2025

National Alert and Response Framework

for Acute Public Health Events

Government of Nepal
Ministry of Health and Population
Department of Health Services
Epidemiology and Disease Control Division
Teku, Kathmandu

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Preface

It is my great pleasure to present the *National Alert and Response Framework (ARF) for Acute Public Health Events, 2025,* developed by the Epidemiology and Disease Control Division (EDCD) under the Department of Health Services, Ministry of Health and Population.

This framework represents a major step forward in strengthening Nepal's public health security architecture. Lessons from recent outbreaks, emergencies, and global health crises have underscored the importance of having an integrated and well-coordinated system to detect, verify, assess, and respond to acute public health events. Strengthening such capacities is crucial to reduce the impact of emergencies on communities and to enhance health security at national and global levels.

This framework provides a structured approach that connects surveillance and response functions through a unified system. It integrates indicator-based and event-based surveillance, outlines processes for signal detection, triaging, verification, and risk assessment, and paves the pathway for coordinated response at all levels. The ARF adopts an all-hazards approach, aligning with the International Health Regulations (IHR 2005) and global principles such as the 7-1-7 timeliness for outbreak detection and response.

The framework is intended to guide public health authorities, response teams, and multisectoral partners at the federal, provincial, and local levels in strengthening early warning, risk assessment, and coordinated response. When used in conjunction with other national frameworks, guidelines, and operational tools that support surveillance, response, and coordination, it will contribute to a more resilient and responsive health system.

I would like to commend the technical team at the Epidemiology and Disease Control Division (EDCD), World Health Organization (WHO), and all national and provincial stakeholders who contributed to the development of this important document. I am confident that this framework will serve as a cornerstone for strengthening Nepal's public health surveillance and emergency response at all levels of the health system.

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Foreword

It is my great pleasure to share the *National Alert and Response Framework (ARF) for Acute Public Health Events, 2025*, developed by the Epidemiology and Disease Control Division (EDCD) under the Department of Health Services, Ministry of Health and Population.

Nepal continues to face evolving public health threats, from infectious disease outbreaks to environmental and other hazards. These challenges have highlighted the need for an integrated system that ensures timely detection, verification, and response to acute public health events. The *National Alert and Response Framework* has been developed to bridge the existing gaps between surveillance and response, ensuring that signals of public health concern are systematically detected, triaged, verified, risk assessed, and responded to in a timely and coordinated manner.

The framework introduces a structured and standardized approach that integrates *indicator-based surveillance (IBS)* and *event-based surveillance (EBS)* through an all-hazards approach. It aligns with global and regional standards, including the World Health Organization (WHO) guidelines outlined in the "*Early Warning, Alert and Response in Emergencies: An Operational Guide*" (2022), and the global 7-1-7 timeline for outbreak detection and response. The ARF defines the flow of information and responsibilities across the federal, provincial, district, and local levels and underscores the importance of multisectoral collaboration through the One Health approach.

I would like to extend my sincere appreciation to the technical team at EDCD, as well as the valuable contributions of the World Health Organization (WHO), and all partners and stakeholders who provided valuable inputs and expertise during the development of this framework.

The Epidemiology and Disease Control Division remains committed to strengthening national systems to respond to public health threats with greater efficiency and resilience. I encourage all stakeholders to be guided by this framework across all levels of the health system to strengthen readiness and ensure timely and effective action during acute public health events.

Dr Chandra Bhal Jha
Director
Epidemiology and Disease Control Division (EDCD)

Director

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Acronyms

AGE	*Acute Gastroenteritis*
AMR	*Antimicrobial Resistance*
ARF	*Alert and Response Framework*
CBS	*Community Based Surveillance*
CHW	*Community Health Worker*
CRVS	*Civil Registration and Vital Statistics*
DFTQC	*Department of Food Technology and Quality Control*
DLS	*Department of Livestock Services*
DoHS	*Department of Health Services*
EBS	*Event-Based Surveillance*
EDCD	*Epidemiology and Disease Control Division*
EIOS	*Epidemic Intelligence from Open Sources*
EMR	*Electronic Medical Record*
EWAR	*Early Warning Alert and Response*
EWARS	*Early Warning and Reporting System*
FAO	*Food and Agriculture Organization*
FETP	*Field Epidemiology Training Program*
GOARN	*Global Outbreak Alert and Response System*
HEOC	*Health Emergency Operation Center*
IBS	*Indicator-Based Surveillance*
IHR	*International Health Regulations*
MoALD	*Ministry of Agriculture and Livestock Development*
MoH/MoSD	*Ministry of Health/Ministry of Social Development*
MoHP	*Ministry of Health and Population*
NPHL	*National Public Health Laboratory*
WOAH	*World Organization for Animal Health*
PHCC	*Primary Health Care Centre*
PHD	*Provincial Health Directorate*
PHEOC	*Provincial Health Emergency Operation Center*
RRA	*Rapid Risk Assessment*
RRC	*Rapid Response Committee*
RRT	*Rapid Response Team*
SARI	*Severe Acute Respiratory Infection*
WHO	*World Health Organization*

Glossary

Acute public health event: An acute public health event is defined as any event that represents an immediate threat to human health and requires prompt action, i.e. including control or mitigation measures to protect public health. This term encompasses events that have led to disease in humans or may have the potential to cause disease through exposure of humans to infected or contaminated food, water, manufactured products, environments, or as a result of direct or indirect consequences of natural events, conflicts or disruptions of critical infrastructure.

Alert: A public health signal that has been i) verified as an event; ii) risk assessed; and iii) deemed to require an intervention (such as an investigation, response or communication with partners or the public).

Alert threshold: A predefined number of cases (or proportion, rate, trend). Once an alert threshold is reached or surpassed, a signal is triggered, initiating the process of verification, risk assessment and risk characterization is started.

All-Hazards approach: The all-hazards approach is a strategy to prepare for and respond to any public health threat, including diseases, natural disasters, chemical spills, food safety issues, conflicts, or infrastructure damage. It recognizes that while hazards may vary in source, they often challenge health systems in similar ways and require a multisectoral response. The approach focuses on building shared resources and systems for a quicker and more effective response to emergencies.

Community-based surveillance (CBS): The systematic detection and reporting of events of public health events or cases of a specific disease, by community members within a given community.

Epidemic (synonym outbreak): The occurrence of more cases of a specific disease, chronic condition, or injury than expected in a given area or among a particular group of people, over a defined period of time.

Event: The International Health Regulations (IHR (2005)) define an event as "[…] a manifestation of disease or an occurrence that creates a potential for disease; […]" (5). Events may be infectious, zoonotic, food safety, chemical, radiological or nuclear hazards, and can be transmitted by persons, vectors, animals, goods/food or through the environment. In the context of Early Warning Alert and Response (EWAR), an "event" refers to a signal that has been identified and may require verification. Some events originate from unstructured and ad hoc sources, such as media reports, social media, or community observations, as part of Event-Based Surveillance (EBS). These unverified events undergo further verification and confirmation through risk assessment before being classified as a public health threat requiring response.

Event-based surveillance (EBS): The organized collection, monitoring, assessment and interpretation of mainly unstructured ad hoc information regarding potential public health events or risks which may represent an acute risk to human health(1).

Indicator-based surveillance (IBS): The systematic collection, monitoring, analysis and interpretation of structured health-related data (indicators), produced by health facilities or other defined sources. Reporting is based on standardized case definitions of selected priority diseases or conditions.

Response: Public health actions triggered by the detection of an alert.
Responses can include the following actions: monitoring the event, informing the population, conducting field investigation and implementing control measures. The type of response should be adapted to the nature of the public health risk.

Risk assessment: A systematic process of gathering, assessing and documenting information to assign a level of risk (risk characterization) to human health from an acute public health event, and to inform actions to manage and reduce the negative consequences of such events.

Risk characterization: A process of assigning a level of risk to the combination of hazard identification, exposure to it and context assessments, based on its likelihood of occurrence and the scale of potential public health consequences. This may be based upon quantitative models, comparisons against guidance values (e.g., in food safety risk assessments) or expert opinion.

Participatory Surveillance: It involves the regular, bi-directional process of receiving and transmitting health-related data through direct engagement with the general population. Participatory disease surveillance system poses an active approach involving volunteer people who mindfully provide data through and appropriate interference

Signal: The initial detection (by IBS or EBS) of a potential public health event, before verification. Signals may consist of information/reports of cases or deaths (individual or aggregated), potential exposure of human beings to biological, chemical or radio-nuclear agents, or the occurrence of natural or manmade disasters. A signal is not yet an event but may lead to one if verified. Not all signals become events—some may be ruled out after verification.

Surveillance and Response Systems: Global and Regional Perspective

A robust public health surveillance system is essential for detecting, assessing, investigating, and responding to emerging public health threats. Surveillance plays a key role in monitoring disease trends, providing early warning signals, and enabling timely interventions to mitigate risks. The scope of surveillance systems varies by country, depending on the disease burden, health priorities, and the resources available for public health infrastructure. Global health systems have increasingly recognized the need for multi-sectoral collaboration in surveillance, including not only health data but also environmental, behavioral, and socio-economic factors.

Globally, public health surveillance has evolved significantly in response to changes to rapid population growth, urbanization, increased international trade and travel, and scientific advancements. These factors have contributed to the emergence of new pathogens, environmental risks, and the spread of diseases across borders. Recognizing the need for a coordinated international response, the International Health Regulations (IHR) were revised in 2005 to ensure that all countries have core capacities for early detection, risk assessment, and response to public health events of national and international concern. This has led to the development of a more integrated and coordinated approach to public health surveillance, emphasizing timely information-sharing and collaborative action.

At the regional level, the Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies (APSED III) advocates for collective responsibility in managing health security, strengthening surveillance systems, and facilitating cross-border cooperation. In parallel, the WHO framework for resilient surveillance for respiratory viruses of epidemic and pandemic potential emphasizes the need for collaborative surveillance systems that work together in a mosaic to give a complete picture of risk, transmission, severity, impact and response highlighting the global importance of integrating surveillance and response systems. Additionally, the Strategic Framework for Action for strengthening surveillance, risk assessment and field epidemiology for health security threats in the WHO South-East Asia Region highlights the importance of using multiple information sources through collaborative arrangements in making critical decisions during complex emergencies.

As part of this evolving landscape, Early Warning, Alert, and Response (EWAR) has emerged as a key function of disease surveillance, particularly in the context of growing epidemic and pandemic threats. EWAR, as outlined in WHO's "Early Warning, Alert and Response in Emergencies: An Operational Guide" (2022), is an essential component of public health intelligence. It involves systematic collection, analysis, and communication of information to detect, verify, assess, and investigate health-related events and risks, enabling rapid decision-making and response. EWAR operates through two complementary surveillance mechanisms: Indicator-based Surveillance (IBS) which relies on routine

data from health facilities and Event-based Surveillance (EBS) which captures non-routine information from various sources, such as communities, media, and environmental monitoring.

Modern surveillance systems are increasingly adopting an all-hazards approach, which extends beyond infectious diseases to encompass threats such as antimicrobial resistance, environmental hazards, and bioterrorism. This shift necessitates structural changes in surveillance systems, prioritizing flexibility, coordination, and rapid response to diverse public health threats. The integration of IBS and EBS within an all-hazards EWAR framework is essential to ensuring early detection, risk assessment, and timely response at national, regional, and global levels.

Overview of existing surveillance and response system in Nepal

In Nepal, Article 35 of the Constitution (2015) ensures that every citizen has the right to free basic health services and emergency care. The Infectious Disease Act (1964) empowers the Government of Nepal to take necessary actions or designate officials to prevent and control infectious diseases that are spreading or pose a risk of spreading. Furthermore, the Public Health Service Act (2018) provides for disease prevention, information sharing, and emergency response, including the establishment of Rapid Response Teams (RRTs) and Emergency Medical Teams (EMTs) to deliver immediate health services during emergencies. Nepal has undertaken several initiatives to strengthen its surveillance and response systems to combat health emergencies, as detailed in the following sections.

Communicable Disease Surveillance System in Nepal

The Epidemiology and Disease Control Division (EDCD) has been implementing the Early Warning and Reporting System (EWARS) since 1997. Currently, EWARS reporting is conducted from 134 sentinel sites using a DHIS-2 platform. The system primarily monitors three vector-borne diseases (Malaria, Kala-azar and Dengue), three epidemic-prone diseases/syndromes (Acute Gastroenteritis (AGE), Cholera, Severe Acute Respiratory Infection (SARI)) as well as other diseases such as Scrub typhus and Influenza-like Illness (ILI).

Apart from EWARS, the EDCD has implemented several other surveillance systems, including:

o Water quality surveillance: This ensures compliance with the National Drinking Water Quality Standards (NDWQS) 2079, focusing primarily on microbiological parameters and free residual chlorine (FRC) status, including the auditing of water quality

o Surveillance of acute public health events: Includes call center alerts and media monitoring

o Climate Sensitive Disease Surveillance (Piloting): Provides early warnings of suspected climate-induced disease outbreaks, relating climatic effect to the occurrence of diseases (currently under development)

o SORMAS: The Surveillance Outbreak Response Management and Analysis System (SORMAS) incorporates both event based and indicator-based surveillance beyond EWARS sentinel sites, which links laboratory and epidemiological surveillance, covering more than 40 diseases and is planned for integration with all 52 priority diseases.

Beyond EDCD, the Family Welfare Division (FWD), in collaboration with World Health Organization (WHO) Immunization Preventable Disease programme, conducts surveillance for vaccine-preventable diseases (VPDs). Following the elimination of polio, the Acute Flaccid Paralysis surveillance system

was expanded in 2005 to integrate several vaccine-preventable diseases such as measles, rubella, Haemophilus influenzae type b and rotavirus.

Vaccine Preventable Disease Surveillance includes:

- Acute flaccid paralysis surveillance (for Poliomyelitis)
- Acute fever with rash illness surveillance (for Measles/Rubella)
- Sentinel surveillance of suspected Congenital Rubella Syndrome
- Suspected Neonatal Tetanus surveillance
- Acute Encephalitis Syndrome surveillance (for Japanese Encephalitis)
- Acute watery diarrhea surveillance in children under 5 years at Rotavirus sentinel sites (for Rotavirus Surveillance)

Additionally, the National Public Health Laboratory (NPHL) conducts laboratory-based surveillance through its sentinel sites at both the national and subnational levels, focusing especially on COVID-19 and Influenza (dual surveillance), Antimicrobial Resistance (AMR) and Respiratory Syncytial Virus (RSV) along with priority pathogen surveillance.

Laboratory-based surveillance led by NPHL includes:

- Influenza & SARS-CoV-2 integrated surveillance
- Respiratory Syncytial Virus surveillance
- AMR Surveillance through 26 sites for 12pathogens
- Genomic surveillance for SARS CoV-2
- Vaccine preventable diseases

Other human health surveillance systems include:

- Malaria and Kala-azar active Surveillance
- Tuberculosis: Regular Health Facilities-Based Surveillance via the National Tuberculosis Program Management Information System (NTPMIS).
- HIV/AIDS: Regular Health Facilities-Based Surveillance via National Center for AIDS and STI control program
- Maternal and Perinatal Death Surveillance and Response (MPDSR)
- Birth Defect Surveillance
- Hospital acquired infection (HAI) Surveillance

The animal health sector also conducts surveillance for avian influenza and other zoonoses including:

- Avian Influenza surveillance in 10 high-risk districts
- Periodic surveys of Brucellosis, Zoonotic Tuberculosis, Toxoplasmosis, Q-Fever, Leptospirosis
- Collection of epidemiological reports throughout the country

Collectively, these surveillance systems complement the health management information system by collecting, analyzing and utilizing data to design necessary interventions and policy decisions aimed at controlling infectious diseases in Nepal. However, despite these efforts, the surveillance system in Nepal remains heavily reliant on health facilities and laboratories, focusing primarily on infectious hazards, with limited integration with response systems. Thus, there is a need for an all-hazards approach to surveillance that is better interconnected with national, provincial, and local response systems.

Response Systems

Nepal has experienced several outbreaks of infectious diseases over the years, including dengue, cholera, influenza, scrub typhus, measles, and others. Epidemic-prone diseases such as cholera and acute gastroenteritis are endemic across all regions, posing a constant threat to public health. Recent cholera outbreaks have been reported in Kapilvastu (2021) and Kathmandu valley (2022, 2024). A large cholera outbreak in Jajarkot in 2009 affected around 30,000 people, resulting in over 500 deaths. Other notable outbreaks include foodborne diseases in Kavre (2018) and Palpa (2022), as well as viral hepatitis and influenza. The COVID-19 pandemic caused over 12,000 deaths in Nepal. Additionally, mpox was detected in the country, with the first case reported on June 16, 2023, followed by two more cases in December 2024.

Nepal's geographic location along the central Asian migratory flyway makes it particularly vulnerable to avian influenza outbreaks. Since 2009, at least one human case of influenza (H5N1) has been reported. The country's rich biodiversity, combined with an increasing human-animal interface, creates a fertile environment for the emergence of pathogens with epidemic and pandemic potential. These historical trends, coupled with growing risks such as emerging pathogens, international trade and travel, cross-border movement, climate change, environmental degradation, urbanization, and a heightened human-animal interface, underline the need for enhanced surveillance and preparedness in response to potential outbreaks.

In Nepal, the response to outbreaks is primarily led by Rapid Response Teams (RRTs). These teams are activated based on risk assessments and risk characterization and are deployed at the federal, provincial, district, and local levels to address acute public health events. RRTs operate under the guidance of the Rapid Response Teams and Emergency Medical Team Deployment Guideline 2079 B.S. and are coordinated by Rapid Response Committees (RRCs) at various administrative levels. The composition of RRTs is flexible and can be adjusted based on the nature of the public health threat. This may include the integration of experts in animal health, food safety, environmental health, and other relevant sectors. While RRTs have been instrumental in mitigating the impact of outbreaks, several challenges persist such as delayed detection, resource limitations, and gaps in multi-sectoral coordination, which have sometimes hindered response effectiveness. Strengthening the capacity of RRTs, expanding surveillance networks, and improving rapid deployment mechanisms remains essential for improving Nepal’s preparedness and response to future public health emergencies.

Current System and Change in Scenario

The current surveillance systems in Nepal primarily record specified public health events from designated sites (health facilities and laboratories) and focus on specific hazards. Nepal's Early Warning and Reporting System (EWARS) plays a crucial role in detecting and responding to priority epidemic-prone diseases through 134 sentinel sites across the country. EWARS generates automatic alerts to notify responsible officials of potential outbreaks, supporting timely public health interventions. Additionally, unusual events or outbreaks are notified from communities or health facilities directly through informal channels to the Health Emergency Operation Center (HEOC), Provincial Health Emergency Operation Centers (PHEOCs), and EDCD, strengthening the overall disease surveillance system.

However, the system has limitations in detecting new or undefined hazards beyond designated sentinel sites. Despite provisions for immediate reporting and weekly reporting, most data to be reported immediately are also reported weekly, which may cause delays in detecting outbreaks. The cholera outbreak in Kapilvastu (2021) is a recent example of delayed detection, as the initial cases appeared in non-sentinel sites, leading to delays in EWARS reporting and response. While EWARS generates automatic alerts, manual interpretation and verification are still required to confirm unusual increases in reported cases.

National and local media outlets report on acute health events across the country, which are monitored by the EDCD through Epidemic Intelligence from Open Sources (EIOS). However, the processing and utilization of such information remains minimal as there is no formal guidance incorporating this information into risk assessment and decision-making processes. The Standard operating procedure for EIOS is yet to be developed, and there is a need to define how this system should be systematically used for public health surveillance. Additionally, there is limited guidance on what types of signals should be reported, how they should be verified, and if verified, how to respond to the signals coming through call centers and media reports.

Published in the Gazette on 4th July 2024, the Government of Nepal endorsed a list of 52 infectious diseases based on the Public Health and Service Act 2018. Chapter 6, Clause 49 (4) of the Act states: “If patients are identified with the listed infectious diseases, the concerned health institution or the health worker shall transmit the information to the concerned body within the period as prescribed pursuant to the standards prescribed.” Therefore, there is a need to establish a formal and robust reporting mechanism for these diseases. This shows the need for establishment of event-based surveillance and strengthening of indicator-based surveillance in the country, based on a framework. The development of such a framework is one of the major recommendations for strengthening surveillance in a joint external evaluation of IHR core capacities conducted in 2022 in Nepal.

Similarly, on the response aspect, the information system is based on paper and informal communication. There is limited guidance on managing information related to outbreak response

including outbreak investigation reports, case investigation forms, line lists, contact tracing, etc. Currently, there is no centralized system or standardized tools for recording and managing information during outbreak response and public health events. While some provinces have begun using software applications at the local level to address these challenges, there is no centralized repository or digital system to track outbreak response activities systematically.

These challenges underscore the urgent need for a national framework or guideline that clearly defines common platform and processes for signal detection, reporting, verification, and response at appropriate levels, as well as a robust system to capture and manage data across the entire continuum of detection and response. By establishing an integrated system capable of early detection and rapid response, Nepal can significantly enhance its capacity to prevent disease spread and control outbreaks, as illustrated in Figure 1.

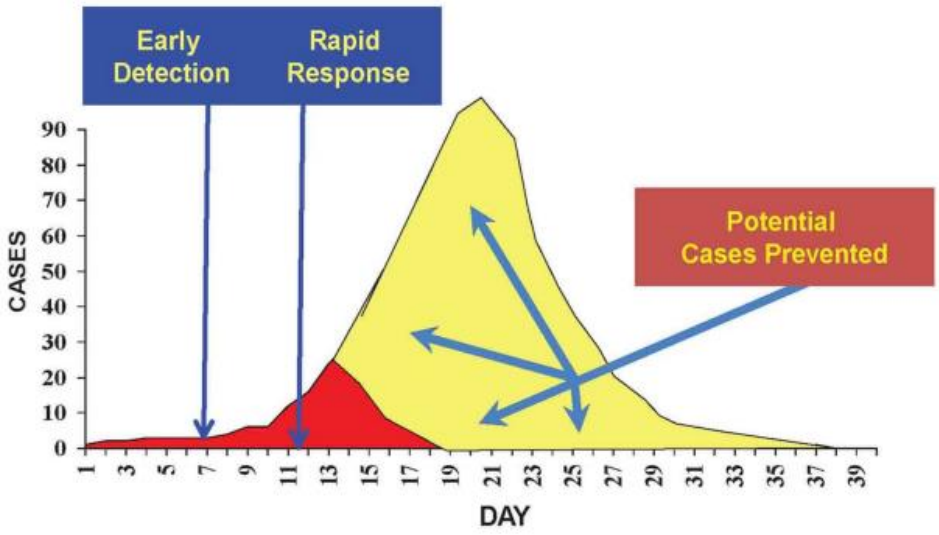

Figure 1: Diagram to show potential cases prevented through early detection and rapid response

Introduction to Alert and Response Framework

The alert and response framework (ARF) provides a systematic approach for collecting, assessing, monitoring and interpreting structured data (from Indicator-Based Surveillance or IBS) and unstructured, ad hoc information (from Event-Based Surveillance or EBS) related to public health events that guides evidence-based decision-making and actions. The aim of ARF is to reduce the time needed to detect and respond to acute public health events, thereby minimizing morbidity and mortality.

Nepal's approach to developing the ARF is aligned with global and regional standards, including the World Health Organization (WHO) guidelines outlined in the "Early Warning, Alert and Response in Emergencies: An Operational Guide" (2022), and the global 7-1-7 timeline for outbreak detection and response.

I. Objectives

General Objective

To strengthen surveillance system for early detection and rapid response to acute public health events through an all-hazard approach, ultimately enhancing national, regional, and global health security.

Specific Objective

The specific objectives of the ARF include:

- Timely detection of acute public health signals and alerts through various sources (IBS and EBS).
- Early detection of global and cross border public health threats to inform preparedness and readiness actions.
- Timely verification of the detected signals at the local level for confirmation and risk characterization (gathering information including hazard, exposure, and contextual information) for initial risk assessment to guide responses.
- Rapid response to the confirmed events with the response measures commensurate with risk assessment.
- Efficiently manage and share near real-time response related information with stakeholders to support informed decision-making.

II. Underlying Principles

- All Hazard approach: Adopt an all-hazard approach, addressing a wide range of public health threats including infectious diseases, zoonoses, environmental hazards, chemical incidents, and other emergencies.

- Collaboration: Emphasizes strong, coordinated collaboration across sectors and levels. This includes collaborative surveillance among health, animal, environmental sectors (One health approach); verification and risk assessment (e.g., Joint risk assessment); and a multisectoral coordinated response. Strong collaboration is essential across federal, provincial, and local levels of government to ensure unified and efficient action.
- 7-1-7 timelines: This principle promotes accountability and timeliness. As per this target, every suspected outbreak is identified within 7 days of emergence, reported to public health authorities within 1 day, and effectively responded within 7 days of reporting.
- Standardization: Establish and maintain standardized processes and tools for signal detection, verification, risk assessment, and response to ensure consistency, comparability, and efficiency across all levels and sectors.
- Actionable information: Prioritize the generation and dissemination of accurate, timely, and relevant information that can directly support prompt decision-making and response activities.
- Core surveillance approach: Strengthen and maintain routine indicator-based surveillance systems that provide continuous monitoring of priority diseases and health conditions.
- Enhanced surveillance approach: Activate targeted or event-based surveillance mechanisms during specific contexts such as outbreaks, mass gatherings, or post-disaster settings to supplement routine systems and ensure rapid signal detection and response.

III. Scope and Target Audience

The Alert and Response Framework aims to establish an integrated and systematic mechanism in Nepal where signal detection and triaging, verification, risk assessment, and response components are seamlessly connected. This system allows for rapid detection, timely verification, risk assessment, and rapid response to acute public health events in a systematic and coordinated manner, contributing to the achievement of the global 7-1-7 timeline. Overall, it provides a skeletal framework and identifies areas that need strengthening in the current structures at local, provincial and federal level such as developing technical guidelines, policies, standard operating procedures, tools, capacity building, establishing or repurposing human resources, and enhancing multisectoral collaboration.

The ARF seeks to:

- outline the signal detection and triaging-verification-risk assessment-response mechanisms, including the flow of information and list of information sources
- identify the focal persons/unit at the different levels for the different roles
- identify the list of policies, guidelines, standard operating procedures, and tools required to fulfil and operationalize the ARF
- identify potential areas for collaboration
- highlight ongoing need for capacity building at different stakeholder levels
- define information management and dissemination process at different stakeholder levels

- establish monitoring and evaluation mechanisms

The document serves as a guiding outline for stakeholders including government bodies, partners, academia, and the private sectors who are responsible for implementing alert and response activities. The primary target audience includes policymakers and health authorities at the federal, provincial, district, and local levels as well as partner agencies at each level, fostering a common understanding of alert and response procedures. (Figure 2)

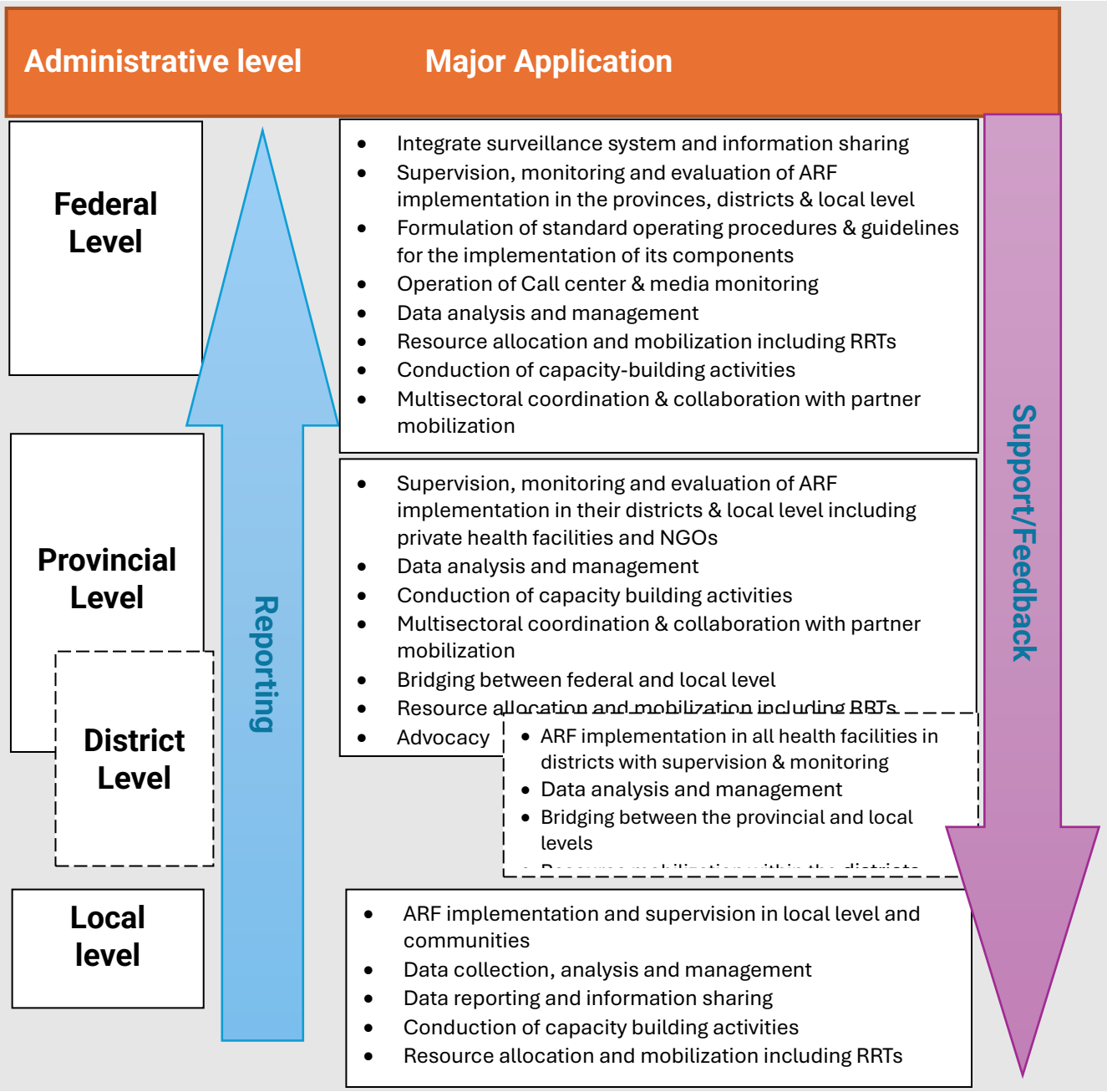

Figure 2: Major Application of Alert and Response Framework as per the administrative level in Nepal

IV. Limitation of this document

Some of the limitations of the document are listed below:

- As the name indicates, this is only a document outlining the alert and response framework and not a detailed operational guideline. It identifies areas (guidelines, tools, SOPs etc.) that need to be developed at different levels in consultation with various stakeholders.
- The document provides a broad overview of the alert and response system in Nepal, without delving into operational specifics.
- While the ARF aims to cover all relevant components, some aspects may be overlooked at this stage and may need to be addressed during implementation. The document will evolve as new information, and needs arise during the implementation phase.

Components of Alert and Response Framework

This framework consists of three key components:

I. Signal Detection
II. Triage, Verification, and Risk Assessment
III. Response

Signal Detection

a. Surveillance System

I. Indicator Based Surveillance

IBS systems are essential for monitoring epidemiological trends and detecting changes in health hazards. It includes disease notification, sentinel surveillance, syndromic surveillance, laboratory-based surveillance (including genomic, wastewater surveillance, water quality surveillance and food surveillance), and community-based surveillance. IBS systems must be regularly reviewed and adapted to evolving public health needs. Timeliness is critical, particularly for acute public health events that may evolve rapidly and require prompt public health actions. During disasters, it is essential to establish a targeted surveillance system designed based on the needs of the humanitarian setting or natural disasters. Private healthcare services should also be incorporated for comprehensive coverage.

II. Event Based Surveillance

EBS is vital for the immediate detection of public health signals. Detected signals will undergo triage and prompt verification. Systems should be in place for healthcare workers and laboratory staff from both public and private health facilities, to immediately report unusual events (health facility EBS). National level systematic screening of formal and informal media sources should be conducted, with information disseminated to all administrative levels. Additionally, mechanisms should be in place to receive reports from communities through call centers or hotlines from non-

governmental organizations, community leaders, community healthcare workers, and other community organizations, particularly for vulnerable populations and humanitarian settings. Additionally, reporting from individuals who do not seek healthcare should also be incorporated.

b. Additional Sources to support the Surveillance System

I. **Monitoring Hospital and ICU Admissions**: Hospitalization and ICU admissions serve as key indicators of disease severity. Monitoring the strain on healthcare services, such as the occupancy of acute and critical care beds and ambulance usage, will also be crucial. These indicators will help guide public health and social measures to prevent overwhelming healthcare services. Effective coordination between healthcare and public health systems is essential for tracking indicators.

II. **Information from Cross-border for Public Health Risk:** Border areas are particularly vulnerable to public health risks due to the movement of people and goods from neighboring countries. Points of entry (PoE) play a role in implementing additional health measures in line with the IHR (2005). National surveillance systems should monitor public health risks associated with international travel and trade, and the cross-border movement of people and animals. Surveillance of events or diseases as guided by the IHR-2005 as well as prioritized national infectious diseases can be done at POE.

III. **Civil Registration and Vital Statistics (CRVS) and Mortality Data:** Functional CRVS data will assist in estimating and monitoring the impact of emergencies and correlating with the surveillance information gathered from the IBS and EBS systems.

IV. **Information on Environmental and Climatic data:** Data from other sectors through One Health coordination, including rainfall, temperature, vectors, wildlife, and water quality, provides early warning signals for public health risks. Mechanisms should be established to utilize this information for risk assessment and decision-making.

V. **Behavioral data:** Social and behavioral data enhance surveillance efforts by analyzing mobility patterns, social interactions, medication sales, compliance with public health measures, vaccine hesitancy, and behaviors affecting public health. This data should be systematically collected to improve preparedness and response.

c. Potential Data Sources for Surveillance System

I. **Health Facilities**: Healthcare workers are primary data sources for both IBS and EBS. Reporting mechanisms should be established at all levels, with designated focal points at each facility. Major data sources include physicians, medical records, hospital infection data, antimicrobial resistance (AMR) reports, diagnostic laboratories, and hospital morbidity and mortality records.

II. **Laboratories:** Laboratory staff contribute to both IBS and EBS by reporting unusual cases or findings. This includes detecting high-threat pathogens, novel antimicrobial resistance profiles, or emerging variants of concern (VOC).

III. **Media:** Traditional and online media play a key role in public health surveillance. Systematic scanning of national and international media, using tools such as WHO's EIOS, ProMed, GDACS, and GPHIN, ensures timely identification of public health signals. Media reports are shared with stakeholders for verification and action.

IV. **Community:** Community-based surveillance (CBS) enables early detection and reporting of unusual health events. Community members, including female community health volunteers (FCHVs), local and religious leaders, school teachers, and pharmacists, play key roles Any unusual events are reported by using hotlines (e.g., 1115) or the nearest designated health facilities. The priority list of the events including human, animal and food sectors, as attached in Annex 3, developed, and updated by the experts acts as the main guidance to the community-based reporting of any unusual events. CBS strengthens overall surveillance and event detection by empowering communities to monitor and report health risks in real-time.

V. **Environmental:** Data from environmental sources, wastewater, and climate are essential for comprehensive public health surveillance. Environmental data, including air and water quality measurements, help identify potential hazards such as pollutants and contaminants that could impact health. Wastewater analysis provides valuable information on the presence of pathogens, chemicals, and other substances, aiding in tracking disease spread and assessing sanitation measures. Climate data, such as rainfall, temperature, and humidity, further enrich this surveillance by revealing how weather patterns and extreme events can influence health risks. For example, high temperatures and humidity can exacerbate heat-related illnesses, while rainfall patterns can affect the spread of vector-borne diseases like malaria and dengue. This will also support predictive analysis with modelling for anticipated threat at the given time.

VI. **Additional Sources:** Data from online sources, various organizations, public health surveys and questionnaires, social media, which provides real-time insights into public sentiment and trends; and mobile apps, which track user behaviors and health metrics. Additional sources are public health research studies published in journals, administrative data offering insights into patient behaviors and treatment adherence, and qualitative data from focus groups and interviews. Market research reports analyze consumer behavior and health-related trends, while government and NGO reports provide valuable information on public health behaviors and program evaluations.

Table 1: Potential Sources for IBS and EBS data

Sources	Indicator Based Surveillance	Event Based Surveillance
Health facilities/ hospitals (sentinel health facility)	Routinely used - e.g., routine (daily/weekly/monthly) reporting of individual case-based data/line-lists from IPDs and aggregate data from OPDs with defined syndrome	Often used - e.g., reporting an unusual increase in patients with fever and rash, diseases not resolving with usual treatment or others with similar symptoms
Laboratories	Routinely used - e.g., routine reporting of positive cases	Often used - e.g., identification of a disease not previously detected in the region, new antimicrobial resistance profile, novel pathogen or muted pathogen (can be VOC) detection in laboratory; can be notified as EBS
Community health workers (CHWs) and volunteers (including community health facilities)	Sometimes used - e.g., CHWs reporting weekly counts of suspected cases in their assigned region during regular outreach clinics (ORCs) or after a confirmed outbreak.	Often used - e.g., CHWs and volunteers reporting clusters of severely sick children with unknown disease as an event
Point of Entry (PoE)	Sometimes used – e.g., routine health screening data collection at borders (e.g., temperature checks, travel history, symptoms).	Often used – e.g., reporting of travelers presenting with symptoms of notifiable diseases, or detection of illness clusters among passengers from affected regions.
Media Monitoring	Not Applicable	Often used- e.g., Digital platform to detect public health signals
General public	Not applicable	Sometimes used- e.g., public hotlines to report acute public health events

Triaging, Verification and Risk Assessment

Triaging and Signal Selection

Triaging of signals is conducted regularly at the federal, provincial, and local levels to initiate responses and communicate through the digitized platform. Not all signals will constitute a public health event, however, reports received via media, hotlines or communities are valuable for early detection and provide important opportunities for timely verification and response. The authenticity of these signals needs to be established. Possible questions during triaging of the signals include:

- Relevance: Is the reported information relevant to early warning (i.e., could this signal be a genuine public health event)?
- Duplication: Has this signal been reported previously (i.e., is this signal duplicate or already covered in IBS)?
- Unusual/unexpected: Is the signal perceived as unusual or unexpected, considering time, place, and person?

After triaging, signals that require verification are forwarded to the appropriate local, district, or provincial authorities through the digital platform. The outcome (whether discarded or sent for verification) is documented and communicated on the same platform. Non-events are discarded but closely monitored, while verified events should be responded. Signals that are prioritized (as attached in Annex 2 & Annex 3) or meet the following criteria, should proceed for verification:

- Higher-than-expected mortality or morbidity for a known disease
- Unknown mode of transmission (MOT) or causative agent
- Unusual/unexpected/unexplained cluster of disease (cases or deaths) in the community with similar symptoms
- Potential to cause an outbreak with a high potential for spread
- Undue level of concern/fear/panic in the affected community
- Possible consequences for international trade or travel
- Mortality or morbidity among specific population groups (i.e., refugees, health care workers, or marginalized populations)
- Unidentified causes of illness or death within a community
- Unusual/unexpected/unexplained cause of sickness or deaths related to international travel or mass gathering
- Unusual death or disease in animals (zoonosis or unknown disease) with potential threat to human health
- Possible diseases with/without national capacity to respond (at least by the local RRT)
- Re-emergence of disease with pandemic potential.
- Re-emergence of vaccine-preventable diseases.

For generically defined or unusual signals that may pose a public health threat, a team of trained epidemiologists or surveillance officers should assess whether to discard the signal or proceed with verification.

Verification

Verification is a process of confirming the validity of the captured signals. Relevant authorities designated as focal points handle the process, with RRTs at the local level verifying the events. Key verification criteria include:

- Ensuring the signal is understood correctly by notifying person.
- Confirming the signal with at least two independent sources, or by having it reported by a medical authority (e.g., veterinarian, physician, or lab assistant).
- Risk assessment and characterization of the event.

I. **Verification flow**: Signals are forwarded for verification through the digital platform so that all the levels are notified. The RRTs at the relevant administrative level (national, provincial, district, or local level) verify the signal as early as possible and report through the platform (as per the SoP developed for verification of acute public health events of outbreak concern). If verification is not completed within 24 hours at the local level, the district will assist in verification. Further, if the district does not verify within 24 hours, the province will support or follow up for verification. If the province does not verify within 24 hours then EDCD will support or follow up for the verification. All the verification and feedback should be updated in the same digital platform, as specified by the MoHP. The use of the same system ensures uniformity in information, recording and verification and reaches all the focal points in time. The local level RRTs should promptly start the investigation of the event by collecting further information in the field.

Discard if…	Confirm as an event if…
• Report is a hoax or a false event • Information has been reported by unreliable sources (word of mouth, random unauthentic social media posts, etc.)	• Information is accurate and true • Information has been reported by credible sources (FCHVs, health facilities, laboratories, etc., national media, official websites, etc.) • Report meets the alert signals pre-determined • Verification by laboratory investigation • Epidemiological Verification

At the provincial, district, and local levels, a designated official focal point handles the receipt and verification of signals, communicates, and shares information with relevant stakeholders especially for zoonotic diseases or environmental hazards if needed.

The outcome of the verification process determines whether a signal is true or false. Once a signal is verified, it becomes an event. If confirmed as an event, information related to it is entered and managed in the digital platform. In situations where digital platforms are unavailable, a paper-based logbook is used until the digital system is functional. Systematic verification of all detected signals is essential to avoid overburdening the public health system with false investigations or unreliable information.

II. Designated Units

The rapid response teams at the respective local level are the responsible authorities for verifying events within their jurisdiction. The team composition shall be as per the RRT guideline or as per the SOP for verification of events.

III. Timeliness

Local RRTs should ideally verify the signal within the first 24 hours of the signal detection and update in the digital platform. If this is not carried out within 24 hours, the district/provincial level should proactively reach out to the local RRTs for initiation of the process and should complete it within the next 48 hours, with all the details updated in the system.

Risk Assessment

Risk assessment is a systematic and continuous process for gathering, assessing, and documenting information to provide the basis for actions required to manage and reduce the negative consequences of an acute public health event. It is conducted by local, district, provincial, or federal RRTs depending on the available resources and expertise and proposes action to manage and minimize the negative consequences of serious public health events.

Risk assessment may be either initial or formal, depending on the stage of the event. Initial risk assessment begins once the event is confirmed and should ideally start within 24 hours. It is conducted for all the signals generated and is done through triangulation of different reported sources, literature review or making phone calls to the relevant experts. The initial assessment helps determine immediate actions and response needs. Formal risk assessment is conducted when more information about the event becomes available and follows a similar format nationally after finalization by the experts.

a) **Rapid Risk Assessment:** This will be conducted by the RRT as soon as the event is verified. This involves identifying the nature of the event, collecting relevant data, and analyzing the potential impact to prioritize response measures. It includes evaluating the severity, spread, and population vulnerability, reviewing current public health interventions and resources, and communicating findings with stakeholders to ensure coordinated responses. Based on the information gathered, a

risk assessment template will be used to guide further interventions such as deploying additional human resources or technical support from the district, provincial and federal levels.

b) **Detailed Risk Assessment:** This will be conducted at the national or provincial level in coordination with local level. It builds upon data from the rapid risk assessment and additional information available from the different sources to thoroughly identify, evaluate, and prioritize potential hazards or threats to health, safety, or the environment. The mechanism for joint risk assessment will be used wherever applicable. It begins with hazard identification to determine potential sources of harm, followed by risk analysis to assess the likelihood and impact of each hazard, considering factors such as exposure levels and population vulnerability. Next, risks are compared against predefined criteria to determine their significance and priority. Based on this assessment, risk control measures are developed and implemented to mitigate or manage the identified risks. Finally, continuous monitoring and review will be done to ensure the effectiveness of these measures and allow for adjustments based on new information or changing conditions. A standard operating procedure shall be developed and implemented for uniformity in the risk assessment of public health events in Nepal.

Response System

Once signals are captured through indicator and event-based surveillance, verification and response activities begin. The complementarity of alert and response systems is illustrated in Figure 3. While this framework does not delve into specific details, cross-sectoral considerations, including surveillance data from animal, food, and environmental health sectors (based on the One Health strategy), are critical, particularly for joint response efforts when needed.

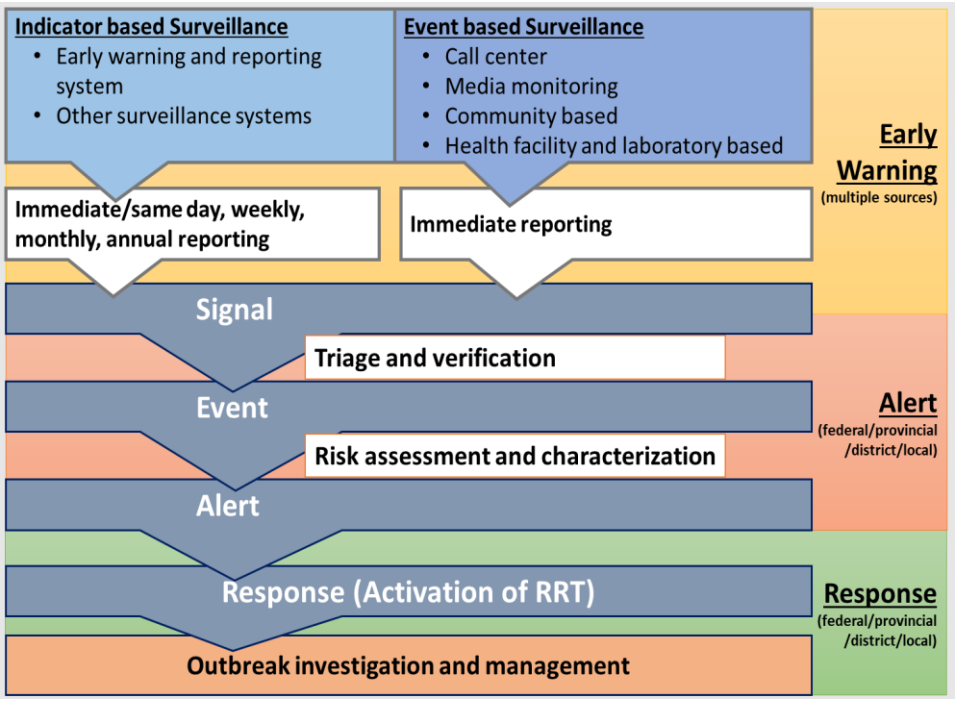

Figure 3: Functions of Alert and Response System

Outbreak Investigation

Once a public health event has been confirmed, the public health system responds using established protocols for investigation and response. Rapid Response Committees (RRCs) are responsible for making timely decisions to save lives during outbreaks and public health emergencies. They decide whether to start, adjust or scale response activities based on available information. RRTs, including graduates of the Field Epidemiology Training Program (FETP), are responsible for investigation and response at their respective levels (federal, provincial, district, or local) and request higher-level support as needed. Case investigations include specimen collection, transport, referral and laboratory diagnostics based on the events and available laboratory facilities as outlined in the Sample transportation guideline.

The steps involved in an outbreak response are as follows:

i. Prepare for fieldwork
ii. Establish the existence of an outbreak
iii. Verify the diagnosis
iv. Construct a working case definition
v. Find cases systematically and record information
vi. Perform descriptive epidemiology
vii. Develop hypotheses
viii. Evaluate hypotheses epidemiologically
ix. As necessary, reconsider, refine, and re-evaluate hypotheses
x. Compare and reconcile with laboratory and/or environmental studies
xi. Implement control and prevention measures
xii. Initiate or maintain surveillance
xiii. Communicate findings

Designated Units

The Rapid Response Committees and teams are the designated units responsible for responding to public health events at their respective administrative levels. Details roles and responsibilities of RRTs are outlined in the Rapid Response Teams and Emergency Medical Team Deployment Guideline 2079 B.S. The visual representation of the RRCs and RRTs at different administrative levels is shown in Figure 4.

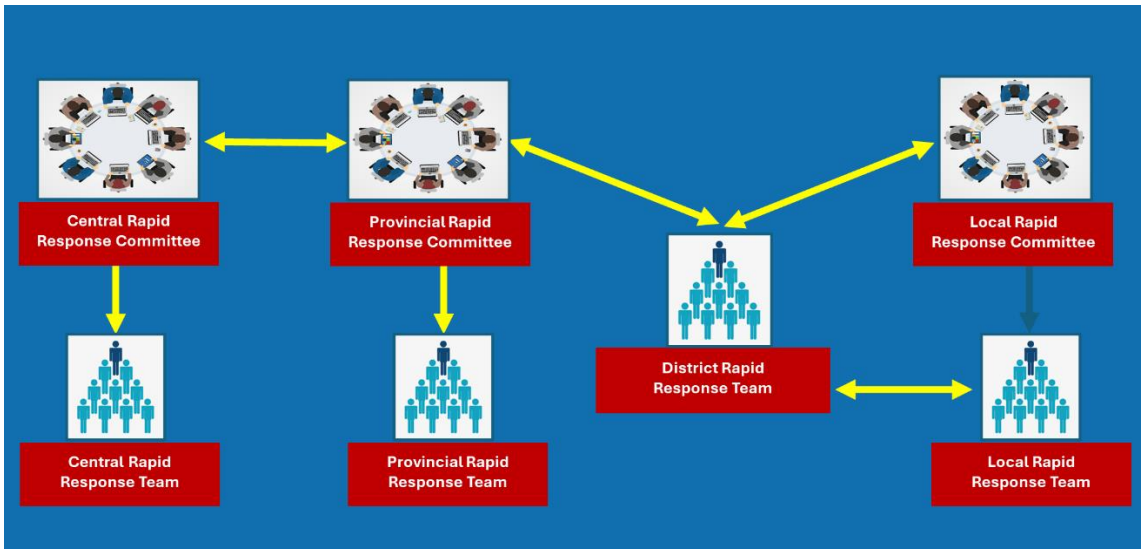

Figure 4: Rapid Response committees and teams as per administrative level in Nepal

Note: Response may be initiated based on initial risk assessment.

The RRTs at the appropriate administrative level follow up on the events and adjust response efforts as necessary.

Information management

The flow of information for signal generation, alert, and response is depicted in Figure 5 below. The framework integrates indicator-based and event-based surveillance, where information flows through various levels of public health administration for appropriate action. Signals detected at peripheral health facilities are immediately reported to the national electronic system and distributed to relevant authorities based on jurisdiction. Local authorities verify and provide additional details into the system, while district and provincial authorities receive reports from larger health facilities such as hospitals, which often require triaging and verification. Events detected at the district or provincial levels are assessed for the level of risk and may require consultation with higher administrative levels.

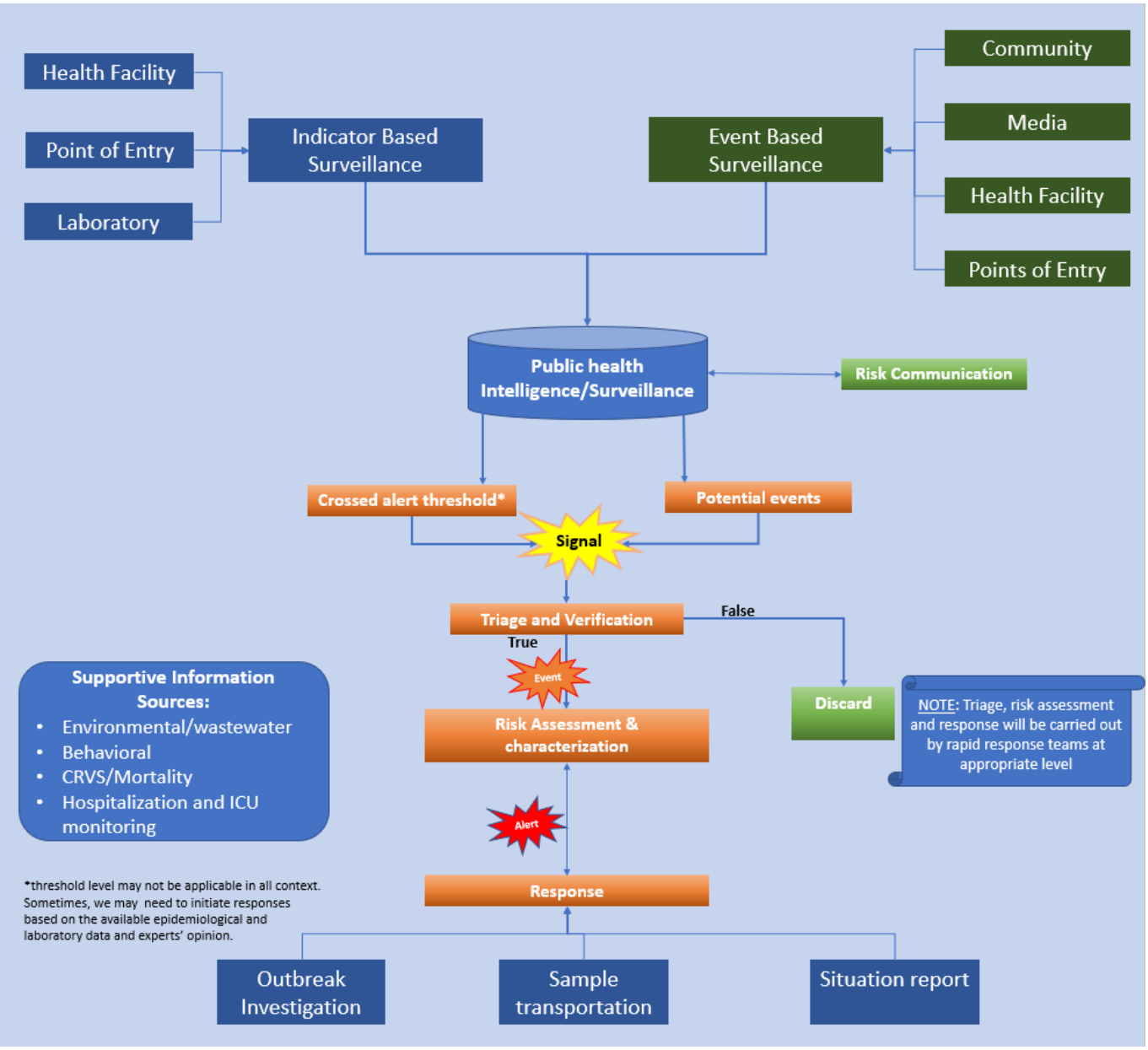

Figure 5: Flow of management of signals, alert and response

Similarly, higher administrative levels provide routine feedback to lower levels, like provincial or district health authorities, regarding reported events. Provincial and district-level authorities provide feedback on signals to local health authorities and large health facilities, respectively. The local public health authorities provide constructive feedback on the reported signals to the communities. The feedback is provided through different modalities to the lower levels, such as:

- Specific feedback shall be provided on the reports submitted by the rapid response teams at the immediate higher administrative level as early as possible, ideally within a month.
- Incorporation of the feedback section on the weekly/monthly bulletins released at the national or provincial level with detailed information to ensure proper and timely documentation.
- Biannual meetings or meetings as required are conducted at the national and provincial levels, while local-level meetings are held regularly as per the RRT guideline in Nepal. In such meetings, specific feedback shall be provided for the surveillance and response activities.
- Specific feedback in the intra-action or after-action reviews of the outbreaks or epidemics, wherever applicable.

Timely and routine feedback helps to encourage informants and maintain consistent implementation of public health activities across the country.

Risk Communication and Community Engagement

Risk communication focuses on disseminating clear, accurate, and timely information to the public, stakeholders, and decision-makers. It emphasizes providing understandable messages about the nature of the risk, its potential impact, and recommended actions while maintaining transparency about what is known and what remains uncertain. Risk communication actions will be continuously derived from the information and events gathered from the surveillance systems, additional information, and ongoing actions toward the public health event. The risk communication messages will be developed and disseminated using the digital platform to the healthcare workers.

Monitoring & Evaluation Mechanism

7-1-7: Timeliness metrics for outbreaks

For the early detection and rapid response of any outbreaks, epidemics, or pandemics, the 7-1-7 global target is applied for all the events for accountability, continuous learning and improvement whereby every suspected outbreak is identified within 7 days of emergence, reported to public health authorities within 1 day, and response initiated within 7 days of reporting as demonstrated in Figure 6.

As per the 7-1-7 target, the required capacities for suspected outbreak detection within 7 days include access to medical care and treatment, trained health workers and laboratory diagnostic capacities. For reporting within a day, provision of clear reporting structures, data systems, and training for reporting

from clinical and laboratory facilities to ensure alerts are communicated promptly to the concerned health authorities to initiate investigation and response. Further, response initiation, epidemiological investigation and laboratory confirmation, medical treatment, application countermeasures with communication and community engagement, and response coordination are required for effective response measures within 7 days of reporting.

This target is applied to assess and improve the performance of the alert and response framework at the national and provincial levels and promote equity in detection and context-appropriate response capabilities at the provincial and local levels.

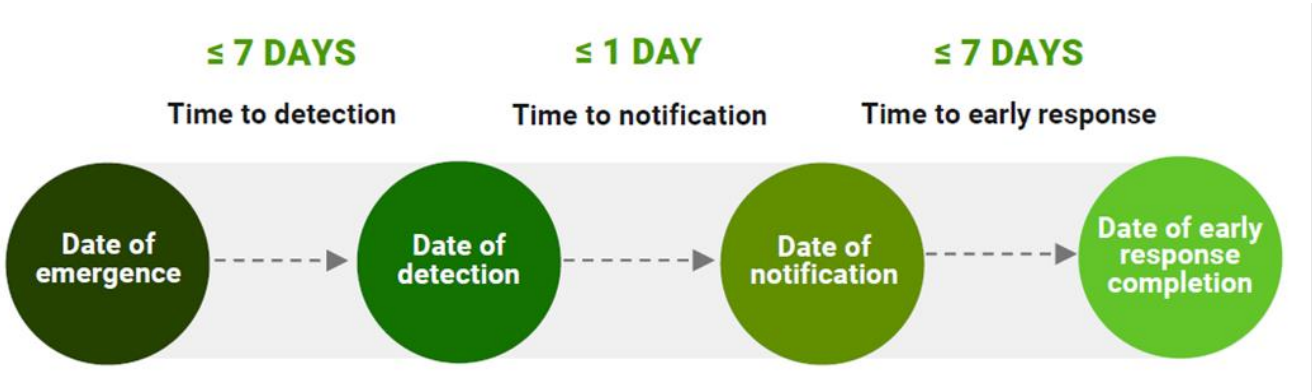

Figure 6: 7-1-7 Timeliness metrics for outbreaks, epidemics and pandemics

Table 4: Definitions of key milestones for 7-1-7 timeliness metrics

Milestones	Definition
Date of emergence	For endemic diseases: this is the date on which a predetermined increase in case incidence over baseline rates occurred. For non-endemic diseases: this is the date on which the index case or first epidemiologically linked case first had symptoms. For other public health events: this is the date on which the threat first met the criteria for a reportable event, based on the country's reporting standards.
Date of detection	The date the event is first recorded by any source or in any system.
Date of notification	The date the event is first reported to a public health authority responsible for taking action.
Date early response is initiated	The date on which the first of the seven early response actions occurred.
Date early response completed	The date on which all applicable early response actions were completed.

In addition to the timeliness, the bottlenecks and enablers of the outbreak response should be discussed, and appropriate actions should be identified for immediate and long-term actions. The major steps in finding the overall performance of the health system for the response of any outbreaks is shown in Annexes 5.A & 5.B, along with an example from response in Uganda to Sudan virus disease (Annex 5.C).

Next Steps

Collaboration

When implementing this framework, public health authorities at local, district, provincial, and federal level should prioritize collaboration with other programs, sectors, and entities. This collaboration can occur across four key dimensions:

- **Collaboration across disease and surveillance systems:** Various existing surveillance systems provide unique insights into diseases, threats, risks, and contexts. For specific hazards, multi-source surveillance supports data triangulation, while for multiple hazards, developing shared systems and approaches enhances decision-making.
- **Collaboration across sectors:** Strong collaboration among one health partners and various sectors including education, tourism, industry, technology, economics, public and private entities, security, academia, NGOs and civil society organizations is essential to safeguard public health security and ensure timely reach to affected populations.
- **Collaboration across emergency cycles**: The collaboration should continue at all the phases of emergency cycles: prevent, prepare, response and recovery phases. Sustained collaboration during both routine and emergency situations creates lasting benefits and strengthens overall emergency management capacity.
- **Collaboration across geographic levels:** As outlined earlier, Nepal's federal structure and geographic diversity require collaboration across federal, provincial, and local levels in routine and emergency phases. With surveillance structures and RRTs at each level, close coordination is essential for early detection and response, enhancing and strengthening national health security.

Collaboration across these dimensions should be grounded in the principles of equity, inclusivity and coherence throughout the planning and implementation process. The surveillance approaches as described in this framework are coordinated and flexible in the context of Nepal to meet the surveillance and response needs of the country. The effective implementation of surveillance activities in close collaboration with the relevant stakeholders strengthens preparedness, prevention, detection and response capacitates to enhance national, regional and global public health security.

Informed Decision Making

Broad collaboration across the surveillance systems, sectors, emergency cycles and geographical levels as envisioned under the alert and response framework enables the public health authorities to make informed decisions. Multi-sectoral collaboration is critical for improving detection, assessment and response to public health events. Collaboration and data sharing across the one-health sectors, education, forestry, tourism, industry and technology and other fields and expertise can help to contextualize and improve the quality of decisions.

Integrating technology into collaboration enhances data collection, visualization, access and sharing across sectors with the development, adaptation and implementation of advanced surveillance tools and methods. Collaboration between public and private sector entities, security sector entities, academia, non-governmental organizations, and civil society organizations to ensure that all affected populations are reached through surveillance approaches built upon best practices while continuing to develop, test, and operationalize innovations.

In addition to event detection and disease monitoring, health service monitoring provides information on local capacities to mitigate morbidity and mortality from barriers to accessing clinical services during emergencies and individual risk factors. It also captures data on the direct and indirect (or collateral) effects on human health, caseloads, antimicrobial consumptions, areas of potentially heightened risk, positioning and allocation of medical countermeasures, and the impact of control measures.

Currently, these data are collected across the sectors but is not consistently accessible to decision-makers. For better decision-making, these systems must be interconnected with public health response mechanisms and flexible enough to adapt to all types of emergencies. The interconnected system for surveillance enables better decision-making and contributes to robust public health surveillance and response systems with One Health Approach and multisectoral collaboration.

The effective implementation of this framework, supported by multisectoral collaboration and informed decision-making, will significantly enhance the ability to respond to public health emergencies. By integrating data and expertise from diverse sectors, we can build a more resilient public health system, better equipped to tackle current and future health threats, ultimately improving health security at national, regional, and global levels.

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