Considerations for surveillance, monitoring and investigations during an influenza pandemic

DRAFT FOR PUBLIC CONSULTATION

World Health Organization

Contents

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Abbreviations

ARI	acute respiratory infection
COVID-19	coronavirus disease 2019
FFX	first few X
GISRS	Global Influenza Surveillance and Response System
HHTI	household transmission investigations
ICU	intensive care unit
ILI	influenza-like illness
IHR	International Health Regulations (2005), as amended through resolutions WHA67.13 (2014), WHA75.12 (2022), and WHA77.17 (2024)
NNDS	nationally notifiable diseases and conditions surveillance
PHEIC	public health emergency of international concern
PHSM	public health and social measure(s)
PISA	Pandemic influenza severity assessment
PRET	Preparedness and resilience for emerging threats
RRA	rapid risk assessment
SARI	severe acute respiratory infection
SARS-CoV-2	severe acute respiratory syndrome coronavirus 2
WHO	World Health Organization
WHO CC	WHO Collaborating Centre

Executive summary

This document provides guidance for countries on surveillance, monitoring and investigations during an influenza pandemic. It outlines the key considerations for detecting, monitoring and responding to pandemic influenza, aiming to strengthen preparedness at national, regional and global levels.

It underscores the role of existing influenza surveillance systems as the foundation of pandemic response, advocating for the use and enhancement of familiar, trusted approaches. The guidance calls for coordinated, standardized surveillance and investigations to inform decision-making and risk assessments, with timely communication to national leadership. Early severity and impact assessments should be refined as new data emerge. Lessons from the COVID-19 pandemic are also integrated.

Priority surveillance objectives before and during an influenza pandemic that each country should ideally address fall into three key domains and are detailed in **Chapters 2 and 3**:

A. early detection and assessment
B. monitoring epidemiological, clinical and virological characteristics and healthcare capacity
C. informing the use of public health interventions.

This document outlines key pandemic surveillance approaches aligned with these priority objectives with a focus on when a pandemic influenza virus is transmitting widely in communities. As surveillance objectives may evolve throughout a pandemic, regular monitoring and evaluation are essential to ensure approaches and data quality remain fit for purpose. Adjustments may involve scaling up or down based on the current context.

This document stresses the importance of strong governance, sustainable financing, a skilled and flexible workforce, and the strategic use of digital technologies to support effective surveillance and investigations. Ultimately, it aims to help countries build resilient, adaptable surveillance systems that deliver timely, actionable data to protect public health and mitigate the impact of the pandemic.

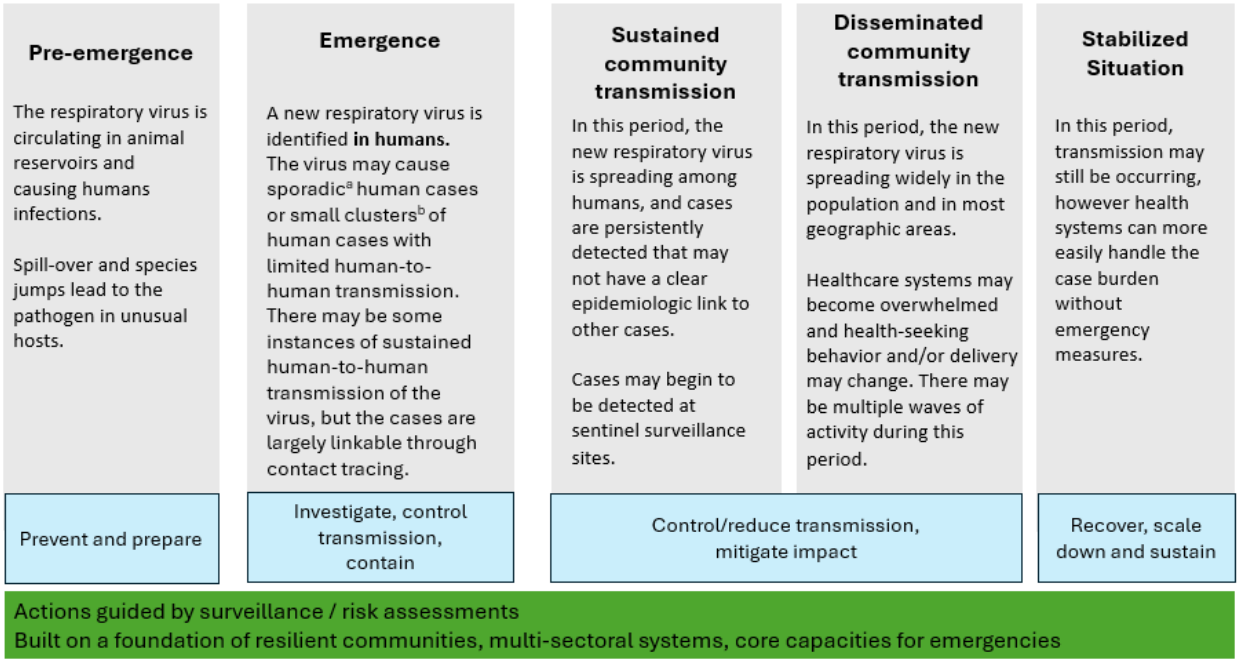
1. Introduction

1.1 Pandemic periods

Fig. 1 outlines global pandemic periods aligned with the Preparedness and resilience for emerging threats (PRET) framework for respiratory pathogen pandemic planning *(1)*. These periods may occur at different times and with varying severity across countries, depending on factors such as when and where the virus emerges or is first introduced (e.g. through accidental release), public health and social measures (PHSM), vaccine and antiviral availability and effectiveness and population characteristics.

Countries should tailor surveillance and investigations to their specific context, resources and evolving objectives throughout the pandemic.

Fig. 1: Global pandemic periods for respiratory pathogens



[a]: Sporadic cases of disease are those separated in time and/or place, as differentiated from endemic or epidemic, or pandemic.

[b]: A cluster is defined as two or more persons with onset of symptoms within the same 14-day period and who are associated with a specific setting, such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks or recreational camp.

1.2 Key considerations for surveillance during an influenza pandemic

An influenza pandemic happens when an influenza virus emerges that infects humans and transmits efficiently between them, and for which there is limited prior immunity in the population. Epidemiologic and virologic data need to be gathered throughout an influenza pandemic to enable public health authorities and policy makers to make evidence-informed decisions to protect their communities.

Surveillance objectives will evolve over time during a pandemic. Countries should be prepared to adapt accordingly. No single surveillance approach can address all surveillance objectives during a pandemic. Countries should use, leverage or enhance existing surveillance approaches to meet surveillance needs, and improve sustainability and efficiency. Surveillance data should inform risk assessments and public health decisions, creating a continuous feedback loop to refine surveillance objectives and approaches *(2)*.

During a pandemic, the **priority surveillance objectives** that each country should ideally address evolve over the course of the pandemic and fall into three domains:

A. detection and assessment
B. monitoring epidemiological, clinical and virological characteristics and healthcare capacity
C. informing the use of public health interventions.

The types and sources of information needed for decision-making will evolve throughout a pandemic, depending on the context, objectives and key questions at each stage. This document outlines how surveillance objectives may shift over time and which surveillance approaches are most relevant during different pandemic periods (see **Fig. 1**). No single surveillance approach can address all public health questions. An adaptable mix of surveillance approaches, investigations and specialized studies is essential to meet changing needs.

The most resilient strategy is to build on existing surveillance approaches used for epidemic respiratory viruses. Maintaining and using these existing approaches, when possible, ensures countries are always prepared to monitor influenza pandemics. However, countries must regularly assess whether current surveillance approaches deliver timely, relevant information to meet specific, intended objectives. If not, then they should quickly identify gaps and adapt, sometimes creatively, to ensure surveillance remains fit for purpose. This guidance provides examples of how surveillance approaches may be adjusted during a pandemic.

Ideally, all countries should have national capacity for priority surveillance approaches aligned with their objectives. Where this is not possible, collaboration with regional partners is essential. In some cases, countries may also rely on additional sources of information from others to meet national surveillance objectives.

1.3 Background and Context

Two respiratory virus pandemics in the 21st century have highlighted the serious health, social and economic risks posed by respiratory pathogens. As of this guidance's publication, avian influenza A(H5N1) viruses continue to diversify genetically and spread geographically, infecting a wider range of wild birds and mammals and increasing human exposure, which underscores the need for coordinated global preparedness *(3)*.

WHO has issued guidance on strengthening influenza and other respiratory virus surveillance during the interpandemic period. The Mosaic framework for resilient surveillance for respiratory viruses of epidemic and pandemic potential *(2)*, organizes surveillance systems, investigations and studies by the public health objectives they best address. It serves as a respiratory use case for implementing collaborative surveillance within the Health Emergency Prevention, Preparedness and Response (HEPR) architecture *(4)* in response to growing epidemic and pandemic threats.

Surveillance and investigations must detect human infections with influenza viruses with pandemic potential, rapidly assess whether sustained human-to-human transmission has occurred, detect further cases, monitor community transmission and impact, understand changes in transmission and clinical severity, and guide the use of interventions such as antivirals, vaccines, and public health and social measures.

While the Mosaic framework *(2)* guides countries in strengthening respiratory virus surveillance in the interpandemic period, by linking surveillance objectives with surveillance approaches, this document applies a similar method to support planning and enhancement of national surveillance during an influenza pandemic. The enabling factors for surveillance during a pandemic largely mirror those outlined for routine surveillance, as detailed in the Mosaic framework.

This document updates WHO's 2017 pandemic surveillance guidance *(5),* has been developed for use by countries as part of influenza pandemic preparedness *(6)* and aligns with published WHO guidance on Pandemic Influenza Risk Management *(7)* and PRET module 1: planning for respiratory pathogen pandemics *(8)*.

Key updates include:

- revised surveillance objectives for different pandemic periods
- recommended surveillance approaches to meet those objectives
- data collection priorities during an influenza pandemic
- emphasis on national risk assessments to guide responses.

1.4 Scope and purpose

This guidance focuses on surveillance, monitoring and investigations during an influenza pandemic, though most of it is adaptable to other respiratory viruses of pandemic potential. It is intended for both preparedness and response, from the early stages of an outbreak to community transmission. However, while surveillance objectives and approaches for the emergence period is covered, the primary focus is on community transmission.

Its purpose is to help countries strengthen surveillance capacities, plan and implement timely investigations and surveillance activities across different pandemic periods, and foster cross-sector collaboration to detect, assess and respond to pandemic threats effectively.

1.5 Target audience

This document is intended for national disease control programmes, policy makers, public health professionals, Global Influenza Surveillance and Response System (GISRS) partners, national public

health laboratories and other stakeholders engaged in multi-pathogen respiratory disease and laboratory surveillance. It is also intended for use by public health professionals and policy makers at the national, regional and global levels who are responsible for pandemic preparedness and response.

1.6 How to use this guidance

1) Prepare surveillance for an influenza pandemic

- Review national priority surveillance objectives during the different periods before and during a pandemic and the approaches that best meet those objectives (**Chapters 2** and **3**).
- Determine which national/regional surveillance approaches the country would prioritize and use during different periods of an influenza pandemic (**Chapter 3**).
- Consider how to monitor influenza when healthcare demand changes during an influenza pandemic (**Chapter 4**).
- Understand how data from surveillance and investigations inform epidemiologic risk and severity assessments (**Chapter 5**).
- Consider the population-level information, metadata, and other contextual information that is important during an influenza pandemic (**Chapter 6**).
- Understand and plan for the data or other information that may be shared with WHO for evidence-informed recommendations and action during a pandemic (**Chapter 7**).

2) During an influenza pandemic

- This document can be used as a reference guide to help public health officers examine surveillance objectives, consider if they've missed any key surveillance objectives and ensure the approaches being used meet those objectives effectively.

1.7 Methods

This guidance was drafted with input from an informal working group, convened in October 2023, and refined via a WHO virtual consultation held on 12-13 November 2024 *(9)*. Discussions focused on these questions below.

- What are the public health questions which need to be answered in each period of a pandemic?
- What investigations and surveillance are best suited to answer these questions?
- How can data from investigations and surveillance be used to support policy-making?
- During an influenza pandemic, which activities should be scaled up or down?
- What data from investigations and surveillance may reasonably be expected to be shared with WHO?

Participants of the virtual consultation reviewed the draft document's proposed surveillance approaches during different periods of a pandemic, offering feedback to support adoption and integration in

national pandemic planning and system strengthening efforts. The WHO secretariat revised the document based on the consultation outcomes and an additional round of peer review.

2. Surveillance before an influenza pandemic

2.1 Pre-emergence

During this period, influenza viruses with pandemic potential may circulate among animals but have not yet infected humans (**Fig. 1**). Surveillance efforts focus on early detection and monitoring for situational awareness, as outlined in the Mosaic framework *(2)*. Countries pursue multiple surveillance objectives using a combination of approaches, as no single surveillance approach can meet all needs. These approaches should be tailored to specific objectives and used in combination to monitor seasonal influenza, detect zoonotic infections and assess pandemic risk.

A collaborative, One Health approach to surveillance is needed to identify when humans could be at risk of zoonotic influenza A virus infections, detect and respond to human cases when they occur, and to prevent and control the spread of influenza A viruses in animals. Information gathered from animal health surveillance on the circulation of influenza A viruses in animals can inform the risk assessment and targeted surveillance of human populations and guide appropriate measures *(10)*.

Core recommended surveillance approaches to address **early detection and assessment objectives** during pre-pandemic periods include but are not limited to:

- event-based surveillance
- nationally notifiable diseases and conditions surveillance (NNDS)
- virologic surveillance via laboratory networks
- investigations and studies in humans and animals (e.g., outbreak investigations).

Core recommended surveillance approaches to address **monitoring objectives** during pre-pandemic periods include but are not limited to:

- sentinel influenza-like illness (ILI)/acute respiratory infection (ARI)/severe acute respiratory infection (SARI) surveillance
- nationally notifiable diseases and conditions surveillance (NNDS)
- virologic surveillance via laboratory networks
- targeted special population surveillance
- healthcare capacity monitoring.

Surveillance approaches used during the interpandemic period should form the foundation of pandemic surveillance. By designing pandemic surveillance plans that enhance and leverage existing approaches, countries can routinely test and refine their preparedness during influenza epidemics.

During the interpandemic period, countries can strengthen preparedness by periodically assessing and refining their existing respiratory virus surveillance approaches. This includes:

- revisiting priority surveillance objectives
- identifying which surveillance approaches collectively support those objectives
- strengthening surveillance approaches through routine use and periodic evaluation *(2, 11, 12)*.

2.2 Emergence

During this period, an influenza virus that is not circulating widely in the human population is identified in one or more individuals, potentially causing sporadic[1] human cases or small clusters[2] of human cases with limited human-to-human transmission (**Fig. 1**). While some instances of sustained human-to-human transmission may occur, cases are generally linkable through contact tracing.

Timely investigation, jointly with animal health partners, and monitoring of cases and clusters are essential to interrupt transmission and assess pandemic risk *(13)*. WHO has developed template Unity Studies protocols to support rapid investigation of novel influenza cases and better understand transmission dynamics *(14, 15)*.

Approaches from the Mosaic framework *(2)* for early detection and rapid assessment of transmissibility and severity remain critical and should be implemented by all countries during this period. Additional surveillance and study objectives, such as assessing pre-existing immunity, may be addressed with further resources (see **Chapter 3, section 3.1D**). Enhanced clinical surveillance may be useful for defining and understanding the natural history, epidemiology, severity and risk factors for infection, transmission, severe disease and death.

2.2.1 First emergence of an influenza virus with pandemic potential: sporadic cases and small clusters

When an influenza virus with pandemic potential infects humans, even in sporadic cases or small clusters, immediate action is essential.

- **Case management:** Suspected cases should be reported to health authorities and managed with appropriate clinical care, including testing, triage, clinical assessment, isolation and treatment.

[1] Sporadic cases of disease are those separated in time and/or place, as differentiated from endemic or epidemic, or pandemic.

[2] A cluster is defined as two or more persons with onset of symptoms within the same 14-day period and who are associated with a specific setting, such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks or recreational camp.

- **Public health response:** Upon confirmation, initiate surveillance, case investigation *(13, 16)*, and contact tracing *(17)* to learn more about infection, clinical severity and transmission dynamics.
- **Risk assessment and surveillance:** National risk assessments should guide surveillance priorities. Affected countries should enhance local surveillance in the community and health facilities and consider targeted retrospective assessments to better understand the extent of the outbreak and characteristics.
- **Surveillance enhancements:** This may include collecting more information and different types of specimens from each case and increasing the number of patients subject to specimen or data collection.
- **Retrospective case finding:** This could include targeted investigation of unusual respiratory cases or clusters, review of clinical records for similar illnesses, interviews with local health providers, or targeted testing of available or stored specimens.
- **International reporting:** National health authorities should be familiar with the International Health Regulations (2005) (IHR) decision instrument in Annex 2 of the IHR *(18)* and communicate with the State Party's National IHR Focal Point for notification to WHO (see below on **Reporting under the IHR**). To guide countries, a minimum set of data about the individual(s) with influenza virus infection is requested. Such data should be case-based data, from which aggregated case counts and deaths can later be calculated. A minimum data set reporting form for human infection with an influenza virus with pandemic potential is available in the **Annex** of this document.

These activities should occur in addition to the routine surveillance (event-based and indicator-based surveillance) for respiratory diseases done year-round in a country.

Zoonotic influenza surveillance in humans

If the influenza virus is also infecting animals, countries should have an approach in place for assessing and monitoring the health of individuals at risk of potential exposure to infected, or presumed to be infected, animals. All individuals at risk of potential exposure to the virus should be registered and placed under close monitoring by local health authorities and have their health monitored for the duration of the known exposure period plus an additional seven days at a minimum, until otherwise informed by the transmission dynamics, and received prompt clinical care if symptomatic. This will facilitate the early detection of onward transmission, illness and timely clinical management. If a person is suspected of having an infection, the health authorities must be notified and appropriate clinical management provided *(13, 19-22)*.

Reporting under the IHR

Pursuant to Article 6 and the decision instrument contained in Annex 2 of the IHR, States Parties, through their National IHR Focal Point, shall notify WHO, within 24 hours from assessment, of any case of "*human influenza caused by a new subtype"* based on laboratory confirmed detection, as defined in WHO document "Case definitions for the four diseases requiring notification under the International

Health Regulations (2005)" *(23)*.[3] A case of "*human influenza caused by a new subtype*" intrinsically fulfil the four criteria contained in Annex 2 of the IHR and enumerated below, of an event that may constitute a public health emergency of international concern (PHEIC):

- serious public health impact
- unusual or unexpected
- significant risk of international spread
- significant risk of international travel or trade restrictions.

For events involving **suspected** cases of human influenza caused by a new subtype (e.g., in the absence of laboratory confirmation), pursuant to Article 6 of the IHR the decision of States Parties to notify WHO, within 24 hours from assessment, shall be guided by the assessment of the event according to the decision instrument contained in Annex 2 of the IHR *(18)*. To support the aforementioned assessment by States Parties, WHO has developed a toolkit including an "Initial and Immediate risk assessment (QIRA)" algorithm and a "Member State Rapid Risk Assessment (MS-RRA) Tool" *(24)*.

In accordance with IHR provisions, notifications and other event-related communications between the State Party and WHO, including in relation to requests for verification by WHO to the State Party (Articles 9 and 10 of the IHR) and follow-ups related to notified or verified events (Article 6 of the IHR) shall take place between the National IHR Focal Point, on behalf of the State Party concerned, and the WHO IHR Contact Point in the respective WHO Regional Office.

Reporting should include sufficiently accurate and detailed information about the individuals and the context, including, where possible, case definitions, laboratory results, source and type of risk, number of cases and deaths, conditions affecting the spread of the disease and health measures employed.

2.2.2 Initial sustained human-to-human transmission

[3] As per footnote of Annex 2 of the IHR, the case definition of "Human influenza caused by a new subtype" is defined in the WHO document "Case definitions for the four diseases requiring notification under the International Health Regulations (2005)", 2025: "A ***laboratory confirmed detection*** of an ***influenza A virus with the potential to cause a pandemic emergency*** in a specimen collected from a human. Evidence of illness is not required for the purpose of notification. An ***influenza A virus*** is considered to ***have the potential to cause a pandemic emergency*** if it has demonstrated the ability to infect a human and its haemagglutinin (HA) gene or protein is not from a seasonal influenza A virus currently circulating among humans. A detection is considered ***laboratory confirmed*** if it has been confirmed by positive results from molecular-based laboratory assays (e.g., polymerase chain reaction (PCR), sequencing), virus isolation, or paired acute and convalescent serologic tests. An antibody titre in a single serum without meeting other epidemiologic or laboratory criteria is insufficient to confirm a recent infection, and should be assessed by reference to valid WHO case definitions for human infections with specific influenza A virus subtypes."

Upon evidence of sustained human-to-human transmission of the new influenza virus, **all** countries, including those without human cases, should elevate alert levels and strengthen operational readiness in anticipation of the occurrence of cases in their jurisdictions. Surveillance systems should be maintained and enhanced accordingly. Clear guidance should be provided to clinicians and laboratory networks on case definitions, detection procedures, integration into national notifiable diseases surveillance, and reporting to national public health authorities.

Countries should promptly review and update pandemic plans and leverage existing surveillance approaches for detection and monitoring during the interpandemic period, including those which are identified as meeting priority objectives for the upcoming community transmission periods (**Chapter 3**). Importantly, countries should optimize their ILI/ARI/SARI sentinel surveillance systems in primary and secondary care to monitor the epidemiological and virological characteristics of circulating viruses sustainably.

Resources

- Public health resource pack for countries experiencing outbreaks of influenza in animals (WHO, 2023)
- The Tripartite Zoonoses Guide (FAO, WHO, WOAH, 2020)
- Protocol to investigate outbreaks of non-seasonal influenza (WHO, 2018)
- Zoonotic influenza A virus outbreak toolkit (WHO, 2022)
- WHO Standardized Outbreak Templates: Influenza viruses with pandemic potential (WHO, 2025)
- Investigation of Zoonotic Respiratory Infection in Humans Exposed to a Confirmed Source (CONCISE, 2013)
- Surveillance for human infections with avian influenza A(H5) viruses: objectives, case definitions, testing and reporting (WHO, 2025)
- WHO guideline on contact tracing (WHO, 2025)
- Protocols to rapidly investigate cases of non-seasonal influenza and understand transmission and infection dynamics (WHO Unity Studies):
    - First few cases, case series (in process)
    - First few cases and contacts
    - Household transmission
    - Transmission in closed settings
    - Clinical severity of infections (in process)
    - Population seroprevalence
- "Crafting the mosaic": a framework for resilient surveillance for respiratory viruses of epidemic and pandemic potential (WHO, 2023)

- Surveillance for human infections with avian influenza A(H5) viruses: objectives, case definitions, testing and reporting (WHO, 2025)
- Checklist for readiness to conduct investigations (pending)

3. Priority surveillance objectives, approaches, investigations and studies during community transmission periods of an influenza pandemic

3.1 Community transmission: summary of objectives and approaches

When cases appear to no longer be linked to specific known exposures to suspected sources, the country is experiencing community transmission. At this stage, public health authorities must gather evidence to guide response and control strategies, intervention targeting and resource allocation. This evidence directly informs the priority surveillance objectives that a country should have during community transmission periods of a pandemic.

It is with the periods of community transmission that **priority surveillance objectives**, and the surveillance approaches to meet them, shift distinctly from interpandemic to pandemic surveillance and fall into three domains:

A. detection and assessment
B. monitoring epidemiological, clinical and virological characteristics and healthcare capacity
C. informing public health interventions

Community transmission of a pandemic virus may persist for months or years, starting locally and potentially spreading nationwide. Surveillance systems must adapt to changing needs, scaling up temporarily for specific investigations and scaling back to a level that can allow sustainable, high-quality data collection. Ongoing monitoring of the situation is essential to ensure surveillance approaches remain able to address priority objectives, feasible and sustainable *(25)*. Adjustments to surveillance approaches should be based on signals of changing virus behaviour, intervention effectiveness, or epidemiological patterns (**Chapter 4**).

The following sections outline the priority and additional surveillance objectives and approaches during community transmission, with further details on the approaches provided later in this chapter (see **sections 3.2-3.12**). Nuances in objectives and approaches are noted where they may change depending on the degree of widespread community transmission. **Tables 1-4** detail the data that can support these objectives, and the surveillance, investigation, or study approaches that can provide supporting data. Certain objectives may be achieved at the national level, with every country collecting the indicated data

and parameters (national objective) while other global objectives may be achieved and supported through data or parameters collected by only a few countries (collective objective).

These considerations are informed by lessons from past pandemics but should not be considered exhaustive given uncertainties around future respiratory pandemics.

A. Detection and assessment

During sustained community transmission, detection and assessment objectives and the surveillance approaches to meet these objectives are similar to those in the emergence or introduction period.

As community transmission becomes disseminated, it continues to be important to rapidly detect and describe outbreaks especially in high-risk settings and vulnerable populations using outbreak and transmission investigations. Enhanced clinical surveillance, with particular locations collecting detailed information on a representative subset of cases, is a priority approach to further understand the virus's natural history, epidemiology, clinical severity and risk factors for infection, transmission and severe outcomes.

B. Monitoring epidemiological, clinical and virological characteristics and healthcare capacity

This domain undergoes the most significant shift in surveillance objectives from the emergence period to community transmission. Objectives and approaches differ depending on whether community transmission is localized or disseminated.

When sustained community transmission is localized, the most valuable information for describing infection and transmission dynamics, including case counts and characteristics, can often be obtained from NNDS, universal case reporting and outbreak investigations, particularly case and transmission investigations. This information supports describing, modeling and forecasting infection burden and severity. Sentinel surveillance may be less informative initially but should be maintained for future utility later in the pandemic. As case numbers grow or the quality of data reported on individual cases declines, countries may transition away from case-based reporting of all confirmed cases to the monitoring of representative subsets of cases through sentinel systems**.**

To monitor the occurrence and epidemiology of infections and illness and virologic characteristics, NNDS, universal case reporting, sentinel ILI/ARI/SARI surveillance (where sufficient coverage) and laboratory-based surveillance are priority approaches. For monitoring severe disease and death, mortality surveillance is a priority approach.

When community transmission becomes disseminated, the focus shifts to monitoring rather than describing infection and transmission dynamics and the priority approaches shift to sentinel surveillance for ILI/ARI/SARI and outbreak and transmission investigations. Sentinel systems providing high quality

data from a representative number of sites become essential when universal surveillance is no longer sustainable. Planning for this transition should ensure continuity of sample and data collection and representativeness, accounting for changes in healthcare delivery and seeking behavior (**Chapter 4**).

Sentinel surveillance, laboratory-based surveillance and mortality surveillance remain essential for monitoring the occurrence of mild and severe disease and death while NNDS and universal case reporting could be used complementarily to track severe and fatal cases.

Monitoring healthcare capacity, through intake/admission surveys, bed occupancy, intensive care unit (ICU) capacity and staffing, for example, is a priority objective during community transmission.

C. Informing the use of public health interventions

Surveillance data and findings from case and outbreak investigations and transmission studies, severity and impact assessments as well as available behavioral and social science findings can be used to guide medical countermeasure and PHSM selection, targeting and enforcement of interventions. Once transmission is more disseminated within a population, the data can be helpful for determining when to implement, adjust, or lift PHSMs, and for monitoring intervention uptake and effectiveness in reducing transmission.

Case investigations, enhanced clinical surveillance and pharmacovigilance (e.g., adverse event and safety reporting systems) should be used or strengthened to monitor the safety and impact of medical countermeasures.

D. Additional objectives

Countries may also have **additional surveillance objectives** that could be addressed with additional resources, including assessing pre-existing immunity, monitoring illness and infections in the community (outside of health facilities), and assessing the impact and effectiveness of interventions (e.g., medical countermeasures, clinical care pathways and PHSMs).

Table 1: A. Detection and assessment surveillance objectives and associated approaches, key questions and data and parameters during community transmission.

Objective(s)	Priority surveillance or investigation/study approach for data	Complementary surveillance or investigation/study approach for data	Key questions for risk assessment	Data and epidemiologic parameters to support objectives[a]
A1. Rapidly detect and describe outbreaks	Health-facility event-based surveillance *(2)*	Targeted special population surveillance	- What are the epidemiological characteristics of the virus (by person, place and time)?	- Description of cases (national)
	Community event-based surveillance *(2)*	Media event-based surveillance		
	Laboratory- based surveillance (chapter 3.7)	Syndromic surveillance *(2)*		
	Notifiable disease surveillance (chapter 3.2)	Sentinel surveillance for ILI/ARI/SARI (where there's sufficient coverage) (chapter 3.6)		
		Wastewater surveillance (chapter 4.4)		
A2. Further understand the natural history, clinical severity and risk factors for infection, transmission, and severe disease/death	Outbreak and transmission investigations (chapter 3.4)		- What are the primary signs and symptoms of infection? - What proportion of cases have specific signs and symptoms? - Are the syndromic case definitions used by sentinel surveillance sensitive and specific enough?	- Description of natural history, epidemiology, clinical severity, attack rates, and transmission, by case characteristics and exposures (collective)

	Enhanced clinical surveillance (chapter 3.5)	- What proportion of cases are hospitalized? - What proportion of hospitalized patients are admitted to ICU or require oxygen support? - How long are hospitalized patients staying in the health facility or ICU? - How long are cases symptomatic? - How long are cases infectious for? - Are asymptomatic or presymptomatic cases infectious? - What factors put people at risk of getting infected? - What factors put people at risk of severe disease or dying? - What factors make people more likely to transmit to others?	- Case-fatality ratio (national) - Case-hospitalization ratio (collective)

[a]: Data should be captured in a stratified way to allow exploration of differences by characteristics of person, place, and time, where possible.

Table 2. B. Monitoring epidemiological, clinical and virological characteristics and healthcare capacity surveillance objectives and associated approaches, key questions and data and parameters during community transmission.

Pandemic period	Objective(s)	Priority surveillance or investigation/study approach	Complementary surveillance or investigation/study approach	Key questions for risk assessment	Data and epidemiologic parameters to support objectives[a]
Sustained community transmission	B1. Describe and forecast infection and transmission dynamics	Outbreak and transmission investigations, specifically case and transmission investigations (e.g. HHTI, closed settings studies) (chapter 3.4) Notifiable disease surveillance (chapter 3.2) Universal case reporting (chapter 3.2)		- When are cases most infectious? - What is the generation interval[b]? - What is the serial interval[c] between cases? - What is the secondary attack rate? - What is the probability that a susceptible person will be infected in a household, among close contacts, or in the community? - Are infection and transmission dynamics changing over time? - Are there differences in transmission dynamics by age or in different populations?	- Number of confirmed cases (national) - Community attack rates (national) - Effective reproductive number (national) - Incubation period (collective) - Secondary attack rates (collective) - Proportion of cases asymptomatic (collective) - Serial intervals (collective)
Disseminated community transmission	B1. Monitor infection and transmission dynamics	Outbreak and transmission investigations, specifically case and transmission investigations (e.g. HHTI, closed settings studies) (chapter 3.4) Sentinel surveillance for ILI/ARI/SARI (chapter 3.6)	Notifiable disease surveillance/universal case reporting for *severe/fatal cases* (chapter 3.2)		
Sustained community transmission	B2. Understand and monitor virologic characteristics over time	Laboratory-based surveillance (chapter 3.7)	Laboratory-based surveillance (genomic surveillance) (chapter 3.7)	-How has the virus evolved antigenically and genetically since its emergence? -What are the antigenic characteristics of the virus? -What are the genetic characteristics of the virus? -Is the virus antigenically similar to existing vaccine viruses? -Is the virus susceptible to current influenza antivirals?	-Antigenic characterization (collective) -Genetic characterization (national) -Antiviral susceptibility (collective)
Disseminated community transmission	B2. Monitor virologic characteristics over time				

Disseminated community transmission	B2. Monitor virologic characteristics over time				
Sustained community transmission	B3. Monitor the occurrence of mild illness, severe disease and death in the population	Sentinel surveillance for mild illness in outpatients (e.g., syndromic ILI/ARI or diagnosed influenza) with integration of laboratory testing where sufficient coverage (chapter 3.6) Sentinel surveillance for severe illness in patients (e.g., syndromic SARI or diagnosed influenza) with integration of laboratory testing where sufficient coverage Laboratory-based surveillance (chapter 3.7) Mortality surveillance (chapter 3.8) Notifiable disease surveillance/universal case reporting (chapter 3.2)	Targeted special population surveillance *(2)* Syndromic surveillance *(2)* Specialized investigations and studies (e.g., serosurveys) (chapter 3.9)	- How many cases, hospitalizations, and deaths are there? Where are cases occurring? - How many people in the population have been infected? - How many people in the population are currently infected? - What proportion of cases are hospitalized? What proportion of cases are being admitted to ICU? What proportion of cases are dying? - Who is getting ill and who is dying? - How many cases, hospitalizations, and deaths are expected in the next month(s)?	- Number of confirmed/suspected cases, hospitalizations, and deaths (national) - Case-hospitalization ratio (national) - Case-fatality ratio (national) - Virological testing and positivity - Virologic testing volume and positivity (national) - Proportion of population infected - from a sample (collective) - Excess mortality (national)
Disseminated community transmission	B3. Monitor the occurrence of mild illness, severe disease and death in the population	Sentinel surveillance for mild illness in outpatients (e.g., syndromic ILI/ARI or diagnosed influenza) with integration of laboratory testing (chapter 3.6)	Specialized investigations and studies (e.g., serosurveys) (chapter 3.9)		

		Sentinel surveillance for severe illness in patients (e.g., syndromic SARI or diagnosed influenza) with integration of laboratory testing (chapter 3.6)					
		Laboratory-based surveillance (chapter 3.7)					
		Mortality surveillance (chapter 3.8)					
		Notifiable disease surveillance/universal case reporting for *severe/fatal cases* (chapter 3.2)					
	B4. Monitor capacity and coping of health care resources	Healthcare capacity monitoring (chapter 3.12)		-	Do health facilities have enough beds to satisfy their admission criteria? - Do the facilities have enough other resources for the current admission needs? Can health facilities/healthcare systems handle the expected cases/hospitalizations/deaths to occur in the coming months?	-	Hospital bed occupancy (national) - Hospital/ICU length of stay (national) - Essential medicine supplies (e.g. medical oxygen, PPE) (national)
	B5. Monitor burden/impact on the healthcare system	Sentinel surveillance for mild illness in outpatients (syndromic e.g. ILI/ARI or diagnosed influenza) with integration of laboratory testing (chapter 3.6)	Specialized investigations and studies (e.g., population surveys) (chapter 3.9)	-	How many cases are going to outpatient clinics? - How many cases are going to hospital facilities? - How many cases are going to emergency departments/wards?	-	Outpatient consultations over time (national) - Hospital admissions over time (national) - ICU admissions over time (national)
		Sentinel surveillance for severe illness in hospitalized patients (syndromic e.g. SARI) or diagnosed influenza) with integration of laboratory testing (chapter 3.6)					

	Healthcare capacity monitoring (chapter 3.12)

[a]: Data should be captured in a stratified way to allow exploration of differences by characteristics of person, place, and time), where possible.
[b]: The generation interval is defined as the period of time from infection in a primary case to infection of a secondary case.
[c]: The serial interval is defined as the period of time from the onset of symptoms in the primary case to the onset of symptoms in a secondary case.

Table 3. C. Informing the use of public health interventions surveillance objectives and associated approaches, key questions and data and parameters during community transmission.

Objective(s)	Priority surveillance or investigation/study approach	Complementary surveillance or investigation/study approach	Key questions for risk assessment	Data and epidemiologic parameters to support objectives[a]
C1. Monitor use and safety of medical countermeasures, such as influenza antivirals and vaccines	Specialized investigations and studies (e.g., case investigations) (chapter 3.9) Enhanced clinical surveillance (chapter 3.5) Pharmacovigilance (chapter 3.10)		- How many cases (severe or mild) are being treated with influenza antivirals? - Are there adverse events from influenza antiviral treatment? - Do we have enough influenza antivirals on hand/in stockpiles to treat all cases? Do we need to prioritize treatment? - When will our stockpile of influenza antivirals run out?	- Antiviral and other medical countermeasure usage among cases (stratified by severity) (national) - Adverse event reports (national) Once vaccines become available: - Vaccine coverage (national) - Vaccine adverse event reports
C2. Monitor use of public health and social measures (PHSM) to mitigate transmission	Specialized investigations and studies to monitor PHSM (chapter 3.11), for example: o For personal protection measures (e.g. mask wearing, hand hygiene and respiratory hygiene and cough etiquette), surveys on public		Which PHSM have been implemented in the community, for example: o Mask wearing o schools and/or work measures? o Restriction on gatherings o Isolation of symptomatic individuals?	- Timely and comprehensive data on the use of PHSM: o Category o Geographical scope o Level of enforcement o Settings

	compliance/perception, social listening ○ For community measures, recording policies, including changes to policies	When was each PHSM implemented (for example, at which stage, geographical scope), and at which level of enforcement and for how long?	○ Target population ○ Date of implementation

[a]: Data should be captured in a stratified way to allow exploration of differences by characteristics of person, place, and time), where possible.

Table 4. D. Additional surveillance objectives and associated approaches, key questions and data and parameters during community transmission.

D. ADDITIONAL OBJECTIVES				
Objective(s)	**Priority surveillance or investigation/study approach**	**Complementary surveillance or investigation/study approach**	**Key questions for risk assessment**	**Data and epidemiologic parameters to support objectives[a]**
D1. Assess pre-existing immunity	Specialized investigations and studies (e.g., population serosurveys with pre-pandemic specimens) (chapter 3.9)		- Is there pre-existing immunity in the population? - If there is pre-existing immunity or cross-reactive antibodies, who in the population has pre-existing immunity? - Does the pre-existing immunity protect against infection, severe disease, or death?	- Pre-existing immunity (collective)
D2. Monitor illness and infections in the community (outside of health facilities)	Population-based specialized investigations and studies (chapter 3.9)	Participatory surveillance (chapter 3.9)	- How many people in the population have been infected? - How many people in the population are currently infected? - How many new cases of infection have occurred in the last x days/weeks?	- Community prevalence (national) - Community incidence (national)
D3. Assess impact and effectiveness of interventions (antivirals, clinical care pathways, influenza vaccines, PHSM)	Specialized investigations and studies (e.g., case-control studies leveraging sentinel surveillance, clinical studies/investigations, case		- Are influenza antivirals or vaccines effective at reducing the severity of infection? - Can influenza antivirals or vaccines prevent severe disease or death?	- Case information and use of intervention - Community use of interventions

	investigations, randomized controlled trials) (chapter 3.11)	- Can influenza antivirals or vaccines prevent transmission? - Can influenza antivirals or vaccines be used to prevent infection? - Did transmission in the community decline when one specific or a set of community measures were put in place? - Did the number of hospitalizations decline when one specific or a set of community measures were put in place?	- Outpatient consultations over time (national) - Hospital admissions over time (national) - ICU admissions over time (national)

573 [a]: Data should be captured in a stratified way to allow exploration of differences by characteristics of person, place, and time), where possible.

3.2 Nationally notifiable diseases and conditions surveillance and universal case reporting

Reporting laboratory-confirmed cases to the national level is essential for detecting and monitoring the virus during community transmission. Case definitions may be adapted nationally with WHO providing suggested case definitions suitable for global reporting.

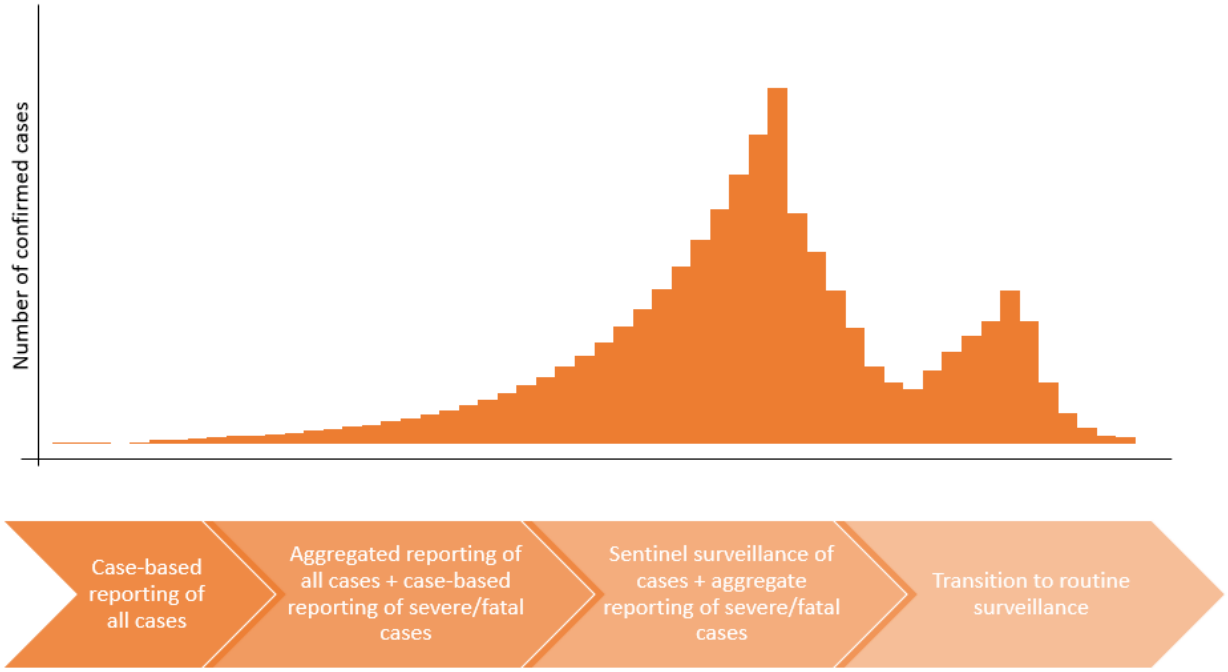
Early in the pandemic, countries could consider making any infection with the pandemic influenza virus reportable for a defined period of time via NNDS or other universal case-based reporting, capturing a minimum amount of demographic, epidemiologic and clinical (e.g., hospitalization[4] and outcome if known) information to assess severity. There is likely to be differential case ascertainment by severity with more severe cases more likely to be detected.

Countries can consider moving away from case-based reporting of all confirmed cases when there are too many cases to count, or the quality of data reported on individual cases declines. During community transmission, rapid increase in cases may overwhelm testing and reporting systems. Moving to aggregated reporting of cases may be easier for local public health staff while maintaining timely information on trends in transmission. At this time, case-based reporting should focus on hospitalized, severe or fatal cases (**Fig. 2**) This could be complemented with a sample-based approach to monitoring incidence in the community once transmission is widely disseminated.

By the time transmission is disseminated and affecting most areas in a country, even aggregated reporting on all cases may become unsustainable. Changes in testing strategies (e.g., changes to the target population for testing) may lead to changes in the number of people being tested (the denominator), affecting data quality and comparability. Other surveillance approaches, such as sentinel surveillance and shifting to aggregated reporting on severe and fatal cases, become more reliable and less resource intensive. Before scaling back case reporting, ensure other surveillance approaches (e.g., sentinel surveillance for ILI/ARI/SARI and mortality surveillance), provide sufficient and representative signals to meet monitoring objectives.

[4] In this document, 'hospital' and 'hospitalization' refer to health facilities where individuals receive acute medical care and to the admission of patients for such care.

Fig. 2: Modifications to national universal case data collection during community transmission.



3.3 Event-based surveillance

Even during community transmission, rapid detection and characterization of outbreaks remain a priority. Event-based surveillance in both community and health facility settings should continue *(26, 27)*. As transmission becomes more disseminated, these efforts may be targeted to specific high-risk settings and vulnerable populations.

3.4 Outbreak, transmission and risk factor investigations

Investigations of clusters of cases and transmission from cases to close contacts are essential for generating key epidemiologic parameters during the localized and early phases of community transmission. Investigations or studies on risk factors for infection, transmission and severe outcomes support decisions on public health and social measures, infection prevention and control, resource allocation and risk communication. These investigations may need to be repeated throughout the pandemic as the virus or its epidemiology evolves. However, not every outbreak warrants full investigation. Resources should be directed towards investigations that are likely to yield useful, generalizable information to improve control measures and fill critical knowledge gaps.

Key investigations to plan for during a pandemic include the following[5]:

- **Case and contact investigations** involve identifying confirmed cases, collecting demographic, exposure and clinical data, tracing close contacts and possibly collecting specimens. Contacts are often monitored for symptoms and tested for infection in these investigations to identify transmission events and to estimate attack rates, serial intervals, and risk factors for infection and transmission.
- **Outbreak investigations** in defined and localized populations (e.g., distinct neighborhoods, community gatherings, schools, care homes) aim to determine the number of cases occurring in the population over a period of time, describe cases by person, place and time, and estimate population-based disease rates. Cases can be detected through community reporting, comprehensive surveillance in healthcare settings accessible to the population and through surveys. These can also provide insights into risk factors for infection and may provide unbiased estimates of case severity if the population is sufficiently large.
- **Household transmission investigations** focus on households with index cases, monitoring household contacts for symptoms and testing them for infection. They help characterize household attack rates, asymptomatic infections, the probability of infection after exposure and the natural history of infection including infection-severity.
- **Closed setting transmission investigations** (e.g., in prisons, schools or events) go beyond outbreak investigations and provide detailed data on transmission dynamics (incubation period, reproduction number and serial interval), clinical spectrum of illness in secondary cases, and chains of transmission. Closed setting investigations entail identifying the initial case(s) and all people within the closed setting and collecting information (e.g., demographic, symptom and exposure information) and ideally also specimens from them. These settings are valuable for studying special populations such as children and multiple waves of infection.
- **Case-control studies of risk factors** are efficient for identifying risk factors for infection. They compare confirmed cases with uninfected controls from the same population to identify characteristics associated with infection or severe outcomes. Cases and controls could be ascertained in a variety of populations using a variety of means.

During the interpandemic period, countries should prepare for these studies by developing and testing protocols, for example, in conjunction with field epidemiology training programs, further supporting the development of a workforce that is prepared to respond during a pandemic. Given the resource intensity of these studies, regional data sharing may support national decision making with contexts are similar.

The WHO Unity Studies initiative supports countries in building capacity for rapid investigation and enhanced surveillance during a future respiratory pandemic. It provides adaptable protocol templates

[5] The above list is not intended to be comprehensive, and other studies may also be considered depending on what is known about the new virus and the resources available.

ethical guidance, reporting standards and statistical tools *(14, 15)*. A global network of Unity Studies sites ensures response readiness for rapid evaluation of novel respiratory virus threats.

3.5 Enhanced clinical surveillance with standardized data collection

Countries are encouraged to collect detailed demographic, epidemiologic and clinical data, including underlying medical conditions, treatments, respiratory interventions, clinical complications, and patient outcomes, from all or a subset of confirmed hospitalized cases. This may already be integrated into existing SARI sentinel or enhanced clinical surveillance or some other surveillance approach with detailed/enhanced case report forms. If not, countries may consider collecting additional data from cases using a standard case reporting form for a defined period.

Standardized protocols and case reporting forms are available and recommended for global comparability. Their use enables multi-country analyses and helps identify rare but serious outcomes, such as severe disease in pregnant women as seen during the influenza A(H1N1) 2009 pandemic *(28)*. The WHO Global Clinical Platform supports secure, standardized data collection and analysis across countries. It enhances the ability to monitor clinical characteristics, disease severity and progression over time and across regions, improving global understanding of emerging infectious diseases *(14-16, 29)*.

3.6 Sentinel surveillance of acute respiratory infections with integrated laboratory testing

During the interpandemic period, many countries maintain sentinel surveillance systems to routinely monitor mild and severe acute respiratory infections and respiratory virus activity. These systems use standardized case definitions (e.g. ILI/ARI and SARI), include laboratory testing, and may be part of integrated disease surveillance. Sentinel systems may allow linkage of laboratory results with clinical and demographic data, enabling analysis by age group, clinical syndrome, clinical severity or vaccination status.

Countries are encouraged to strengthen existing sentinel systems, especially those within integrated platforms, rather than establish new ones during a pandemic. Stable, well-functioning systems are essential for establishing baselines and thresholds of influenza activity, detecting unusual patterns and ensuring consistent high-quality data.

During a pandemic, sentinel ILI/ARI and SARI surveillance becomes especially valuable during community transmission, providing high quality, timely and representative data on trends, disease severity and virus characteristics and is important to maintain through the pandemic. As cases begin to be detected in sentinel syndromic surveillance, these systems help monitor transmission dynamics and epidemiology.

These systems often have historical baselines, infrastructure and efficient data collection processes that can be repurposed and scaled with fewer resources than more universal approaches. When linked with catchment areas or population denominators, they can support burden estimates.

During a pandemic, routine specimen collection from a systematic sample of ILI/ARI and SARI patients at sentinel sites is essential to confirm infection and assess the pandemic virus's contribution to overall illness. Testing should include both pandemic and seasonal viruses to evaluate co-circulation and co-infection burden.

For severe illness, sentinel surveillance should capture hospitalized cases of pandemic influenza, including those meeting the SARI case definition, or patients with confirmed infections. Additional data, such as ICU admissions and in-hospital deaths, can support:

- monitoring clinical severity
- assessing demand for resources like oxygen
- tracking healthcare utilization, which may be less biased than primary care data
- enhanced clinical surveillance or case series.

Any changes to surveillance systems during a pandemic should be planned and documented, as changes may affect data interpretation and comparability over time.

- **Changes to case definitions:** WHO recommends using the ILI case definition to monitor mild illness and the SARI case definition to monitor severe illness due to influenza *(11)*. With a new pandemic virus, countries should assess if these syndromic case definitions reflect clinical presentation, possibly through small-scale studies comparing symptoms in cases and non-cases. Broader ARI definitions may be considered, especially to capture afebrile presentations, but sites should retain ILI classification for consistency with historical data.
- **Representativeness:** Countries should evaluate whether current sentinel sites adequately monitor geographic spread and high-risk groups. Modifications may involve increasing samples sizes or temporarily adding sites for better coverage, but expansion should be balanced with feasibility and data quality. A few high-quality data sources are more valuable than many poor ones.

Chapter 4 provides further considerations for enhancing the usefulness of facility-based surveillance, including sentinel surveillance, to support surveillance objectives.

3.7 Laboratory-based surveillance

High-quality laboratory-based surveillance at national, regional and global levels is fundamental to effective disease surveillance and public health response. Tiered networks such as GISRS *(30)* enable efficient diagnostics, specimen referral, rapid reporting and virus characterization, supporting timely detection and response during both routine periods and emergencies.

Integration across sectors is essential. Public, private and clinical laboratories should be linked into surveillance networks and report notifiable diseases and unusual findings to public health authorities. Strengthening linkages between laboratory testing and clinical/epidemiological data improves virus confirmation, genetic sequencing, risk assessment and the development of diagnostics and medical countermeasures.

Laboratory-based surveillance extends beyond sentinel sites, incorporating data from routine diagnostics, outbreak investigations, and public health reporting, offering a broader view of virus circulation.

Preferred testing methods include molecular assays, particularly real-time reverse transcription polymerase chain reaction (rRT-PCR) assays, due to their high sensitivity and specificity. Rapid antigen tests are not recommended for routine virologic surveillance due to lower sensitivity and specificity compared to molecular assays, though they may assist in clinical triage when laboratory capacity is limited. Molecular testing remains the standard for surveillance.

During an influenza pandemic, WHO will issue updated guidance on the optimal use of available assays, including recommendations for detecting novel pandemic viruses and evaluate test performance.

As community transmission expands, countries should scale up virologic surveillance by testing more syndromic patients (those presenting with ILI, ARI, or SARI at sentinel sites) and accepting specimens from outside sentinel sites (analyzed separately to preserve data integrity).

Countries should also monitor clinical and surveillance practices to ensure continued specimen collection. Adjustments may include collecting additional specimens from a subset of patients for surveillance alongside clinical testing, prioritizing certain patient groups for testing, or shifting specimen collection to alternative settings like triage areas.

National Influenza Centres, as part of GISRS, play a central role by collecting, analyzing, and sharing influenza viruses and respiratory specimens with WHO Collaborating Centres (CCs). This supports virus characterization, vaccine development, antiviral susceptibility monitoring and global coordination.

3.7.1 Genetic sequencing

Genomic surveillance is essential before, during and after an influenza pandemic. It supports monitoring of antiviral susceptibility, informs candidate vaccine virus selection and ensures timely updates to pandemic vaccines, helping to reduce overall impact of the pandemic. During community transmission, sequencing all specimens may not be reasonable or feasible. Instead, countries should follow operational guidance on how many and which specimens to sequence to monitor trends and detect emerging variants. These specimens are typically drawn from routine influenza surveillance systems, but additional sources may be needed depending on specific surveillance objectives and these considerations should balance the public health priority of these objectives with available resources.

3.7.2 Surveillance for antiviral susceptibility

Virologic surveillance also supports monitoring susceptibility of influenza viruses to antivirals. Continuous tracking of antiviral resistance is critical for guiding timely decisions on the use of antivirals to reduce severity and transmission during an influenza pandemic. Countries should have plans to either monitor antiviral susceptibility themselves, using genomic sequencing or phenotypic assays or continue to submit specimens from virologic surveillance to WHO CCs through the GISRS network, for antiviral susceptibility testing.

3.8 Mortality surveillance

Monitoring mortality is essential for understanding the pandemic's severity and overall impact, guiding public health decisions *(31)*. Two complementary approaches are used: enumerating individual deaths and monitoring excess mortality. Each provides distinct insights and requires different data sources and methods.

3.8.1 Enumerating individual deaths

Initially, all deaths associated with the pandemic influenza virus should be universally reported. This informs early severity assessments and supports real-time response. However, as transmission becomes disseminated, capturing all deaths from the pandemic virus becomes increasingly challenging and deaths reported to the health sector are more likely an underestimate. Underreporting and under-ascertainment of deaths happens because of misclassification of causes (deaths may be attributed to secondary infections or conditions), limited testing capacity, and because more deaths may occur away from healthcare facilities.

Deaths outside health facilities

In settings where many deaths occur at home and are not registered, verbal autopsies can be implemented. This involves interviewing relatives or caregivers using a standardized questionnaire to determine likely causes of death. For accuracy, this process should ideally occur within one month of death and no later than one year. The information on deaths outside of health facilities should then be reported systematically to the health sector to support the monitoring of national mortality trends and help generate population-level, cause-specific mortality, critical for prioritizing and evaluating public health interventions *(32)*.

Hospital mortality monitoring

Tracking deaths among hospitalized patients with confirmed pandemic virus infection helps estimate the hospital case-fatality ratio. However, this ratio may vary across settings and can be influenced by factors such as individual susceptibility, severity on admission, access to care and availability of treatment options. Specialized studies may be needed to follow patients to the outcome of their hospitalization and analyze mortality risk factors.

3.8.2 Monitoring excess mortality

As enumeration becomes less reliable, excess mortality analysis, comparing observed deaths to historical baselines, offers a more accurate picture of the pandemic's overall impact. Routine civil registration and vital statistics systems become the most reliable source for this analysis.

3.8.3 Strengthening mortality surveillance

Countries should assess the quality and timeliness of both types of data during the interpandemic period and strengthen coordination between civil registration, health and statistics agencies. Countries with functioning and digitalized civil registration and vital statistics systems should leverage them to monitor excess mortality during the pandemic using historical baselines.

Countries with limited systems should assess and improve data quality, timeliness and representativeness. In settings with fragmented or incomplete civil registration and vital statistics systems, alternative approaches for rapid mortality surveillance may need to be implemented during a pandemic *(33, 34)*. This could include implementing mortality surveillance in sentinel or representative population clusters. Local data sources should align with national civil registration and vital statistics processes and include a minimum essential dataset for each death *(31)*. In the long term, the coverage of such partial systems should be expanded and integrated with or evolve into complete national civil registration and vital statistics systems, as the foundation for ongoing mortality surveillance activities.

3.9 Specialized investigations and studies

3.9.1 Prevalence investigations and studies

Routine surveillance often underestimates the true number of infections in a population due to several reasons: not all infected individuals seek healthcare, not all are enrolled in surveillance or tested, and asymptomatic cases are missed entirely. Estimating the total number of infections is essential for understanding clinical severity (e.g., infection-fatality and case-hospitalization ratios), informing public health response, resource procurement and allocation, and communicating the scale of the pandemic.

Prevalence investigations or studies are generally cross-sectional and aim to detect evidence of infection, regardless of symptoms and can provide insights on the proportion of infections that are asymptomatic, mild, medically attended or hospitalized. Prevalence investigations could use a variety of approaches to detect infections, including serology, testing of respiratory specimens, or the use of syndromic or clinical case definitions.

3.9.2 Methods for detecting infection

- **Serology*:*** Seroprevalence studies estimate the proportion of the population with antibodies to the pandemic virus. They also help inform understanding of the proportion of the population *(35)* who remain susceptible to infection and to refine estimates of infection severity and

transmission. Early in a pandemic, they can reflect the proportion of the population that has been infected with the pandemic virus, assuming no pre-existing immunity or cross-reactivity of antibodies to the pandemic virus and depending on availability of serological test kits (especially validated and well performing kits). However, these assumptions about pre-existing immunity and cross-reactivity should be investigated through sero-studies, ideally using pre-pandemic serum and subsequent serial surveys. Over time, interpretation becomes more complex because antibodies produced from recent infection may be indistinguishable from those produced following vaccination *(36, 37)*.

- **Respiratory specimen testing:** During the COVID-19 pandemic, a variety of prevalence studies were conducted and, while not as timely as sentinel surveillance, provided information on the extent of infection, including asymptomatic or subclinical infection *(38, 39)*. Cross-sectional studies can test a sample of the population, regardless of symptoms, to estimate the proportion of the population currently infected. These studies can be repeated over time to monitor trends in infection, including asymptomatic infection. Alternatively, cross-sectional studies could capture self-reported testing data for a given period of time, though this is influenced by test availability and behavior.
- **Cohort studies:** Community cohort studies follow individuals over time, collecting symptom data and specimens. These provide high-quality data on incidence and prevalence but are resource intensive. Community cohorts that have yielded timely and high-quality data during pandemics were typically established during an interpandemic period *(40-44)*. Cohorts of populations at higher risk of infection or severe disease have been useful in past pandemics *(42, 45, 46)*.
- **Participatory surveillance:** Individuals report symptoms and test results on a regular basis typically through an electronic survey or a mobile application. Some systems include self-swabbing for virological confirmation. This approach has proven useful in both seasonal respiratory epidemics and pandemics *(47)*.

3.9.3 Community surveys

Community surveys estimate infection incidence or prevalence, health seeking behavior and testing practices. Unlike cross-sectional studies, they may not include virological testing. They are considered a priority approach, but additional approaches may also be considered to monitor prevalence or incidence in the community (**Chapter 4**).

3.10 Adverse event and safety reporting systems (pharmacovigilance)

As vaccination and antiviral use increase during an influenza pandemic, monitoring for adverse events becomes essential. While vaccines and treatments undergo rigorous clinical testing, rare side effects may only emerge once used in larger, more diverse populations. Robust pharmacovigilance systems are critical for detecting unexpected or rare adverse events, ensuring ongoing safety of interventions and maintain public trust in vaccines and treatments. Countries should use existing reporting systems to capture safety data related to influenza vaccines and treatments throughout the pandemic.

3.11 Healthcare capacity monitoring

Routine and systematic monitoring of health care capacity and utilization are important to inform operational decisions, such as optimizing service delivery and patient referrals and guiding outbreak response strategies. These data complement other surveillance sources by providing insight into the burden of disease and the strain on health systems. Common approaches used by countries include admission and intake surveillance or surveys, hospital bed occupancy monitoring and tracking availability of essential medical supplies. Ideally, these systems are maintained during the interpandemic period and enhanced during a pandemic such as by increasing reporting frequency or expanding indicators. Indicators used during the COVID-19 pandemic may be adapted for influenza and other circulating respiratory viruses. Examples include the number (or rates per unit population) of patients with influenza/SARI/respiratory illness in hospitals, in ICUs or with oxygen support; the proportion of hospital, ICU or oxygen-supported beds occupied by such patients; or healthcare workforce absenteeism which can signal system strain *(48)*.

3.12 Monitoring the use of interventions

During an influenza pandemic, a range of interventions, including medical countermeasures (e.g., vaccines, antivirals) and PHSM (e.g., active case finding and contact identification, personal protection, social, environmental, international travel and trade measures) are implemented to reduce transmission and severe outcomes. For medical countermeasures, individual-level usage is typically tracked through vaccine registries, patient medical records, or population-based surveys *(49)*.

For PHSM, consistent and transparent documentation of policies, such as when measures are introduced, their duration and target populations, are essential for contextualizing their use and evaluating impact. Monitoring should also include individual-level adherence and uptake, which can be assessed through community surveys, PHSM effectiveness studies, or during targeted investigations *(50)*.

4. Monitoring influenza amid changing healthcare demand and delivery

During an influenza pandemic, healthcare seeking behavior and service delivery may change significantly. These changes may be driven by public health guidance, individual risk perception, or system-level constraints such as staff shortages, repurposing of personnel or increased patient load. Health and care worker absenteeism, due to illness, risk factors or reassignment, can further strain the system and reduce capacity. Such disruptions can impact the effectiveness of public health surveillance.

To maintain meaningful monitoring, facility-based surveillance systems, particularly sentinel ILI/ARI and SARI surveillance, should be adapted to reflect changes in healthcare access and utilization.

4.1 Changes to healthcare seeking behavior and delivery

During community transmission, shifts in healthcare delivery and patient behavior can significantly affect the reliability and consistency of facility-based surveillance systems. Countries should proactively monitor and adapt surveillance processes to maintain data quality and relevance.

- **Health care-seeking behavior:** Continue collecting weekly denominators for total outpatient consultations/visits and hospital admissions. These metrics allow for contextualizing trends in ILI/ARI and SARI case relative to overall patient volumes.
- **Patient flow and triage changes:** Assess whether modifications to patient flow at sentinel sites are impacting surveillance operations. Surveillance teams should coordinate closely with clinical and operational staff to ensure surveillance activities are maintained and adjusted as needed. **Clinical testing practices**: Monitor changes in testing practices at sentinel sites such as prioritizing certain patients groups or shifting specimen collection to alternative settings. Evaluate whether these changes affect specimen collection rates or introduce bias into surveillance data. Adjust procedures to ensure consistent submission of respiratory specimens to designated laboratories for virologic surveillance.

4.2 Responding to increased healthcare demand

As healthcare demand increases during a pandemic, surveillance activities may be disrupted due to overwhelmed staff and limited capacity and specimen collection. To maintain surveillance under pressure, countries could consider strategies to reduce the burden while preserving core functions.

- **Streamline data collection:** Limit the data collection to essential core elements for sentinel surveillance. This includes clinic/hospital site, date of visit or admission, patient age and sex, hospitalization status and specimen collection status.
- **Dedicated surveillance support staff:** Assign personnel specifically to support surveillance activities in health-care facilities. Maintain a registry of health and care workers who can be mobilized when needed, including health graduate students, retired professionals, or staff from clinics with reduced patient volumes.
- **Training and supervision:** Ensure all new and existing staff are trained or re-trained in surveillance protocols and infection prevention and control (IPC) measures *(51)*. Provide supportive supervision, safe working conditions, mentoring and incentives to retain staff and sustain surveillance quality.

4.3 Responding to decreases in healthcare demand decreases

A drop in healthcare demand can reduce patient volume at sentinel sites, potentially affecting the representativeness and effectiveness of surveillance. Any decline in case reports or specimens should be jointly investigated with the site to identify causes and necessary adjustments. Strategies to sustain surveillance could include the examples listed below.

- **Expand site coverage:** Add clinics or hospital facilities that manage respiratory cases and have the capacity and willingness to participate in surveillance.
- **Adapt to patient flow changes:** If triage occurs in new locations, assess feasibility of conducting surveillance (data and specimen collection) in those areas.

4.4 Dramatic changes in healthcare utilization

If healthcare utilization drops significantly (e.g., outpatient clinics stop seeing respiratory cases), facility-based surveillance (like sentinel systems) may no longer be viable. In such cases, alternative approaches are needed to monitor infections until normal healthcare patterns resume. The approaches listed below could provide complementary information.

- **Community surveys:** Cross-sectional or serial surveys can estimate illness frequency in the population and could include serologic or antigen testing to assess infection levels (**Chapter 3.9**).
- **Participatory surveillance**: Regularly self-reported symptom surveys (often digital), sometimes with self-swabbing, can track community-level trends (**Chapter 3.9**).
- **Wastewater surveillance:** In settings with capacity, testing wastewater for influenza can help monitor influenza activity, especially if the pandemic virus dominates *(52)*.

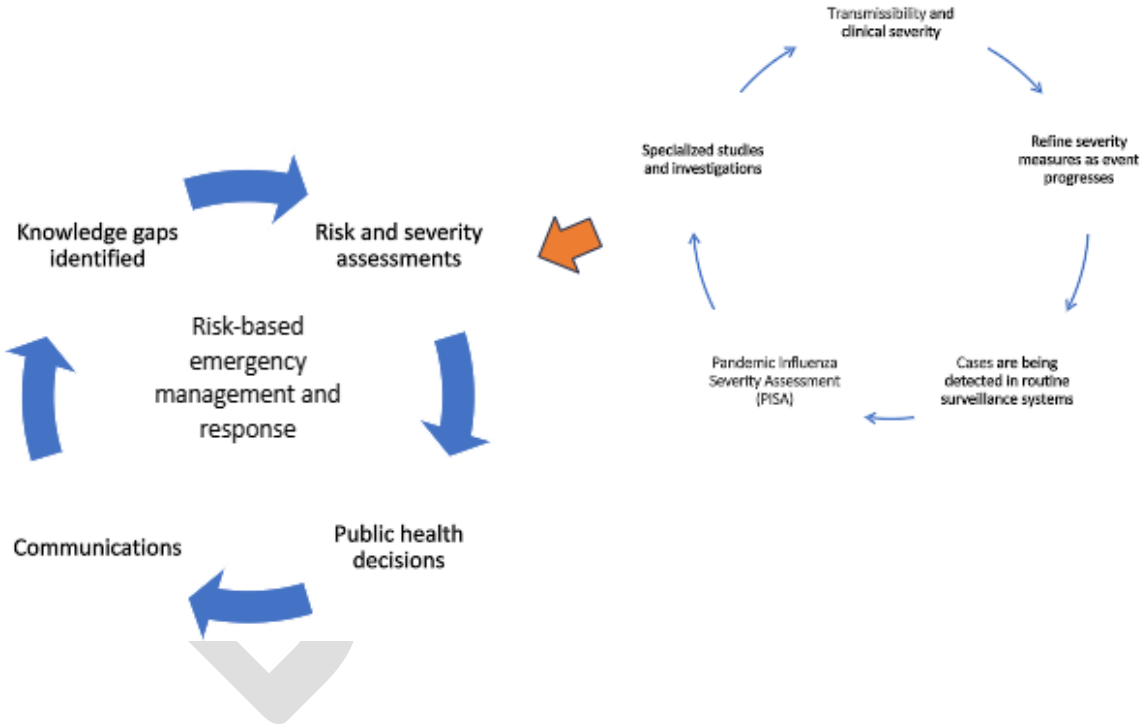
Even if outpatient care remains stable, these approaches can be helpful for describing the full burden of infection, including asymptomatic or unreported infections.

For SARI or hospital surveillance, major disruptions are less likely, but patient redirection to non-sentinel health facilities may occur. Pandemic plans should anticipate and address such shifts to preserve surveillance continuity.

5. Data from surveillance and investigations to inform epidemiologic risk and severity assessments

In a public health emergency such as a pandemic, surveillance and investigation data are critical inputs for risk-based emergency management and response. These data support timely risk assessments, guide public health decisions and shape communication strategies. As new questions emerge, ongoing surveillance and targeted investigations become essential to gather additional evidence and refine risk assessments (**Fig. 3**).

Fig. 3. The cycle of risk-based emergency management and response based on risk assessments and changing needs for evidence to inform decisions and communications.



5.1 Epidemiological parameters for risk and severity assessment

Early in a pandemic, the key public health needs are to capture the key epidemiologic parameters of transmissibility and clinical severity, to obtain respiratory specimens to confirm infection and gather information on the virus. Multiple measures of transmissibility and clinical severity could be estimated and useful for risk assessment; some examples are outlined in **Table 5**.

Specialized studies and investigations, such as investigating the first few cases and their contacts (e.g., the Unity Studies FFX protocol), outbreak investigations, or household transmission investigations, are likely to be the primary source of information on transmissibility and clinical severity and a primary source for respiratory specimens early in a pandemic.

It is important to recognize that early data on clinical severity and transmissibility are often incomplete and potentially biased. For example, initial estimates of the case-fatality ratio may be skewed because early case detection typically focuses on cases that involve travelers, hospitalization or severe cases, and there is often a time lag between infection and outcome *(53)*. Therefore, it is essential to plan for regular updates of clinical severity and transmissibility estimates as more cases occur and data become more complete. It is expected that the clinical severity, and possibly transmissibility, of a pandemic influenza virus would vary by sub-populations (e.g., by age, underlying medical conditions or other vulnerabilities); therefore, where possible, data should be stratified by relevant sub-populations.

It is helpful to put the estimates of clinical severity and transmissibility in context using historical data from the prior influenza or SARS-CoV-2 pandemics, and compilations of parameters are published to provide this context *(54)*.

Table 5. Measures of transmissibility and clinical severity that are useful for characterizing the epidemiologic risk of a pandemic influenza virus.

	Definition	Sources of data during a pandemic
Measures of transmissibility		
Secondary clinical attack rate	A measure of the frequency of new symptomatic persons among contacts in a defined period of time.[a]	FFX: case and contact investigations Outbreak investigations Household transmission investigations
Secondary infection rate	A measure of the frequency of new infections among contacts in a defined period of time.[a]	FFX: case and contact investigations Outbreak investigations Household transmission investigations

R (reproductive number)	The average number of secondary cases for each primary case	Case counts over time
Virus-specific characteristics	Presence of mutations known to be related to increased transmissibility Animal studies suggesting increased transmissibility	Laboratory characterizations of influenza virus (e.g., viral sequencing or animal studies)
Measures of clinical severity		
Case-hospitalization ratio / infection-hospitalization ratio	The proportion of cases that involved hospitalization / the proportion of cases with a laboratory confirmed infection that were hospitalized	Case line list (when patient outcomes are known and reported) or case investigations
Case-fatality ratio / infection-fatality ratio	The proportion of cases in a population that died / the proportion of cases with a laboratory confirmed infection that died	Case line list (when patient outcomes are known and reported) or case investigations
Ratio of deaths to hospitalizations	The proportion of cases that involved hospitalization that died	Case line list (when patient hospitalization status is known and reported) or case investigations
Proportion admitted to ICU	The proportion of cases that involved hospitalization that were admitted to the ICU	Case line list or rapid assessment of clinical severity

[a]: The secondary attack rate or secondary infection rates can then be further defined as first generation, second generation or cumulative to account for multiple generations of transmission.

During the period in the pandemic when there is community transmission and cases are being detected in routine surveillance systems, countries may be able to use the Pandemic influenza severity assessment (PISA) framework to qualitatively classify and monitor the intensity of community transmission, the seriousness of disease and the impact, in the context of thresholds determined from historical surveillance data *(48)*.

The PISA framework is most effectively implemented on a continuous basis using data from stable, routine reporting systems that are operational during the interpandemic period and remain functional during a pandemic. Countries that have established thresholds prior to a pandemic should continue using these pre-pandemic thresholds. Doing so provides a valuable context for interpreting pandemic data by comparing it to activity levels typically observed during seasonal influenza epidemics.

5.2 Risk assessment methodology and tools

In addition to the toolkit developed by WHO to support risk assessment by States Parties (**Chapter 2**) *(24)*, since 2016, WHO also conducts formalized WHO rapid risk assessments for acute public health events (RRA) using a standardized methodology outlined in the Rapid Risk Assessment of Acute Public Health Events manual *(55, 56)*. The WHO RRA are based on the all-hazard approach and are conducted for large scale acute events potentially exceeding the capacity of the affected country(ies) to respond, for acute events with international implications and for those requiring response and coordination support by WHO.

The outputs of WHO RRA formalize WHO's assessment of risks and reflect WHO's independent assessment including capacities and vulnerabilities to control an outbreak. They also provide information to understand and communicate the public health risk(s) and the potential requirements for a response by WHO and partners. The RRAs draw on the technical expertise of the WHO secretariat, general situational awareness and IHR information-sharing requirements.

The WHO RRA reports highlight urgent actions required such as advising the Director-General of WHO that the event may warrant to be determined as a PHEIC, including a pandemic emergency, and if an Emergency Committee may need to be convened, under the provisions of the IHR, to provide advice with respect to such determination, as well as the issuance of related temporary recommendations to States Parties *(18)*, and the activation of Emergency Response Framework mechanisms *(57)*, among others. The RRA serves as a key resource document for these deliberations. The outcomes of the WHO RRA are intended to promote transparency in the spirit of IHR provisions, provide resources to national authorities facing similar or comparable situations, and foster a shared risk assessment culture among States Parties, as well as regional and global entities contributing to preparedness for and response to health emergencies.

National authorities are encouraged to conduct their own risk assessments to guide preparedness and response actions, adapting existing tools as needed and using global assessments to inform local risk assessments and decisions.

6. Contextual information

To support effective interpretation of surveillance data, risk assessments and disease modeling, it is important to collect and integrate contextual information *(58)*. This includes population-level data and metadata describing how surveillance and investigation data are generated and managed.

6.1 Population-level information

Population-level data provide context for understanding the spread and impact of a pandemic. These data should include the size and composition of the population, disaggregated by sex, age and geography, as well as information on movement and mixing patterns. It is also important to identify groups at higher risk of infection or severe disease, such as individuals with underlying medical conditions (e.g., with asthma or lung disease, cardiovascular disease, HIV), pregnant people, health-care workers, or those exposed to possibly infected animals. Population and demographic data are typically obtained through national censuses or large-scale surveys. However, data on specific risk groups may not be routinely available and may need to be estimated using statistical methods, such as regression *(59, 60)*. The interpandemic period is the ideal time to identify data sources for and plan for generating estimates where gaps exist.

6.2 Metadata on surveillance and investigations

Metadata provide important context for interpreting surveillance and investigation data. Each data source should be accompanied by documentation that outlines its public health objectives, data collection methods and timing, the populations or sub-populations represented, measures of data quality, completeness, timeliness and known limitations *(53)*. Metadata for surveillance approaches used for seasonal influenza monitoring could be generated during the interpandemic period and updated as needed during a pandemic. Similarly, templates for documenting investigation methods and approaches should be prepared in advance and refined as specific approaches are implemented.

7. Reporting to WHO during an influenza pandemic emergency

Surveillance and investigations conducted during an influenza pandemic emergency primarily support national and local decision-making. However, timely reporting of these findings to WHO is also essential for informing regional and global responses. Sharing surveillance data with WHO enables aggregation and analysis across countries, providing a clearer picture of the pandemic's characteristics, spread and impact. This supports coordinated international action and helps mitigate the global effects of the pandemic.

During a PHEIC, including a pandemic emergency, any communication of information, including the reporting of surveillance data, from States Parties to WHO would occur under temporary recommendations issued by the Director-General. It is anticipated that temporary recommendations would be issued in relation to global surveillance and would address the reporting of global surveillance data and information such as those included in the following sections.

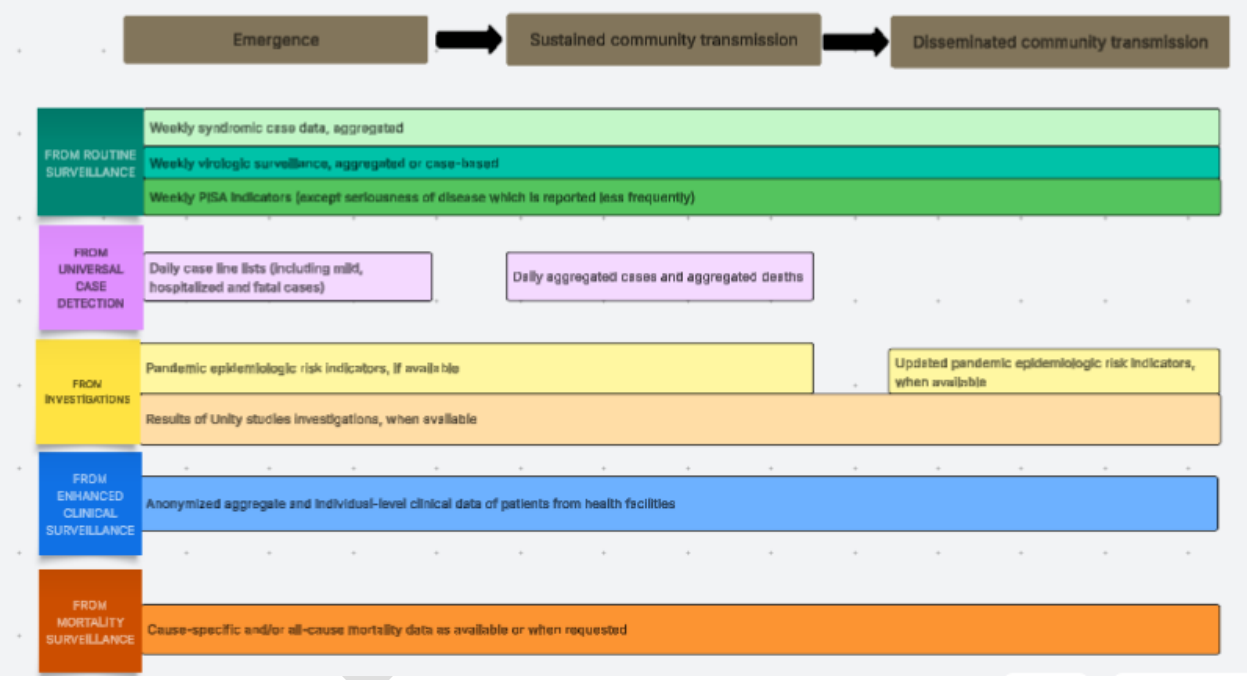
Countries should report de-identified case-based data to WHO for each detected case, using a minimum dataset. This should continue until sustained transmission in the country is evident, defined as new infections occurring in individuals without epidemiologic links to known clusters.

Once sustained transmission is established, countries may shift to reporting daily aggregated case counts. As the event evolves, additional relevant public health information should be shared with WHO to support ongoing risk assessments. This collaboration ensures that WHO can accurately assess the event and coordinate with affected States Parties.

WHO maintains several regional and global platforms for the reporting, storage and analysis of surveillance data. These platforms not only facilitate global data integration but also enhance Member States' capacity to manage and interpret their own data. WHO continues to strengthen these systems by promoting timely data visualization, user accessibility and sustainable design.

Countries are encouraged to report surveillance findings promptly and consistently throughout the pandemic emergency to support effective global monitoring and response (**Fig. 4**).

Fig. 4: The types of data and information from different surveillance approaches to be reported to WHO during different periods of an influenza pandemic emergency.



7.1 Reporting surveillance and study findings

Countries should report the results of ongoing surveillance, investigations and relevant studies to WHO in a timely manner to support global risk assessment and guidance development. This includes information on human infections and findings that are anticipated to fall under the temporary recommendations.

Most countries have established routine surveillance approaches for monitoring respiratory virus activity and regularly report surveillance data to WHO or its Regional Offices during the interpandemic period. This data should continue to be reported weekly during a pandemic emergency through the GISRS platform, in line with standards for sentinel surveillance for respiratory viruses *(11)*.

During a pandemic emergency, countries should leverage both routine and universal surveillance reporting pathways. To avoid duplication, it is important to distinguish between cases detected through universal surveillance and those from routine surveillance. This can be achieved by including a variable or metadata field indicating the surveillance source.

Once cases are detected through routine surveillance systems, countries should report:

- daily aggregated counts of new cases and deaths from notifiable disease surveillance
- weekly de-identified case-based data from sentinel sites on individuals tested for respiratory viruses
- weekly aggregated data on consultations and admissions at sentinel sites and the number of patients meeting the case definitions (ILI/ARI or SARI)
- weekly aggregated data on specimens tested for respiratory viruses and those testing positive for pandemic and non-pandemic influenza, SARS-CoV-2 and other respiratory viruses
- where feasible, number of in-hospital deaths among SARI patients.

When community transmission is disseminated, countries may discontinue daily reporting of new cases and deaths but should continue reporting weekly aggregated or weekly case-based data through GISRS as mentioned above.

7.2 Reporting PISA indicators

When community transmission is disseminated and cases are being detected through routine surveillance systems, countries may apply the PISA framework to support national and global assessments *(48, 61)*. Countries should assess and report weekly on the following indicators: transmissibility, morbidity and mortality and impact on healthcare capacity. The seriousness of disease indicator is assessed and reported less frequently (e.g., monthly). Timely reporting of these assessments contributes to WHO's overall evaluation of pandemic severity and supports global response efforts.

7.3 Reporting enhanced clinical surveillance data

During an influenza pandemic, anonymized aggregate and individual-level clinical data from health facilities should be collected using standardized case reporting forms and templates provided by WHO. These forms are designed to facilitate consistent data synthesis and analysis across countries. Collected data should be entered into the WHO Global Clinical Platform *(29)*, a secure database governed by its

"terms of use" *(62)*. Aggregated results will be generated using standardized statistical plans linked to the protocol shared with each participating site.

7.4 Reporting mortality surveillance data

During an influenza pandemic, WHO may request cause-specific mortality and/or all-cause mortality data from countries on a regular basis and more frequently than the usual annual reporting. These data are essential for estimating pandemic-related excess mortality and guiding urgent public health actions, as was done during the COVID-19 pandemic. WHO will provide a standardized template for pandemic-period mortality reporting. This may include protocols for reporting daily or weekly death counts by sex, age and location. Given the urgency, countries may submit provisional counts which can be updated once verification is complete. Countries that collect baseline mortality data and are able to estimate excess all-cause mortality may be asked to share these findings with WHO. Additionally, data from civil registration and vital statistics systems, if timely and efficient, may be requested more frequently than the usual annual submissions *(31, 63)*.

7.5 Reporting results from investigations and specialized studies

Countries should promptly analyze data from investigations and studies at the national level to support risk assessment and evidence-based decision-making, including the implementation, adjustment or lifting of PHSM. Countries conducting Unity Studies may be requested to share aggregated, de-identified results with WHO using standardized templates. This enables timely global situational analysis and meta-analysis. Important insights can be gained by collating standardized results from similar studies conducted globally, as demonstrated during the influenza A(H1N1) 2009 and COVID-19 pandemics *(64-69)*. WHO's primary interests include the study methodology, the population under study, and key outcomes (e.g., seroprevalence estimates, transmission and severity parameters overall and by age, sex and vaccination status). Aggregated results should be derived using the statistical plans associated with each Unity Study protocol. WHO will provide templates and a secure platform for data sharing to facilitate consistent synthesis and analysis.

7.6 Synthesis and publication of information shared with WHO

In accordance with Article 11 of the IHR, WHO shall share information provided by States Parties with other States Parties to enable them to respond to a public health risk, and the general public when there is a need for the dissemination of authoritative and independent information *(18)*. Aggregate results from WHO's synthesis of submitted information may be used to produce situation updates, technical reports and open-access peer-reviewed publications. These outputs inform surveillance strategies, diagnostic and clinical evaluations, and support national and international pandemic response efforts.

Principal country investigators will be contacted for permission/consent and invited to be a collaborating author or acknowledged in any academic publication resulting from WHO-led analyses. All contributors retain the right to publish their own study results independently and are strongly encouraged to do so.

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Annex. Minimum data set for reporting notifying a human infection with an influenza virus with pandemic potential

Table A1: Minimum data set for reporting notifying a human infection with an influenza virus with pandemic potential. Adapted from the Go.Data template outbreak for influenza viruses with pandemic potential *(1)*.

Case detection	
Country reporting the case	
Case detected through	*OPTIONS= Sentinel ILI, Sentinel SARI, Targeted surveillance, Contact monitoring/tracing, Unknown, Other*
Case identifier information	
Unique case ID/cluster number	
Sex	*OPTIONS= Female, Male, Othe, Unknown*
Date of birth	
Age (years)	
Country of residence	
Address (village/town, district, province/region)	
Case status	*OPTIONS= Confirmed symptomatic, Confirmed asymptomatic, Probable, Suspect, Not a case (discarded), Unknown*
Current medical history	
Underlying conditions	*OPTIONS= yes/no/unknown*
Pregnancy	*OPTIONS= Not pregnant, Pregnant - 1st trimester, Pregnant - 2nd trimester, Pregnant - 3rd trimester, Pregnant – trimester, unknown*
Case had pre-existing condition	*OPTIONS= Cancer, Diabetes, HIV/other immune deficiency, Heart disease, Asthma, Chronic lung disease (non-asthma), Chronic liver disease, Chronic haematological disorder, Chronic kidney disease, Chronic neurological impairment, Obesity, Hypertension, Tuberculosis, Prematurity, Organ or bone marrow recipient, Other.*
Case received antiviral treatment	*OPTIONS= yes, no, unknown*
Patient was vaccinated for influenza in the past 12 months	*OPTIONS= yes, no, unknown*
Health-care interactions	

Total health facilities visited till outcome	
Date of first primary healthcare contact	
Currently hospitalized	*OPTIONS= yes, no, unknown*
Reason for hospitalization	
Date of first hospitalization	
Discharged from hospital and date	
Admitted to ICU	*OPTIONS= yes, no, unknown*
Date of intensive care unit admission	
Date of discharge from ICU	
Signs and symptoms if case is/has been symptomatic	
Date of symptom onset	
Symptom onset date is approximate	*OPTIONS= yes, no, unknown*
Case was symptomatic	*OPTIONS= yes, no, unknown*
-If yes, Fever or history of fever	*OPTIONS= yes, no, unknown*
-If yes, Chills	*OPTIONS= yes, no, unknown*
-If yes, Cough	*OPTIONS= yes, no, unknown*
-If yes, Sore throat	*OPTIONS= yes, no, unknown*
-If yes, Runny nose	*OPTIONS= yes, no, unknown*
-If yes, Vomiting	*OPTIONS= yes, no, unknown*
-If yes, Diarrhoea	*OPTIONS= yes, no, unknown*
-If yes, Headache	*OPTIONS= yes, no, unknown*
-If yes, Neurological signs	*OPTIONS= yes, no, unknown*
-If yes, Rash	*OPTIONS= yes, no, unknown*
-If yes, Conjunctivitis	*OPTIONS= yes, no, unknown*
-If yes, Shortness of breath	*OPTIONS= yes, no, unknown*
-If yes, Muscle aches	*OPTIONS= yes, no, unknown*
-If yes, Symptoms: loss of consciousness	*OPTIONS= yes, no, unknown*
-If yes, Symptoms: no symptoms	*OPTIONS= yes, no, unknown*
-If yes, Anosmia (loss of smell)	*OPTIONS= yes, no, unknown*
-If yes, Ageusia (loss of taste)	*OPTIONS= yes, no, unknown*
-If yes, Nausea	*OPTIONS= yes, no, unknown*

-If yes, Joint aches	*OPTIONS= yes, no, unknown*
-If yes, Loss of appetite	*OPTIONS= yes, no, unknown*
-If yes, Nose bleed	*OPTIONS= yes, no, unknown*
-If yes, Fatigue	*OPTIONS= yes, no, unknown*
-If yes, Chest pain	*OPTIONS= yes, no, unknown*
-If yes, Seizures	*OPTIONS= yes, no, unknown*
-If yes, Altered level of consciousness	*OPTIONS= yes, no, unknown*
-If yes, Other symptoms	*OPTIONS= yes, no, unknown*
Complications	
Case received respiratory support	*OPTIONS= yes, no, unknown*
-If yes, Date of mechanical ventilation	
-If yes, Length of ventilation	
-If yes, Highest level of respiratory support (at time of reporting)	*OPTIONS= Room air, Nasal prongs, Simple face mask, Venturi mask, High flow Nasal Cannula (HFNC), Continuous positive airway pressure (CPAP) or bi-lateral positive airway pressure (BiPAP), Invasive Ventilation/Intubation*
Case presents/has presented with ANY complications	*OPTIONS= yes, no, unknown*
-If yes, Acute renal failure	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Cardiac failure	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Consumptive coagulopathy	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Hypotension requiring vasopressors	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Extracorporeal membrane oxygenation (ECMO) required	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Pneumonia by chest x-ray	*OPTIONS= yes, no, unknown*
-If yes, Dated started	
-If yes, Acute respiratory distress syndrome	*OPTIONS= yes, no, unknown*

-If yes, Dated started	
-If yes, Other complications	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Severity at time of reporting	*OPTIONS= Asymptomatic, Mild/moderate, Severe, Critical, Fatal, Unknown*
Epidemiology and human exposures	
Patient exposed to probable or confirmed case	*OPTIONS= yes, no, unknown*
Date of last unprotected contact with probable or confirmed case	
Type of contact	*OPTIONS= Direct physical contact, Admitted to the same health facility room, Admitted to same health facility (but different room), Visited the same health facility (including traditional), Handled person's bodily fluids/excreta, Shared same household, Other (please specify in comment field)*
Location of exposure	*OPTIONS= Home/household, Hospital/healthcare, Workplace, School/daycare, Other (please specify in comment field)*
Unique case ID of probable or confirmed case (if available)	
Relationship to current case (specify, e.g. family, friend, health-care worker, colleague)	*OPTIONS= Spouse/partner; Household member; Non-household relative; Friend; Sexual partner; Colleague; Healthcare exposure; Other (specify)*
Is this case part of an institutional outbreak	*OPTIONS= yes, no, unknown*
Is this case part of a cluster; if yes, specify cluster ID number?	*OPTIONS= yes, no, unknown*
Number of contacts associated with the case	
Occupational, healthcare, and social setting exposures in the 14 days prior to illness onset	
Occupational exposure / occupational exposure likely	*OPTIONS= yes, no, unknown*
-If yes, Health-care worker	*OPTIONS= yes, no, unknown*
-If yes, Please specify the type, geographic location, and facility name	
-If yes, Laboratory worker	*OPTIONS= yes, no, unknown*
-If yes, Please specify the type, geographic location, and facility name	
-If yes, Working with animals	*OPTIONS= yes, no, unknown*

-If yes, Please specify the type, geographic location, and facility name	
-If yes, Other occupation	*OPTIONS= yes, no, unknown*
-If yes, Please specify the type, geographic location, and facility name	
Case visited outpatient treatment facility	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Case visited traditional healer	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Case visited or was admitted to inpatient health facility	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Case attended festival or mass gathering	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Case had blood link to a confirmed case	*OPTIONS= yes, no, unknown*
-If yes, Please specify	
Human-to-human transmission	*OPTIONS= No, Unlikely, Suspected, Probable, Confirmed*
Travel history up to 14 days before illness onset	
Case traveled domestically in the 14 days prior to onset of illness	*OPTIONS= yes, no, unknown*
Case traveled internationally in the 14 days prior to onset of illness	*OPTIONS= yes, no, unknown*
Case travelled with companions	*OPTIONS= yes, no, unknown*
Case animal exposures in the 14 days before illness onset	
Case had exposure to animals, such as live animals, animal products or live animal markets or other environments 14 day prior to onset of illness. This includes consuming raw or unpasteurized animal products	*OPTIONS= yes, no, unknown*
-If yes, Case handled animals	*OPTIONS= yes, no, unknown*
-If yes, Types of animals handled (e.g. pigs, chickens, ducks or others)	*OPTIONS= Chickens, Ducks, Turkeys, Other domestic birds, Poultry, Other birds, Swine, Cattle, Other*

-If yes, Nature of contact (e.g. feed, groom or slaughter)	*OPTIONS= Slaughtering, Butchering, Purchasing live animals, Food preparation, Handling animals, Hunting, Eating raw food, Traditional medicine, Other.*
-If yes, Location of animal contact	*OPTIONS= Home/backyard, Neighbourhood, Market, Live animal, bird market, wet market, or wholesale market, Workplace, Hospital, Tour group, Agricultural fair/zoo group, Farm, Other.*
-If yes, Within 2 weeks before or after contact, any animals sick or dead?	*OPTIONS= yes, no, unknown*
- Please specify type and number, and proportion from flock or herd	
-If yes, Case exposed to animals in environment but did not handle them (e.g. in neighbourhood, farm, zoo, at home, agricultural fair or work)	*OPTIONS= yes, no, unknown*
-If yes, Types of animals in that environment (e.g. pigs, chicken, ducks or others)	*OPTIONS= Chickens, Ducks, Turkeys, Other domestic birds, Poultry, Other birds, Swine, Cattle, Other.*
-If yes, Location of exposure	*OPTIONS= Home/backyard, Neighbourhood, Agricultural fair/zoo group, Farm, Other.*
-If yes, Within 2 weeks before or after exposure to animals in the environment, any animals sick or dead?	*OPTIONS= yes, no, unknown*
- Please specify type and number, and proportion from flock or herd	
-If yes, Case exposed to animal-by-products (e.g. bird feathers) or animal excreta	*OPTIONS= yes, no, unknown*
-If yes, Please specify the product	
-If yes, Case visited live animal market	*OPTIONS= yes, no, unknown*
-If yes, Please specify the market	
-If yes, Case consumed raw or unpasteurized animal products	*OPTIONS= yes, no, unknown*
-If yes, Please specify the consumed product	
-If yes, Case consumed health or traditional remedies with raw or unpasteurized animal products	*OPTIONS= yes, no, unknown*
-If yes, Please specify the consumed remedies	
Influenza A virus detected in the animals or the environment the case had exposure to	*OPTIONS= yes, no, unknown*

Detailed exposure comments	
From the point of view of the patients or family, what is the likely source of infection and geographic location of exposure?	
Case outcome	
Outcome at reporting	*OPTIONS= Not applicable/asymptomatic, Recovered, Deceased, Not recovered but Not hospitalized, Still in hospital, Asymptomatic, Unknown/not reported*
Outcome day 7 post-onset	*OPTIONS= Not applicable/asymptomatic, Recovered, Deceased, Not recovered but Not hospitalized, Still in hospital, Unknown/not reported.*
Final outcome	*OPTIONS= Not applicable/asymptomatic, Recovered, Deceased, Not recovered but Not hospitalized, Still in hospital, Unknown/not reported.*
Final outcome date	
Laboratory information	
Day of sample collection per sampling strategy	
Pathogens testing done	*OPTIONS = Influenza A/B, Influenza subtyping, MERS-CoV, SARS, RSV, hMPV, Parainfluenza (1,2,3), Adenovirus, Rhinovirus, Enterovirus, Rhinovirus, Seasonal coronavirus, Chlamydia pneumonia, Mycoplasma pneumonia, Legionella, Streptococcus pneumonia, Other.*
Who collected the respiratory specimen	*OPTIONS= Study staff/research nurse, Self-collected, Other professional specimen collection service*
Which laboratory was the specimen sent to	
Lab identification number	
Diagnostic method	*OPTIONS= PCR, Viral culture, Virus isolation, Serology, Other (specify)*
Specify specimen(s) positive	*OPTIONS= Positive for targeted pathogen (Specify in Notes field), Negative for targeted pathogen / Inconclusive for targeted pathogen, Positive for other pathogens (specify in Notes field), Pending*
Specify targets positive (e.g. for MERS-CoV)	
Specify subtype positive (e.g. for influenza)	
Specify titres (e.g. paired serum for influenza)	
Other laboratory results	*OPTIONS= Other pathogens (specify), Negative, NA/not tested*
Date received at local laboratory	
Date of testing at local laboratory	
Date of results at local laboratory	

Date sent to national laboratory	
Date of testing at national laboratory	
Date of results at national laboratory	
Specimens shipped to international reference laboratories	*OPTIONS= yes, no, unknown*
Date sent to WHO CC or H5 reference laboratory	
Test performed at WHO CC or H5 reference laboratory	
Date of testing at WHO CC or H5 reference laboratory	
Results at WHO CC or H5 reference laboratory	
Date of results at WHO CC or H5 reference laboratory	
Specimens collected from patient & date collected	*Tracheal aspirate, Blood, Bronchoalveolar lavage, Endotracheal aspirate, CSF, Nasal swab,* *Nasal wash, Nasopharyngeal aspirate, Nasopharyngeal swab, Serum, Sputum, Throat swab*

Reference

1. World Health Organization. WHO Standardized Outbreak Templates. Geneva, Switzerland: World Health Organization; 2025 [3 Sept 2025]. Available from: https://worldhealthorganization.github.io/godata/outbreak-templates/.