

Poliomyelitis

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This is a summary of WHO global poliomyelitis surveillance guidance available at <http://polioeradication.org/tools-and-library/resources-for-polio-eradicators/gpei-tools-protocols-and-guidelines/>.



DISEASE AND VACCINE CHARACTERISTICS

Polioviruses are human enteroviruses with serotypes 1, 2 or 3. The incubation period is usually 7–10 days (range 4–35 days). Most people infected with poliovirus do not have symptoms, though they can still excrete virus in faeces and, for a shorter time, in saliva. Approximately one-quarter of those infected develop minor, transient symptoms including fever, headache, malaise, nausea, vomiting and sore throat. Some individuals (approximately 4%) develop a self-limited illness with signs of meningeal irritation (neck stiffness, severe headache). Paralytic poliomyelitis is a rare outcome and occurs when poliovirus enters the central nervous system and replicates in anterior horn cells (motor neurons) of the spinal cord or brainstem. In children < 5 years of age, it is observed in < 1% of poliovirus infections.

Inactivated poliovirus vaccine (IPV) is an injectable vaccine consisting of all three poliovirus serotypes. Oral poliovirus vaccines (OPV) are composed of live attenuated polioviruses, and can be monovalent (mOPV, type-specific) or bivalent (bOPV, types 1 and 3). Trivalent OPV (tOPV, all serotypes), which has been used in many countries for decades, has been unavailable since May 2016 when its use was discontinued as part of the global removal of type 2 from OPVs in immunization programmes following the declared eradication of wild poliovirus (WPV) type 2 in 2015. OPV has been predominantly used in immunization programmes due to its ease of administration (oral drops), ability to induce intestinal immunity (critical to limit transmission), low cost and ability to confer immunity via secondary exposure. However, in rare instances the attenuated viruses in OPV (Sabin strains) may re-acquire neurovirulence leading to vaccine-associated paralytic poliovirus

(VAPP) in the vaccine recipient or close contact. Vaccine-derived polioviruses (VDPVs) are Sabin strains that re-acquire neurovirulence and efficient transmissibility as a result of prolonged replication in an immunodeficient individual (immunodeficiency-associated VDPV or iVDPV), or in a community with low population immunity to polio (circulating VDPV or cVDPV). The paralysis of both VAPP and VDPVs is clinically indistinguishable from poliomyelitis caused by WPVs. After the Global Certification Commission certifies the eradication of the remaining two serotypes of WPV, the use of all OPV will cease in a coordinated manner.

Since 1988, Global Polio Eradication Initiative (GPEI) efforts, including use of poliovirus vaccines through routine and intensive supplementary immunization as well as the rapid detection and response to poliovirus transmission, have led to a precipitous drop in the global incidence of poliomyelitis by > 99%. Moreover, the number of countries with endemic polio has reduced from 125 to just three in 2017 (Nigeria, Afghanistan and Pakistan) (1). Type 2 WPV was declared eradicated in 2015 (last case detected in 1999); the last isolation of type 3 WPV was in 2012. GPEI has outlined a strategy for achieving eradication in the Polio Eradication and Endgame Strategic Plan 2013–2018, which includes the introduction of at least one dose of IPV into routine immunization schedules as a strategy to mitigate the potential consequences of any re-emergence of type 2 poliovirus after the global switch from tOPV to bOPV in 2016 (2).

RATIONALE AND OBJECTIVES OF SURVEILLANCE



► Poliomyelitis caused by WPV is targeted for eradication; however, the ultimate goal is a polio-free world, including poliomyelitis caused by VDPVs and VAPP. Highly sensitive surveillance for acute flaccid paralysis (AFP), including immediate case investigation and specimen collection for standardized testing, is critical for the detection of the circulation of poliovirus.

► AFP surveillance is also critical for documenting the absence of poliovirus circulation for certification of eradication. Certification of polio-free status requires the absence of WPV transmission from any source (AFP, sewage samples, community samples) for at least three successive years together with timely and sensitive AFP surveillance that meets Global Certification Commission certification standards.



TYPES OF SURVEILLANCE RECOMMENDED

The minimal recommended standard for poliovirus surveillance is nationwide, case-based syndromic surveillance for AFP with laboratory confirmation of poliovirus from stool specimens. AFP cases should be identified using both active and passive surveillance, and facility- and community-based detection methods. AFP surveillance is supplemented by environmental surveillance (testing for poliovirus in sewage samples) under specific conditions (see Box 1).

CASE DETECTION

- Establish passive reporting from a network of reporting sites that includes public and private healthcare facilities and clinics, and preferably includes traditional healers and community informants such as community leaders and village volunteers.
- In addition to passive reporting, regular active surveillance visits should be made to selected priority reporting sites that are most likely to treat AFP patients (such as major hospitals, large paediatric clinics, physiotherapy centres) to identify unreported AFP cases.
- Community-based surveillance plays a key role and relies on a network of trained or sensitized volunteers to report AFP cases to public health authorities. Community-based surveillance can be especially important in areas where health systems are weak or non-existent, such as areas with compromised security.

LINKAGES TO OTHER SURVEILLANCE

Ideally, AFP surveillance should be linked with case-based surveillance for measles-rubella and neonatal tetanus, and should also be linked with integrated

BOX
1

Role of environmental surveillance for detecting poliovirus

Environmental surveillance, or testing of sewage samples for poliovirus, can supplement AFP surveillance in some settings. The purpose of environmental surveillance is to identify poliovirus transmission that might occur in the absence of detected AFP cases, since < 1% of new infections with WPV or VDPV leads to paralysis. Environmental surveillance is currently conducted in the three countries with endemic transmission (Afghanistan, Nigeria, Pakistan) and 34 countries without recent active WPV transmission. Environmental surveillance can also be employed as part of a polio outbreak investigation if it is feasible to establish quality environmental surveillance.

surveillance for other vaccine-preventable or outbreak-prone diseases. Countries that conduct iVDPV surveillance, enterovirus surveillance, or environmental surveillance for polio should also link AFP surveillance to these efforts.



CASE DEFINITIONS AND FINAL CLASSIFICATION

SUSPECTED CASE DEFINITION FOR CASE FINDING

A suspected case is any case presenting with AFP. An AFP case is defined as a child < 15 years of age presenting with recent or sudden onset of floppy paralysis or muscle weakness due to any cause, or any person of any age with paralytic illness if poliomyelitis is suspected by a clinician.

FINAL CASE CLASSIFICATION (SEE FIGURE 1)

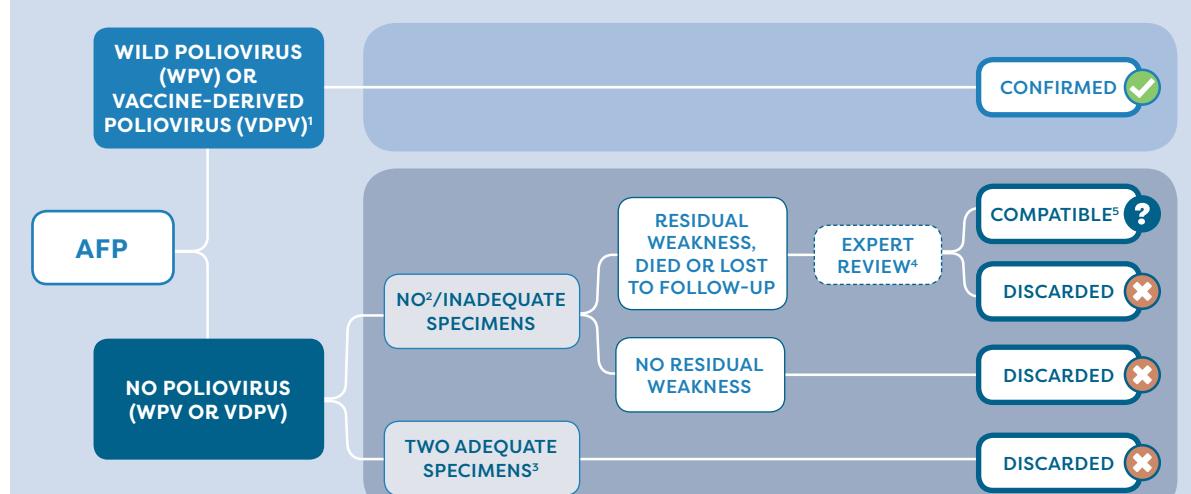
- **Confirmed:** A suspected case with isolation of WPV or VDPV in stool specimens collected from the suspected case or from a close contact
- **Compatible:** A suspected case with no adequate specimens (see Specimen collection section below); no isolation of WPV or VDPV from the case or close contacts; and residual paralysis after 60 days follow up that is deemed by the national

expert review committee to be clinically and epidemiologically compatible with poliomyelitis. The expert review committee may classify compatible cases presented to the committee as poliomyelitis when there is insufficient clinical and epidemiological data to rule it out.

- **Discarded:** A suspected case that was adequately investigated (including collection of adequate stool specimens) and resulted in any of the following:
 - » no laboratory evidence of WPV or VDPV infection
 - » inadequate specimens collected and resolution of weakness within 60 days of paralysis onset
 - » deemed by the national expert review committee to not be compatible with poliomyelitis.

**FIGURE
1**

Final classification of acute flaccid paralysis (AFP) cases



¹ Isolation of poliovirus (WPV or VDPV) from a contact of an AFP case is also used to confirm poliovirus infection of the AFP case.

² All cases reported between 2 to 6 months after date of onset must be investigated even though a stool specimen is not collected on them. They follow the follow up needed for those with inadequate stools

³ Adequate specimens are two specimens (at least 8 grams) collected within 14 days of paralysis onset, at least 24 hours apart, and arriving at a WHO-accredited laboratory in good condition (no evidence of desiccation or leakage, and evidence that reverse cold chain was maintained).

⁴ Cases undergoing expert review and subsequently classified as "discarded" or "compatible" should be line listed.

⁵ Compatible cases represent a surveillance failure and should be scrutinized for clustering in space and time.



OTHER DEFINITIONS

AFP cases with laboratory evidence of poliovirus infection other than WPV should be further classified as described below.

➤ **Vaccine-associated paralytic poliomyelitis (VAPP):**

AFP case occurring within 4–35 days of receipt of OPV with **all** of the following:

- » Sabin or Sabin-like strain poliovirus is isolated from stool specimens
- » residual paralysis 60 or more days following onset
- » national expert review committee determines that there is clinical compatibility with poliomyelitis that cannot be associated with ongoing circulation of WPV or vaccine-derived poliovirus.

➤ **Vaccine-derived poliovirus (VDPV):** OPV-derived virus strains that have diverged from their parent type-specific Sabin strain by > 1%, (\geq 10 nucleotide changes) for types 1 and 3, or by > 0.6% (\geq 6 nucleotide changes) for type 2 in the complete VP1 genomic region. See the **Laboratory testing** section below for classification of VDPVs.

➤ **Sabin-like:** Any poliovirus isolate from human or environmental sample with any nucleotide difference from Sabin less than the number that meets the definition of a VDPV.

Note: Given that tOPV is no longer used, a full investigation should be done if any Sabin-like type 2 isolate is detected in stool, sewage or other samples collected, or detected more than four months after the last use in those countries that have used mOPV2 as part of an outbreak response. The investigation should determine whether tOPV (or mOPV2) is still in use or if there may be a containment breach.

The following definitions relate to the classification of circulating polioviruses within a country.

➤ **Endemic:** Uninterrupted circulation of indigenous strains of WPV within a country.

➤ **Introduction:** Poliovirus introduced into an area that previously had no evidence of circulation, with genetic linkage to a country with endemic or outbreak transmission.

➤ **Re-established transmission:** Following an introduction of WPV into a polio-free country, there is clear evidence of continued local circulation for more than 12 months.

➤ **Emergence:** Detection of a genetically distinct strain of VDPV.

CASE INVESTIGATION

All suspected cases should be investigated within 48 hours of notification; ideally, all stool specimens should be collected within 14 days of paralysis onset. Case investigation forms should be completed for each case to collect basic demographics and clinical illness details including neurological examination findings, vaccination history, medical services and risk factor information. To identify the possible source of exposure, it is important to collect any history of travel outside the area of residence, or visitors from outside the area of residence within 35 days of paralysis onset. Determine exposure within this 35-day period to any persons with AFP.

For an AFP case where WPV or VDPV infection is suspected, carry out detailed case investigations. As part of the detailed case investigation, meet with key community members (community or religious leaders, school teachers, health workers, traditional healers) and ask them if other children have been paralysed. Also make house-to-house visits in the immediate neighbourhood of the patient to search for additional cases. Assess the immunity status of other children in the community. Any clustering of AFP cases should immediately arouse suspicion of an outbreak.

For each AFP case, adequate stool specimens for laboratory confirmation of poliovirus should be obtained as soon as possible after paralysis onset. A 60-day follow-up investigation should be completed for all AFP cases that did not have adequate stool specimens collected to assess for residual paralysis. Share complete reports for all AFP cases with inadequate stools, including 60-day follow-up investigation along with detailed case and other workup notes if available, with

the national expert review committee for determination of final classification.

All cases reported between two months and six months after date of onset must be investigated; these are usually identified because of retrospective case search. Since stools are not collected after 60 days post-onset, investigation of these cases follows the trajectory of those with inadequate stool specimens (see Figure 1).



SPECIMEN COLLECTION

SPECIMEN COLLECTION FROM CASES

Collect two stool specimens from the AFP case, ideally within 14 days of paralysis onset (maximum 60 days), and at least 24 hours between sample collections.

- **Volume of stool:** 8–10 grams, about the size of two adult thumbnails. This amount permits duplicate testing, if required.
- **Timing of collection:** Samples should be collected within 14 days of paralysis onset when the probability of detecting poliovirus is the highest. However, specimens should be collected up to 60 days after paralysis onset because it is possible to detect poliovirus up until this point. Because poliovirus can be shed intermittently, two specimens should be collected at least 24 hours apart to increase the chance of detection. Stool samples are not collected from cases with onset beyond 60 days.
- **Storage and handling:** Specimens should be placed in appropriate containers with a tight seal to ensure there is no leakage or possibility of desiccation. Specimen containers must be placed immediately in a designated cold box at 4–8°C between frozen ice packs. Specimens should arrive at a WHO-accredited laboratory within 72 hours of collection. If this is not possible, the specimens must be frozen

at -20°C and then shipped frozen, preferably with dry ice or with cold packs that have also been frozen at -20°C. This process of keeping the specimen refrigerated or frozen until arrival in the laboratory is called “reverse cold chain”.

- **Documentation:** A laboratory investigation form should be completed and accompany the specimen containers to the laboratory. Forms must be completed accurately and legibly; information will be used to link the AFP case investigation form with the laboratory report.

SPECIMEN COLLECTION FROM CONTACTS (CONTACT SAMPLING)

If two stool specimens cannot be collected from the AFP case within 14 days of paralysis onset, or stool specimens arrive at a WHO-accredited laboratory in poor condition, one stool specimen each should be collected from **three** close contacts preferably aged < 5 years old. Specimen should be collected from close family members or household contacts, and if not possible, then from neighbors or playmates. Collection and transport of these specimens is the same as those collected for the AFP case.



LABORATORY TESTING

Laboratory testing of AFP cases is a critical component of AFP surveillance, providing information necessary for confirmation of poliovirus cases and valuable genomic sequence analysis to guide eradication efforts. The Global Polio Laboratory Network (GPLN) includes 146 WHO-accredited poliovirus laboratories in all WHO regions. GPLN member laboratories follow standardized protocols to 1) isolate poliovirus, 2) conduct intratypic differentiation and 3) conduct genomic sequencing (in specialized labs).

- Laboratory confirmation is based on isolation of poliovirus on monolayers of tissue culture cells (RD and L20B). As part of testing for poliovirus, isolation of non-polio enterovirus (NPEV) is possible and is reported as a separate result.
- Intratypic differentiation is conducted by reverse transcriptase polymerase chain reaction (RT-PCR) to identify the virus as WPV, VDPV or Sabin, as well as serotype (1, 2, 3).
- Genetic sequencing results help monitor pathways of poliovirus transmission by comparing the nucleotide sequence of the VP1-coding region of poliovirus isolates.

The identification of orphan polioviruses indicates prolonged undetected virus circulation and gaps in AFP surveillance. An orphan poliovirus is a poliovirus isolate with $\geq 1.5\%$ nucleotide divergence in genomic sequencing of the VP1-coding region compared with previous isolates.

All identified VDPVs are further classified based on the source and circulation of the virus.

➤ **Circulating VDPV (cVDPV):** VDPV isolates for which there is evidence of person-to-person transmission in the community. These isolates must be genetically linked VDPVs, isolated from one of the following:

- » at least two individuals (not necessarily AFP cases), who are not direct (household) contacts
- » one individual and one or more environmental surveillance (ES) samples
- » two or more ES samples if they were collected at more than one distinct ES collection site (no overlap of catchment areas), or from one site if collection was more than two months apart.

➤ **Immunodeficiency-associated VDPV (iVDPV):**

VDPVs isolated from persons with evidence of B-cell primary immunodeficiency disease (PID).

➤ **Ambiguous VDPV (aVDPV):** A VDPV isolate from individuals or environmental samples without evidence of circulation, and from individuals with no known immunodeficiency. A VDPV isolate should only be classified as ambiguous once additional investigations have excluded that it is part of an ongoing chain of transmission (cVDPV), or is occurring in an immunodeficient individual. Such investigations should include enhanced surveillance for AFP cases in the area, collection of stool specimens from healthy persons in the community, and blood collection from the affected child for immunoglobulin quantitation. Efforts to rule out local circulation should be particularly intense if sequencing of the index VDPV isolate is consistent with prolonged independent replication. A VDPV classified as ambiguous may need to be reclassified as circulating if genetically linked isolates are found subsequently or reclassified as iVDPV if secretion from an immunodeficient person is subsequently confirmed.



DATA COLLECTION, REPORTING AND USE

RECOMMENDED DATA ELEMENTS

- Case notification
 - » Name and unique identifier (EPID number)*
 - » Date of notification
 - » Name, contact information, and affiliation of the source of notification
 - » Date of case investigation
 - Demographic
 - » Residence (province, district, village, etc.)
 - » Date of birth
 - » Age
 - » Sex
 - Vaccination status and risk factors
 - » Occupation
 - » Ethnicity
 - » Special population (check all that apply): refugee, internally displaced population, reside in security-challenged area, migrant/mobile population
 - » Travel history (outside district or country)
 - » Total number of oral polio vaccine doses received in routine immunization (include code for unknown, e.g. 99)
 - » Total number of inactivated polio vaccine doses received in routine immunization (include code for unknown, e.g. 99)
 - » Total number of oral polio vaccine doses received during supplemental immunization activities (SIAs) (include code for unknown, e.g. 99)
 - » Total number of inactivated polio vaccine doses received during SIAs (include code for unknown, e.g. 99)
 - » Date of last OPV dose*
 - Clinical Information
 - » Date of paralysis onset*
 - » Fever at onset of paralysis?
 - Specimen
 - » Specimen numbers*
 - » Date of collection of stool specimen*
 - » Date stool specimen received in laboratory*
 - » Condition of stool (good, poor, unknown)*
 - Laboratory results
 - » Date final culture results sent from laboratory to Expanded Programme on Immunization (EPI)*
 - » Date intratypic differentiation results sent from laboratory to EPI*
 - » Date genomic sequencing results sent from laboratory to EPI*
 - » Polio type 1 isolated? (yes, no, specimen not processed)*
 - If yes, include type (WPV, VDPV, Sabin-like, mixture, pending, unknown)*
 - » Polio type 2 isolated? (yes, no, specimen not processed)*
 - If yes, include type (WPV, VDPV, Sabin-like, mixture, pending, unknown)*
 - » Polio type 3 isolated? (yes, no, specimen not processed)*
 - If yes, include type (WPV, VDPV, Sabin-like, mixture, pending, unknown)*
 - » Non-polio enterovirus (NPEV) isolated? (yes, no, specimen not processed)*
- * Data elements with asterisks should be included on both the case investigation and laboratory investigation forms.



REPORTING REQUIREMENTS AND RECOMMENDATIONS

Notify public health authorities of all suspected AFP cases immediately. Designated reporting sites should report at a specified frequency (weekly or monthly) even if there are no cases (“zero reporting”).

All positive WPV, VDPV and type 2 Sabin-like virus results from human and environmental samples must be reported to WHO as required under International Health Regulations (IHR).

RECOMMENDED DATA ANALYSES

- Suspected cases by geographic area, month, year, source of notification and healthcare contact (name of facilities or traditional healers visited for treatment of AFP).
- All suspected cases by final case classification and type of poliovirus (confirmed WPV or VDPV, polio-compatible, discarded) by geographic area, month and year.
- Confirmed cases by age group, sex, immunization status and risk factors (such as migrant status).
- Percentage of stool samples collected before and after 14 days of onset of paralysis.
- Percentage of AFP cases with inadequate stool that had 60-day follow-up investigations completed.
- Percentage of non-polio acute flaccid paralysis (NPAFP) cases aged 6–59 months by doses of polio vaccine (0, 1–2, and ≥ 3 doses).
- Results of environmental surveillance sampling for each collection site by poliovirus characterization, month and year.
- Epi-curve of final classification status by geographic area and year.
- Spot maps of confirmed cases by poliovirus type (WPV1/3, VDPV1/2/3), polio-compatible cases and positive environmental surveillance samples.
- Percentage of subnational areas meeting two key surveillance indicators:
 - » subnational areas meeting targets for NPAFP rate;
 - » stool adequacy rate.

USING DATA FOR DECISION-MAKING

- Track WPV circulation and VDPV emergence and outbreak control.
- Use data for classifying suspected AFP cases as confirmed, compatible or discarded.
- Identify high-risk populations (for example, migrants or people of a certain ethnicity) to design appropriate messaging and interventions, and investigate reasons for missed vaccination.
- Include in annual risk assessments to identify high-risk geographical areas for conducting SIAs and other targeted programme activities.
- Monitor impact of interventions, including SIAs.
- Document evidence needed for changes in immunization policy or strategy and outbreak response (such as targeted SIAs in areas with low polio vaccine coverage among NPAFP or use of mOPV versus bOPV).
- Monitor surveillance performance indicators and identify areas that need targeted surveillance reviews or strengthening (for example, re-assessing reporting network and prioritizing for active surveillance visit).
- Provide evidence to national certification committee (NCC) and regional commission of the interruption of WPV.



SURVEILLANCE PERFORMANCE INDICATORS

In countries in polio-free regions, AFP surveillance should be evaluated through periodic national reviews at least every five years and may be integrated with other VPDs, including data triangulation (comparisons of coverage, surveillance and other data sources). As part of the quarterly EPI data review meetings, surveillance, coverage and programme performance data should be reviewed at national and subnational levels to help identify potential areas where surveillance gaps might exist or surveillance needs to be strengthened.

In countries in polio-endemic regions, surveillance desk reviews should be conducted at least every six months at the national level, and a field review plan should be developed for targeted districts (usually twice per year).

At the subnational level, surveillance performance should be monitored monthly, including regular assessments of reporting networks, active surveillance site visits, timeliness of investigation activities and follow-up of silent districts (no reported AFP cases in a 12 month period). Improvements in surveillance performance are strengthened by routine supportive supervision to immediately correct any actions or activities that adversely affect the AFP surveillance system.

In all settings, the indicators in Table 1 should be reviewed at least every six months at all levels. Data gathered from AFP surveillance system evaluations should be included in NCC reports for poliomyelitis eradication.

TABLE
1

AFP surveillance performance indicators

SURVEILLANCE INDICATOR (*Key Indicator)	DESCRIPTION	TARGET	FORMULA	NOTES
COMPLETENESS OF REPORTING	Percentage of designated sites reporting AFP data, even in the absence of cases	≥ 80%	# sites reporting / # designated reporting sites for AFP surveillance x 100	For a given time period such as one month, six months, 12 months
TIMELINESS OF REPORTING	Percentage of designated sites reporting AFP data on time, even in the absence of cases	≥ 80%	# of sites reporting by the deadline / # of designated reporting sites for AFP surveillance x 100	At each level reports should be received on or before the requested date.
SENSITIVITY*	Non-polio AFP (NPAFP) rate	Endemic WHO regions: ≥ 2 NPAFP rate Non-endemic WHO regions: ≥ 1 NPAFP rate Outbreak setting: ≥ 3 NPAFP rate	# of cases discarded as NPAFP in children < 15 years of age/ # of children aged < 15 years x 100 000 per year	Achieving target NPAFP rate indicates sufficiently sensitive surveillance to detect WPV/cVDPV cases if poliovirus is circulating.
TIMELINESS OF NOTIFICATION	Percentage of cases reported to public health authorities within a defined time period (typically ≤ 7 days) from onset of paralysis	≥ 80%	# of cases AFP reported within 7 days of paralysis onset / # of reported AFP cases x 100	



SURVEILLANCE INDICATOR (*Key Indicator)	DESCRIPTION	TARGET	FORMULA	NOTES
TIMELINESS OF INVESTIGATION	Percentage of cases investigated within 48 hours of notification	≥ 80%	# of AFP cases investigated within 48 hours of notification / # of AFP cases reported x 100	
ADEQUATE STOOL SPECIMEN COLLECTION*	Percentage of AFP cases with two stool specimens collected ≥ 24 hours apart, both within 14 days of paralysis onset, and the arrival of these specimens in good condition at a WHO-accredited laboratory	≥ 80%	# of AFP cases with two stool specimens collected ≥ 24 hours apart, within 14 days of paralysis onset, and arriving in good condition / # of AFP cases reported x 100	Achieving target stool adequacy percentage indicates ability to detect poliovirus among AFP cases if poliovirus is circulating. Good condition: reverse cold chain maintained and received without leakage or desiccation
TIMELINESS OF STOOL COLLECTION	Percentage of AFP cases with two stool specimens collected within 14 days of paralysis and ≥ 24 hours apart	≥ 80%	# of AFP cases with two stool specimens collected ≥ 24 hours apart, within 14 days of paralysis onset / # of AFP cases reported x 100	
SPECIMENS IN GOOD CONDITION	Percentage of AFP cases with specimens arriving at a WHO-accredited laboratory in good condition	≥ 80%	# of AFP cases with two stool specimens arriving in good condition at a WHO-accredited laboratory / # of AFP cases reported x 100	Good condition: reverse cold chain maintained and received without leakage or desiccation
COMPLETENESS OF 60-DAY FOLLOW-UP	Percentage of AFP cases with a follow-up exam for residual paralysis at 60 days after the onset of paralysis	≥ 80%	# of AFP cases with inadequate specimens that have a 60-day follow-up exam / # of AFP cases with inadequate specimens reported x 100	
TIMELINESS OF STOOL SPECIMEN SHIPMENT	Percentage of specimens arriving at a WHO-accredited laboratory within 3 days of collection	≥ 80%	# of specimens arriving within 3 days of collection / # of specimens collected x 100	
TIMELINESS OF REPORTING LABORATORY RESULTS	Percentage of stool specimens for which laboratory results are sent to submitting agencies within a defined period	≥ 80%	# of specimens with results available within a defined period at the submitting agency / # of stool specimens collected x 100	Timely reporting of results: 1. within 14 days of specimen receipt for poliovirus isolation; 2. within 7 days of isolate receipt for intratypic differentiation; and 3. within 7 days of intratypic differentiation for sequencing results



CLINICAL CASE MANAGEMENT

There is no specific treatment for poliomyelitis. Suspected AFP cases should be referred to a hospital immediately for medical care. Any problem with

respiration suggesting involvement of the diaphragm requires immediate attention. Supportive care should be given to paralytic cases under physician management.



CONTACT TRACING AND MANAGEMENT

To determine the source of confirmed poliovirus in an AFP case and to determine the potential for further spread, outbreak investigation is conducted with tracing of contacts from 35 days before to 30 days after the

onset of paralysis, with special consideration for history of travel and visitors outside the area of residence. Active search for additional cases is performed to find the extent of the outbreak.



SURVEILLANCE, INVESTIGATION AND RESPONSE IN OUTBREAK SETTINGS

A general overview of outbreak response procedures is provided below. Please refer to the GPEI Outbreak Standard Operating Procedures Part 1 (General) (3) and Part 2 (Type 2) (4) for specific details.

DEFINITION OF AN OUTBREAK

Definitions of poliovirus events (that is, no current evidence of transmission) and outbreaks are included in Table 2.

CHANGES TO SURVEILLANCE DURING AN OUTBREAK

Passive and active AFP surveillance should be enhanced to increase sensitivity and timeliness of detecting AFP cases, including facility- and community-based active case searches. Changes in contact sampling and environmental surveillance sampling may be warranted and are made on a case-by-case basis. In outbreak settings with suboptimal surveillance performance, collection of stool specimens from contacts of all reported AFP cases may be warranted, but is not universally recommended at this time.

PUBLIC HEALTH RESPONSE

There are procedures and resources available unique to polio compared to other VPD outbreaks. Because polio is targeted for eradication, an outbreak of polio is a public health emergency of international concern (PHEIC) per IHR (2005), and an IHR Emergency Committee on Polio was convened in 2014 that advises the Director-General of WHO to provide continuous oversight and guidance to countries to limit international spread. GPEI makes financial, human, vaccine and other resources available to countries to respond quickly and effectively to control outbreaks. External and internal partners carry out formal, regular outbreak response assessments (OBRA). OBRA details are used by the Emergency Committee on Polio to support final determination on whether an outbreak is over. However, similar to other VPD outbreaks, the initial general steps include outbreak investigation of the confirmed polio case, active case searches and other enhanced surveillance activities, and assessment of population immunity. Vaccination response activities will depend on the characteristics of the poliovirus (WPV versus VDPV) and for VDPV, by serotype.

TABLE
2

Definitions of poliovirus events and outbreaks (3)

TYPOLOGY	SOURCE	DEFINITION
EVENT <i>(as yet, no evidence of transmission)</i>	Human	<p>Detection of</p> <ul style="list-style-type: none"> » VPDV in: <ul style="list-style-type: none"> - single AFP case or asymptomatic person (contact), or - one or more persons,^a with no evidence of further community-level circulation (iVDPV or aVDPV isolates) OR » Sabin-like 2 isolate from individual sample(s) OR » WPV2 infected individual with documented type 2 virus exposure in a laboratory or vaccine production facility
	Environmental	<p>Detection of</p> <ul style="list-style-type: none"> » WPV single environmental sample without follow-up evidence of virus excretion^b OR » VPDV without evidence of further transmission, such as <ul style="list-style-type: none"> - single environmental sample without evidence of prolonged circulation, or - an aVDPV OR » Sabin-like 2 isolate from environmental sample(s)
OUTBREAK	Human	<p>Detection of</p> <ul style="list-style-type: none"> » any WPV infected individual(s)^a (in addition, for type 2: “without documented exposure to type 2 virus in a laboratory or vaccine production facility”) OR » any cVDPV infected individual(s)^a
	Environmental	<p>Detection of</p> <ul style="list-style-type: none"> » two or more separate^c environmental samples positive for WPV with genetic sequencing information indicating sustained local transmission OR » a single environmental sample positive for WPV with follow-up evidence of virus excretion^b (in addition, for type 2: “without documented exposure to type 2 virus in a laboratory or vaccine production facility”) OR » any cVDPV positive environmental sample

Abbreviations: aVDPV: ambiguous vaccine-derived poliovirus; cVDPV: circulating vaccine-derived poliovirus; iVDPV: immunodeficiency-associated vaccine-derived poliovirus

^a Infected person can be an AFP case or an asymptomatic/healthy person.

^b Evidence of virus excretion is defined by identification during follow-up investigation of WPV or VDPV infected individual(s)

^c “Separate” means that: samples were collected at more than one distinct environmental surveillance collection site (no overlapping catchment areas), OR samples were collected from one site, but collection was more than two months apart.



SPECIAL CONSIDERATIONS FOR POLIO SURVEILLANCE

RISK ASSESSMENTS

Risk assessments are guided by WHO regional offices. The risk of poliovirus introduction, VDPV emergence and outbreak spread is evaluated using a tool to examine indicators of population immunity and surveillance quality at subnational levels, proximity to active poliovirus transmission, presence of high-risk groups and other factors. This process is completed annually in polio-free regions and twice a year in endemic regions. Identified weaknesses in AFP surveillance should prompt enhanced supervision and closer examination of factors contributing to increased risk, including suboptimal surveillance quality.

IMMUNODEFICIENCY-ASSOCIATED VACCINE-DERIVED POLIOVIRUS (iVDPV) OR PRIMARY IMMUNODEFICIENCY (PID) SURVEILLANCE

Screening of patients with PID is recommended to detect possible long-term excretion of iVDPV. Pilot surveillance for PID is being conducted in specific locations to determine the feasibility of screening individuals for possible PID and collecting stool specimens to test for potential excretion of polioviruses.

ENTEROVIRUS SURVEILLANCE

In some countries within regions where polio-free status has been certified and it is challenging to maintain robust AFP surveillance, long-standing laboratory surveillance for enteroviruses provides a supplementary source of surveillance data on polioviruses.

SEROLOGICAL SURVEYS OR SEROSURVEILLANCE

Seroprevalence surveys in endemic countries have been helpful in assessing the effects of immunization strategies. Surveys in otherwise unaffected populations allows an assessment of population immunity to compare to an evaluation of vaccination coverage of a given community or area. Reduced levels of protective immunity in an area can indicate need for supplemental vaccination efforts.

HUMANITARIAN EMERGENCIES

In humanitarian emergencies, rapid syndromic surveillance that is established should include AFP.



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