**MOSAIC DOMAIN II: MONITORING EPIDEMIOLOGICAL, CLINCIAL AND VIROLOGICAL CHARACTERISTICS OF RESPIRATORY VIRUSES IN INTERPANDEMIC PERIODS**

**SCENARIO BASED DISCUSSION**

**Facilitator Guide**

The purpose of these scenarios is to assist country representatives in mapping out the national surveillance approaches that are best positioned to meet the objectives of Domain II. The scenario also will help users to assess how functional each of these approaches are in meeting objectives and help guide country representatives to determine any needs and corresponding priority actions that will be necessary to strengthen surveillance. This facilitator guide includes the scenarios and corresponding questions, as well as an optional section for recorders to take notes based on conversations during the scenarios.

## Domain II Objectives

1. To monitor epidemiologic and clinical characteristics of illness over time
2. To monitor virologic and genetic characteristics of circulating viruses
3. To monitor situation in high-risk groups and vulnerable populations
4. To monitor impact on and coping abilities of health care systems

**Table of contents**

[CASE 1: Monitoring epidemiological and clinical characteristics of illness over time 2](#_Toc187849140)

[CASE 2: Monitoring the situation in high-risk groups 7](#_Toc187849141)

[CASE 3: To monitor virologic and genetic characteristics 10](#_Toc187849142)

[CASE 4: Monitor impact on and coping abilities of healthcare systems 12](#_Toc187849143)

[ANNEX 1: Functionality indicators to guide discussion 14](#_Toc187849144)

## Acronyms

ARI Acute respiratory infection

ILI Influenza-like illness

ISARIC International Severe Acute Respiratory and emerging Infection Consortium

GIHSN Global Influenza Hospital Surveillance Network

NNDS National Notifiable Disease and conditions Surveillance

PISA Pandemic Influenza Severity Assessment

SARI Severe acute respiratory infection

# CASE 1: Monitoring epidemiological and clinical characteristics of illness over time

***It is [month], and there are signs that respiratory disease activity is increasing in your country. Clinicians are concerned by the number of acute respiratory infection cases they are seeing in their healthcare facilities, which they feel are much higher this year than in recent years. Some prominent academic physicians have raised the alert of concurrent epidemics of influenza virus, SARS-CoV-2, and RSV, and the [Prime Minister’s/President’s (or other context-relevant government position/office)] office is being questioned by the media. Others have claimed that this is the beginning of a “very bad flu year.” The [Ministry of Health’s Director (or other context-relevant government position)] wants to assess the situation and requests to review existing surveillance data.***

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| *The following probes should assist you in determining which core and enhanced surveillance approaches and investigations the country uses to address* ***Domain II Surveillance Objective 1: To monitor epidemiologic and clinical characteristics of illness over time.*****Functionalities being assessed:** Functionality 1,2, 3 and 4 (see Annex 1)  |

## Questions for discussion

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| **Q 1.1 What surveillance approaches do you use to monitor the weekly number of cases and severity of respiratory diseases?**  |
| ***Possible core surveillance approaches****: Sentinel ILI/ARI/SARI surveillance, National notifiable disease and conditions surveillance (NNDS)****Possible enhanced surveillance approaches****: Syndromic surveillance (without integrated lab testing – often an early warning system)* |
| **Probe: Sentinel ILI/ARI/SARI Surveillance**  |
| If you have sentinel surveillance, how many sites do you have and where are they located? ***Indicators / Case Definitions***Do you use standardized case definitions (e.g., ILI, ARI, or SARI)? If yes: * Define them.
* If you use multiple syndromic case definitions (e.g., ILI and SARI), are the data reported as a combined total, or can they be separated by case definition?
* Is training on case definitions and reporting conducted?

***Laboratory Testing***Do you collect specimens from any identified cases? If yes:* Which types of cases are swabbed? (e.g., ILI, ARI, or SARI)
* For which respiratory pathogens (e.g., influenza virus, SARS-CoV-2 or RSV) are these specimens tested?
* Can you quantify the proportion of swabbed cases that test positive for specific pathogens? For example, can you determine what percentage of SARI cases tested positive for influenza virus and what percentage tested positive for SARS-CoV-2?
 |
| **Probe: National Notifiable Disease Conditions Surveillance (NNDS)** |
| What types of facilities report to NNDS? (e.g., primary, secondary, or tertiary health facilities; public vs. private)***Indicators / Case Definitions***Which respiratory conditions are reported as part of your NNDS? * How are these conditions defined?
* How frequently do reporting facilities report these conditions?
* Are these data reported in a case-based form or aggregated?
	+ If aggregated, at which level is this information aggregated (e.g., facility level, district level, provincial level, nationally)

***Laboratory Testing***Do you collect specimens from any cases or respiratory conditions identified through NNDS? * If yes, what viruses do you test these specimens for?
 |
| **Probe: Trends** |
| For each approach, can you generate trends from syndromic or lab confirmation data? If yes:* What indicators are you using for each approach to calculate weekly trends?
* Is reporting from sites consistent enough to have confidence in trends observable from the data?
* Do you routinely examine data completeness and timeliness of reporting from the various sites?
* Are any abnormalities investigated in a timely way to determine if they are real changes or spurious (e.g., due to incomplete reporting or changes in case definition or in testing strategies)?
* Can you monitor weekly trends at a sub-national level? If yes, using which approach(es)?
 |
| **Probe: Thresholds and baselines** |
| *Note to facilitators: It is expected that this set of probes will mostly focus on sentinel surveillance, though this is also an opportunity to determine if other approaches are leveraged to generate seasonal and severity thresholds.*Have you calculated periods of increased respiratory virus activity (e.g., the start and end of a season) for endemic seasonal respiratory viruses such as influenza and RSV? If yes:* What surveillance approaches did you use to calculate these (e.g., sentinel ILI/ARI/SARI surveillance, NNDS, syndromic surveillance)?
* What analytic methods did you use (e.g., WHO’s PISA guidance)?
* How many years of data did you use?

Can you assess whether current respiratory disease activity is more severe than expected? If yes: * What surveillance approaches do you use to make this assessment?
* What analytic methods do you use (e.g., WHO’s PISA guidance)?
* How many years of data did you use to establish severity levels?
* How long into the season does it take for an assessment of relative severity to be made?
 |
| **Facilitator supporting information (optional)** |
| The c*ountry may use sentinel ILI/ARI/SARI surveillance, NNDS, or syndromic surveillance to monitor the weekly number of cases of respiratory disease. Country may use sentinel ILI/ARI/SARI surveillance, NNDS, or perhaps syndromic data to calculate baselines and thresholds for transmissibility, seriousness of disease, and impact (morbidity and mortality, or impact on healthcare capacity) based on at least 3 years of historical data using PISA guidance and methods like the WHO Average Curves or MEM methodologies. Country may use these thresholds to indicate the relative severity of an epidemic period (e.g., in terms of incidence of ILI or ARI cases, number of SARI or pneumonia hospitalizations, and number of influenza-associated intensive care unit admissions) in comparison to past epidemic periods.* *The country may have ILI/ARI/SARI sentinel surveillance with integration of laboratory testing. The use of standard case definitions (e.g., ILI/ARI/SARI/pneumonia) through sentinel surveillance to select respiratory specimens for testing allows for the percentage of respiratory specimens testing positive for each pathogen to be reported and the relative contribution of each pathogen to be assessed.**The country may be able to determine the start and end of the influenza (and potentially RSV) season for the past 3–5 years/seasons using high quality and representative surveillance data coming from approaches that use standard case definitions (for example, outpatient ILI or ARI, or inpatient SARI or pneumonia) with a virological surveillance component.**The country may have the percentage of respiratory specimens testing positive for each virus during the last 4 weeks and can detect the start and end of the influenza (and potentially RSV) season.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 NNDS: see Mosaic Framework Domain II, page 39**Further information on enhanced surveillance approaches:**Syndromic surveillance: see Mosaic Framework Domain II, page 42  |

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| **Q 1.2 Are epidemiologic data (e.g., demographic and clinical data collected through case report forms) linked with laboratory testing data in your routine surveillance approaches to assess the current respiratory disease situation?** |
| ***Possible core surveillance approaches****: Sentinel ILI/ARI/SARI surveillance, NNDS* |
| **Probe: Linkage of epidemiologic, clinical, and laboratory testing data** |
| * Which of your surveillance approaches link epidemiological data to laboratory testing data? For each approach that links these data: How are these data linked (e.g., manually, digitally)?
* At what level are data linked (e.g., facility level, district level, provincial level, nationally)?
* How long does it take between when a respiratory illness is documented and when the epidemiologic and laboratory data are linked to the case?
 |
| **Facilitator supporting information (optional)** |
|  *The country may routinely link epidemiologic data, including clinical data, collected as part of its sentinel surveillance, NNDS, and other surveillance approaches to laboratory testing data. Country may use data associated with specimens collected at designated surveillance sites (with standardized procedures) to interpret virological results and their association with known clinical presentations, treatments received, epidemiological parameters, or disease outcomes.* *The country may quantify the lag time between documentation of a respiratory illness and laboratory-epidemiological data linkage, as well as the percentage of case report forms that have linked laboratory data.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 NNDS: see Mosaic Framework Domain II, page 39 |

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| **Q 1.3 Do you have stable surveillance approaches to monitor all-cause and respiratory mortality at the national or sub-national level?**  |
| ***Possible enhanced surveillance approaches****: Mortality surveillance (e.g., community mortality, hospital mortality, vital statistics, specialized studies)* |
| **Probe: Mortality surveillance data** |
| For each mortality surveillance approach in your country:* What is the process in which these data are collected and reported?
* What indicators are collected? For instance, are all-cause deaths reported? Are there mortality indicators that represent death due to respiratory infections?
* Can your mortality surveillance approach detect increases in the number of deaths associated with respiratory diseases?

Are you able to access or do you receive the desired mortality data to have what you need for respiratory disease surveillance?* If not, what mechanisms do you need to get these data?
* If yes:
	+ How often do you receive these data? If infrequent, are there ways to increase that frequency?
	+ How long does it take between a death occurring and your ability to use it as a surveillance output?
 |
| **Facilitator supporting information (optional)** |
| *The country may use mortality surveillance approaches to inform whether there has been an increase in the number of deaths associated with respiratory diseases at national or sub-national levels, with timeliness to represent the past four weeks. Country may use mortality data paired with virological surveillance data to adjust models for the viruses that are most prominently in circulation during an epidemic period.***Further information on enhanced surveillance approaches:**Mortality surveillance: see Mosaic Framework Domain II, page 41 |

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| **Q 1.4 How do you access and review your data (e.g., through reports, dashboards, or other tools)?** |
| ***Possible core surveillance approaches****: Sentinel ILI/ARI/SARI surveillance, NNDS, Laboratory networks****Possible enhanced surveillance approaches****: Enhanced clinical surveillance, Investigations and studies, Syndromic surveillance, Mortality surveillance, Targeted special population surveillance, Hospital clinical code monitoring*  |
| **Probe: Dashboards and reports** |
| What mechanism(s) (e.g., dashboards, reports) does your country use to view respiratory data from your mosaic of surveillance approaches?* Does each surveillance approach have its own dashboard or report, or are these data triangulated and viewed in a centralized way?
* If data from different surveillance approaches need to be viewed alongside one another, do they share the same timescales or reporting periods?
* Are there data from any surveillance approaches that should be included but are not?
* Are all reports and dashboards considered useful by users?
* How is the surveillance information reported back to government leadership in a timely way?
* Is there a national data center or hub that integrates surveillance outputs from various surveillance approaches?
 |
| **Probe: Data reporting and storage** |
| * Do current data reporting procedures facilitate efficient receipt and analysis of national and subnational data?
* If your data are digitized (paper to electronic), at what level does this digitization step occur (e.g., at the facility or national level)?
* Are all the data reported utilized?
* Are some data sources considered more important than others?
 |
| **Probe: Harmonization** |
| Are data harmonized at the source of data collection (collected once, used multiple times, e.g., data collected from health facilities feeds into both infectious disease surveillance and routine health information systems)?Do you experience any barriers to collecting data in health facilities with multiple co-operating systems?* If yes, what are these barriers?
 |
| **Probe: Linkage between health and non-health sector data** |
| Do you view surveillance data in the context of demographic or other non-health sector data (e.g., animal health data, environmental data)? |
| **Facilitator supporting information (optional)** |
| *This is an opportunity to probe and document whether the country uses any other surveillance approaches in addition to those covered by Q 1.1-1.3. These could include syndromic surveillance, enhanced clinical surveillance, targeted special populations surveillance, hospital clinical code monitoring, and/or investigations and studies.**This question also is an opportunity to collect information on if and how data systems are integrated, digitized, and stored.**The cross-checking of multiple sources of information is enabled by central housing, data linkages (where pertinent) and visualization of multiple data streams. Please focus on the relevant probes to draw out the discussion.* *This is also an opportunity to probe any overlap in surveillance outputs and potential duplication of effort.** *Assessing usefulness of data:* Has an evaluation or feedback survey been conducted to assess their acceptability, simplicity, timeliness, and/or value?

**Further information on enhanced surveillance approaches:**Enhanced clinical surveillance: see Mosaic Framework Domain II, pages 42-43 Investigations and studies: see Mosaic Framework Domain II, pages 41-42 Targeted special population surveillance: see Mosaic Framework Domain II, page 40 Hospital clinical code monitoring: see Mosaic Framework Domain II, pages 44  |

# CASE 2: Monitoring the situation in high-risk groups

***It is the beginning of the [winter (adapt to local context)] season and syndromic data has signaled that [outpatient facility (adapt to local context)] visits for influenza-like illness are increasing rapidly in [region (enter country-relevant region)]. A doctor’s WhatsApp group (i.e., informal clinical network) has also noted increased influenza hospital admissions among [school-aged children (or other context-relevant risk group)].***

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| *The following probes should assist you in determining which core and enhanced surveillance approaches and investigations the country uses to address* ***Domain II Surveillance Objective 1: To monitor epidemiologic and clinical characteristics of illness over time*** *and* ***Surveillance Objective 3: To monitor situation in high-risk settings and vulnerable populations.*****Functionalities being assessed:** Functionality 5 and 6 (see Annex 1) |

### Questions for discussion

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| **Q 2.1 Can your respiratory disease surveillance data be stratified by age group and other priority risk groups to assess if this season is worse in certain groups?** |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, NNDS, Targeted special population surveillance* |
| **Probe: Sentinel surveillance and NNDS** |
| Are surveillance data from sentinel surveillance and NNDS stratified by standardized age groups? If yes:* What age groups are monitored in each surveillance approach?
* Is the relative proportion of respiratory illnesses across the different age groups available for multiple years?
 |
| **Probe: Priority risk groups** |
| Are data on risk groups collected (e.g., persons with chronic underlying conditions, pregnant women, persons of different races or ethnicities)?* If yes, which groups do you collect data on, and what kind of data do you collect?
* How often are risk group data analyzed and reported?
* Are data from certain risk groups not currently collected but needed?
 |
| **Facilitator supporting information (optional)** |
| The c*ountry may use standardized age groups for sentinel surveillance data that align with country’s objectives or with WHO guidance (see WHO’s “Implementing the integrated sentinel surveillance of influenza and other respiratory viruses of epidemic and pandemic potential by the Global Influenza Surveillance and Response System: standards and operational guidance”, 2024 at:* <https://iris.who.int/handle/10665/379678>*). Data by age group may be available for multiple years.* *Country may have identified priority risk groups that they monitor through NNDS or targeted special population surveillance. Country may conduct analyses of virus-specific illness in high-risk groups annually.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 NNDS: see Mosaic Framework Domain II, pages 39Targeted special population surveillance: see Mosaic Framework Domain II, page 40 |

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| **Q 2.2 This concern comes from a specific region. How well does your routine surveillance capture sub-national changes in disease activity?***Note: The facilitator should clarify that changes in disease activity indicate higher or lower intensity (i.e., more or less disease circulation) and not disease severity (i.e., seriousness of disease based on clinical outcomes like hospitalizations).* |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, NNDS****Possible enhanced surveillance approach****: Syndromic surveillance, Targeted special population surveillance* |
| **Probe: Surveillance geographic representativeness** |
| Do you have surveillance across the country to represent the desired sub-national administrative areas? * Describe how you use combinations of surveillance data from different approaches to understand sub-national trends.
* Are there gaps/needs?
 |
| **Probe: Population denominators** |
| Are the catchment populations of any surveillance sites known? * If yes, do you calculate population-based rates of priority respiratory diseases?
* If no, what alternative denominators are known (hospital admissions, primary care consultations etc.)
 |
| **Facilitator supporting information (optional)** |
| *The country may have placed surveillance sites to represent regions around the country and priority populations. Site-specific syndromic and associated virological data should be robust enough to interpret respiratory disease activity in the population captured by each site. The country may have defined catchment areas for some of their surveillance sites, allowing for calculation of population-based rates. The country may use NNDS, syndromic surveillance, targeted special population surveillance, and/or other approaches to monitor sub-national respiratory illness activity and provide additional context for changes in activity throughout the country. NNDS may include reporting from all or nearly all jurisdictions and facilities, including the private sector. Country may view these data together to provide a national picture of respiratory disease activity.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 NNDS: see Mosaic Framework Domain II, page 39**Further information on enhanced surveillance approaches:**Syndromic surveillance: see Mosaic Framework Domain II, page 42Targeted special population surveillance: see Mosaic Framework Domain II, page 40 |

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| **Q 2.3** **Can you use your surveillance data to monitor if there have been changes in demographic or clinical characteristics of severe respiratory disease cases in your country?**  |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, NNDS****Possible enhanced surveillance approach****: Enhanced clinical surveillance* |
| **Probe: Epidemiological and clinical data** |
| How are case-based data collected, managed, and reported?* Do case-based data include information on patient age, sex, race/ethnicity, illness signs and symptoms, underlying medical conditions, vaccine status (if applicable), and information on clinical interventions and clinical outcomes?
 |
| **Probe: Linkage of data** |
| If yes, can these data be reliably linked to laboratory results quickly? Is their linkage of data to vaccine registries? |
| **Probe: Data analysis** |
| How frequently are these data analyzed to assess the epidemiologic characteristics of transmission, demographic risk groups, and clinical characteristics associated with respiratory illness in the country? |
| **Facilitator supporting information (optional)** |
| *The country may collect case-based data for severe respiratory illness cases meeting a specified case definition through SARI sentinel surveillance and NNDS systems, with data interpreted at the national level. While the country may have collected case-based data via universal case-finding during the COVID-19 pandemic, this data collection may now be part of a routine, ongoing surveillance system. Country may collect demographic and clinical information on case report forms and have an established system to link this information with laboratory test results within a week of specimen submission. These data may be analyzed annually to assess the epidemiologic characteristics of transmission, demographic risk groups, and clinical characteristics associated with respiratory illness in the country.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 NNDS: see Mosaic Framework Domain II, page 39**Further information on enhanced surveillance approaches:**Enhanced clinical surveillance: see Mosaic Framework Domain II, pages 42-43  |

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| **Q 2.4** **Do you have enhanced clinical surveillance sites or national clinical networks (standing or ad hoc) that can help monitor clinical characteristics over time and identify changes?**  |
| ***Possible enhanced surveillance approach****: Enhanced clinical surveillance, Investigations/studies****Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance* |
| **Probe: Informal sharing mechanisms** |
| If a formal clinical network does not exist, are there forums or other avenues that allow clinicians to share clinical case studies or clinical data with the Ministry of Health leadership? |
| **Probe: Networks for other pathogens** |
| If a network does not exist for respiratory viruses, is such a network in place for other pathogens (e.g., tuberculosis) that could be leveraged for respiratory viruses? * Are specific sites designated for enhanced clinical data collection?
 |
| **Probe: Enhanced clinical surveillance sites and data** |
| If clinical surveillance sites exist (sites that collect enhanced clinical data), how are sites selected to participate?* Are data collected using standardized clinical case report forms?
* What data are collected (e.g., age, sex, race/ethnicity, illness signs and symptoms, underlying medical conditions, vaccine status [if applicable], and clinical interventions and outcomes)?
* Does your country contribute clinical data to regional or global clinical platforms?
 |
| **Probe: Linkage with routine surveillance** |
| Are existing surveillance approaches (e.g., ILI/ARI/SARI sentinel surveillance) used to refer patients to clinical networks for more detailed longitudinal follow-up? |
| **Probe: Independently funded networks** |
| Are there any independently funded clinical networks (e.g. The International Severe Acute Respiratory and emerging Infection Consortium (ISARIC), The Global Influenza Hospital Surveillance Network (GIHSN), Wellcome Trust) operating in your country that can help monitor clinical characteristics over time and identify changes? Are these networks well-connected to serving Ministry of Health objectives? |
| **Facilitator supporting information (optional)** |
| *The country may conduct enhanced clinical surveillance through clinical networks. Clinical networks refer to organized groups of healthcare facilities, clinicians, or researchers that collaborate to systematically collect, share, and analyze clinical and epidemiological data. These networks often span multiple hospitals or healthcare facilities at a national or multi-national level. Data generated from this surveillance may include age, sex, race/ethnicity, illness signs and symptoms, underlying medical conditions, vaccine status (if applicable), clinical interventions, and clinical outcomes to monitor changes in the natural history of illness, the relative severity of disease, risk factors for severe disease and poor outcomes, as well as treatment interventions and outcomes.* *The country may also participate in global clinical platforms, like ISARIC (The International Severe Acute Respiratory and emerging Infection Consortium), GIHSN (The Global Influenza Hospital Surveillance Network), or Wellcome Trust.* **Further information on core surveillance approaches:** Enhanced clinical surveillance: see Mosaic Framework Domain II, pages 42-43 **Further information on enhanced surveillance approaches:**Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37  |

# CASE 3: To monitor virologic and genetic characteristics

***There are reports that a study conducted by a university in a neighboring country [alternatively: a university/research institute in your country] has identified some genetic changes in the circulating coronaviruses that they feel may confer greater pathogenicity. These reports have raised concerns among clinicians and public health officials that this could be a new mutation that will cause increased caseloads and strained healthcare capacity. You want to monitor for this potentially new strain of coronaviruses in your country.***

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| *The following questions should assist you in determining which core and enhanced surveillance approaches and investigations the country uses to address* ***Domain II Surveillance Objective 2: To monitor virologic and genetic characteristics of circulating viruses.*****Functionalities being assessed:** Functionality 9, 10, 11 and 12 (see Annex 1) |

## Questions for discussion

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| **Q 3.1 What kind of tests does your national reference laboratory perform to characterize respiratory pathogens?**  |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, Laboratory networks****Possible enhanced surveillance approach****: Targeted special population surveillance* |
| **Probe: Laboratory testing** |
| Are the tests done on clinical specimens from routine surveillance approaches? If yes: * Describe how specimens are tested from different surveillance approaches.
* Are you currently submitting specimens to global collaborating centers for further characterization and to support global risk assessments?
	+ If yes, for which pathogens?
	+ If no, are you experiencing challenges in submitting specimens?
 |
| **Facilitator supporting information (optional)** |
| *The national reference laboratory may perform viral culture, molecular diagnostics, phenotypic characterization (e.g., antiviral susceptibility, antigenic characterization in the case of influenza) on clinical specimens received through routine and hospital-based surveillance. If any characterization capacity is limited, the reference laboratory has agreements in place with international reference laboratories, like a WHO Collaborating Centre, to ensure a subset of specimens from routine surveillance in the country are characterized. It participates in a global external quality assurance program annually.**This is an opportunity to discuss whether external quality assurance programs are run in the country.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 Laboratory networks: see Mosaic Framework Domain II, page 40**Further information on enhanced surveillance approaches:** Targeted special population surveillance: see Mosaic Framework Domain II, page 40 |

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| **Q 3.2 Can your national reference laboratory perform genetic sequencing? If your national reference lab does not conduct genetic sequencing, are there agreements with other reference labs to conduct timely genomic sequencing when needed?** |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, Laboratory networks* |
| **Probe: Sequencing methodologies** |
| What are the strengths and limitations of sequencing in your country?If your national reference laboratory performs genetic sequencing, what kind of sequencing is performed on clinical specimens? * Do you have a sequencing strategy that includes how many and which specimens should be selected for sequencing?
* Does your routine surveillance collect an adequate number of specimens to meet sequencing targets of the country’s strategy or global guidelines (e.g., GISRS)?
* Does your national reference laboratory conduct bioinformatics analyses on genetic sequencing results?
 |
| **Probe: Global data sharing**  |
| Does your laboratory participate in global data sharing of pathogen characterization data (e.g., genetic sequencing and antigenic data) into global public repositories? |
| **Facilitator supporting information (optional)** |
| The c*ountry’s national reference laboratory may have the capacity to perform next generation sequencing (whole genome, amplicon, and metagenomic sequencing) and bioinformatics analyses; bioinformatics analyses may be conducted via participation in a bioinformatics hub. Country’s epidemiology and laboratory staff at the national level may have communication channels with the WHO Collaborating Centre(s) and their WHO Regional Office to learn about genetic changes in circulating viruses in other countries. Designated national reference laboratory staff may routinely upload genetic sequence data to GENBANK, GISAID or similar within one week of receiving sequencing results from the national reference laboratory. They may be familiar with centralized repositories where this information can be visualized for some respiratory viruses.**The questions and probes provide the opportunity to see if epidemiology and laboratory staff are familiar with centralized repositories for genetic sequencing information where sequencing data can be visualized for some respiratory viruses (e.g., GenBank; Nextstrain:* [*https://nextstrain.org/flu/seasonal/h3n2/ha/2y*](https://nextstrain.org/flu/seasonal/h3n2/ha/2y)*; GISAID)***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 Laboratory networks: see Mosaic Framework Domain II, page 40 |

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| **Q 3.3 Does your respiratory surveillance system allow linkage of genetic, clinical, and epidemiologic data to help interpret how genetic changes affect risk groups, treatment approaches, or virus spread?**  |
| ***Possible core surveillance approach****: Sentinel ILI/ARI/SARI surveillance, Laboratory networks****Possible enhanced surveillance approach****: Targeted special population surveillance* |
| **Probe: Representativeness and timeliness of linked data** |
| If no [to Q3.3], are you able to identify whether sequenced specimens are from hospitalized or non-hospitalized individuals (i.e., are you able to determine the source of the sequenced virus)?If yes [to Q3.3], do you have a nationally representative subset of sequenced viruses linked to case-based clinical, epidemiologic, and treatment information to help interpret any observed changes? * How often are these data linked, and how soon after specimens are collected are these data available?
 |
| **Facilitator supporting information (optional)** |
| The c*ountry may collect a nationally representative subset of sequenced and phenotypically characterized viruses with associated case-based clinical and epidemiologic to facilitate interpretation of any observed changes in genetic sequence. These data are linked routinely, retained at the national level, and timely within the past 4 weeks.***Further information on core surveillance approaches:** Sentinel ILI/ARI/SARI surveillance: see Mosaic Framework Domain II, pages 34-37 Laboratory networks: see Mosaic Framework Domain II, pages 40**Further information on enhanced surveillance approaches:** Targeted special population surveillance: see Mosaic Framework Domain II, page 40 |

# CASE 4: Monitor impact on and coping abilities of healthcare systems

***It is the height of the [winter (adapt to local context)] season and there has been concurrent high activity of both influenza and COVID-19. Local public health officials report that hospital bed space and oxygen capacities are being challenged. You need to determine if this is a localized problem or a broader healthcare capacity issue nationwide.***

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| *The following probes should assist you in determining which core and enhanced surveillance approaches and investigations the country uses to address* ***Domain II Surveillance Objective 4: To monitor impact on and coping abilities of healthcare systems.*****Functionalities being assessed:** Functionality 7 and 8 (see Annex 1) |

## Questions for discussion

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| **Q 4.1 Do you routinely monitor healthcare capacity?**  |
| ***Possible core surveillance approach****: Healthcare capacity monitoring****Possible enhanced surveillance approach****: Investigations and studies* |
| **Probe: Monitoring approaches** |
| If you routinely monitor healthcare capacity, what types of hospital metrics are monitored (e.g., bed occupancy, essential medicines (e.g. oxygen), supplies, human resources including healthcare worker absenteeism)?* How frequently are these metrics monitored?
* If bed occupancy is monitored, are all beds monitored or only critical care/ICU beds?
* Which types of facilities (public or private) and health system level(s) (tertiary, secondary/regional, local/primary) are reporting healthcare capacity metrics?
 |
| **Facilitator supporting information (optional)** |
| *Note to facilitators: If the country is not currently (or not regularly) monitoring health care capacity, the country may have conducted monitoring during the COVID-19 PHEIC or another emergency. Discussion could then be on what was undertaken in the past, why this was stopped or adjusted, and needs in the inter-pandemic period.**The country may have a healthcare monitoring system that monitors bed capacity, healthcare provider availability or shortages, availability of other resources in the hospital (like oxygen), and available capacity for intensive care. Current healthcare capacity monitoring may be in place either through comprehensive reporting or sentinel-based systems and may represent public and private health facilities. This system may permit both national and subnational assessments to inform operational decision-making on service delivery and patient referrals and may supplement other data to give a more detailed picture of virus transmission. Country may provide guidance in its pandemic preparedness plan to ensure surveillance is adjusted to continue to document cases of acute respiratory illness and test them for all relevant pathogens in the event these cases are triaged to a temporary location. Country may use this guidance to ensure that cases are not lost to surveillance during time periods when clinic and hospital capacity is strained.***Further information on core surveillance approaches:** Healthcare capacity monitoring: see Mosaic Framework Domain II, page 40**Further information on enhanced surveillance approaches:**Investigations and studies: see Mosaic Framework Domain II, pages 41-42 |

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| **Q 4.2 How often are healthcare capacity data reported and reviewed by Ministry of Health officials?**  |
| ***Possible core surveillance approach****: Healthcare capacity monitoring* |
| **Probe: Timeliness of data** |
| How long does it take between when these data are collected and when they are reviewed by public health officials? * Is this monitoring routine or undertaken as *ad hoc* audits when needed?
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| **Probe: Data use for decision-making** |
| Are healthcare capacity data used for real time evidence-based decision-making (e.g., service delivery, patient referrals, outbreak response strategies, and community intervention evaluations)?* If yes, who has access to these data? How are these data used?
 |
| **Facilitator supporting information (optional)** |
| *Note to facilitators: If the country is not currently (or not regularly) reporting and reviewing health care capacity data, the country may have done this during the COVID-19 PHEIC or another emergency. Discussion could then be on what was undertaken in the past, why this was stopped or adjusted, and needs in the inter-pandemic period.**Data may be reported and reviewed at the national level at least once per month.* *The country may have regularly evaluated its healthcare facility monitoring system, including recording which decisions were made in response to data and what data informed that decision-making. A country may have adjusted the system as required in response to evaluation findings.***Further information on core surveillance approaches:** Healthcare capacity monitoring: see Mosaic Framework Domain II, page 40 |

# ANNEX 1: Functionality indicators to guide discussion

1. Country’s sentinel or monitoring surveillance approaches can:
	1. Define the seasonality of regularly recurring respiratory pathogens.
	2. Indicate the start and end of the seasonal epidemic.
	3. Objectively reflect the relative severity of the current season compared to previous ones.
2. Country’s sentinel or monitoring surveillance approaches can provide data sufficient to characterize the relative healthcare-based burden of different respiratory pathogens.
3. Country’s sentinel or monitoring surveillance approaches link laboratory and epidemiological data for individual cases.
4. When measuring the relative severity of an outbreak or seasonal epidemic, country uses multiple sources of data to contribute to severity monitoring. These may include but not be limited to:
	1. Sentinel-based hospitalizations data;
	2. Hospital administrative code on admissions data;
	3. ICU admissions data;
	4. Emergency department visits data.
	5. Mortality data;
	6. Excess mortality data;
5. Country’s sentinel or monitoring surveillance approaches are representative, including:
	1. Geographically within the country.
	2. Across the country’s different climactic zones.
6. Country’s sentinel or monitoring surveillance approaches can:
	1. Monitor the clinical and demographic characteristics of severe cases of respiratory illness.
	2. Identify whether specific priority groups are at higher risk for severe illness.
7. Country’s healthcare facility monitoring system has the ability to monitor:
	1. Bed capacity.
	2. Available capacity for intensive care.
	3. Healthcare provider availability or shortages.
	4. Availability of oxygen and other resources.
8. Country is able to quantify the lag time of its healthcare facility occupancy data.
9. Country’s sentinel or monitoring surveillance approaches are able to:
	1. Provide clinical specimens for pathogen characterization (molecular diagnostics, viral culture, genetic sequencing, and/or phenotypic characterization).
	2. Submit these data or specimens as part of global efforts for risk assessment and to select vaccine strains.
10. Country’s national reference laboratory has the capacity to perform:
	1. Molecular diagnostics.
	2. Viral culture.
	3. Genetic sequencing.
	4. Phenotypic characterization.
11. Country’s national reference laboratory has the capacity to perform next generation sequencing (e.g., whole genome, amplicon, or metagenomic sequencing) and bioinformatics analyses; bioinformatics analyses are conducted either in-house by laboratory staff or in collaboration with an external laboratory or organization.
12. Country’s national reference laboratory or equivalent institution participates in a global external quality assurance program.