OVERVIEW MODULE: STRATEGIC GUIDANCE ON VPD SURVEILLANCE IN THE WHO SOUTH-EAST ASIA REGION

Surveillance Guide for Vaccine-Preventable Diseases in the WHO South-East Asia Region

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Foreword

Overwhelming evidence demonstrates the benefits of immunization as one of the most successful and cost-effective public health interventions ever known. Over the past several decades, immunization has achieved many milestones, including the eradication of smallpox, an accomplishment that has been called one of humanity’s greatest triumphs. Vaccines have saved countless lives, lowered the global incidence of polio by 99% and reduced illness, disability and death from diphtheria, tetanus, whooping cough, measles, *Haemophilus influenzae* type b disease and epidemic meningococcal A meningitis. We have been able to make the Region free of polio for the last 10 years, eliminate maternal and neonatal tetanus and eliminate measles in five countries and eliminate rubella in 2 countries.

We have vaccines against more than 25 diseases in the present-day world, and this has increased the need for better surveillance against these diseases to control or eliminate them. As the essence of this subject matter, I would like to highlight that high vaccination coverage may not necessarily indicate the caseload or disease burden in a population. We need to look into the surveillance performance as the key indicators progress towards disease control and/or elimination.
A functional vaccine-preventable disease surveillance system is a key part of public health decision-making in all countries. Thus, there is an urgent need to build on the current efforts to strengthen vaccine-preventable disease surveillance with the latest state-of-the-art technologies at subnational and national levels.

I hope that this second edition of the vaccine-preventable diseases surveillance guide will be well translated into respective national programmes and add to the efforts to have a high-quality surveillance system for priority vaccine-preventable diseases and accelerate progress towards strengthening vaccine-preventable disease surveillance in our Region.

Finally, every individual in our Region deserves our best work. We all agree that every family, no matter where residing, has the right to all immunization and health services that are provided by the respective government, in the spirit of universal health coverage contributing towards Sustainable Development Goals, especially Goal 3 on health.

Dr. Poonam Khetrapal Singh

Regional Director, WHO South-East Asia Region
Strategic guidance on VPD surveillance in the WHO South-East Asia Region

Background

Public health surveillance is the continuous and systematic collection, analysis and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice (1). Surveillance for vaccine-preventable diseases (VPDs) is similar to other types of disease surveillance in the matter of design (2). VPD surveillance is of vital importance for its potential to inform policy. It is also of great value in the monitoring of immunization programmes, including the introduction and coverage of vaccines and their potential use in outbreak response. Surveillance also helps to detect changes in the epidemiology of VPDs over time due to vaccination and other preventive measures. As the burden of a VPD decreases, the objectives and design of the surveillance system may shift. This document provides standards for the design and implementation of VPD surveillance to meet the objectives of immunization programmes.

Vision

All countries in the Region have sustainable, high-quality VPD surveillance systems which are supported by efficient laboratories that detect and confirm cases and generate useful data to guide outbreak prevention and response, immunization programme management, and vaccine policy.

Objectives

The key objectives of VPD surveillance in the Region are:

- monitoring disease elimination or eradication efforts;
- detecting outbreaks and new pathogens;
- collecting evidence for the introduction of new vaccines or the optimization of vaccine schedules;
- evaluating the performance of immunization programmes and defining the need for supplementary immunization;
- evaluating the effectiveness of vaccines and their impact on the disease burden; and
- detecting changes in the strains or nature of disease (for example, flu).
Guiding principles

A VPD surveillance system must be:

- comprehensive
- country-led and country-owned
- high quality
- sustainable
- tailored to the needs of a country
- evidence-informed
- integrated across diseases
- accountable
- flexible
- efficient
- useful for programme and policy decisions
### Current situation of VPD surveillance in the Region

#### Table-1: Current situation of VPD surveillance by country (June 2022)

<table>
<thead>
<tr>
<th>Country</th>
<th>Laboratory supported case-based</th>
<th>Nationwide case-based</th>
<th>Nationwide aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Polio; MR; CRS; JE/AES;</td>
<td>IBD; Rota</td>
<td>NNT; Diphtheria; Pertussis;</td>
</tr>
<tr>
<td>Bhutan</td>
<td>Polio; MR; CRS; JE/AES;</td>
<td>Rota</td>
<td>Diphtheria; Pertussis; NNT</td>
</tr>
<tr>
<td>DPR Korea</td>
<td>Polio; MR; CRS; Diphtheria; Pertussis NNT; Rota</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>Polio; MR; JE/AES</td>
<td>CRS; IBD; Rota, Typhoid</td>
<td>Diphtheria, Pertussis, NNT</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Polio; MR; Diphtheria, Pertussis</td>
<td>CRS; JE/AES; Rota</td>
<td>NNT</td>
</tr>
<tr>
<td>Maldives</td>
<td>Polio; MR;</td>
<td>CRS; Rota</td>
<td>Diphtheria, Pertussis, NNT</td>
</tr>
<tr>
<td>Nepal</td>
<td>Polio; MR ; JE/AES</td>
<td>CRS ;Rota</td>
<td>Diphtheria; NNT</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>Polio; MR; CRS Diphtheria; Pertussis; NNT; JE/AES</td>
<td>IBD, Typhoid</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>Polio; MR; CRS Diphtheria; Pertussis; NNT; JE/AES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>Polio ; MR</td>
<td></td>
<td>Diphtheria, Pertussis, NNT</td>
</tr>
</tbody>
</table>

AES: acute encephalitis syndrome; CRS: congenital rubella syndrome; IBD: invasive bacterial diseases; JE: Japanese encephalitis; MR: measles rubella; NNT: Neonatal tetanus; Polio: poliomyelitis; Rota: Rotavirus
Design characteristics of VPD surveillance

Once the objectives of surveillance are set, it is necessary to create a surveillance system design that meets the objectives. The following questions must be considered for the process:

- Is it necessary to capture all cases, or is a subset or fraction acceptable? If the elimination or eradication of the VPD is the goal, then all cases must be captured.
- What level of detailed case information is necessary to inform public health action?
- Are the resources adequate for obtaining detailed information for every case, or would it be more efficient to have focused surveillance in high-yield scenarios, or to integrate with other surveillance systems?

The following characteristics could be considered during the designing process. These may depend on the existing public health system and infrastructure in a country. Although these have been presented as either/or, many surveillance systems contain a mixture of elements, for example, a system may have both passive and active elements, or be both facility- and community-based.

- Aggregate/case-based
- Nationwide/subnational: When controlling a VPD is the goal, subnational surveillance may be acceptable to determine the risk factors or evaluate the impact of a vaccine. However, if elimination or eradication is the goal, nationwide surveillance that strives to detect all cases is essential.
- Population-based/sentinel
- Facility-based/community-based
- Active/passive
- Clinical/laboratory-based

Passive surveillance

In this type of surveillance, data/reports are sent routinely by designated health facilities (reporting sites) or individuals. Weekly reports are sent even if no cases have been detected (zero reports).

The reporting network for passive surveillance should consist of the following sites:

- public sector facilities, such as medical colleges, district hospitals and subdistrict health facilities;
- private sector health facilities that VPD cases are most likely to visit (personnel should be trained to identify cases); and
community-based informants, such as village-level health extension workers/volunteers, teachers, members of nongovernmental organizations (NGOs) and civil society organizations (CSOs).

The reporting sites should be regularly reviewed and assessed for performance and new sites should be included as required. There should be a mechanism to provide feedback to the reporting sites.

Active surveillance

In this type of surveillance, designated surveillance officers visit health facilities to search for and investigate unreported cases through:

- a review of health facility records;
- interviews with health workers; and
- visits to wards.

Surveillance sites should be prioritized according to the probability of finding VPD cases. In other words, those which have a higher probability of having VPD cases should be visited more regularly. Every surveillance officer should have a list of surveillance sites and a schedule of the visits to be made. Each surveillance visit should be documented.

Community-based surveillance

The systematic detection and reporting of events of public health significance within a community-by-community members is called community-based surveillance. This is especially important in areas where the health system is weak or non-existent, such as areas with compromised security.

Trained community members (e.g., informants, volunteers) are engaged to report suspected cases, based on a simplified case definition tailored for use by community members, to a designated focal person who is part of the surveillance system.

Additional surveillance activities

Additional surveillance activities are undertaken in areas with underreporting or no reporting (‘silent’). These help to assess the sensitivity of the VPD surveillance system. Some examples are as follows.

Retrospective record review: A limited number of international classification of diseases (ICD) codes is used to categorize all patients. Their records are reviewed for any sign of
the targeted VPD. The review is conducted for a minimum period of one year in selected health-care facilities. The objectives of the review are to:

- identify missed cases;
- determine the sensitivity of the surveillance system;
- identify factors contributing to inadequate surveillance; and
- raise awareness of the importance of VPD surveillance through the involvement of key local personnel.

**Active case search:** In this case, health officials contact key persons in the community to find out about VPD events in the community. The key persons could be community leaders, schoolteachers, social workers, leaders of women’s organizations, traditional healers, and religious leaders.

Active case finding (ACS) is conducted in:

- districts that have been silent for one or more years;
- high-risk populations; and
- areas that have reported outbreaks/increased transmission for diseases that are close to elimination/eradication/control.

**Minimum requirements for VPD surveillance**

Starting a surveillance requires the following:

- planning a strategy and partner coordination;
- defining standards for surveillance and information systems (interoperable or well-integrated with the existing system) to support the collection, analysis, sharing and programmatic use of data;
- a workforce that is appropriately trained in the core competencies of surveillance, including data analysis;
- a laboratory network (where applicable);
- technical support for implementation; and
- sustainable financing.
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Laboratory network

A laboratory result confirming a VPD case is the starting point of surveillance for many diseases. Laboratories or hospitals report these cases to public health authorities, either as part of national disease reporting requirements or sentinel surveillance networks. This approach is best implemented when a majority of patients with specified signs and symptoms are laboratory tested as part of the existing clinical practice. Data management systems are essential for linking laboratory and epidemiological (clinic-based) data.

WHO coordinates global and regional laboratory networks to support surveillance for several VPDs, including polio, measles–rubella, Japanese encephalitis (JE), rotavirus and invasive bacterial diseases (IBD). Global laboratory networks engender confidence in the data used in eradication and elimination programmes and for national and global vaccine policy decisions. They also allow for valid comparison of VPD epidemiology and incidence across countries. National laboratory personnel are trained to test for a VPD and are supported by regional reference laboratories for confirmatory testing and quality assurance/control. A few global specialized and regional reference laboratories conduct advanced testing, such as molecular typing.

A network of laboratories has been established in the Region to support case-based surveillance for priority VPDs (polio, measles–rubella, JE, IBD) and ensure the reporting of quality assured results of surveillance specimens. Laboratory quality assurance (QA) procedures relate to the testing process (for example, external quality assurance, proficiency panel testing, periodic retesting, and regular site visits), while quality control (QC) procedures relate to laboratory results, such as internal assay controls. Both are encouraged as part of the laboratory component of surveillance.

Integration of VPD surveillance

The integration of VPD surveillance into existing communicable disease surveillance systems or the linking of one VPD surveillance system to another has clear advantages. The integration of disease surveillance capitalizes on an economy of scale and can be less resource-intensive than starting a new disease-specific surveillance system.
VPD surveillance can be integrated into existing surveillance in three main ways.

1. Use the existing system as is. If the existing surveillance system already captures the complement of cases and data elements from the desired population, then the system might already be sufficient to meet the standards for some VPDs as outlined in this document.

2. Add more VPDs to an existing VPD platform. An existing VPD surveillance platform might be adapted to meet the surveillance standards for additional VPDs. An example is the adaptation of measles case definitions and testing algorithms to allow integrated surveillance with rubella.

3. Integrate surveillance activities instead of systems. If separate VPD-specific surveillance is required, the team can integrate surveillance activities in areas of overlap between the two surveillance systems.

The integration of VPD surveillance activities with existing surveillance efforts will require integration in the following areas:

- policy, including regulations, prioritization, and standards;
- financing, including costing, funding, and sustainability plans;
- infrastructure, including facilities, equipment, supplies, and maintenance;
- workforce, including staffing, retention plans and cross-cutting training;
- field logistics, including case investigations, supervision, active surveillance visits and transport of laboratory samples;
- laboratory, including expansion and diversification of global networks, shared procurement processes and quality management systems (for example, external quality assessment); and
- monitoring and evaluation, including information systems and performance indicators.

**Syndromic surveillance platform**

In the context of VPD surveillance, syndromic surveillance refers to the use of a clinical syndrome – a constellation of symptoms and signs – as the case definition for the detection of suspect cases of a VPD. Using syndromic surveillance platforms for multiple VPDs can be more efficient than doing surveillance for a single disease.
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Key steps in conducting surveillance in the Region

Following are the key steps proposed for conduction VDP surveillance in the Region. However, countries will need to adopt and adapt to the respective surveillance system.

**Figure 1: Key steps in conducting surveillance in the Region**

![Diagram of surveillance process]

**Prioritization of VPDs for surveillance**

Not all VPDs are prioritized for surveillance. WHO specifies a set of criteria for prioritizing the surveillance of communicable diseases (3). Many VPDs would be prioritized according to these, partially because they have a proven method of control and prevention – namely vaccination.

The following points must be taken into consideration when deciding whether to undertake surveillance for a particular VPD:

- whether it is a VPD with a global surveillance mandate, for example, diseases as defined by International Health Regulations; and
- whether surveillance data will inform key vaccine policy and immunization strategy decisions.
- The following questions related to resources must be considered when deciding the type of surveillance to be conducted.

<table>
<thead>
<tr>
<th>Case-based surveillance</th>
<th>Aggregate surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case detection</td>
<td>Case detection</td>
</tr>
<tr>
<td>Case investigation</td>
<td>Case reporting</td>
</tr>
<tr>
<td>Sample collection and lab testing</td>
<td>Sample collection and lab testing</td>
</tr>
<tr>
<td>Case classification</td>
<td>Data analysis and interpretation</td>
</tr>
<tr>
<td>Case reporting</td>
<td>Feedback &amp; dissemination</td>
</tr>
<tr>
<td>Data analysis and interpretation</td>
<td>Feedback &amp; dissemination</td>
</tr>
<tr>
<td>Public health action</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case detection</th>
<th>Surveillance standards available</th>
<th>Work force trained</th>
<th>Laboratory network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active surveillance in all health facilities, Zero reporting, community informants</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CRS, JE, IBD, Rota</td>
<td>Passive Surveillance, selected health facilities, sentinel sites</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surveillance standards available</th>
<th>Work force trained</th>
<th>Laboratory network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, a regional network supported by regional reference lab</td>
<td>Yes, a regional network supported by regional reference lab</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical Support for Implementation</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO network in selected country</td>
<td>MOH, GPEI, MRI</td>
</tr>
<tr>
<td>WHO network, collaboration with academic</td>
<td>MOH Research funds</td>
</tr>
</tbody>
</table>
Can surveillance objectives be met by using the existing integrated surveillance platforms, with a minimal increase in resources, or is disease-specific surveillance required?

Is there sufficient technical capacity, including epidemiological staff and laboratory infrastructure?

Is there adequate funding and other resources to conduct a high-quality surveillance that addresses the objectives of the immunization programme? If not, the decision to conduct surveillance for the VPD should be reconsidered.

Poor-quality surveillance can be worse than no surveillance because it can lead to decision-making based on erroneous or incomplete data.

Table 2 lists the current recommendations of WHO for comprehensive VPD surveillance on the basis of a country’s resources and disease burden.

**Table 2: WHO global recommendations for comprehensive VPD surveillance**

<table>
<thead>
<tr>
<th>Tier</th>
<th>Country characteristics</th>
<th>Recommended strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier - 1</td>
<td>Limited surveillance capacity</td>
<td>Minimum surveillance standards for at least 5 VPDs (polio, measles, rubella, congenital rubella syndrome and neonatal tetanus)</td>
</tr>
<tr>
<td></td>
<td>High communicable disease burden and risk, including polio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fragile</td>
<td></td>
</tr>
<tr>
<td>Tier - 2</td>
<td>Moderate surveillance capacity</td>
<td>Minimum surveillance standards for at least 7 VPDs (polio, measles, rubella, congenital rubella syndrome, neonatal tetanus, diphtheria and pertussis)</td>
</tr>
<tr>
<td></td>
<td>High communicable disease burden and risk</td>
<td></td>
</tr>
<tr>
<td>Tier - 3</td>
<td>Adequate surveillance capacity</td>
<td>Minimum or enhanced surveillance standards for priority VPDs (at least 10, including invasive bacterial diseases, rotavirus, and Japanese encephalitis)</td>
</tr>
<tr>
<td></td>
<td>Moderate communicable disease burden and risk; support needed for specific VPDs</td>
<td></td>
</tr>
<tr>
<td>Tier - 4</td>
<td>High surveillance capacity</td>
<td>A national system beyond minimum VPD surveillance standards (for at least 15 VPDs) that coordinates with other communicable disease surveillance systems and supranational entities</td>
</tr>
<tr>
<td></td>
<td>Low communicable disease burden and risk</td>
<td></td>
</tr>
</tbody>
</table>
Strengthening VPD surveillance in South-East Asia Region

A regular review of VPD surveillance should be conducted to identify good practices, and issues and challenges, to guide the future course of action and strengthen VPD surveillance.

The following key activities are essential to strengthen VPD surveillance.

1. Case detection in the public and private sectors must be enhanced through
   - regular review and updating of reporting sites;
   - the addition of informants; community based as well as health facility based (private and public);
   - linkage with other surveillance systems.

2. Surveillance guides and standard operating procedures must be updated.

3. The surveillance workforce must receive initial and refresher training.

4. Effective and efficient laboratory support must be ensured, and the laboratory network expanded to increase access.

5. Sustainability must be ensured by
   - making provisions in the national and local budget;
   - having a dedicated workforce; and
   - establishing a mechanism for accountability at all levels.

6. Adequate technical assistance must be ensured for the implementation of the surveillance programme.

7. The quality of data must be enhanced, and the data must be used for further action.

8. Surveillance functions must be integrated.

9. Other activities may be identified during the review of the programme.

The way forward

The following actions will be required to further strengthen surveillance.

- Ensure that the existing system meets the standards for VPD surveillance (captures data and information required), for example, aggregate facility-based surveillance for non-neonatal tetanus.
- Adapt the existing surveillance platform to meet the surveillance standards for additional VPDs.
- Integrate activities in functional areas of overlap, even if separate surveillance is required for specific VPDs.
Minimum surveillance requirement for VPDs in countries in SEA Region

A set of VPDs has been recommended for surveillance in the Region. This includes, at a minimum, all VPDs with global surveillance mandates, including diseases as defined by International Health Regulations (4), and other regional and country priorities.

Table 5: VPDs identified for surveillance in the Region

<table>
<thead>
<tr>
<th></th>
<th>Nationwide, laboratory-supported, case-based</th>
<th>Nationwide, aggregate</th>
<th>Sentinel, case-based with laboratory confirmation of every case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In all countries</strong></td>
<td>Poliomyelitis, measles and rubella</td>
<td>Diphtheria, pertussis, neonatal tetanus</td>
<td>Congenital rubella syndrome,</td>
</tr>
<tr>
<td><strong>In selected countries</strong></td>
<td>Japanese encephalitis/ AES</td>
<td>Non-NT, Hepatitis B</td>
<td>Invasive bacterial diseases Rotavirus</td>
</tr>
</tbody>
</table>

The guidance and minimum core variables to be recorded and reported along with key performance indicators for each of these VPDs have been defined and available in respective modules.

Module 1 – Measles and rubella
Module 2 – Congenital rubella syndrome
Module 3 – Poliomyelitis
Module 4 – Diphtheria
Module 5 – Pertussis
Module 6 – Neonatal tetanus
Module 7 – Non-neonatal tetanus
Module 8 – Hepatitis B
Module 9 – Rotavirus
Module 10 – Japanese encephalitis
Module 11 – Invasive bacterial vaccine-preventable diseases
References


CONTRIBUTION

The document was produced under the strategic guidance of the Regional Director, Dr. Poonam Khetrapal Singh; Director, Programme Management Dr. Pern Namgyal, and Director CDS Dr. Suman Rijal WHO SEARO.

The entire process was overseen by Dr. Sunil Bahl, Coordinator, COVAX, Immunization and Vaccines Development.

Dr. Sudhir Khanal, IVD/CDS WHO SEARO, lead the coordination and development of the technical document together with Dr. Sudhir Joshi, IVD/CDS WHO SEARO. WHO Consultant Dr. Lalit Kant played a crucial role in updating the technical content of the document.

This document also benefited from the expert input of all the participants of the Regional workshop to review progress towards measles-rubella and other priority VPD surveillance and outbreak preparedness and response in WHO South-East Asia Region from 13-16 June 2022 in Dhaka, which included National EPI Programme Managers and VPD Surveillance Officers from Member States, as well as a number of WHO country office staff, UNICEF, and other external collaborators.

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