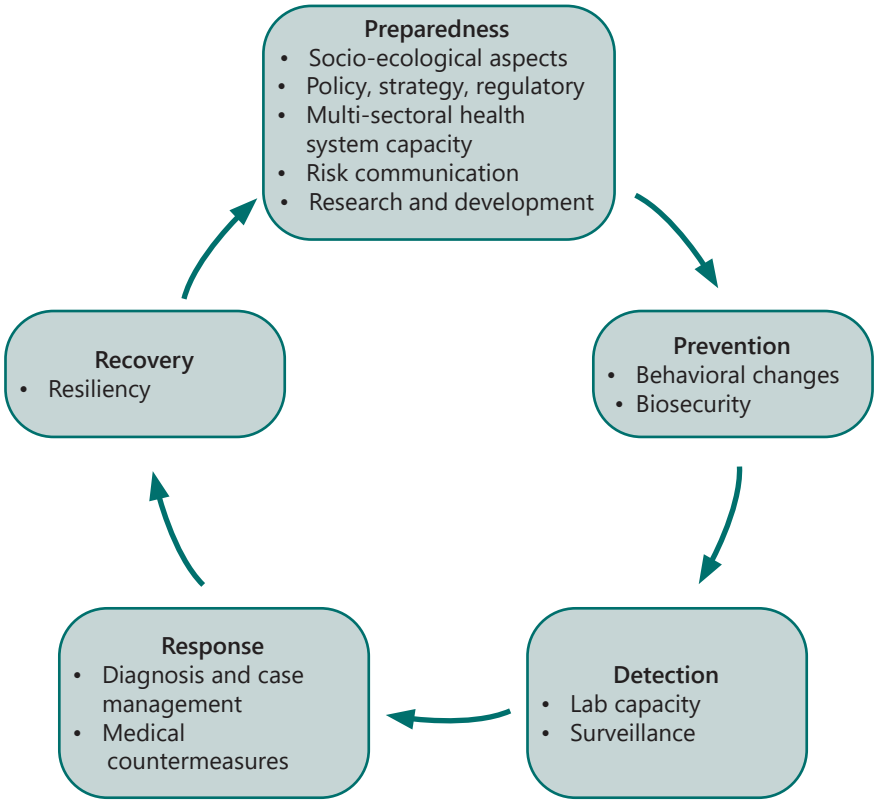
The Strategy was developed with several principles in mind:

1. NiV is an emerging zoonotic pathogen in the Region and is associated with severe illness and death.
2. Not all Member States are at equal risk of NiV outbreaks, due to variability in health systems and the presence of the animal host, virus, susceptible animals and pathways of transmission.
3. While the focus of this Strategy is on NiV, some recommended actions, particularly regarding diagnosis and surveillance, should encompass the genus of henipaviruses to prepare for related high-threat infectious disease hazards.
4. NiV prevention requires a One Health approach, involving the human, animal and wildlife sectors, and must include actions to reduce spillover of NiV and related henipaviruses into domestic animals and from domestic animals into humans.
5. Preventing and controlling NiV disease requires strong and sustained political and financial commitment at the international, regional and national levels.
6. Investments in NiV prevention and control should leverage investments related to COVID-19 and other EIDs, including surveillance, laboratory systems, clinical care, infection prevention and control (IPC), medical countermeasures, risk communication, coordination and recovery.
7. Investments in reducing NiV spillover, spread, illness and death will strengthen health systems to prepare for, prevent, detect, respond to and recover from other infectious hazards.

The Strategy follows the overall Emergency Response Framework (ERF)[1] of preparedness, prevention, detection, response and recovery. Each component of the Strategy includes key activities and outcomes for the next eight-year period by Member States and WHO. The Strategy includes broad guidance on governance, financing, and M&E across the entire Region. The relationship between the ERF, Strategy and activities is captured in **Fig. 3** and **Annexure 3**.

1 The purpose of the ERF is to clarify WHO's roles and responsibilities in emergency response and to provide a common approach for WHO's work in emergencies. The ERF provides WHO staff with essential guidance on how the Organization manages the assessment, grading and response to public health events and emergencies with health consequences, in support of Member States and affected communities. It adopts an all-hazards approach and is therefore applicable in all public health events and emergencies.

Fig. 3. Relationship between WHO Emergency Response Framework and main components of South-East Asia Regional Nipah Virus Strategy.



3

Rolling out the South-East Asia regional prevention and control strategy

The resources and effort allocated to the activites in this Strategy will vary by Member State. All Member States should have had a One Health risk assessment (e.g. joint risk assessment [JRA]) to better understand their NiV risk profile. The risk assessment may have been conducted as part of IHR core capacity implementation or One Health and whole-of-government approaches to all hazards, such as the NAPHS. This is consistent with the Regional Office's approach to encouraging development of multisectoral and multidisciplinary networks to address emerging zoonoses with pandemic potential, such as NiV. An eight-year time frame (2023–2030) has been proposed for Member States in the Region to implement the Strategy, which has been adapted to suit their unique country situations and address their risks and vulnerabilities.

The risk of NiV across Member States is poorly understood due to the inconsistency and, in some cases, lack of surveillance in humans and animals. While multiple outbreaks have been detected in the two countries that conduct surveillance and have laboratory diagnostic capacity for NiV (Bangladesh, India), it is possible that infections have occurred but not been detected in other Member States. For the Strategy, Member States will be categorized as below:

Category	Criteria	Member States
A	Human infections reported	India, Bangladesh
B	Natural reservoir present; no human infections reported	Bhutan, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste

DPR Korea: natural reservoir not known to be present; no human infections reported. At present, *Pteropus* bats are not known to occur in the Democratic People's Republic of Korea (DPR Korea). While it is possible that there are other, related Pteropodid species (e.g. *Rousettus leschenaulti*) present that may be hosts to NiV, further studies of NiV host distribution and viral ecology are needed to classify DPR Korea as at risk.

Member States should set priorities and an appropriate budget for planned activities based on their risk assessment and existing resources. For Category A, most of the investment needs to take place by 2024 and has more of a bias towards activities needed for outbreak response, whereas for Category B, there is a relatively more extended time frame covering all elements of the framework over time. The risk category assignment of Member States may change during the period of the Strategy as new evidence related to NiV infection in humans or animals emerges.

The Strategy anticipates that multiple sectors and stakeholders, both public and private, government and academic (e.g. via research or capacity-building activities) will contribute to activities consistent with a One Health approach. Coordination across ministries and agencies involved in the prevention and control of zoonoses will be critical. WHO and its Quadripartite partners (FAO, WOAH, UNEP) must advocate to, promote the Strategy and support Member States in coordinating across ministries and agencies involved in the prevention and control of zoonoses.

Timeline for action

Components of the Strategy and key activities for Member States to prevent and control NiV disease by 2030 are listed in **Table 1** within the preparedness, prevention, detection, response and recovery headings. Timelines within this table are indicated separately for Category A and Category B Member States. Note that most of the 2024 timelines are for Category A countries (Bangladesh and India), which have systems in place and activities ongoing. For Category B, achievement refers to the year when more than 50% of those Category B Member States would have commenced work on implementing these activities. Many other activities are ongoing and require continued investment and support.

Table 1. Components of activities and timelines for the South-East Asia Regional Strategy

	Timeline*			
	2024	**2025**	**2027**	**2030**
Preparedness				
Improve understanding of socioecological aspects				
Conduct studies to improve understanding of relevant bat species, NiV prevalence, and spillover and transmission pathways	A		B	
Conduct and disseminate systematic risk assessments	A			B
Policy, strategy and regulatory capacity				
Leverage IHR to improve core capacities			A	B
Develop, implement, and test national plans for NiV			A	B

	Timeline*			
	2024	**2025**	**2027**	**2030**
Coordinate between human, animal and wildlife health agencies to strengthen capacity for NiV and other health emergencies	A			B
Strengthen regulatory capacities and systems for medical countermeasures			A	B
Increase multisectoral, One Health system capacity and readiness for detection, early warning, and response to cases and outbreaks				
Ensure functional mechanism for coordinating communication and data-sharing for surveillance in human, animal and wildlife populations	A		B	
Ensure One Health mechanisms at the subnational level for preparedness and response	A		B	
Continue to invest and strengthen IHR core capacities at national and subnational levels	A	B		
Develop and continuously build a multidisciplinary health workforce	A	B		
Establish systems for deployment of multidisciplinary outbreak investigation teams	A		B	
Enhance risk communication and awareness to reduce spillover and spread				
Strengthen risk messaging for NiV spillover, spread and outbreak response	A		B	
Educate about the value of bats and other wildlife species	A		B	
Evaluate approaches to making interventions more affordable and acceptable in communities	A		B	
Promote research and development				
Map priority NiV knowledge gaps and identify common research challenges	A		B	
Support SE Asia Regional Research platform activities for NiV	A		B	
Prevention				
Promote behavioural changes to reduce risk				
Strengthen links between social science and public health practitioners, clinicians, veterinarians, wildlife practitioners and animal caretakers	A		B	
Engage social scientists to understand community perceptions and practices	A		B	
Develop locally appropriate protocols for NiV spillover reduction	A		B	
Improve control of disease in domestic animals through enhanced biosecurity				
Identify all farms that raise pigs, horses and/or livestock in areas at highest risk to strengthen biosecurity	A		B	

	Timeline*			
	2024	2025	2027	2030
Strengthen messaging to farms of all sizes about the economic benefits of biosecurity	A		B	
Promote training of veterinarians, farmers and others in national biosecurity protocols	A		B	
Detection				
Increase laboratory diagnostic capability in the human, animal and wildlife sectors				
Develop and implement national and regional laboratory surveillance standards for prompt and accurate NiV diagnosis and safe and timely specimen collection, storage, transport and handling	A	B		
Develop plans for enhancing capacity of national and subnational laboratories and improving access to specialized laboratories	A	B		
Train the laboratory workforce in molecular and serological platforms	A	B		
Work with WHO and WOAH to strengthen national referral laboratories and mobilize support for a regional reference laboratory	A	B		
Increase surveillance and information-sharing among the human, animal and wildlife sectors				
Develop national surveillance and outbreak response protocols for humans, bats and other animals	A		B	
Develop workforce in veterinary and wildlife departments to conduct bat surveillance	A		B	
Incorporate additional epidemiological data collection into surveillance to support risk assessment	A	B		
Strengthen capacity for syndromic surveillance, event-based surveillance, rumour detection in humans, domestic animals and wildlife	A	B		
Strengthen knowledge and awareness in human, animal and wildlife health professionals for prompt disease detection	A	B		
Response				
Improve clinical diagnosis and case management				
Strengthen surge capacity of health facilities, isolation areas, IPC practices and intensive care for managing NiV-infected patients	A		B	
Improve access to IPC in hospitals and other facilities likely to care for NiV-infected patients	A	B		
Facilitate access and participation of clinicians to NiV knowledge networks	A	B		
Establish national guidelines on clinical management, IPC, transfer to specialized centres and follow up	A		B	

	Timeline*			
	2024	2025	2027	2030
Establish guidance for collection of clinical data on specialized populations with linkage to national NiV surveillance systems	A		B	
Develop and improve access to medical countermeasures				
Support capacity for exploratory studies and clinical trials of vaccines and therapeutics in populations at risk for NiV transmission	Regional focus			
Review existing regulatory laws, specifically for high-threat pathogens requiring expedited processes for vaccines and therapeutics				
Contextualize and adapt the protocol for the use of monoclonal antibodies				
Recovery				
Ensure resilience				
Strengthen the capacity of local communities affected by NiV infection to avoid recurrent outbreaks	A			B
Institutionalize mechanisms for conducting after action reviews and incorporating lessons learned into NiV prevention and response plans	A			B

* when more than 50% of Category B Member States would have commenced work to implement these activities.

Member States should align and incorporate components and key activities detailed in the Regional Strategy into relevant existing national documents, including NAPHS, to ensure a harmonized approach to NiV preparedness, prevention, detection, response and recovery. The national strategic and operational plan will consider current NiV epidemiology, risk levels, and prevention and control capacities in respective Member States and will be supported by M&E plans to ensure alignment, implementation, and realization of national and regional goals and targets.

The NiV national plans will require adaptation of global and regional standard guidance and tools for implementation of key actions. **Annexure 2** provides an illustrative list of documents for Member States to refer to and adapt**.** WHO will continue to develop further guidance, where lacking, to facilitate implementation.

WHO will provide technical support for overall implementation and M&E of NiV prevention and control in the Region. This will include support for development of national strategic/operational plans and technical guidance, as well as capacity-building, including through mobilization of regional and global expertise through networks and centres of excellence. One Health coordination to ensure alignment and implementation of corresponding activities will be done through the Asia-Pacific Regional Quadripartite offices and respective country offices.

4 Implementation actions and outcomes

Preparedness

Improve understanding of socioecological aspects

Key issues

The wide geographical distribution of *Pteropus* and other relevant bat species suggests that NiV and related henipaviruses are more widespread in the South-East Asia Region than in the two countries (Bangladesh, India) that have reported human cases. Targeted surveillance in human and animal populations is needed to better characterize NiV distribution and incidence. The distribution of NiV hosts, and therefore the virus, is also likely to change over the period of this Strategy. Forest fragmentation, climate change, human encroachment and increased livestock production impact the distribution and behaviour of bats and other wildlife reservoirs, which may increase the frequency of NiV and other henipavirus spillover *(44,45,46,47,48,49)*. Infection control measures in domestic animal rearing ("biosecurity") and in human health-care facilities ("IPC") remain inadequate across Member States, helping to amplify outbreaks after spillover occurs. The potential for NiV to emerge in new areas of the SE Asia Region is fast growing, as indicated by the first detection of NiV in Kerala in 2018 and subsequent cases detected in 2019, 2021 and 2023.

Although recent modelling studies have attempted to identify higher-risk areas within the Region *(50)*, formal One Health risk assessments that involve all relevant sectors are needed to estimate the likelihood and impact of NiV spillover and spread in each Member State. Key risk questions include the following:

1. How frequently does human infection occur in Category A and B countries?
2. What is the likelihood and impact of NiV infection being **detected in a new area** within a Category A country within the next 4 years?

3. What is the likelihood and impact of NiV infection being **detected anywhere** in a Category B country within the next 4 years?
4. What is the distribution, if any, of NiV and related henipavirus host species and prevalence of detectable henipavirus in the one Member State (DPR Korea) in which neither the virus nor susceptible hosts have been documented?

Key actions

For Member States

- Conduct studies to improve understanding of the abundance and distribution of *Pteropus* bats and other relevant bat species associated with henipaviruses (e.g. *Rousettus* species); determine NiV prevalence in bats or at a minimum, whether shedding is occurring in excreta; identify likely spillover and transmission pathways to livestock and humans, and socioanthropological and health system drivers of outbreaks with a focus on local areas with a high incidence of acute encephalitis syndrome (AES) or severe acute respiratory illness (SARI) in humans.
- Conduct and disseminate systematic risk assessments[2] to assess the likelihood and impact of NiV spillover and transmission in different domestic animal species and humans.

For WHO

- Conduct workshops to review henipavirus surveillance, detection and diagnosis, focusing on field sampling strategies and laboratory techniques.
- Facilitate collaboration for research and investigation through regional platforms for high-threat pathogens (e.g. South-East Asia Regional Knowledge Network for IHR national focal points (NFP)+, Regional Research Platform, etc.)
- Provide technical support for One Health risk assessment through mobilization of Quadripartite partners (e.g. FAO to assist with livestock biosecurity improvement strategies).

Key outcomes

- One Health NiV risk assessments completed in each Member State (Category A by 2024, Category B by 2027), including: understanding of NiV and henipivirus host species and ecology; identification of high-risk points of contact between bat reservoirs, livestock and people; presence of NiV in bats, abilty to detect NiV infection in domestic animals and humans; and estimated incidence in human populations (Category A by 2024 and Category B by 2030)

2 The joint risk assessment (JRA) (with available standard tools) that has been jointly developed by the Tripartite allows Member States to undertake a formal One Health risk assessment. The tool has been designed to assist Member States to identify, assess, manage and reduce risks from zoonotic diseases such as NiV, which benefit from coordination and collaboration between ministries and other agencies responsible for various aspects of human health, animal health and the environment; JRA tool at https://www.who.int/initiatives/tripartite-zoonosis-guide/joint-risk-assessment-operational-tool.

Enhance policy, strategy and regulatory capacity

Key issues

In the human health sector, IHR (2005) has provided the most important framework for strengthening preparedness and response capacities for infectious hazards in Member States. Similar efforts in the animal health sector have been guided by tools such as the World Organization for Animal Health (WOAH)'s Performance of Veterinary Services (PVS). For high-threat pathogens at the human–animal–environment interface, such as NiV, the Quadripartite has provided One Health tools to strengthen One Health preparedness and response capacity. Similarly, the Pandemic Influenza Preparedness (PIP) framework serves as a template for Member States to use against other high-threat pathogens of pandemic potential. The South-East Asia regional policy and strategy proclamations on health security, health resilience and diagnostic preparedness in the Region referred to earlier in this document have also played an important role by providing an enabling policy environment that is consistent with the IHR (2005).

In the Region, these mainstream efforts have often been supported by other research and programmes, including the Field Epidemiology Training Programme (FETP) and associated veterinary, laboratory and wildlife workforce training programmes (e.g. FETP-V, FELTP); USAID PREDICT (2009–2019) for training field and laboratory scientists from the human and animal sectors in viral surveillance and research activities, including for henipaviruses; Global Health Security Agenda (GHSA), a Member State-led collaborative initiative, for laboratory and epidemiology capacity strengthening across a range of EIDs and pathogens of pandemic potential.

The COVID-19 pandemic demonstrated how major gaps remain in the human, animal and wildlife animal sectors. It is critical now for Member States to leverage funding and initiatives from COVID-19 toward other acute public health threats, such as NiV, and to engage more than the health sector alone.

Key actions

For Member States

- Leverage IHR (2005) and other frameworks for health security, health resilience and diagnostic preparedness to improve core capacities for public health preparedness for and response to NiV.
- Develop, implement and test national prevention and control plans for NiV, along with other emerging and re-emerging infections, and ensure alignment with national IHR plans, all hazards NAPHS and other national emergency preparedness and response plans.

- Coordinate between human, animal and wildlife health agencies to improve prevention, preparedness, detection and response to NiV and other acute health emergencies.
- Strengthen regulatory capacities and systems to ensure access to and availability of current and future medical countermeasures for NiV.

For WHO

- Provide technical support to countries to develop and implement policies and national NiV prevention and control plans linked to NAPHS upon request.

Key outcomes

- National plans for NiV preparedness and response developed and tested (Category A by 2027, Category B by 2030)

Increase multisectoral, One Health system capacity and readiness for detection, early warning and response to cases and outbreaks

Key issues

Improving One Health coordination and capacities is critical for Member States in response to the increasing threat of EIDs such as NiV. The processes needed to improve collaboration are detailed in the *Tripartite guide to addressing zoonotic diseases in countries* and encompass both leadership and technical coordination functions. One common theme in joint external evaluations (JEEs) from Member States is weak linkages across sectors in surveillance and information-sharing. While some Member States, such as Bangladesh and Thailand, are well advanced in this area, others are still developing strong One Health multiagency coordinating mechanisms. Many of the actions recommended in this Strategy cannot be performed without such mechanisms functioning well. For example, the risk of NiV in Member States at national and subnational levels can be assessed accurately only through surveillance and information-sharing across the human, animal and wildlife sectors.

Key actions

For Member States

- Establish a functional mechanism for coordinating communication and data-sharing among entities responsible for surveillance in human, domestic animal and wildlife populations, for example, a One Health Secretariat, with defined roles and responsibilities of stakeholders for improving knowledge, coordination and

policies for surveillance, spillover reduction, mitigation and control of NiV at the human–animal–environmental interface.

- Establish One Health mechanisms at the subnational level to facilitate actions for preparedness (e.g. simulations, planning, training a One Health workforce, etc. [e.g. FETP, FETP-Vet]) and response to acute public health events.
- Establish data management systems that are shared by and useful to all relevant agencies involved in One Health activities, including NiV prevention and control.
- Continue to invest in and strengthen IHR core capacities with the aim of installing these capacities in health systems components (e.g. health policies, services, multidisciplinary health and non-health workforce) at the national and subnational levels.
- Develop and continuously build capacity of a multidisciplinary health workforce through a clear strategy, plans and innovative approaches so that the health system is prepared for, capable of responding to and can recover from any acute public health event, including NiV.
- Establish systems that enable deployment of multidisciplinary outbreak investigation teams (e.g. rapid response teams), including joint training, using a One Health approach.

For WHO

- Advocate for, promote and facilitate "One Health" mechanisms within health systems for NiV and strengthen "One Health" collaborations among stakeholders.
- Support operationalization of "One Health" mechanisms at country level through various activities for capacity-building (e.g. national IHR/PVS bridging workshop, JRA, training and workshops).
- Leverage the regional Quadripartite secretariat and the One Health High-Level Expert Panel (OHHLEP) for guidance on scaling up One Health approaches in countries, including sharing good practices and lessons learnt.

Key outcomes

- A functional coordination mechanism exists for NiV infection prevention and control within the broader One Health mechanisms in all Member States (Category A by 2024, Category B by 2030).
- Response protocols, including multidisciplinary teams, are established to ensure that human and animal health agencies are ready to respond to the detection of NiV infection in humans or domestic animals in all Member States (Category A by 2024, Category B by 2030).

Enhance risk communication and awareness to reduce spillover and spread

Key issues

Risk communication capacity has been identified as a critical gap in a recent JEE in Member States and lagging behind as an IHR core capacity. This is particularly the case with NiV as the spillover pathways and risk factors for exposure are not always known. Even in places such as Bangladesh, which have more complete understanding about risk factors and ongoing communication in endemic districts, the ongoing occurrence of outbreaks suggests that more work is needed.

Member States will benefit from strategic, consistent and targeted risk communication through a One Health approach. In developing these approaches, Member States need to consider their risk profile, transmission pathways, transmission settings, and relevant communities and stakeholders.

Key areas of messaging include the following:

1. identifying areas and practices where spillover of NiV or other henipaviruses is most likely;
2. reducing spillover from bats to domestic animals and humans;
3. increasing the awareness of clinicians and veterinarians of NiV disease in livestock and humans, and that NiV infection is a possibility in any area where the fruit bat host is present;
4. improving community understanding around the ecological importance of bats, specifically not vilifying bats or advocating their extermination when discussing their role as reservoirs for viruses that are harmful to people.

Key actions

For Member States

- With the support of communication professionals, strengthen culturally appropriate risk messaging to prevent NiV spillover and spread, including during outbreak response, accounting for scientific uncertainties.
- Educate people about the value of bats and other wildlife species to prevent vilification of and retribution against bats and other wildlife, and balance ecological, health and economic impact messages to communicate to the public about risk and incentivize the implementation of interventions.
- Evaluate approaches to making interventions more affordable and acceptable to communities.

For WHO

- Promote capacity-building for risk communication, professional development for in-service health-care providers, and community engagement for public health emergencies, considering the sociocultural dimension of NiV infections.

Key outcome

- Culturally appropriate risk, conservation and awareness messaging developed to reduce spillover, avoid vilification of wildlife and prevent spread of NiV (Category A by 2024, Category B by 2027).

Promote research and development

Key issues

Most of the early ecological and epidemiological NiV research has focused on identifying reservoir species, characterizing transmission dynamics within bat reservoirs, identifying transmission pathways from fruit bats to livestock (especially Malaysia) and humans (Bangladesh and India), and understanding person-to-person transmission. In Bangladesh, epidemiological and ecological research has been continuously used to supplement and complement government-led investigations since 2003. India has increased NiV-related research in the wake of the cases in Kerala from 2018 to 2021. Several Member States (Bangladesh, India, Indonesia, Myanmar, Nepal, Thailand) have implemented targeted viral surveillance in bats and people. With the exception of Bangladesh, India and Thailand, NiV research in the region has been minimal, despite the increasing global occurrence of EIDs and the need for understanding events that drive spillover from wildlife to humans and subsequent human-to-human spread.

Research is also needed to advance the development of diagnostics, drugs and vaccines. The Coalition for Epidemic Preparedness Innovations (CEPI) has been developing vaccines for NiV, which are expected to be available before 2025. Research has identified remdesivir and monoclonal antibodies as potential candidates for NiV treatment. Rapid diagnostics are needed both for humans and animals, particularly livestock.

For a low-incidence disease such as NiV, establishing a research consortium across the Region could greatly accelerate development of new knowledge and technologies through sharing of resources, experiences and infrastructure and enrolment of study subjects from multiple countries.

Key actions

For Member States

- Profile the risk of NiV infections and develop research priorities (e.g. postmortem, ecological and socioanthropological studies).

- Identify common research challenges and work together for One Health solutions to address these challenges.
- Support RESEARCH (the SEA Regional Research platform) activities on NiV among Member States.

For WHO

- Support the establishment of an NiV research and development (R&D) consortium for the Region to address priority needs and advocate for funding support by 2027.
- Support expansion of socioeconomic, ecological and health systems research to prevent and control NiV in the South-East Asia Region and conduct NiV-related research before, during and after outbreaks.
- Support research activities in Member States as well as transfer knowledge on NiV vaccine, therapeutic drugs and diagnosis.

Key outcomes

- NiV research and development consortium for the SE Asia Region established to address priority needs and funding available by 2027

Prevention

Promote behavioural changes to reduce risk

Key issues

Human activity is driving disease emergence globally, and it is critical to change human behaviour to decrease spillover and spread. Changing human behaviour requires first understanding the drivers of spillover in different communities, then testing approaches to modify this behaviour. This work requires all sectors to embrace a sociocultural approach to health crises, particularly the engagement of anthropologists, communication experts and other social scientists before, during and after outbreaks *(51)*. While Bangladesh has improved linkages with social scientists, especially anthropologists, to better understand the behaviours that promote NiV spillover and spread, most other Member States are yet to engage with this expertise. Interventions designed to reduce spillover of viruses from bats to people and domestic animals should be developed, tested, evaluated and scaled up in locations where people and animals (especially bats) have high contact frequency.

Key actions

For Member States

- Strengthen links between social scientists and people working on human, domestic animal and wildlife health to integrate social science approaches at every stage of outbreak preparedness and response.
- Engage social scientists to understand community perceptions and practices and the feasibility and acceptability of interventions to reduce contact between people, livestock and bats.
- Develop locally appropriate protocols for reducing NiV spillover, considering the social, political and community perceptions of disease and balancing human rights with disease control activities.

For WHO

- Promote multidisciplinary research, programmes and capacity-building for behaviour change communication and community engagement for NiV prevention and control.

Key outcomes

- Social science input incorporated into NiV spillover reduction, spread, case management and response protocols (Category A by 2024, Category B by 2027)

Improve control of disease in domestic animals through enhanced biosecurity

Key issues

Controlling infectious diseases in domestic pigs, horses and cattle can help reduce the frequency of NiV and other zoonoses spilling over into humans. The World Organization for Animal Health (WOAH) recommends that farms have strict biosecurity, which it defines as "the set of managerial and physical measures designed to reduce the introduction, establishment and spread of animal diseases, infections or infestations to, from and within an animal population" *(52)*. Biosecurity measures include: hygiene and sanitation of animal areas, equipment and supplies; tick and pest control; vaccination; restrictions on the movement of animals; isolation and culling of infected and quarantine of exposed animals; feed management; and strict procedures for handling manure and carcasses. In the context of NiV, which has emerged through domestic animals, enhanced biosecurity may also include ensuring exclusion of bats and other wildlife from inside or next to animal enclosures, ensuring appropriate distance between fruit trees and livestock enclosures to avoid dropped fruit from falling into enclosures; avoidance of using dropped or bitten fruit to feed livestock; protection of animal feed and food resources from wildlife to avoid

contamination with excreta, and avoidance of livestock grazing or foraging under or around trees occupied by *Pteropus* fruit bats.

Biosecurity does not simply prevent transmission of disease to humans. It also directly benefits farmers' financial situation by increasing productivity, reducing costs associated with disease treatment or loss of animals due to disease, and ensuring a market for their products. In Category A and B Member States, efforts to promote biosecurity, particularly in subnational areas at highest risk, may help to reduce the risk of NiV spillover and spread.

Key actions

For Member States

- Map farms that raise pigs, horses, and/or livestock in areas at highest risk of NiV spillover and work with local health and agriculture authorities to strengthen biosecurity measures.
- Strengthen messaging to farms of all sizes about human and animal health, and the economic benefits of biosecurity.
- Promote training of veterinarians, farmers and others in national biosecurity protocols.

For WHO

- Collaborate with Quadripartite partners, particularly WOAH and FAO, to promote existing biosecurity standards, protocols and tools at national and subnational levels.

Key outcomes

- Stronger biosecurity measures on pig, horse and livestock farms (Category A by 2024, Category B by 2027)

Detection

Increase laboratory diagnostic capability in human, animal and wildlife health sectors

Key issues

Prompt and accurate diagnosis of NiV infection depends on laboratory testing. The two currently accepted approaches involve detection of nucleic acid and immune response. rRT-PCR testing can detect NiV in specimens from the oropharynx, throat, nasopharynx, CSF, urine and blood *(53,54)*. Because NiV nucleic acid may not be detectable in acutely ill or deceased cases, detection of antibodies, specifically

IgM and IgG using an enzyme-linked immunosorbent assay (ELISA), may be more sensitive, as is current practice in Bangladesh *(55,56)*. IgM antibodies have been found to be present by day 2 of infection and are used to diagnose active NiV infection.

Current research is focused on developing PCR assays that can detect any henipavirus or any paramyxovirus. While such assays are available in research settings, they are not real-time assays and require more time and a different technical skill set for laboratories to run them *(57,58)*. Similarly, researchers have used a multiplexed, bead-based serological assay that can detect IgG antibodies against all known henipaviruses in bat, livestock and humans in Bangladesh and Thailand *(59,60)*. This technology is currently too expensive to be used in routine testing.

Several major challenges exist to scaling up laboratory diagnosis in the Region. First, countries in Category B would need to expend substantial resources for supplies, equipment and training for an infection that has not yet been demonstrated to cause human illness in their country. This is particularly challenging, given that the shelf-life of rRT-PCR reagents is 12–18 months, meaning that they may need to be discarded routinely. Second, despite the rapid expansion of rRT-PCR laboratories due to COVID-19, the ability of these laboratories to operate consistently and at high throughput remain constrained by inadequate electricity, water and supply chains. Third, NiV is classified as a biosafety level 4 agent, requiring the highest levels of biosafety for handling and culturing infectious virus. PCR and serology can be performed safely at biosafety level 2 as long as samples have been rendered non-infectious.

An SE Asia Region laboratory network approach can help to address these challenges, by leveraging existing resources in the SE Asia Region. Bangladesh, India, Indonesia and Thailand have demonstrated the capacity to enable regional support for NiV testing. India, in particular, has a biosafety level 4 facility at the ICMR-National Institute of Virology in Pune, which currently serves as a national reference laboratory for NiV diagnosis. An SE Asia Region laboratory network could also assist with evaluating and supporting expansion of newer technologies for surveillance and diagnosis, including whole-genome sequencing capacity developed in response to COVID-19. A laboratory network will be successful, however, only with substantial political, financial and administrative support to establish specimen transfer agreements, handling and transport systems, and information technology for secure, confidential results reporting.

Key actions

For Member States

- Develop and implement national and regional laboratory surveillance standards for prompt and accurate NiV diagnosis and safe and timely specimen collection, storage, transport and handling.

- Develop plans for enhancing the capacity of national and subnational laboratories and improve access to specialized laboratories within and outside countries.
- Train the laboratory workforce in molecular and serological platforms.
- Work with WHO and WOAH to strengthen national reference laboratories and mobilize support for a regional reference laboratory for NiV, leveraging specific capacities of laboratories in Member States.
- Invest in equipment and training of personnel to allow the use of new diagnostic technologies such as metagenomic detection using portable sequencing devices.

For WHO

- Promote, support and facilitate laboratory networking and strengthening laboratory capacities for NiV diagnosis as well as for deployment of the WHO's Research and Development Blueprint in areas pertinent to laboratory diagnosis.
- Support regional laboratory centres of excellence within the SE Asia Region.

Key outcomes

- At least one laboratory in each Member State can diagnose NiV using rRT-PCR and IgM ELISA or arrangements are in place for samples to be tested in a nominated regional laboratory for NiV diagnosis (Category A by 2024, Category B by 2025).

Increase surveillance and information-sharing among the human, animal and wildlife health sectors

Key issues

NiV surveillance in the Region has been limited to date due to lack of awareness, lower risk perception (especially in Category B Member States), resource and workforce constraints, and limitations in current technologies. Incorporating NiV surveillance into existing systems is likely to provide substantial benefit with fewer resources compared with developing NiV-specific systems.

Human surveillance

Early detection and diagnosis of NiV is challenging due to the non-specific symptoms of the disease and lack of widespread testing availability. To improve NiV surveillance, Member States should work to include NiV testing into existing hospital-based surveillance systems for respiratory (SARI) and neurological (AES) syndromes. Integrating NiV testing into laboratory algorithms for SARI and AES will improve the sensitivity, specificity and performance of current NiV surveillance *(56)*. As the vast majority of patients will not have NiV, testing should be restricted to those who

test negative for more common pathogens or according to epidemiological risk, e.g. known outbreak in that area, high-risk exposure. Such protocols can be adapted from existing guidance used during outbreaks. When human NiV cases are identified, other agencies, including wildlife and animal health departments, need to be advised and engaged as part of the outbreak investigation. Bangladesh, India and Thailand regularly use an integrated One Health approach to NiV surveillance and outbreak investigation. Similar mechanisms for information-sharing and engagement with wildlife and livestock professionals, however, is limited among most Member States.

In addition to surveillance in clinical settings, there is also a need to explicitly strengthen the capacity for event-based surveillance in general, especially One Health surveillance across sectors for rumour investigation, analysis and management.

Bat surveillance

While the role of *Pteropus* species as natural reservoirs for NiV has been well described, there is still limited understanding of the full genetic diversity of bat-borne henipaviruses and the range of other species that may host them. This knowledge is critical to assess the risk of NiV outbreaks. It has been hypothesized that some NiV strains already in bats may be more transmissible in humans and, therefore, may cause larger epidemics following spillover *(61)*. Likewise, understanding whether there are other Nipah-like henipaviruses that are less pathogenic (e.g. cedar virus) will help elucidate whether asymptomatic infection with related viruses could protect some populations against NiV disease. Thus, studies of henipavirus diversity in bats, coupled with experimental studies that characterize the relationship between viral genetic and clinical disease, are crucial to assessing public health risk from this group of viruses.

To better understand the full diversity and distribution of henipavirus reservoirs, it would be necessary to undertake intensive spatial and temporal sampling of potential bat hosts. This is unlikely to be a priority in most Member States, except by following human NiV disease outbreaks in new areas. Quadripartite agencies, academic researchers and others involved in wildlife surveillance may be useful partners for expanding knowledge of henipavirus ecology.

In Category B Member States, bat surveillance should be designed based on One Health risk assessments. If sampling from live bats is neither feasible nor affordable, environmental urine collection from beneath bat colonies is relatively simple and inexpensive to implement. Repeated environmental urine collection from single populations over time and testing of pooled samples using RT-PCR or whole-genome sequencing can improve understanding of shedding and provide data for vaccine and therapeutic development.

Conducting NiV surveillance in bats may carry an increased risk of exposure to NiV; however, these risks can be mitigated through the use of appropriate personal protective equipment (PPE) and biosafety practices during sample collection and transport. Strategies for biosafety and biosecurity during wildlife sampling have been previously described *(62)*.

Domestic animal surveillance

Domestic animals, including pigs, cows and horses, have played an important role in zoonotic transmission of NiV, and investigations have found evidence of likely prior NiV infection. There remains substantial uncertainty, however, about the likely transmission pathways involving domestic animals when taking into account fruit bat populations and their interactions with domestic animals. Similarly, domestic animal populations where surveillance is likely to provide actionable public health information have not been identified. This Strategy, therefore, recommends that livestock health agencies implement syndromic surveillance in pigs, horses and cows as part of comprehensive One Health infectious disease surveillance, but does not recommend routine NiV surveillance testing of domestic animals.

Key actions

For Member States

- Develop national surveillance and outbreak response protocols for humans and bats that are adaptable and flexible to the subnational context.
- Support workforce development in veterinary and wildlife departments to conduct bat and, if indicated by data, domestic animal NiV surveillance.
- Incorporate additional epidemiological data collection into surveillance periodically to support risk assessment.
- Strengthen capacity for syndromic surveillance, event-based surveillance and rumour detection in humans, domestic animals and wildlife.
- Strengthen knowledge and awareness in human, animal and wildlife health professionals for prompt disease detection.

For WHO

- Provide technical support where appropriate and needed to improve surveillance for NiV disease.
- Develop regional surveillance standards, protocols and guidelines that countries can adapt to their national and subnational contexts.

Key outcomes

- Hospital-based SARI and AES surveillance systems enhanced to include NiV testing in all Member States (Category A 2024, Category B 2027)
- Increased capacity for NiV surveillance in domestic animals and wildlife
- Increased capacity for event-based surveillance in humans, domestic animals and wildlife in all Member States by (Category A 2024, Category B 2025)
- Member States may decide whether to conduct ongoing bat or domestic animal surveillance based on One Health NiV risk assessments (Category A 2027, Category B 2030).

Response

Improve clinical diagnosis and case management

Key issues

Some Member States have developed clinical diagnosis and case management guidelines, including Bangladesh and India (Kerala), for hospitals and homes. Guidelines are needed for all Member States, along with a process that reviews and updates them continuously based on the latest evidence.

Hospitals are high-risk settings in which NiV infections can be amplified into outbreaks, as demonstrated during the outbreak in Kerala. While substantial efforts are being made throughout the Region to improve IPC in response to COVID-19, protocols should be adapted for issues specific to NiV, including for fomites and corpse management for different cultural and religious groups.

Key actions

For Member States

- Strengthen surge capacity of health facilities, isolation areas, IPC practices (including enabling multimodal interventions) and intensive care for managing NiV-infected patients routinely and during outbreaks.
- Improve access to IPC supplies (e.g. PPE) in hospitals and other facilities likely to admit NiV-infected patients.
- Facilitate access to and participation of clinicians to regional and international NiV knowledge networks.
- Establish national guidelines on clinical management, IPC, transfer to specialized centres and follow up.
- Establish guidance for collection of clinical data on specialized populations (e.g. pregnant women) with linkage to national NiV surveillance systems.

For WHO

- Support country experts to collaborate through regional and international knowledge networks.

Key outcomes

- Guidelines and protocols for NiV clinical diagnosis, case management and IPC up to date and readily available (Category A 2024 and Category B 2027)

Develop and improve access to medical countermeasures (therapeutics and vaccines)

Key issues

At present, patients with NiV infection are managed with supportive care, including mechanical ventilation. WHO has designated NiV and other henipaviruses as priority pathogens for the development of vaccines and therapeutics. Although the likelihood of large-scale NiV epidemics is considered low based on current knowledge of its epidemiology, vaccines are considered an important measure for protecting frontline health-care workers and community contacts of NiV cases to effectively limit human-to-human transmission and control outbreaks.

Category A Member States should engage in vaccine and therapeutic R&D activities, including clinical trials where possible. All Member States should prepare for the availability of vaccines by developing vaccination strategies for health-care workers and for emergency use in an outbreak setting.

Key actions

For Member States

- Build capacity for exploratory studies and clinical trials of vaccines and drugs in areas at risk for NiV transmission.
- Review existing regulatory laws, specifically for high-threat pathogens requiring expedited processes for vaccines and therapeutics.
- Contextualize and adapt protocols for the use of monoclonal antibodies.

For WHO

- Promote, support and facilitate capacities for public–private partnerships on medical countermeasures aligned with the WHO Research and Development Blueprint.

Key outcome

- Processes established that support the development and deployment of medical countermeasures for NiV by 2027 in the SE Asia Region

Recovery

Ensure resilience

Key issues

Resilience requires a whole-of-government and whole-of-society approach. Recovery is a complex component of the ERF involving a large number and variety of stakeholders that affect the long-term impact on the health system. In this regard, a structured approach to rebuilding the health system after outbreaks needs to be developed based on lessons learned during outbreak response and in line with Member States' recovery policies and strategies. Advantage must also be taken of opportunities identified and recommendations made during any evaluation or after-action review to strengthen capacities to reduce the risks of future NiV spillover and spread.

Resilience of the community is equally important to systems' resilience. The recovery phase needs to increase the resilience of the community to better address the evolving NiV risk. Community outreach campaigns should be conducted to increase understanding of how exposure can occur, how the outbreak happened, what measures can help reduce the risk of exposure to NiV and reduce stigma and misinformation. In addition to public health risk reduction messages, outreach campaigns should include positive ecological messages about the importance of bats for insect pest control, pollination and seed dispersal. Including positive messaging about bats can help mitigate fear responses that could result in exterminating bats or destruction of their roosts. Recovery phase communication strategies that address both specific risk factors for NiV exposure and risk factors for exposure to zoonotic pathogens, in general, may serve to more broadly reduce the risk of outbreaks. Community capacities and activities, including strong primary health care that ensures universal health coverage (UHC) and the roles of local health workers, civil society and the private sector are all important in ensuring recovery *(63)*.

Researchers should continue to study the prognosis of NiV infection survivors, as is being done by CEPI (https://cepi.net/news_cepi/nipah-survivors-study-to-advance-new-vaccines-against-highly-fatal-threat/), given reports of persistent or recurrent NiV infection and the possibility of long-term health complications.

Key actions

For Member States

- Strengthen the capacity of local communities affected by NiV infection to avoid recurrent outbreaks through community education campaigns.
- Institutionalize mechanisms for conducting after-action reviews and incorporating lessons learned into NiV prevention and response plans.

For WHO

- Support Member States in strengthening recovery capacities in affected communities and link with best practices from across the Region.

Key outcomes

- Recovery measures designed that build community resilience to address future NiV outbreaks (Category A 2024 and Category B 2030)

5 Governance and financing mechanisms

Governance

At the level of Member States

The Strategy requires cooperation and coordination at the regional, national and subnational levels. At the national and subnational levels, each Member State is encouraged to leverage the One Health platforms and guides that have been developed by the Quadripartite to engage all relevant sectors and disciplines in assessing and managing risk. In consultation with stakeholders, Member States will then decide how to allocate resources for priority activities in the Strategy and how to track progress over the period to 2030.

The Strategy will require organizational support to ensure that there is clarity in decision-making at the regional and national levels. Any legislative changes or legal requirements related to the Strategy will be the responsibility of individual Member States.

At the level of WHO

WHO will advocate to and coordinate across Member States at the regional level. In addition, WHO will be involved at national levels via the respective WHO country offices. On the ground, delivery at subnational levels may also be supported by WHO. WHO will also facilitate stakeholder consultations that include partners, donors, manufacturers, public–private partnerships, international research agencies and institutions such as CEPI.

WHO will promote knowledge- and experience-sharing among Member States to ensure that they have the most current information about prevention and control of NiV.

WHO will work with the One Health High-Level Expert Panel and the One Health Initiative as well as the Quadripartite to advocate for multisectoral, multidisciplinary One Health

approaches to NiV prevention and control in the Region, as part of the overall high-threat pathogen prevention and control strategy. In Member States that do not have formal national One Health platforms, WHO and Quadripartite agencies will advocate for and support their establishment at the national and subnational levels.

WHO also has a responsibility to support countries in efforts to meet their IHR (2005) obligations more generally and in the preparation of NAPHS. WHO will contribute in resource mobilization and financing, where feasible, to enhance laboratory capacity and related activities to accomplish the Plan.

Financing the components of the Strategy and for contingencies

Adequate financial allocations are required at every level to complete the activities in the Strategy. Preparedness, prevention, detection and response activities involve recurring costs, and the COVID-19 pandemic has again highlighted the insufficiency of current investments. The High-Level Independent Panel *(64)* that examined how finance can be organized systematically and sustainably to reduce the world's vulnerability to future pandemics recommended that Member States increase domestic investment in IHR (2005) core capacities to prevent and contain future pandemics. The Panel also recommended that low- and middle-income Member States will need to add about 1% of the gross domestic product (GDP) to public spending on health over the next five years and ensure that funding supports core capacities to prevent and contain future disease pandemics. It is worth noting that new financial mechanisms are being created to provide resources donated by high-income countries to low- and middle-income countries for the purpose of implementing pandemic prevention strategies (e.g. the World Bank's Pandemic Fund; www.projects.worldbank.org)

Accordingly, multiyear cost projections need to be made, identifying and mapping existing and potential financing sources. In this regard, Member States' commitment and national budgetary systems become critical in the Region, as do contributions from stakeholders in the public and private sectors. These investments would support virtually all NiV-related activities in this Strategy.

The financial requirements need clear identification focusing on all five key components of the Strategy, from prevention to recovery. Financial mechanisms should also include contingency funding for response and recovery with national budgetary systems being sufficiently flexible to quickly provide financing during and after an NiV outbreak.

Strong and continued advocacy is needed at every level to engage decision-makers from Member States and partners to ensure that existing sources of financing are maintained and new sources are explored for sustainable and predictable financing for the implementation of actions in the Region.

6 Monitoring and evaluation

Monitoring and evaluation are integral to the implementation of the regional NiV prevention and control strategy. The M&E system will allow both WHO and Member States to monitor progress against the priority activities that they have identified. Performance indicators with indicative time frames are described in **Annexure 1**. Of note, these only refer to the overall Regional Strategy and focus specifically on the key outcomes from this Strategy that are measurable, quantifiable and important. As part of implementing this Strategy, Member States will develop their own national M&E plans that include indicators specific to their context.

Evaluation must include an assessment of the elements that contribute to the completion of priority activities for Member States and for progress across the SE Asia Region. External and self-evaluation tools need to be developed for this purpose by each Member State, with technical support from WHO and other agencies, as needed. Some of the indicators require specific approaches (e.g. surveys) to estimate progress.

Member States will be encouraged to share the annual reviews of progress with WHO at the regional level so that appropriate support can be sought and advocacy provided to help Member States move closer towards a scenario where there is better preparedness for prevention and control of NiV in the Region.

WHO will also conduct a mid-term evaluation in 2027 to assess the progress and make recommendations for mid-course corrections, if any.

7

The way forward

This Strategy is necessarily ambitious, seeking to build upon the experience and capacity from the Ebola, COVID-19, and Mpox epidemics. The Strategy will be challenging to implement, because it encompasses a large number of complex activities in multiple sectors across a large, heavily populated, diverse and underresourced region. Successful implementation, however, is a high priority given the threat of NiV, related henipaviruses, and other high-threat pathogens that emerge from bats, domestic animals and wildlife.

The SE Asia Region NiV prevention and control strategy sets out the context and need for a well-integrated approach to combat NiV infection in the Region. By 2030, the Regional Strategy envisions recommended steps for both Category A and Category B Member States implemented through adequate resources allocated to zoonotic disease prevention and control. Implementing the components listed in this Strategy will result in Member States being better prepared to prevent NiV illness and deaths and will, in general, improve the Region's level of preparedness and capacity to prevent and respond to zoonotic disease outbreaks in the Region.

To implement this Strategy, WHO will support Member States through its country offices in adapting existing global and regional guidance and toolkits regarding surveillance, One Health, laboratory systems, outbreak response, risk communications, biosecurity and IPC. Where such documents may not already exist, e.g. bat surveillance, clinical case management, WHO will work with regional and global experts to meet these gaps.

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Annex 1
M&E indicators and indicative time frames for the Region

The indicators in this table are developed for monitoring progress across the South-East Asia Region. The targets were based on our best possible judgement at this time of capacities and risks, using available data in the Region on IHR (2005) implementation, opinions from regional experts, and feedback from Member States. These indicators will be revised as needed during the mid-period evaluation of the Strategy. As part of national planning for implementing the Regional Strategy, Member States will be asked to develop indicators relevant to their context.

Indicator	Definition	Source of data	Baseline	Target (number of MS)		
				2024	2027	2030
Number of Member States (MS) that have conducted NiV One Health risk assessment	An NiV One Health risk assessment involves all relevant sectors and provides an understanding of the likelihood and impact of NiV spillover and spread (e.g. knowledge of presence/location of host and virus; key routes of spillover; identification of high-risk human and livestock populations)	NiV risk assessment MS reports	Cat A 0 Cat B 0	2	6	9
Number of MS with functional One Health platforms* capable of addressing NiV infection	One Health platform established with human, animal (domestic and wildlife) and environmental sectors, which meets at least six-monthly	IHR M&E Framework MS reports	Cat A 1 Cat B 2	9	9	10

Indicator	Definition	Source of data	Baseline	Target (number of MS)		
				2024	2027	2030
Number of Category A and B MS with established protocols to ensure that all relevant agencies are ready to respond to detection of NiV infection in humans or domestic animals	Protocol that details specific steps, responsibilities, activities and coordination processes across agencies at national levels if NiV infection is detected	MS progress report	Cat A 2 Cat B 2	9	9	10
Number of MS with NiV-specific risk communication plans and materials developed	Risk communication plan and communication material that is culturally appropriate taking note of specific MS needs and priorities	MS progress report Annual report	Cat A 2 Cat B 0	Cat A 2 Cat B 2	Cat A 2 Cat B 5	Cat A 2 Cat B 7
Contingency plan for NiV preparedness and response developed and tested	NiV contingency plan exists and simulation exercise has been conducted to test the plan	NiV outbreak exercise reports from MS	Cat A 0 Cat B 0	Cat A 0 Cat B 0	Cat A 2 Cat B 3	Cat A 2 Cat B 7
Functional Regional R&D Consortium for NiV	A platform with participation of priority MS exists and is functional	Regional annual report	0		Consortium established	
Multisectoral protocols exist to prevent and respond to NiV outbreaks	Protocols specify how a multisectoral team (e.g. public health personnel, epidemiologists, veterinarians, social scientists, clinicians and laboratory personnel) will work together	MS progress report	Cat A 1 Cat B 0	Cat A 2 Cat B 0	Cat A 2 Cat B 7	

Indicator	Definition	Source of data	Baseline	Target (number of MS)		
				2024	2027	2030
Proportion of all NiV outbreaks that were rapidly detected and investigated	NiV outbreaks that were detected within 7 days of detection of lab-confirmed index case, including contact tracing and identification of possible secondary cases, divided by all NiV outbreaks	Outbreak investigation/ Rapid Risk Assessment (RRA) reports	Cat A 50%	Cat A 75%	Cat A 100%	
Number of MS with rRT-PCR and IgM ELISA testing capacity for NiV	Public sector laboratory with rRT-PCR and IgM ELISA testing capacity for NiV	MS annual report	Cat A 2 Cat B 2	Cat A 2 Cat B 7		
Number of MS investing in new screening tools, including whole genome sequencing (WGS), for detecting NiV	Sequencing technology exists within laboratory and staff are trained to detect NiV using new technology	MS annual report	Cat A 0 Cat B 0	Cat A 2 Cat B 7		
Number of MS with national guidelines and protocols for NiV clinical diagnosis, case management and IPC	Clinical management, including IPC, protocols issued by government and national medical associations	MS annual report	Cat A 2 Cat B 0	Cat A 2 Cat B 0	Cat A 2 Cat B 7	
Number of MS that have conducted after-action reviews (AAR) following outbreaks	AAR is a tool to review actions taken in response to a public health event and serves as a routine management tool for continuous learning and improvement	MS annual report	Cat A 0 Cat B 0	Cat A 2 Cat B 0	Cat A 2 Cat B 3	Cat A 2 Cat B 7

Indicator	Definition	Source of data	Baseline	Target (number of MS)		
				2024	2027	2030
Number of MS with detailed recovery measures to build community resilience following an NVD outbreak	Recovery measures include health and community capacities to reduce the risk of future NiV spillover and spread	MS annual report	Cat A 0 Cat B 0	Cat A 2 Cat B 0	Cat A 2 Cat B 3	Cat A 2 Cat B 7

*Could be identified within the existing One Health platforms/mechanisms etc.

Annex 2
Illustrative list of frameworks, guidance and tools that Member States could further reference

One Health risk assessment

1. The Joint Risk Assessment – Operational tool

https://www.who.int/initiatives/tripartite-zoonosis-guide/joint-risk-assessment-operational-tool

Allows Member States to undertake a formal One Health risk assessment; tool designed to assist Member States to identify, assess, manage and reduce risks from zoonotic diseases such as NiV that benefit from coordination and collaboration between ministries and other agencies responsible for various aspects of human health, animal health and the environment.

Policy, strategy and regulatory capacity

2. National Action Plan for Health Security (NAPHS)

https://www.who.int/emergencies/operations/international-health-regulations-monitoring-evaluation-framework/national-action-plan-for-health-security

A country-owned, multiyear, planning process that can accelerate the implementation of IHR core capacities, and is based on a One Health for all-hazards, whole-of-government approach. It captures national priorities for health security, brings sectors together, identifies partners and allocates resources for capacity development in health security.

3. NAPHS for ALL – a country implementation guide for NAPHS

https://www.who.int/publications/i/item/naphs-for-all---a-country-implementation-guide-for-naphs

Provides guidance at each step of the NAPHS framework, and the necessary tools and templates for developing and implementing a national action plan, which countries, partners and agencies can use in the local context

4. NAPHS for all: a 3-step strategic framework for national action plan for health security

https://www.who.int/publications/i/item/naphs-for-all-a-3-step-strategic-framework-for-national-action-plan-for-health-security

Three-step approach to help countries plan and implement priority actions to attain health security

5. WHO benchmarks for International Health Regulations (IHR) capacities

https://www.who.int/publications/i/item/9789241515429

A tool with a list of benchmarks and corresponding actions that can be applied to increase the performance of countries in emergency preparedness through the development and implementation of a National Action Plan for Health Security (NAPHS)

6. Regional strategic roadmap on health security and health system resilience for emergencies 2023–2027

https://www.who.int/publications/i/item/9789290209959

Guidance to the Member States of the WHO South-East Asia Region in their efforts to strengthen national health security and health system resilience for emergencies and contribute to the consolidation of the collective, supportive, and augmenting capacities needed at the regional level

7. South-East Asia regional roadmap for diagnostic preparedness, integrated laboratory networking and genomic surveillance (2023–2027)

https://www.who.int/publications/i/item/9789290209942

Outlines a range of policy options that Member States can use to develop sustainable strategies to improve their national laboratories and prepare laboratory systems to improve surveillance and respond more effectively to emerging and re-emerging diseases, and other potential public health emergencies

8. Emergency response framework, 2nd edition

https://www.who.int/publications/i/item/9789241512299

The ERF provides WHO staff with essential guidance on how the Organization manages the assessment, grading and response to public health events and emergencies with health consequences, in support of Member States and affected communities.

9. WHO guidance on preparing for a national response to health emergencies and disasters

https://www.who.int/publications/i/item/9789240037182

The guidance was developed to support countries in developing and designing the national health emergency response operations plan for multiple hazards. It draws on the Health Emergency and Disaster risk Management Framework, refers to country emergency risk profiles and builds on all existing capacity development plans, including the National Action Plan for Health Security.

One Health capacity-building

10. Taking a multisectoral, one health approach: a tripartite guide to addressing zoonotic diseases in countries

(https://www.who.int/publications/i/item/9789241514934)

The TZG provides principles, best practices and options to assist countries in achieving sustainable and functional collaboration at the human–animal–environment interface.

11. Multisectoral coordination mechanisms operational tool: an operational tool of the tripartite zoonoses guide

(https://www.who.int/publications/i/item/9789240053236)

MCM-OT provides a standard step-wise approach for countries to establish or strengthen a mechanism for multisectoral, One Health coordination to manage zoonotic diseases, with references to principles and best practices described in the Tripartite zoonosis guide.

12. IHR-PVS bridging

https://www.woah.org/en/document/summary-fact-sheet-on-ihr-pvs-nbws/

https://www.woah.org/en/document/ihr-pvs-nbw-participant-handbook/

The workshops bring together national stakeholders and decision-makers from the animal health and the human health services from national, regional and local levels, as well as representatives of other relevant sectors (environment, wildlife, media, police, etc.). The aim is to analyse and improve collaboration between the two sectors so that they can better tackle major health security risks at the animal–human interface, including zoonotic diseases, as well as threats related to food safety, food security or antimicrobial resistance, among others.

13. Surveillance and information sharing operational tool: an operational tool of the tripartite zoonoses guide

https://www.who.int/publications/i/item/9789240053250

The SIS OT supports national authorities in their efforts to establish or strengthen a One Health multisectoral coordinated surveillance and information-sharing system for zoonotic diseases.

Risk communication and awareness

14. Risk communication strategy for public health emergencies in the WHO South-East Asia Region: 2019–2023

https://apps.who.int/iris/handle/10665/326853

Provides guidance for national risk communication action plans to strengthen national capacities. The goal is "Five in Five": to achieve adequate capacity for risk communication in the five key areas, in five years, as part of the steps taken to scale up national emergency preparedness. The five areas are risk communication systems; partner coordination; public communication; community engagement and perception; and risky behaviour and misinformation.

Research and development

15. Nipah research and development (R&D) roadmap

https://www.who.int/publications/m/item/nipah-research-and-development-(r-d)-roadmap

Provides a 5-year framework for identifying the vision, underpinning strategic goals and prioritizing areas and activities (from basic research to advanced development, licensure, manufacture, acceptance and deployment, and assessment) for accelerating the collaborative development of medical countermeasures (MCMs) – diagnostics, therapeutics and vaccines – against NiV infection.

16. The regional research platform on infectious diseases of public health importance in the WHO South-East Asia Region

https://main.icmr.nic.in/content/2nd-meeting-regional-research-platform-infectious-diseases-public-health-importance-who

Leverages the existing capacities of SE Asia Region countries to work on infectious diseases, which are of priority to this Region

Laboratory diagnostic capability

17. Regional manual for the laboratory diagnosis of Nipah virus

WHO has developed this manual with an aim to strengthen laboratory diagnosis and virological surveillance of NiV by providing standard operating procedures for sample collection, transportation, processing, testing, virus isolation and characterization, which can be utilized universally.

Surveillance and information-sharing

18. Surveillance and information sharing operational tool: an operational tool of the tripartite zoonoses guide

https://www.who.int/publications/i/item/9789240053250

19. Strengthening public health surveillance and risk assessment for health security threats in the WHO South-East Asia Region

https://www.who.int/publications/i/item/SEA-WHE-16

Identifies common priority regional actions related to surveillance, risk assessment and field epidemiology with key directions for efforts and investment to advance health security and implementation of the International Health Regulations (2005).

20. National guideline for management, prevention and control of Nipah virus infection including encephalitis. IEDCR Bangladesh and technical support from WHO Country Office for Bangladesh

https://www.moh.gov.bt/wp-content/uploads/afd-files/2014/11/WHO-guideline-for-Management-Prevention-and-Control-of-Nipah-Virus-Infection.pdf

National guideline for surveillance, diagnosis, case management, prevention and control of Nipah virus encephalitis for prompt detection of human cases and prevention of further human–human transmission

21. Nipah virus guidelines. National Centre for Disease Control, DGHS, MoHFW, Government of India

https://ncdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=113&lid=228

Clinical diagnosis and case management

22. National guideline for management, prevention and control of Nipah virus infection including encephalitis. IEDCR Bangladesh and technical support from WHO Country Office for Bangladesh

https://www.moh.gov.bt/wp-content/uploads/afd-files/2014/11/WHO-guideline-for-Management-Prevention-and-Control-of-Nipah-Virus-Infection.pdf

23. Nipah virus guidelines. National Centre for Disease Control, DGHS, MoHFW, Government of India and Nipah Virus Infection: Guidelines for Surveillance, Diagnosis,Treatment, Prevention and Control, Department of Health and Family Welfare, Government of Kerala

https://ncdc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=113&lid=228

https://dhs.kerala.gov.in/wp-content/uploads/2021/09/Nipah-Guidelines-9-04-21-2-1.pdf

24. Core components for infection prevention and control programmes

https://www.who.int/teams/integrated-health-services/infection-prevention-control/core-components

Part of WHO strategies to prevent current and future threats from infectious diseases such as Ebola, strengthen health service resilience, help combat antimicrobial resistance (AMR) and improve the overall quality of health-care delivery. They are also intended to support countries in developing their own national protocols for infection prevention and control (IPC) and AMR action plans and to support health-care facilities as they develop or strengthen their own approaches to IPC.

25. Disease Outbreak News; Nipah Virus Infection in India

https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON490

Recovery and resilience

26. Guidance for after action review (AAR)

https://www.who.int/publications/i/item/WHO-WHE-CPI-2019.4

Methodology for planning and implementing a successful AAR to review actions taken in response to a public health event, but also as a routine management tool for continuous learning and improvement

Annex 3
WHO Emergency Response Framework and Regional Strategy for Nipah Virus

ERF Category	Strategy Component	Activity	Key Outcome
Preparedness	Improve understanding of socio-ecological aspects	Conduct studies to improve understanding of relevant bat species, NiV prevalence, spillover and transmission pathways *(Cat A by 2024, Cat B by 2027)*	One Health NiV risk assessments completed in each MS *(Cat A by 2024, Cat B by 2027)*
		Conduct and disseminate systematic risk assessments *(Cat A by 2024, Cat B by 2030)*	
	Enhance policy, strategy, regulatory capacity	Leverage IHR to improve core capacities *(Cat A by 2027, Cat B by 2030)*	National plans for NiV preparedness and response developed and tested *(Cat A by 2027, Cat B by 2030)*
		Develop, implement, and test national plans for NiV *(Cat A by 2027, Cat B by 2030)*	
		Coordinate between human, animal, and wildlife health agencies to strengthen capacity for NiV and other health emergencies *(Cat A by 2024, Cat B by 2027)*	
		Strengthen regulatory capacities and systems for medical countermeasures *(Cat A by 2027, Cat B by 2030)*	
	Increase multisectoral health system capacity and readiness for detection, early warning, and response to cases and outbreaks	Ensure functional mechanism for coordinating communication and data sharing for surveillance in human, animal, and wildlife populations *(Cat A by 2024, Cat B by 2030)*	Functional coordination mechanism exists for NiV infection prevention and control within the broader One Health mechanisms in all MS (Cat A by 2024, Cat B by 2030) Response protocols, including multi-disciplinary teams, established to ensure that human and animal health agencies are ready to respond to detection of NiV infection in humans or domestic animals in all MS (Cat A by 2024, Cat B by 2030)
		Ensure One Health mechanisms at the sub-national level for preparedness and response *(Cat A by 2024, Cat B by 2030)*	
		Continue to invest and strengthen IHR core capacities at national and sub-national level *(Cat A by 2024, Cat B by 2025)*	
		Develop and continuously build multidisciplinary health workforce *(Cat A by 2024, Cat B by 2025)*	

ERF Category	Strategy Component	Activity	Key Outcome
		Establish systems for deployment of multidisciplinary outbreak investigation teams *(Cat A by 2024, Cat B by 2030)*	
	Enhance risk communication and awareness to reduce spillover and spread	Strengthen risk messaging for NiV spillover, spread, and outbreak response *(Cat A by 2024, Cat B by 2027)*	Culturally appropriate risk, conservation, and awareness messaging developed to reduce spillover, avoid vilification of wildlife, and prevent spread of NiV *(Cat A by 2024, Cat B by 2027)*
		Educate about the value of bats and other wildlife species *(Cat A by 2024, Cat B by 2027)*	
		Evaluate approaches to making interventions more affordable and acceptable in communities *(Cat A by 2024, Cat B by 2027)*	
	Promote research and development	Map priority NiV knowledge gaps and identify common research challenges *(Cat A by 2024, Cat B by 2027)*	NiV research and development consortium for SEAR established to address priority needs and funding available by 2027
		Support SEA Regional Research platform activities for NiV *(Cat A by 2024, Cat B by 2027)*	
Prevention	Promote behavioural changes to reduce risk	Strengthen links between social science and public health practitioners, clinicians, veterinarians, wildlife practitioners, and animal caretakers *(Cat A by 2024, Cat B by 2027)*	Social science input incorporated into NiV spillover reduction, spread, case management, and response protocols *(Cat A by 2024, Cat B by 2027)*
		Engage social scientists to understand community perceptions and practices *(Cat A by 2024, Cat B by 2027)*	
		Develop locally appropriate protocols for NiV spillover reduction *(Cat A by 2024, Cat B by 2027)*	
	Improve control of disease in domestic animals through enhanced biosecurity	Identify all farms that raise pigs, horse, and/or livestock in areas at highest risk to strengthen biosecurity *(Cat A by 2024, Cat B by 2027)*	Stronger biosecurity measures on pig, horse, and livestock farms *(Cat A by 2024, Cat B by 2027)*
		Strengthen messaging to farms of all sizes about economic benefits of biosecurity *(Cat A by 2024, Cat B by 2027)*	

ERF Category	Strategy Component	Activity	Key Outcome
		Promote training of veterinarians, farmers, and others in national biosecurity protocols *(Cat A by 2024, Cat B by 2027*)	
Detection	Increase laboratory diagnostic capability in human, animal, and wildlife sectors	Develop and implement national and regional laboratory surveillance standards for prompt, accurate NiV diagnosis and safe, timely specimen collection, storage, transport, and handling *(Cat A by 2024, Cat B by 2025*)	At least one laboratory in each MS can diagnose NiV using rRT-PCR and IgM ELISA or arrangements are in place for samples to be tested in a SEAR nominated Regional Laboratory for NiV diagnosis (Cat A by 2024, Cat B by 2025)
		Develop plans for enhancing capacity of national and sub-national laboratories and improving access to specialized laboratories *(Cat A by 2024, Cat B by 2025*)	
		Train laboratory workforce in molecular and serologic platforms *(Cat A by 2024, Cat B by 2025*)	
		Work with WHO and WOAH to strengthen national referral laboratories and mobilize support of a regional reference laboratory *(Cat A by 2024, Cat B by 2025*)	
	Increase surveillance and information sharing among human, animal, and wildlife sectors	Develop national surveillance and outbreak response protocols for humans and bats *(Cat A by 2024, Cat B by 2027*)	Hospital-based SARI and AES surveillance systems enhanced to include NiV testing in all MS by 2024
		Develop workforce in veterinary and wildlife departments to conduct bat surveillance *(Cat A by 2024, Cat B by 2027*)	Increased capacity for NiV surveillance in domestic animals and wildlife
		Incorporate additional epidemiologic data collection into surveillance to support risk assessment *(Cat A by 2024, Cat B by 2025*)	Increased capacity for event-based surveillance in humans, domestic animals, and wildlife in all MS by 2024
		Strengthen capacity for syndromic surveillance, event-based surveillance, rumour detection in humans, domestic animals, and wildlife *(Cat A by 2024, Cat B by 2025*)	MS decide whether to conduct ongoing bat or domestic animal surveillance based on One Health NiV risk assessments *(Cat A by 2027, Cat by B 2030)*
		Strengthen knowledge and awareness in human, animal and wildlife health professionals for prompt disease detection *(Cat A by 2024, Cat B by 2025*)	

ERF Category	Strategy Component	Activity	Key Outcome
Response	Improve clinical diagnosis and case management	Strengthen surge capacity of health facilities, isolation areas, IPC practices, and intensive care for managing NiV-infected patients *(Cat A by 2024, Cat B by 2027*)	Guidelines and protocols for NiV clinical diagnosis, case management and IPC up-to-date and readily available *(Cat A by 2024 and Cat B by 2027)*
		Improve access to IPC in hospitals and other facilities likely to care for NiV-infected patients *(Cat A by 2024, Cat B by 2025*)	
		Facilitate access and participation of clinicians to NiV knowledge networks *(Cat A by 2024, Cat B by 2025*)	
		Establish national guidelines on clinical management, IPC, transfer to specialized centres, and follow-up *(Cat A by 2024, Cat B by 2027*)	
		Establish guidance for collection of clinical data on specialized populations with linkage to national NiV surveillance systems *(Cat A by 2024, Cat B by 2027*)	
	Develop and improve access to medical countermeasures	Support capacity for exploratory studies and clinical trials of vaccines and therapeutics in populations at risk for NiV transmission	Processes established that support the development and deployment of medical countermeasures for NiV by 2027 in SEAR
		Review existing regulatory laws, specifically for high-threat pathogens requiring expedited processes for vaccines and therapeutics	
		Contextualize and adapt the protocol for the use of monoclonal antibodies	
Recovery	Ensure resiliency	Strengthen capacity of local communities affected by NiV infection to avoid recurrent outbreaks *(Cat A by 2024, Cat B by 2030*)	Recovery measures designed that build community resilience to address future NiV outbreaks *(Cat A by 2024 and Cat B by 2030)*
		Institutionalize mechanisms for conducting After Action Reviews and incorporating lessons learned into NiV prevention and response plans *(Cat A by 2024, Cat B by 2030)*	

This document provides guidance for Member States of the WHO South-East Asia Region to prevent severe illness and death from Nipah virus. Since 2001, Nipah virus has caused outbreaks of severe illness and death in Bangladesh and India. Countries of the Region are at risk wherever there are susceptible animals, the presence of the virus, and a pathway for transmission.

This document considers and incorporates the best evidence from scientific research and practical field experiences from previous outbreak investigations, and describes key components of the Regional Strategy, priority activities for each component, milestones, and timelines based on whether countries have reported human cases or not. A section on monitoring and evaluation describes indicators to assess progress for the Region towards achieving the Strategy. Using a 'One Health' approach, the document will be helpful for programme managers to develop strategies for the prevention and control of other high-threat pathogens

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