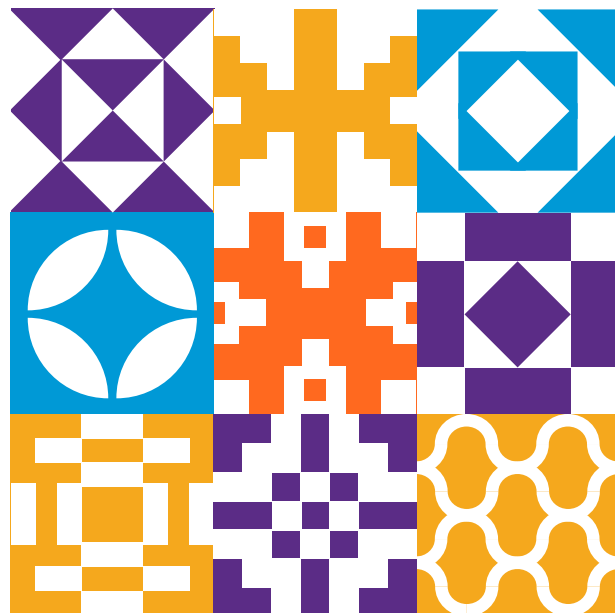**World Health Organization**

Facing the future of respiratory virus surveillance:

The mosaic surveillance framework

This brochure outlines the process of development of the mosaic surveillance framework and what it aims to achieve.

At a glance:

1 It is impossible to address the many complex needs of respiratory virus surveillance with a single system.

2 Therefore, multiple surveillance systems and complementary studies must fit together as tiles in a "mosaic".

3 The "mosaic" provides a complete picture of the risk, transmission, severity, and impact of respiratory viruses of epidemic and pandemic potential.

Objectives of the framework

The mosaic surveillance framework aims to assist local authorities to:

Identify priority respiratory virus surveillance objectives and the best approaches to meet them

Develop implementation plans according to national context and resources

Prioritize and target technical assistance and financial investments to meet most pressing needs

1 ▸ The need for the mosaic framework

As we progress through the coronavirus disease 2019 (COVID-19) pandemic towards an inter-pandemic period, countries are faced with the need to sustainably transition their surveillance strategies to monitor:
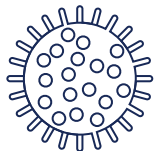
- Influenza
- SARS-CoV-2
- Respiratory Syncytial Virus (RSV) and
- Other respiratory viruses of epidemic and pandemic potential

Multiple challenges present an ongoing risk of new pandemics, and a continuing need to strengthen detection and monitoring of respiratory viruses. These challenges include:

Population expansion

Travel patterns

Global trade

To face these challenges countries must now:

1 **Increase** the number of effective surveillance approaches to address multiple surveillance objectives

2 **Extend** partnerships for surveillance and collaborative analyses of data across sectors

This will improve data for decision-making during interpandemic periods and help to ensure that respiratory virus surveillance is both timely and scalable in emergencies.

A coordinated approach

WHO Member States have requested a **coordinated approach to the sustainable monitoring of respiratory viruses** of epidemic and pandemic potential *(1)*.

For respiratory virus surveillance to function during interpandemic periods, and to be resilient to inform decision-making during times of emergency, surveillance systems must be well-suited to the objectives that they are being implemented to address.

Fit-for-purpose surveillance will produce actionable and policy-relevant information that will engender trust and demonstrate their value for money, increasing commitment by public health authorities to invest in surveillance over time. Conversely, poorly targeted, or inefficient surveillance systems may generate sub-optimal or misleading data for decision-making, and not be perceived as cost-effective to sustain or scale in emergencies.

Comprehensive surveillance for respiratory viruses involves:

Detecting and assessing emerging or re-emerging pathogens
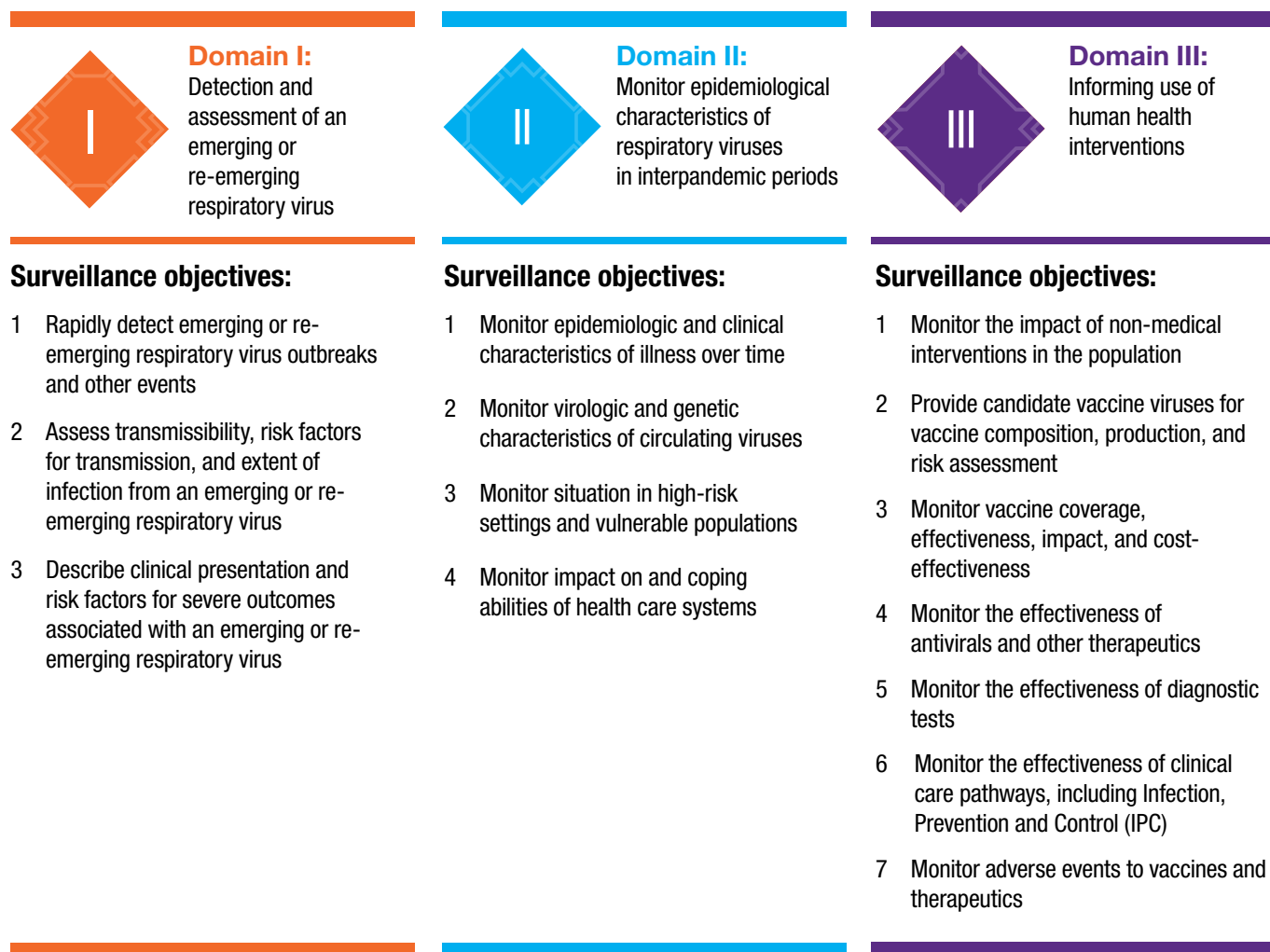
Monitoring epidemiological and clinical characteristics of illness associated with infections and the virological characteristics of respiratory viruses currently in circulation
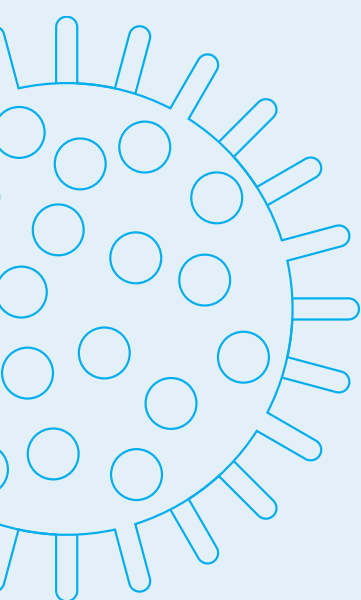
**Informing** the use of human health interventions (Figure 1)

Figure 1: Surveillance domains and associated objectives for respiratory viruses of epidemic and pandemic potential

Domain I:
Detection and assessment of an emerging or re-emerging respiratory virus

Surveillance objectives:

1 Rapidly detect emerging or re-emerging respiratory virus outbreaks and other events

2 Assess transmissibility, risk factors for transmission, and extent of infection from an emerging or re-emerging respiratory virus

3 Describe clinical presentation and risk factors for severe outcomes associated with an emerging or re-emerging respiratory virus

Domain II:
Monitor epidemiological characteristics of respiratory viruses in interpandemic periods

Surveillance objectives:

1 Monitor epidemiologic and clinical characteristics of illness over time

2 Monitor virologic and genetic characteristics of circulating viruses

3 Monitor situation in high-risk settings and vulnerable populations

4 Monitor impact on and coping abilities of health care systems

Domain III:
Informing use of human health interventions

Surveillance objectives:

1 Monitor the impact of non-medical interventions in the population

2 Provide candidate vaccine viruses for vaccine composition, production, and risk assessment

3 Monitor vaccine coverage, effectiveness, impact, and cost-effectiveness

4 Monitor the effectiveness of antivirals and other therapeutics

5 Monitor the effectiveness of diagnostic tests

6 Monitor the effectiveness of clinical care pathways, including Infection, Prevention and Control (IPC)

7 Monitor adverse events to vaccines and therapeutics

The COVID-19 pandemic generated innovations to support surveillance, including:

Environmental surveillance
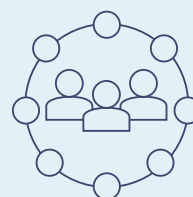
Community participatory surveillance
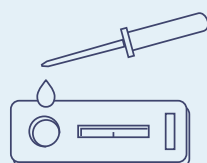
Those related to **improved point-of-care or self-test diagnostic technologies**

The rapid improvement in **global genomic surveillance** *(3)*

To inform longer-term surveillance planning, this framework considers some of the benefits, limitations, and most appropriate applications of these innovations to inform possible surveillance strategies.

Context-specific, locally relevant

Critically, national surveillance strategies must be directed by the objectives and information needs of local authorities, locally available resources, and feasibility within the populations under surveillance.


Surveillance methods that can help address needed objectives include but are not limited to:

- **Event-based surveillance** in healthcare facilities, the community and at the animal-human interface
- **Sentinel surveillance** using standardized case definitions and integrated laboratory testing
- **Strong networks** of connected public health and clinical laboratories

- Efficient and comprehensive **nationally notifiable disease surveillance systems**
- **Sustained health care capacity monitoring**
- **Targeted surveillance** in specific high-risk settings and vulnerable populations
- **Enhanced clinical surveillance**, among others

Surveillance systems need to be complemented with high quality and timely outbreak investigations and studies to obtain information not routinely available from ongoing systems.

Sustainable surveillance

There are also several structural or enabling factors that are critical to the success of any sustainable surveillance. These include:
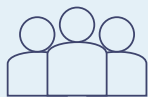
Strong governance and leadership
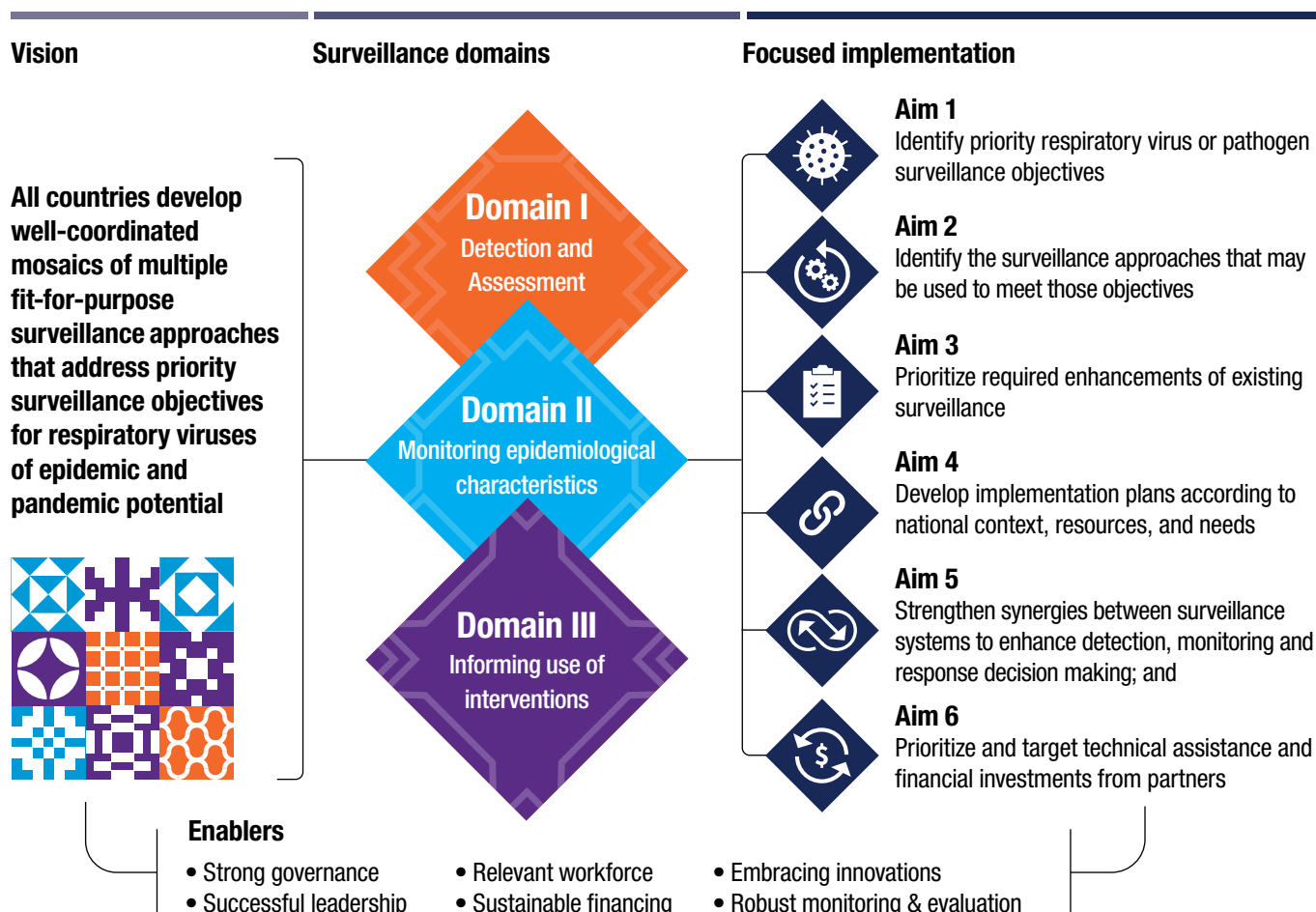
Sustainable financing and workforce

Appropriate innovations and data standards to promote timely and collaborative analyses of surveillance information from multiple sources

An evidence-based framework

Given the complexity of the current respiratory surveillance landscape, national authorities now need an evidence-based framework to help their countries rapidly (Figure 2):

- **Identify** priority respiratory virus surveillance objectives
- **Select** the surveillance approaches that have been used to meet these objectives

- **Prioritize** required enhancements of existing surveillance
- **Develop** implementation plans according to the national context, resources and needs
- **Strengthen** collaborative synergies between surveillance systems
- **Target** technical assistance and financial investments from partners

Figure 2: Vision, domains, aims, of the mosaic surveillance framework

Vision

Surveillance domains

Focused implementation

All countries develop well-coordinated mosaics of multiple fit-for-purpose surveillance approaches that address priority surveillance objectives for respiratory viruses of epidemic and pandemic potential

Domain I
Detection and Assessment

Domain II
Monitoring epidemiological characteristics

Domain III
Informing use of interventions

Aim 1
Identify priority respiratory virus or pathogen surveillance objectives

Aim 2
Identify the surveillance approaches that may be used to meet those objectives

Aim 3
Prioritize required enhancements of existing surveillance

Aim 4
Develop implementation plans according to national context, resources, and needs

Aim 5
Strengthen synergies between surveillance systems to enhance detection, monitoring and response decision making; and

Aim 6
Prioritize and target technical assistance and financial investments from partners

Enablers
- Strong governance
- Successful leadership
- Relevant workforce
- Sustainable financing
- Embracing innovations
- Robust monitoring & evaluation

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2 **Leveraging global expertise and experiences to develop the mosaic framework**

The mosaic surveillance framework was developed by drawing on the experiences of a technical working group (TWG) that included WHO subject matter experts from more than 20 teams / departments at WHO headquarters, and members from WHO Regional Offices (RO) in all six WHO regions. To further obtain experiences and perspectives from countries of all socio-economic levels, a secretariat supported WHO Regional Offices as they worked with Country Offices and Ministry of Health partners to implement surveys and gather data on priority objectives, surveillance systems currently used to meet those objectives, and priority surveillance enhancements needed.

The Regional Offices also convened regional consultations and/or focused discussions with countries, informed by surveys, to obtain input for the global consultation. WHO headquarters then hosted a global consultation entitled "'Crafting the mosaic': resilient surveillance systems for respiratory viruses of pandemic potential" on 10 & 11 May 2022.

Regional consultations included:

340 In-person and online attendees including those working in surveillance at the country level

Representatives from WHO Country Offices, all six Regional Offices, WHO headquarters, and external partner organizations

The framework incorporated iterative feedback from:

- The TWG
- The WHO COVID-19 incident management team leadership
- External subject matter experts from the United States Centers for Disease Control and Prevention
- The European Centre for Disease Prevention and Control
- The Global Fund
- The Bill and Melinda Gates Foundation
- The Rockefeller Foundation

The secretariat also collected case studies by working with WHO Regional Offices to obtain examples of implementation of different surveillance systems and studies to meet priority objectives. These case studies provide national authorities with examples of the use of different systems to help them move from a theoretical to practical level.

3 Coordination with existing surveillance guidance and initiatives

The mosaic surveillance framework is in line with the collaborative surveillance component of the WHO Global Architecture for Health Emergency Preparedness, Response and Resilience (HEPR) *(4)*.

This tool will evolve to ensure it meets countries' needs and synchronizes with the ongoing discussion for the pandemic convention accord + (CA+).

This tool also supports the International Health Regulations (IHR) 2005, specifically the core capacity requirements for surveillance and response and the National Action Plans for Health Security *(5)* and will be adapted if the ongoing discussion related to the revision of the IHR (2005) requires it.

Importantly, this framework is a conceptual structure that:
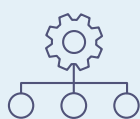
Underpins and supports current initiatives

Does not supersede any existing global or regional normative surveillance guidance

Is intended to place the systems represented by existing guidance into a context where they may address the objectives for which they are best intended

The framework presents **appropriate uses of existing systems** for respiratory virus surveillance and refers to **existing global and regional surveillance-specific guidance and operating procedures** wherever they exist.

◆4 Implementation during the coming year

Our vision is that all countries develop well-coordinated mosaics of multiple fit-for-purpose surveillance approaches that address priority surveillance objectives for influenza, SARS-CoV-2, RSV and other respiratory viruses of epidemic and pandemic potential according to country context. Respiratory viruses serve as a prototypical example of the way surveillance systems can work together resiliently to provide a comprehensive picture of disease emergence, spread and impact. There are several respiratory viruses that have important commonalities in terms of virological, epidemiological and clinical surveillance approaches. However, there are areas where this framework has applicability beyond respiratory viruses, and in some cases beyond respiratory pathogens.

The specific tools to help countries implement the mosaic surveillance framework will include those to:

Help prioritize respiratory surveillance objectives
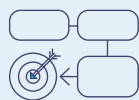
Identify priority enhancements needed

Map existing systems to priority objectives

However, associated tools will also help national authorities to consider the need to strengthen broader enabling structures for surveillance in their countries.

The next respiratory pandemic remains imminent, and the time is now to apply lessons learned to assure that newly strengthened and properly focused routine surveillance may better support epidemic, pandemic, and other emergency monitoring needs.

◆R References

1. Statement on the eleventh meeting of the International Health Regulations (2005) Emergency Committee regarding the coronavirus disease (COVID-19) pandemic (who.int) https://www.who.int/news/item/13-04-2022-statement-on-the-eleventh-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic

2. WHO Unity Studies: Early Investigation Protocols (who.int) https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/early-investigations

3. Public health surveillance for COVID-19: interim guidance. Geneva: World Health Organization; 2022 https://www.who.int/publications/i/item/WHO-2019-nCoV-SurveillanceGuidance-2022.2 accessed 21 January 2023.

4. Strengthening the Global Architecture for Health Emergency Preparedness, Response and Resilience (who.int) https://www.who.int/publications/m/item/strengthening-the-global-architecture-for-health-emergency-preparedness-response-and-resilience

5. World Health Organization strategy (2022-2026) for the National Action Plan for Health Security https://apps.who.int/iris/handle/10665/365581