

Making surveillance work

Module 3: Logistics management



**DEPARTMENT OF VACCINES
AND BIOLOGICALS**



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Glossary

Cold chain: A system whereby vaccines or drugs are transported from the manufacturers to the point of administration at a specified temperature. For example, most vaccines used in the EPI are stored between 4°C and 8°C. This is referred to as the vaccine cold chain.

Cold life: The interval of time between the coldest point in a load stored in cold chain equipment (i.e. specimens or vaccine) passing -3°C and the warmest point reaching +10°C at a specific ambient temperature. WHO usually tests cold chain equipment (refrigerators, freezers, cold boxes and vaccine and specimen carriers) at ambient temperatures of 32°C and 43°C.

Feedback: The process of routinely sending analyses and reports to the more peripheral levels of the surveillance system, particularly to the suppliers of data. Feedback may occur in the form of newsletters, bulletins, letters, memoranda, telephone calls, visits or any combination of these.

Incidence: The number of new cases of a specified disease diagnosed or reported during a defined period of time divided by the number of persons in a stated population in which the cases occurred.

Logistics (for surveillance): The management, obtaining and movement of human resources, diagnostic specimens and data supported through resource management, training and supervision.

Morbidity rate: An incidence rate used to include all persons in the population under consideration who become clinically ill during a stated period of time. The population may be limited to a specific gender or age group or to people with certain other characteristics.

Mortality rate: A rate calculated in the same way as an incidence rate by dividing the number of deaths occurring in a given population during a stated period of time, usually a year, by the number of persons at risk of dying during the period. A total or crude mortality rate relates to deaths from all causes and is usually expressed as deaths per 1000 persons. A disease-specific mortality rate relates to deaths attributable to only one disease and is often expressed as deaths per 100 000 persons.

Performance indicators: The quality of surveillance should be demonstrated with data on standard surveillance performance indicators or measures of the function of surveillance. An example of a performance indicator for acute flaccid paralysis (AFP) surveillance is the reporting rate of non-polio AFP per 100 000 population aged less than 15 years.

Prevalence: The total number of persons sick or exhibiting a certain condition in a stated population at a particular time (point prevalence) or during a stated period of time (period prevalence), regardless of when the illness or condition began, divided by the population at risk of having the disease or condition at the point in time or midway through the period in which it occurred.

Proportional morbidity: The relative amount of illness attributable to a given etiology (cause).

Sentinel site: A specific surveillance site, e.g. a hospital, clinic or health facility, that collects surveillance data on a disease in order to provide an indication of the epidemiological trends of the disease in a wider area.

Surveillance: The continuing systematic collection, consolidation and analysis of data and the dissemination of the information obtained to those who need to know in order that action may be taken.

- **Passive surveillance** occurs when data are routinely collected and forwarded to more central levels on a routine basis, i.e. the data do not have to be requested on each occasion.
- **Active surveillance** occurs when data are sought out by visiting or contacting a feed-forward site and reviewing the medical records and registers of the site to identify cases.
- **Comprehensive surveillance** occurs when data are collected from as many sites as possible throughout a country in order to achieve representativeness.
- **Sentinel surveillance** occurs when only selected sites report data. This is rarely representative of a population but can be used to monitor trends and collect more detailed information.
- **Community-based, facility-based and laboratory-based surveillance** involve detection and notification by communities, health facilities and laboratories respectively.

Reverse cold chain: In AFP surveillance the reverse cold chain involves transporting and storing stool specimens on ice from the moment of collection until arrival in a laboratory.

Reverse warm chain: Stool specimens are kept warm from the time of collection until the time of receipt in a laboratory (e.g. for *Haemophilus influenzae* type B surveillance; cf. reverse cold chain).

Timeliness: (1) The number of reports received on time compared to the number of health facilities designated to report. National authorities should define “on time” in accordance with local communication facilities. (2) The interval between the occurrence of an adverse health event and (i) the report of the event to the appropriate public health agency, (ii) the identification by that agency of trends or outbreaks, or (iii) the implementation of control measures. Effective disease surveillance provides information when it is due.

Thoroughness: The number of cases or outbreaks investigated compared to the number reported. Various time limits can be built in, e.g. the number of cases investigated within 48 hours after the receipt of reports.

Vaccine vial monitor: A temperature-monitoring device or indicator applied to oral polio vaccine vials by major vaccine manufacturers in order to determine whether the cold chain has been maintained during vaccine transportation and storage.

Venepuncture: The collection of a blood sample from a vein, usually in the forearm, with a syringe and needle.

Zero reporting: Reporting on a regular basis even if no cases are detected. The absence of surveillance reports in a given time period may indicate a failure of reporting or that no cases have been detected. Zero reporting removes this uncertainty.

Abbreviations

AFP	acute flaccid paralysis
CDC	Centers for Disease Control and Prevention (USA)
EPI	Expanded Programme on Immunization
IATA	International Aviation and Transportation Agency
ICAO	International Civil Aviation Organization
ICRC	International Committee of the Red Cross
NGO	nongovernmental organization
NT	neonatal tetanus
OPV	oral polio vaccine
PI	packaging instruction
UN	United Nations
UPU	Universal Postal Union
VVM	vaccine vial monitor
UNICEF	United Nations Children's Fund

Description of the manual

This manual describes surveillance systems and gives recommendations on setting up the logistics of surveillance within a country.

Why a manual on surveillance logistics?

Disease surveillance require the efficient coordination of human resources and the proper handling of diagnostic specimens and data by a wide range of personnel at different levels in the health system if effective action is to be achieved in the field of public health. The present manual has been written to ensure that staff at all levels adopt a uniform approach to surveillance logistics so that surveillance systems can operate effectively.

The work of improving the logistics of surveillance systems, especially in areas where surveillance and the transportation of diagnostic specimens are difficult, inevitably transcends national and international borders. Adequate surveillance makes it possible for disease control activities to be guided in a timely and effective manner.

For whom is it intended?

The manual has been written with a practical focus for staff working in the field. Disease surveillance is a process that relies on communication, cooperation and teamwork by many categories of health professionals at different levels and in many places. The manual is intended for all personnel belonging to a surveillance system, including clinicians, epidemiologists, laboratory staff, data managers, logisticians and public health administrators.

Why are logistics emphasized?

Adequate logistics ensure that a surveillance system can collect, consolidate, analyse and communicate information effectively for action on public health.

Most examples in the manual are related to vaccine-preventable diseases, and especially to AFP and measles surveillance, both of which are now priorities in immunization systems. However, the manual is applicable to surveillance systems in general.

Table 1. Tour of the manual

	Description of contents	Target readers
Surveillance functions	The six universal functions of surveillance are introduced and the types of surveillance are defined.	Logisticians, epidemiologists, clinicians, laboratory workers, data managers, public health administrators.
Logistical elements, actions and supportive elements	This section reviews the logistical elements (human resources, specimens and data) which must be obtained, managed and moved. Surveillance must be supported by effective resource management, training and supervision.	Logisticians, epidemiologists, clinicians, laboratory workers, data managers, public health administrators.
Steps for microplanning good surveillance logistics	<p>The steps used to microplan the logistics needed for effective surveillance are described.</p> <ul style="list-style-type: none"> • Defining the surveillance process for each health event. • Determining the flow of data and specimens. • Determining the logistical functions and actions for the six surveillance functions: <ol style="list-style-type: none"> 1. Detection and notification 2. Investigation and confirmation 3. Data collection and consolidation 4. Data analyses and reports 5. Feedback 6. Feed-forward 	Logisticians, epidemiologists, clinicians, laboratory workers, data managers, public health administrators.
Implementation of plan and monitoring of progress	The planning and monitoring of surveillance using standard performance indicators are discussed.	Logisticians, epidemiologists, public health administrators.
Evaluation of the system	It is shown how the system should be on evaluated a regular basis so that appropriate corrective measures can be taken.	Logisticians, epidemiologists, public health administrators.

Disease surveillance

Disease surveillance is the ongoing systematic collection, consolidation and analysis of data and the dissemination of this information to those who need it so that action may be taken. It can be seen as the compass that guides disease control activities and measures the impact of the system.

The purposes of disease surveillance include:

- predicting or detecting disease outbreaks with a view to investigation and containment;
- identifying high-risk populations and areas requiring special attention;
- guiding disease eradication, elimination and control initiatives;
- identifying areas where the system performs poorly so that corrective measures can be taken;
- determining the burden of a disease on the health system and/or community in terms of incidence/prevalence or proportional morbidity/mortality.

FIRST: define the outputs needed from the surveillance system!

1. Define clearly national surveillance priorities and determine **what** the surveillance system should monitor and why it will do the monitoring.
Ask if the disease under surveillance is associated with:
 - high disease impact (morbidity and mortality);
 - significant epidemic potential;
 - a specific target of a national, regional or international disease control initiative.
2. Define the outputs (i.e. analyses) needed from the surveillance system to guide public health decision-making and action
3. Define the minimum data necessary for producing the required outputs and the most efficient means for collecting these data.

For example, the objectives of AFP surveillance in polio eradication are:

- to track where poliovirus is in circulation;
- to identify high-risk areas or groups;
- to monitor progress towards the interruption of poliovirus transmission;
- to provide evidence for the certification of a region as being polio-free.

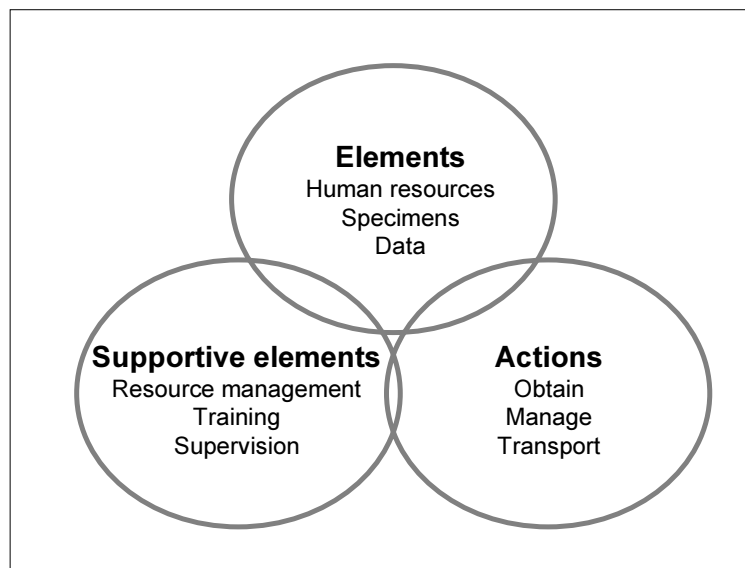
Logistics for surveillance

Good logistics are necessary for effective disease surveillance. The logistics for surveillance revolve around three essential elements:

- human resources;
- specimens;
- data.

These elements must be obtained, managed and moved. The supportive elements for good surveillance logistics include training, resource management and supervision. The elements, actions and supportive elements are completely interdependent and integral components of surveillance logistics, as shown in Fig. 1.

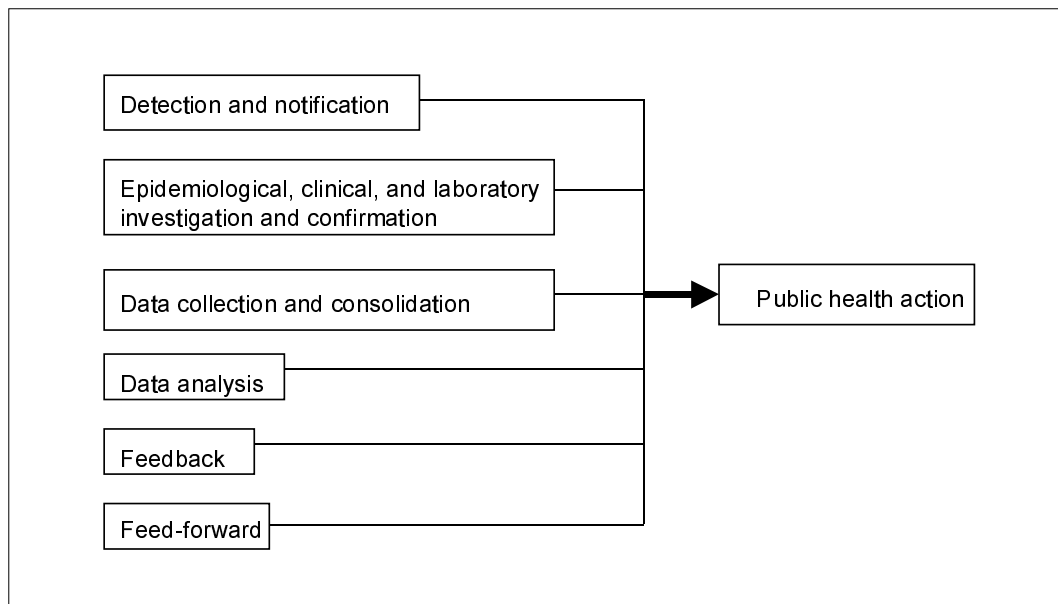
Fig. 1. Logistical elements, actions and supportive elements for surveillance



Surveillance functions

The six universal surveillance functions leading to public health action are shown in Fig. 2.

Fig. 2. The six universal functions of surveillance



The six universal surveillance functions are carried out at various administrative levels, depending on the size, resources and infrastructure of the country concerned and the characteristics of the health event. Most surveillance systems have a central level, intermediate levels and a level of point-of-contact with the health event, which may include health facilities, laboratories, and rehabilitation institutes and community centres. Table 2 shows an example of different levels at which surveillance functions might be performed. These levels vary from country to country and should always be mapped out.

Table 2. Example of levels at which surveillance functions might be performed in a country*

Functions	Central level	Intermediate levels	Point of contact
Detection of cases and notification			Yes
Collection and consolidation of data	Yes	Yes	Yes
Analysis and routine reports	Yes	Yes	Yes
Investigation and confirmation of cases/outbreaks			
• Epidemiological		Yes	
• Clinical		Yes	
• Laboratory	Yes	Yes	
Feedback (to more peripheral levels)	Yes	Yes	Yes
Feed-forward (to more central levels) (to international levels)	Yes Yes	No	

* The level at which a specific function would be carried out varies by country. The table above is just one example.

Different types of surveillance

Types of surveillance

Passive surveillance occurs when data are routinely collected and forwarded to more central levels on a routine basis.

Active surveillance occurs when data are sought out by visiting or contacting a reporting site.

Comprehensive surveillance occurs when data are collected from as many sites as possible throughout a country in order to achieve representativeness.

Sentinel surveillance occurs when only selected sites report data. This is rarely representative of a population but can be used to monitor trends and collect more detailed information.

Community-based, facility-based and laboratory-based surveillance involve detection and notification by communities, health facilities and laboratories respectively.

Steps for setting up surveillance

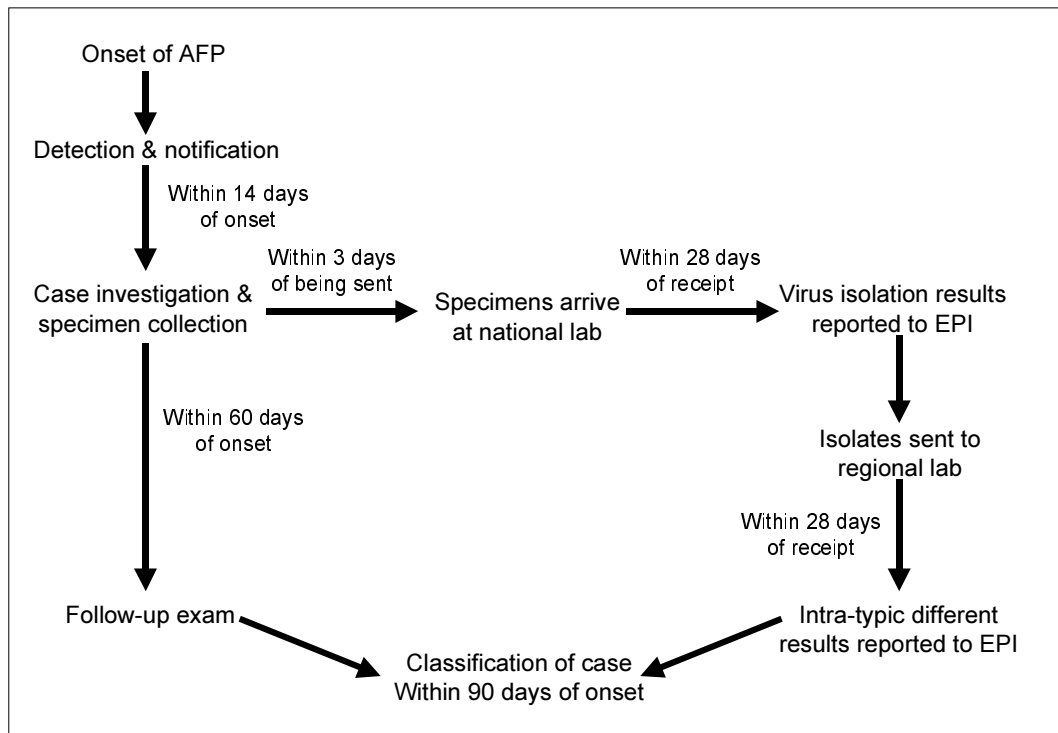
- Step 1. Define the surveillance process, i.e. what is supposed to happen, for each health event under surveillance.
- Step 2. Review the six universal functions of surveillance and determine what logistical functions and actions are needed. In other words, define the what, who, where, when and how for each health event under surveillance.
- Step 3. Determine how data and specimens should flow.
- Step 4. Define the supportive functions that will be needed in terms of training, supervision and resource management.
- Step 5. Include the aspects of surveillance logistics in an overall plan to strengthen surveillance.

Each step is described in greater detail below with examples of AFP and measles surveillance. The same processes may be adapted for surveillance of other diseases.

Step 1. Define the surveillance process

The process for each disease or health event in a surveillance system can usually be represented diagrammatically, starting with the identification of a suspected case and followed by the steps leading to case classification. Fig. 3 gives an example for AFP surveillance. By defining the surveillance process for each health event, it is possible to identify commonalities and opportunities for integration.

Fig. 3. Process of acute flaccid paralysis surveillance



It is important to ensure that case definitions (of what should be reported) are clear, appropriate and consistent throughout the surveillance system. Case definitions should be translated into local languages and local terms should be adopted so that the definitions can be easily understood and used.

Case definitions

Acute flaccid paralysis

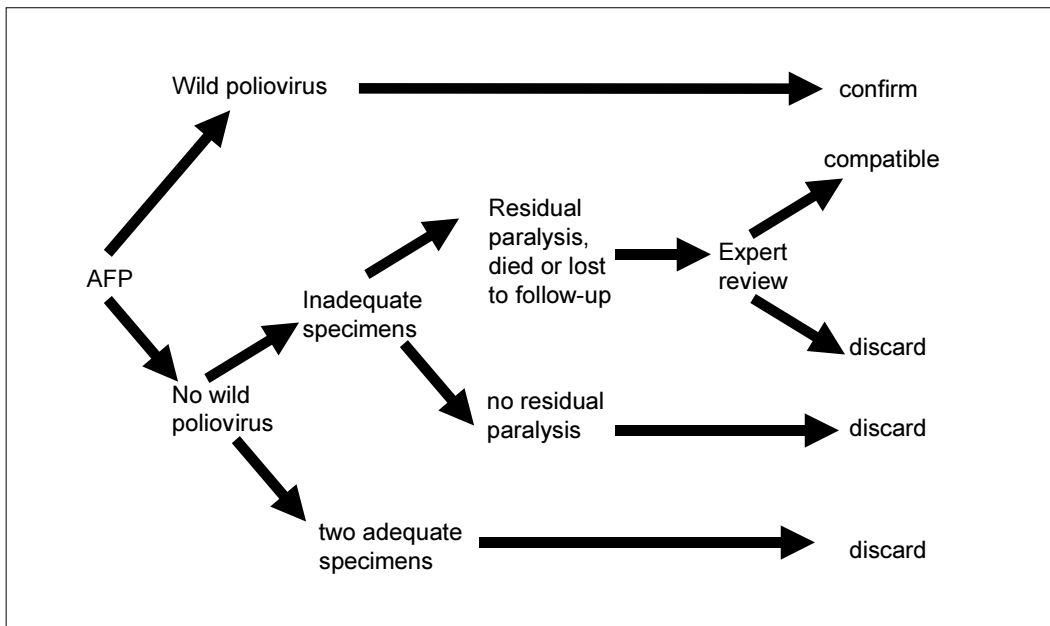
Any child under 15 years of age with acute flaccid paralysis or any person with paralytic illness at any age when polio is suspected.

Measles

Any person in whom a clinician suspects a measles infection or any person with fever and maculopapular rash (non-vesicular) and cough, coryza (runny nose) or conjunctivitis (red eyes).

The process of case classification may also be depicted in the form of a diagram or flow chart, as in Fig. 4.

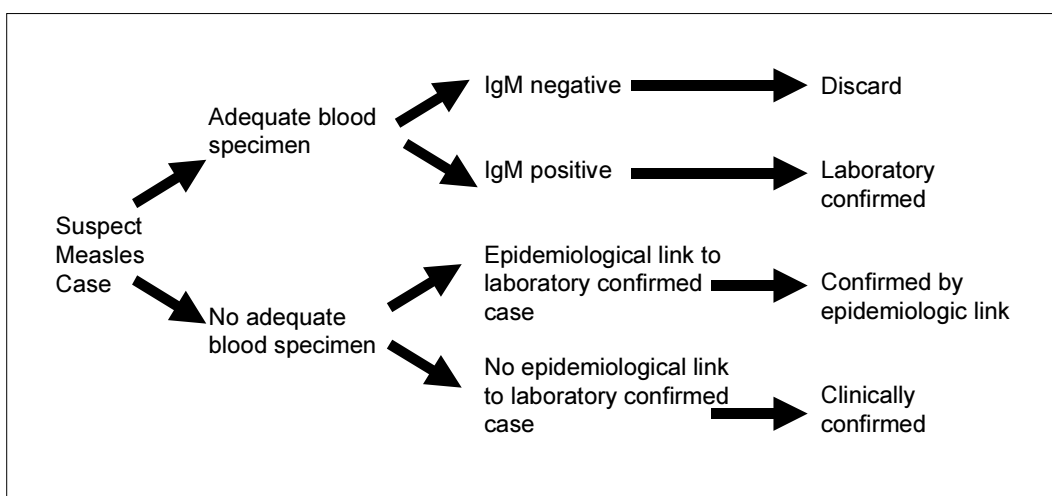
Fig. 4. Virological classification of AFP cases



The classification of cases should result in useful information being fed back and reported through the surveillance system and should lead to public health action. For example, the identification of wild poliovirus or polio-compatible cases through AFP surveillance should guide strategy for strengthening routine and supplementary OPV immunization.

The classification of suspected measles cases can be depicted in a flow chart and provide guidance for strategies of routine and supplementary measles immunization (Fig. 5). The identification of a laboratory-confirmed measles case in the elimination phase should result in an intense investigation, the immunization of eligible children, and strengthened surveillance and routine immunization activities in the area around the point of contact with the case.

Fig. 5. Laboratory classification of measles cases in the elimination phase



Step 2. Review the six universal functions of surveillance and determine what logistical functions and actions are needed.

Function 1. Detection and notification

1. Number and location of reporting sites

Reporting sites should be selected according to the objectives of surveillance, e.g. the detection of every case/infection, or of infected districts, or of outbreaks. To select appropriate reporting sites it is necessary to determine where cases are occurring and the most efficient way of detecting them.

Reporting sites may include:

- hospitals;
- health facilities with a trained health worker;
- physical rehabilitation facilities;
- private physicians;
- communities.

2. How to detect and notify cases

The person responsible for case detection varies according to the type of reporting site. In AFP surveillance, paediatric clinicians and rehabilitation technicians are usually responsible for case detection. Measles cases are often detected by nurses and private practitioners.

The efficiency of detection and notification of diseases may be strengthened when the surveillance of selected diseases is integrated. Weekly active surveillance for AFP cases is often performed at provincial hospitals, and, with minimal effort, surveillance for measles and neonatal tetanus (NT) may be integrated with that for AFP.

There are different ways to detect a health event. Choose the most efficient and feasible means of detection to meet your surveillance objectives. Depending on the purpose of surveillance, it may not be necessary to detect every case. This is true of the early stages of accelerated measles control, yellow fever control, and NT elimination; a single confirmed case usually indicates a larger problem involving pockets of low vaccine coverage and high risk. Appropriate action can usually be taken on the basis of a single case report.

A phased approach to surveillance may be adopted, beginning at sites where the maximum number of cases can be detected with the least effort. AFP and measles surveillance should begin in major hospitals in large cities. Yellow fever surveillance may begin at health facilities in areas known to be at highest risk. Guinea worm surveillance can be established initially in communities where a countrywide search has revealed the disease to be endemic. Once this first phase is operational the system can be expanded as needed to meet the specific objective of disease control.

The persons who are designated to detect and notify cases must be trained and provided with the means to carry out their work. This includes providing the appropriate forms and a method for sending forms in a timely manner. Other logistical requirements may include telephone, messenger, radio or email systems for the communication of case reports.

Table 3. Examples of data sources of various health events for various purposes of surveillance

Health event	Purpose	Data source
Neonatal tetanus	Identification of high-risk areas	Hospitals Communities
Onchocerciasis	Identification of recrudescence	Community survey every three years
Measles	Phase 1: Detection of outbreaks, monitoring of trends and case management Phase 2: Detection of areas/populations at risk for virus circulation	Health centres Sentinel hospitals Communities
Acute flaccid paralysis	Detection of virus circulation	Hospitals Health centres Private physicians Rehabilitation facilities
Meningitis	Detection of epidemics	Hospitals
Cholera	Detection of epidemics	Hospitals
Yellow fever	Detection of epidemics	Hospitals

For some health events, active surveillance may be conducted; this usually supplements passive surveillance as a means of verifying that cases are being properly detected and notified. Active surveillance tends to rapidly improve case detection and notification; it identifies areas where passive surveillance is weak so that corrective measures can be taken. Regularly available transport is essential for staff responsible for active surveillance, often at the provincial level, so that they can visit selected reporting sites, e.g. provincial hospitals, usually at weekly intervals). These health workers also need standard forms, per diem allowances and a means of reporting cases that require investigation.

Summary of logistics for detection and notification

- Appropriate case definition
- Appropriate paper forms and communication equipment
- Means to notify or send data/information
- Transport (for active surveillance visits)
- Per diem allowances (for active surveillance visits)
- Training/clinician sensitization for detection and notification

Function 2. Investigation and confirmation

Transport, supplies and other equipment must be in the right place at the right time in order to facilitate the investigation and confirmation of case reports. Depending on the type of health event, it may be necessary to conduct clinical, epidemiological and/or laboratory investigations. Initially, it is critical to designate the persons responsible for investigations, including the collection of specimens if necessary, and exactly how they should proceed.

Staff at the district level are often designated for case or outbreak investigation, but this varies from country to country. For clinical and epidemiological investigations the logistical considerations include transport, case investigation forms and, sometimes, per diem allowances. For laboratory investigations it is necessary to consider specimen kits, specimen carriers, laboratory request forms, the transportation of specimens, and, frequently, a reverse cold chain. In specimen processing the laboratory must have the appropriate infrastructure, equipment, supplies and reagents.

Investigation and confirmation require good communication and coordination of activities between all personnel at different levels within the surveillance system. This requires training and the exchange of information both in writing and verbally.

1. Type of specimen to be collected

Different surveillance systems require different types of diagnostic specimens, e.g. stools (AFP surveillance), blood (measles and HIV/AIDS surveillance), skin snips (onchocerciasis surveillance) and nasopharyngeal swabs (diphtheria surveillance).

Training requirements vary according to the type of diagnostic specimen collected. A much higher level of training and skill is necessary for invasive procedures, e.g. the collection of blood specimens by venepuncture, than for the collection of a stool specimen.

2. Persons collecting specimens

The person responsible for collecting a surveillance diagnostic specimen varies with the type of specimen required. For an AFP case, stool specimens are often best collected by the parents of the child after specific instructions have been given or by a public health worker who has been trained to perform this task. (1) Venepuncture for measles surveillance is often the responsibility of nurses or doctors.

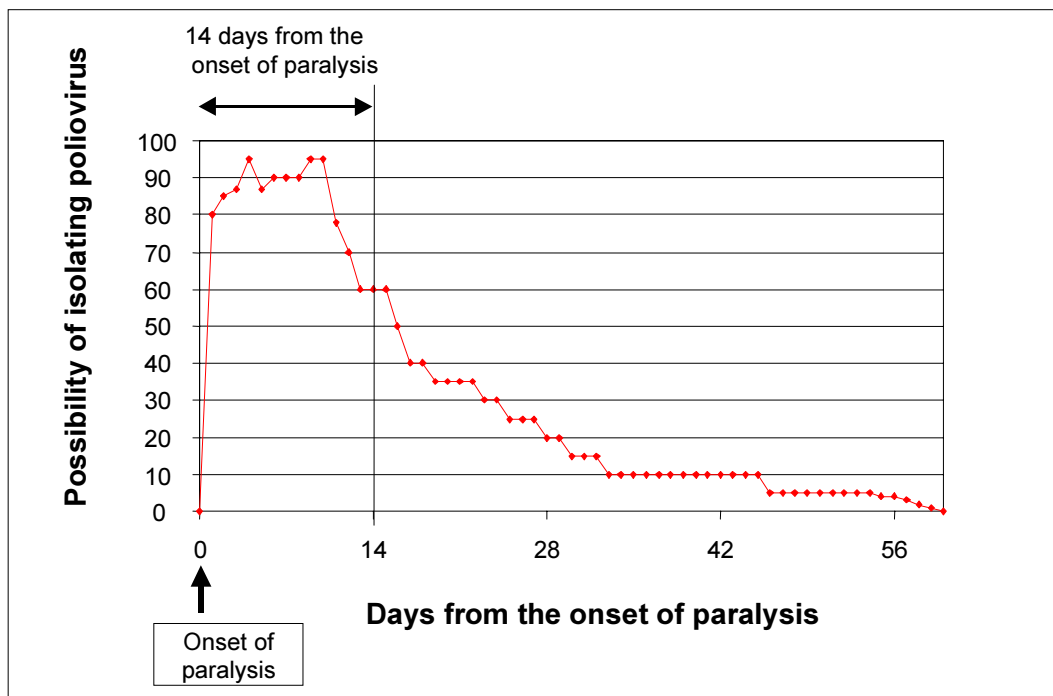
Special precautions are needed to protect the investigator, the patient and the community. For example, universal precautions must be taken when collecting blood specimens in order to protect against diseases such as HIV/AIDS, hepatitis B and haemorrhagic fever. Expert advice should always be sought and safety precautions should always be taken.

3. *Timing of specimen collection*

The timing of the collection of diagnostic specimens varies with the surveillance system. It is related to the presence of organisms in body fluids or tissues, or to the body's reaction (i.e. immune response) to the pathogen. In measles surveillance a single serum obtained at first contact with the health care system, preferably within 28 days of the onset of rash, is considered adequate. For practical reasons it is recommended that the specimen be collected as soon as the case is detected.

Fig. 6 represents a theoretical example of the possibility of isolating poliovirus from stool specimens collected from AFP cases. It can be seen that the likelihood of isolating virus in the stool is greatest if the specimens are collected within 14 days of the onset of paralysis and that it has diminished markedly by 30 days.

Fig. 6. Possibility of isolating poliovirus related to days after onset of paralysis
(Note: rate of decline of poliovirus is proportional to temperature.)

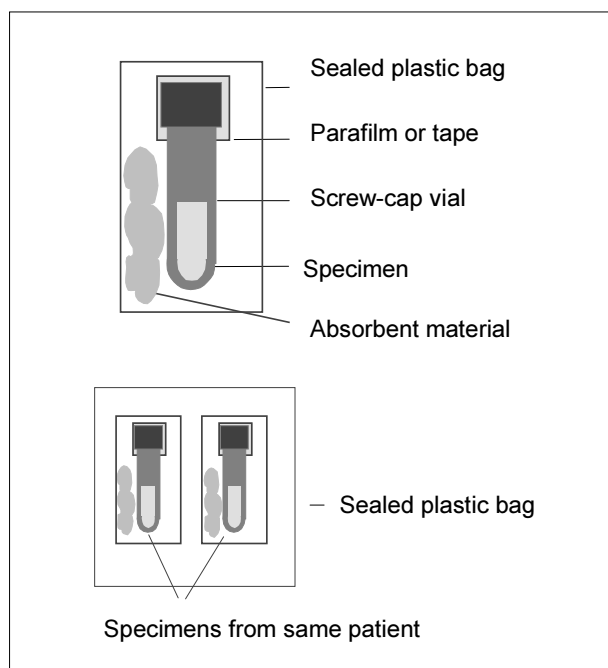


4. *Number of specimens and interval between collections*

In AFP surveillance, two stool specimens should be collected at least 24 hours apart so as to increase the probability of detecting poliovirus. A single blood specimen is sufficient for measles surveillance.

5. Specimen collection device

Fig. 7. Stool specimen collection kit



Surveillance diagnostic specimens often require specific collection devices, depending on the type of specimen collected.

In AFP surveillance the following are needed for specimen collection (Fig. 7):

- a 30-60 ml faeces container with an external screw cap;
- a plastic bag to hold the faeces container;
- a plastic bag to hold report forms;
- absorbent materials (cotton wool absorbs 8-10 times its own weight).

All of these are provided in the polio specimen collection kit (Product Information Sheets, 2000, code number E11/02). (2) If this kit is unavailable, any clean leak-proof jar with a screw cap that can securely contain a stool specimen should be used.

For measles surveillance the following are needed:

- a 5 ml Vacutainer tube (non-heparinized) with a 23 gauge needle (if unavailable, use any sterile 5 ml syringe with a sterile 23 gauge needle and a 5 ml non-heparinized vacuum blood vial);
- a tourniquet;
- sterilizing swabs;
- serum storage vials;
- specimen labels;
- band aid;
- plastic bags which can be sealed.

Venepuncture must be performed safely (3) with sterile equipment. Disposable equipment should be used only once and then carefully placed in a safety box, without recapping the needle, and incinerated.

Specific expert advice should be obtained on other surveillance diagnostic specimens.

6. Requirements for the highest quality specimens to arrive in the laboratory

Specimens often need to be kept at a specific temperature from the point of collection to the point of processing in the laboratory. They should therefore flow as directly as possible between these points, for which purpose a means of transport is required.

Adequate surveillance specimens

AFP surveillance: Two stool specimens collected 24 hours apart within 14 days of the onset of paralysis.

Definition of specimens arriving in a laboratory in good condition:

- there is ice or a temperature indicator showing less than 8°C in the container;
- the specimen volume is adequate (more than 8 g);
- there is no evidence of leakage or desiccation;
- appropriate documentation is complete and accompanies the specimen.

For further information see reference 1.

Measles surveillance: A single serum obtained at first contact with the health care system, ideally within 28 days of the onset of rash. A specimen of at least 1 ml should be collected in a sterile tube. Whole blood may be held at refrigerator temperatures (4-8°C) if it can be transported so as to arrive at a testing laboratory within 24 hours. If this is not possible the tube must be centrifuged to separate the serum. Sterile serum should be shipped on wet ice within 24 hours, or stored at 4-8°C for a maximum period of seven days. Alternatively, sera may be frozen at -20°C for longer periods and then transported to a laboratory on frozen ice packs. For further information see reference 3.

In AFP surveillance the reverse cold chain means transporting and storing stool specimens on ice from the moment of collection until their arrival in a laboratory. The reverse cold chain for AFP surveillance is similar to the vaccine cold chain except for the following important differences.

- Stool specimens should be transported in a similar way to OPV. However, vaccines are transported from the central level to the point of vaccination, whereas stool specimens are transported in the reverse direction, i.e. from the point of collection to a more central level (a laboratory).
- OPV may be frozen and thawed several times. Freezing and thawing of stool specimens reduces the possibility of detecting poliovirus in the laboratory.
- Major vaccine manufacturers attach VVMs to OPV vials but there is no equivalent device for monitoring the temperature of stool specimens.

Specimen carriers and ice packs (or ice) must be available for case investigators (usually at the district or provincial levels). The standard specimen carrier is often referred to as the yellow box. It has a capacity of two stool collection kits or up to six stool collection tubes with four standard ice packs. The cold life of this carrier is 48 hours at an ambient temperature of 43°C if four frozen ice packs are inserted and the lid is closed securely. At lower ambient temperatures the cold life of the specimen carrier exceeds 48 hours. The cold life of specimen carriers should be tested at local ambient temperatures. For one specimen carrier specifications are described in reference 2 (Product Information Sheets 2000, code E11/05-M).

In the absence of stool specimen carriers, any available vaccine carrier and ice packs should be used. Ensure that vaccine carriers and ice packs used for transporting stool specimens are not used for vaccine transportation unless they are first properly washed and disinfected.

Storage of stool specimens

Specimens and vaccines should not be stored together in the same refrigerator, freezer or cold box because of the risk of contamination. If such storage is unavoidable, vaccine carriers used for specimen transfer should be thoroughly washed and disinfected with bleach before placing vaccine in them.

Specimen carriers and ice packs should not be used to transport vaccine unless disinfected with a mixture of 1 part of bleach to 10 parts of water. Any washing powder solution may also be used for washing vaccine carriers and ice packs before disinfecting them. Try to avoid keeping stool and blood specimens in vaccine refrigerators and freezers. If this is unavoidable, as is often the case at the local level, specimens should be well sealed in a leak-proof container and placed in a double layer of plastic bags. If there is any leakage, vaccines and drugs should be removed from the refrigerator or freezer and discarded. The refrigerator or freezer should then be washed in the same way as vaccine carriers.

For AFP surveillance, stool specimens must be placed in a refrigerator if they cannot be shipped immediately. The specimens should preferably arrive in a laboratory within 72 hours (three days) after dispatch. They should be kept at 4-8°C by means of a specimen carrier (yellow box) and ice packs. If this is impossible the specimens should be frozen at -20°C and then shipped frozen with ice packs that have also been frozen at -20°C.

If the reverse cold chain is not maintained from the point of collection to arrival in the laboratory, poliovirus may not survive and consequently may not be detected. Repeated freezing and thawing also decrease the probability of recovering poliovirus in stools. If the transportation of specimens is delayed, melting ice packs should be replaced with frozen ones. If safe transportation cannot be ensured, try to send patients to a laboratory or hospital for the collection of stool specimens.

Clearly mark any freezer used for the storage of specimens with a sign resembling that shown below:

For laboratory specimens only
Do not place any vaccine, drug, food or
drink in this freezer!

In areas with unreliable or no electricity, use kerosene or gas-powered freezers. It is advisable to use the same brand of freezer/refrigerator for the storage of both vaccine and stool specimens in order to simplify repair and maintenance. Electricity and fuel contribute to the operating costs of freezer/refrigerators. It may be economically advantageous to provide a single freezer/refrigerator for several reporting facilities.

Since two specimens must be collected at least 24 hours apart it may be necessary to leave a specimen kit, specimen carrier and frozen ice packs with a family member caring for a patient. The family should be given clear instructions on how to collect and store the specimens. If the patient is at home the investigator should collect the specimens as soon as possible. If the patient is hospitalized the family member who is caring for the patient in the hospital may help to collect the specimens.

Sometimes a reverse warm chain is needed to transport specimens. This is similar to a reverse cold chain except that the specimen should be kept warm from the time of collection until the time of receipt in the laboratory (e.g. for *Haemophilus influenzae* type B surveillance).

7. Sending specimens to the laboratory

A person should be designated and trained to send specimens to the laboratory. In many countries the officer responsible for case/outbreak investigation and specimen collection may also be designated to pack and dispatch laboratory specimens. Continuity of employment for these officers is advantageous in that it minimizes the need to retrain personnel.

- **Packaging and labelling**

Ensure that labels are firmly applied to the specimen tubes. For AFP surveillance, wrap the tubes in absorbent material, seal them in a plastic bag and place them in the specimen carrier. Laboratory forms should be inserted in a plastic bag in the specimen carrier. Staff should be trained in preparing the labels and applying them to the tubes. Use permanent ink that does not fade with water contact and ensure that staff write complete information clearly on the labels. Data on labels should be kept to a minimum according to the needs of the laboratory and surveillance staff. For further information see reference 1. An example of a label for AFP surveillance stool specimens is given below:

<p>Identification number:</p> <p>Name of patient:</p> <p>Specimen number (1 or 2):</p> <p>Date collected:</p>

- **Forms accompanying specimens sent to a laboratory**

Stool specimen collection kits recommended for AFP surveillance (code PIS E11/02) should be accompanied by laboratory request forms. The minimum information required by a laboratory involved in the detection of poliovirus is printed on the forms, which should be designed in collaboration with the laboratory. Laboratories should receive data facilitating the identification of the cases and allowing decisions on the analysis of the specimens.

Important information for AFP surveillance includes the date of onset of paralysis, age, sex, the dates of the first and second collections of stool specimens, and the address of the patient. The local language should be used on forms. If specimens are sent overseas for laboratory analysis the forms should be translated into the language used by the reference laboratory. Surveillance staff should be trained to complete the forms.

The forms should be placed in waterproof plastic bags or envelopes in order to protect them from specimen leakage. The identification number of each case should be carefully checked both on the label and on the form to ensure that the same number has been used. A sample of forms for AFP surveillance is given in reference 1.

- **Transporting specimens to the laboratory**

Competent laboratories should be designated to process specimens by means of standard methods. The laboratories must be properly equipped and supplied and their staff must be trained in standard procedures.

The an AFP Surveillance Laboratory Network is formally accredited by WHO for the analysis of stool specimens. The laboratories are regularly supplied with standard reagents, cell lines and other supplies, their equipment is updated and fulfils international requirements, and their staffs are trained to perform standard procedures. A similar network is being set up by WHO for measles surveillance.

AFP stool specimens should arrive in a laboratory within 72 hours and should be sent by the fastest, most reliable means of transport available. The specimens should be addressed, by name, to a specific person in the laboratory and should arrive at a time when the laboratory is open (i.e. not at weekends or during holidays), unless special arrangements have been made. Staff at the receiving laboratory should be informed in advance when specimens are expected to arrive.

A dummy specimen may be sent to test the system with a view to overcoming any unforeseen problems. The internal temperature of the stool specimen carrier should be measured and a check should be made to ascertain whether four frozen ice packs are sufficient for the specimens to reach the laboratory in adequate condition, i.e. the ice packs should still be at least half-frozen on arrival. In deciding what means of transport to use for specimens, sustainability and economic factors should be considered. A bicycle may be provided for transporting specimens from reporting sites to the district health office where they are kept pending dispatch to the laboratory. The bicycle could also be used for transporting vaccine from the district health office to the reporting site. Commercial means of transport may be considered if they are reliable, frequent and affordable.

A motorcycle may be provided for the transportation of specimens over long distances. In the interest of cost-effectiveness it could also be used for transporting vaccines and could serve several reporting sites. For the most efficient use of motorcycles a good communications system should be in place. In estimating costs for motorcycles it is necessary to consider fuel, spare parts, repairs and maintenance. Locally produced motorcycles are often the best since spare parts and expertise for repairs and maintenance are usually available for them. An appropriate type of motorcycle should be selected for the terrain where it is to be used. The specifications of several types of motorcycle are given in *WHO/UNICEF Product Information Sheets. (2)* Staff using motorcycles should be properly trained and must wear a helmet. Some countries require a specific type of licence and accident insurance. Training costs, insurance premiums, fuel, spare parts and the servicing and maintenance of motorcycles should be considered when an overall budget for surveillance is being prepared.

Courier services might be another affordable and reliable option for the transportation of specimens. There are examples of successful operations using public and commercial courier facilities. In countries where the UN or NGOs have regular air services, the latter may be worth considering for long distance transportation. For instance, both UN and ICRC aircraft transport stool specimens from Afghanistan to Islamabad specimens for laboratory analysis.

- **Regulations for air transport**

IATA regulations are observed when specimens are sent by air (Annex 3), although in exceptional circumstances the regulations may not be applicable.

Summary of logistics for investigation and confirmation

- Appropriate specimen collection kits, labels, packaging material, specimen carriers and laboratory request forms distributed **beforehand** to those responsible for collecting specimens.
- Appropriate transport and per diem allowances whenever a suspect case or outbreak must be investigated.
- Designated staff who are properly trained for collecting specimens, completing forms and dispatching specimens.
- Means of dispatching specimens, e.g. courier services, private transport, public transport.
- A clearly designated laboratory that will receive and process specimens
- Well-trained laboratory staff who can process specimens and report results.
- Appropriate supplies, equipment and reagents for processing specimens, managing data and communicating results.

Function 3. Data collection and consolidation

Surveillance data must be collected and consolidated. It is important that agreement is reached on a set of standard variables (core variables or minimum data set), that everyone collects the same type of information, and that the flow of information is clearly defined. Once the data collection needs and procedures at each level have been clearly defined, the logistics include the provision of appropriate paper forms or computer equipment and/or computing support. Carefully organized training and supervision are needed for the collection and consolidation of data. During training sessions, practise form-filling and conduct role play on what happens at each level from case detection to investigation, the reporting of final results, and action.

Well-designed, simple forms are necessary for data collection. The forms should be adapted and translated into local languages. Before printing, the forms should be field-tested under various conditions. If the forms are translated from another language, test the translated forms on various people or have the forms translated back into the original language so as to verify the translation. Check whether all respondents have the same answers and the same understanding.

In most surveillance systems, data are collected by staff and then entered on a computer. Human factors should be considered when data collection systems and forms are being designed. Forms and questionnaires should not only facilitate computer data entry but should also take into consideration the persons who collect data and complete forms in the field. Adequate space should be provided on forms for hand-written information.

Collect only essential information so that the system operates as efficiently as possible. Data management skills should also be developed for staff in the system. (4)

Decide the level at which data should be computerized. Computers must be maintained and replaced about every three years with updated models. This provision should be included in the overall budget.

If a decision is made to provide computers, consider the following points:

- sustainability;
- staff training;
- maintenance;
- availability of power;
- possibility of misuse for other purposes.

When procuring a computer it is not necessary to purchase the most powerful machine available. One of the most important considerations is the availability of local technical support. Local purchase often has the advantages of technical support, a local guarantee in the event of malfunction, and the availability of accessories. The importation of computers carries the risks of theft, lack of technical support, and few options for recourse if malfunction occurs.

Function 4. Data analyses

Staff at all levels should be trained to analyse data and create routine reports. There are many software programmes that support computerized data analysis. See reference 5 on setting up a computer-based information system (WHO/EPI/GEN/98.15) and module 4 of the “Making surveillance work” series. (4). The one that is used should provide a means for data entry, data cleaning and analysis (including automated routine reports), feedback and feed-forward. The training of staff in data management and data analysis is necessary. Routine reports should be defined beforehand with technical/programme staff. Do not leave it to the data manager alone to define the routine reporting procedure and format.

At the central level, routine reports might be created for a minister of health, the head of each disease control system, and partner agencies. Staff at all levels should at least analyse their data in terms of time, persons and places to show when, how much and where disease is occurring. This might include the calculation of incidence (the number of cases occurring over time), the preparation of graphs showing how many cases are occurring annually (Fig. 8) or monthly (Fig. 9), a pie chart showing the proportion of cases of each disease of interest, i.e. proportional morbidity, and the plotting of cases (or incidence rate) on maps to show areas at high risk (Fig. 10). It might also include pie charts of the immunization status of cases and a graph of the age-specific incidence rate.

Fig. 8. Reported measles morbidity/100 000 population, Viet Nam, 1987-1997

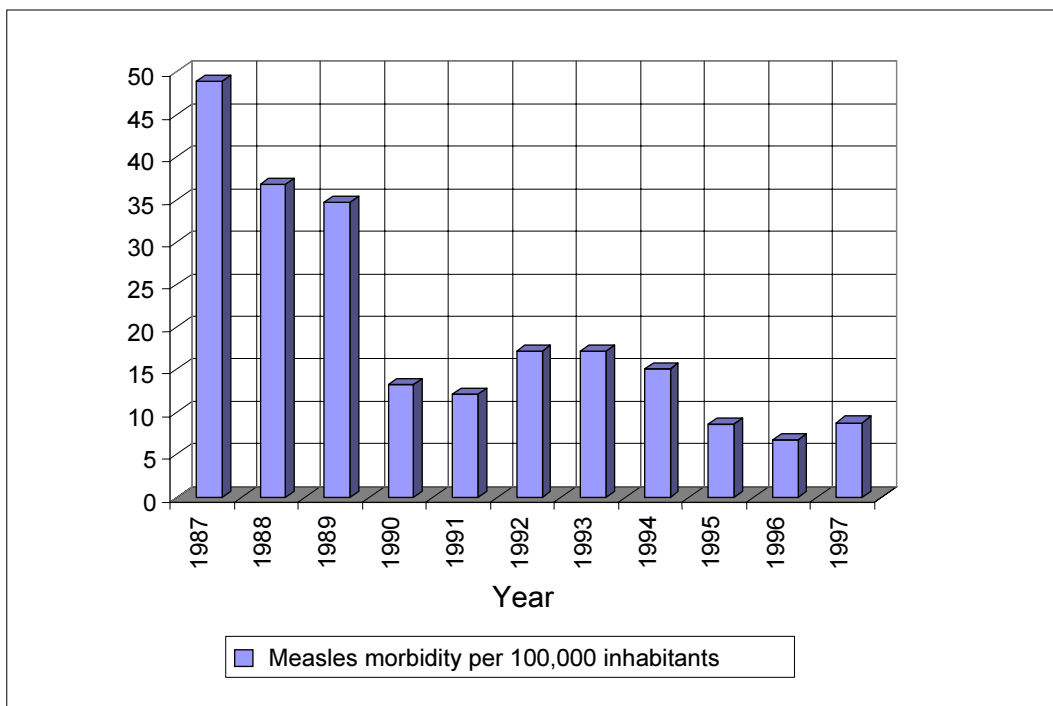


Fig. 9 shows a peak of measles cases in Viet Nam from April to June.

Fig. 9. Distribution of reported measles cases by month in Viet Nam, 1997-1998

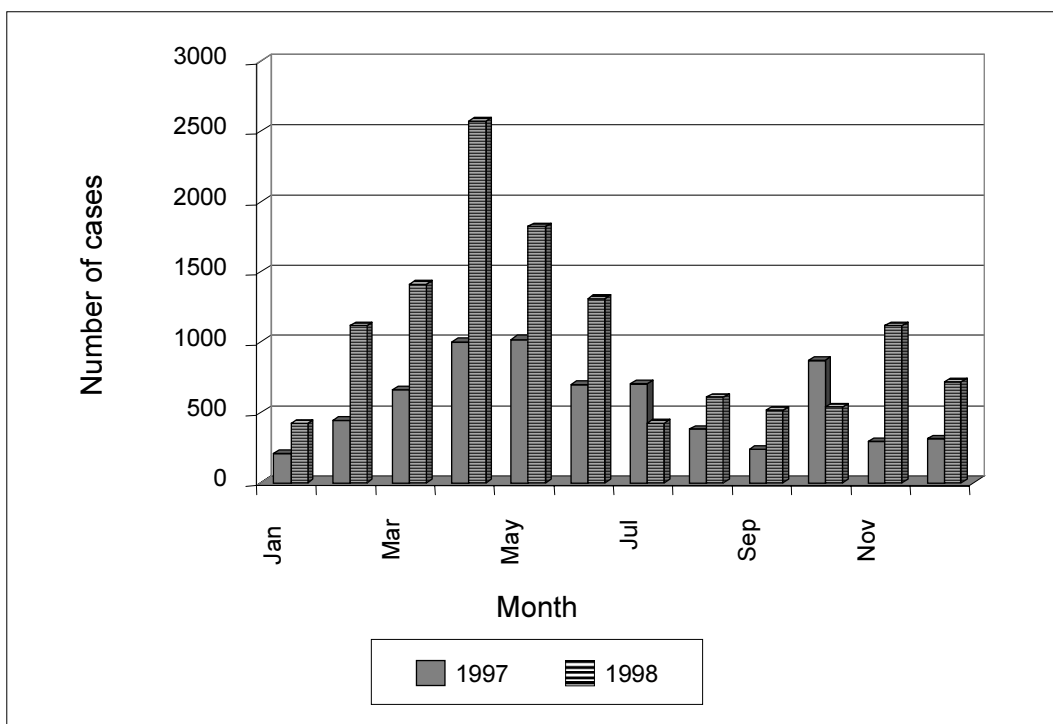
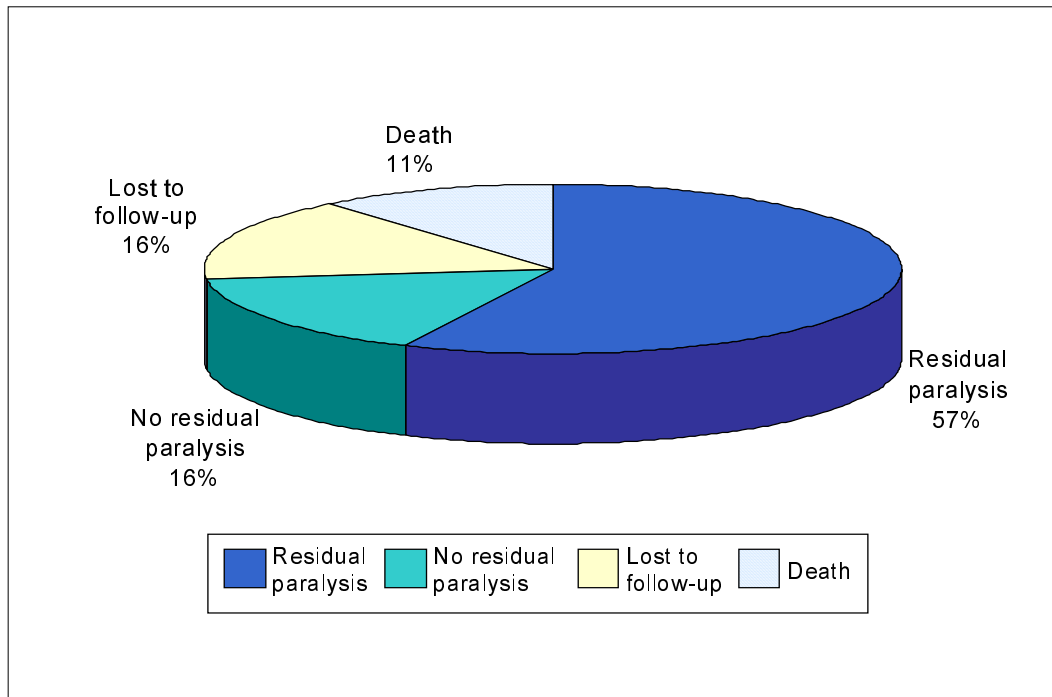


Fig. 10 shows that 57% of reported wild poliovirus cases in Viet Nam between 1992 and 1997 involved residual paralysis, that 16% did not involve residual paralysis, and that death had occurred in 11% at the time of follow-up; 16% of reported wild virus cases were lost to follow-up.

Fig. 10. Outcome of follow-up of wild poliovirus cases, Viet Nam, 1992-1997

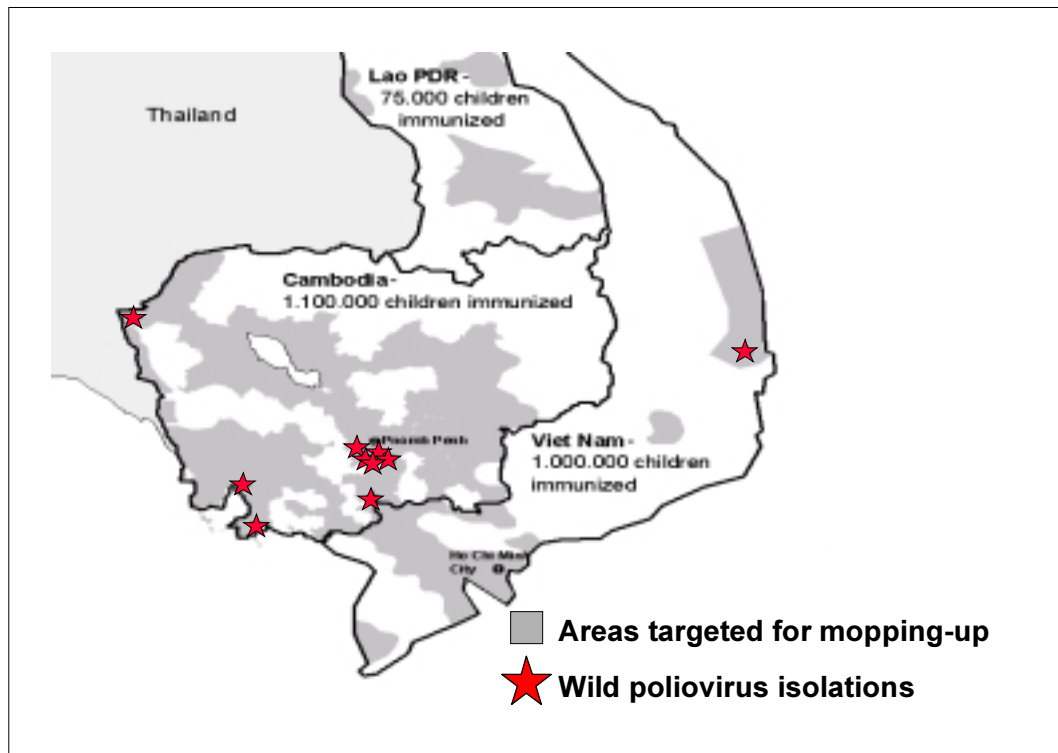


Mapping is a useful way of displaying surveillance data at national, regional or local levels. Maps can clearly display the relationship between cases and geographical and demographic features, including the clustering of cases. This information can be used in planning the allocation of resources for surveillance and disease control interventions.

A base map showing administrative units is required for the preparation of surveillance maps. Base maps are often obtainable from government ministries. Many are available as boundary computer files and are supported by computer mapping software. Aerial photographs and local knowledge may be used to add more detail and information on maps.

Fig. 11 shows the clustering of polio cases in Cambodia (and one case in Viet Nam). Geographical displays of these cases along with other information were used to plan routine and supplementary immunization in these countries.

Fig. 11. Wild poliovirus isolates and areas targeted for mopping-up in Cambodia, Laos PDR, and Viet Nam



The surveillance system should include zero reporting, i.e. each site should provide information for each reporting period even if that means indicating an absence of cases. This avoids the confusion of equating “no report” with “no cases”.

All levels should calculate standard performance indicators to monitor surveillance. An indicator of the performance of an immunization system might include the number of measles cases over time, the incidence rate of measles and the coverage rate for measles vaccine. For surveillance performance it might include a calculation of completeness and timeliness of reporting as well as the proportion of outbreaks that were investigated. An analysis of performance indicators helps to locate areas where logistics, training or supervision may be weak.

Performance indicators

Surveillance performance indicators are necessary for identifying weaknesses in surveillance systems, often related to weak logistics, supervision, training and/or resource management.

Performance indicators are criteria used to identify areas of weak surveillance logistics, training or supervision. The measurement of “completeness of reporting” may reveal problems of communication (i.e. means of sending data), training, supervision or motivation of staff. Similarly, a low “rate of investigation/specimen collection” could reveal a lack of transport needed to conduct an investigation.

The two most important surveillance indicators for AFP surveillance are:

- detection of non-polio AFP cases (i.e. the non-polio AFP rate per 100 000 children under the age of 15 years);
- the proportion of all stool samples collected that were adequate.

For the first indicator it is expected that there is a rate of at least one case of non-polio AFP per 100 000 children in the community in a 12-month period. A sensitive AFP surveillance system should therefore detect at least one case of non-polio AFP per 100 000 children under the age of 15 years. (See reference 1 for descriptions of 10 performance indicators.)

Summary of logistics for data analyses and reports

- Routine feed-forward forms.
- Paper maps of the area under surveillance.
- Computer equipment/software.
- Computer support.
- Base maps (on paper and, if possible, computerized maps).
- Means of disseminating routine reports.
- Means to communicate with key contacts who are sending data.

Performance indicators for measles surveillance depend on the stage of accelerated measles control or elimination achieved in a given country. For example, surveillance performance indicators in the first phase of measles control include:

- the proportion of designated reporting sites providing a report each week, including zero reports;
- the percentage of cases with data on location, age and immunization status;
- the percentage of outbreaks reported within two weeks after the onset of the index case;
- the percentage of outbreaks with laboratory confirmation of at least one case.

Function 5. Feedback

Feedback is the process of routinely sending analyses and reports to the more peripheral levels of the surveillance system, particularly to the senders of data. Feedback may occur in the form of newsletters, bulletins, letters, memoranda, telephone calls, visits or any combination of these methods of communication.

The four major reasons for feedback are to:

- create a collaborative environment by acknowledging the hard work of data providers and making them aware that their data are analysed;
- verify with the peripheral levels that the data received at more central levels are correct;
- improve performance by showing national progress towards specific public health goals and comparing performance between regions;

-
- facilitate the use of data by providing data analysis in greater depth than can be achieved peripherally; for instance, if the peripheral level is not computerized the central level might provide computerized tables, graphs and maps to enhance the local analysis of data.

The logistical needs for written feedback usually include computer equipment, appropriate software, paper and ink supplies, and a means of duplicating and disseminating the material produced. Newsletters are a very effective means of providing written feedback. The logistics for verbal feedback include means of communicating and travelling (for face-to-face feedback).

Summary of logistics for feedback

Written feedback

- Computer equipment, software, supplies (e.g. paper, ink).
- Means of duplicating written feedback.
- Means of disseminating written feedback.

Verbal feedback

- Means of communicating.
- Transport for face-to-face visits.

Function 6. Feed-forward

Feed-forward is the reverse of feedback. It is the process of forwarding data to more central levels. In a hierarchical reporting system, health facility staff usually forward surveillance data to district staff, who forward them to provincial staff. The latter send them to central level staff, who may forward selected data to WHO regional office staff. Subsets of data may then go to WHO headquarters staff. Data might also be broadcasted (i.e. sent to several places and levels at once), instead of flowing hierarchically. (4)

Depending on the level of computerization and the telecommunications infrastructure in a country, logistical needs may include the provision of:

- appropriate feed-forward forms and a means of forwarding them;
- radios and technical support for transferring data electronically or by voice;
- computer equipment, modems, appropriate software and technical support for forwarding data in a standard data exchange format either on diskette or by email.

For transferring data, radio communication may be used at subnational levels wherever the telecommunication infrastructure is weak (e.g. between remote health centres and districts). Computer-telephone modem systems are suitable where there is a reliable telecommunications infrastructure. The successful transmission of data sent by email should be confirmed by a message from the receiver to the sender. Some countries have used modem systems with satellites where such an infrastructure does not exist.

Summary of logistics for feed-forward of data

- Paper, feed-forward forms.
- Radio, fax machine and/or computer equipment/software with modem.
- Appropriate technical support for using communications/computer equipment.

Step 3. Define the flow of data

Data should flow from the point of detection to central levels so that staff at each level can monitor the epidemiological situation within their catchment area. Although data at all levels should be analysed, the data at more central levels should be consolidated, synthesized and communicated routinely as feedback to those providing the data. In this way it becomes possible to take action for disease control and to improve the surveillance system.

1. *Responsibility for data management*

Data are managed at each level of the system, sometimes on paper and sometimes using a computer. There should be clear designation and training of staff responsible for managing data at each level. The more central levels tend to be computerized in order to cope with the amount of data that has to be managed. The degree to which subnational levels are computerized varies between countries. Training needs therefore vary according to what data are managed and how this is done at each level.

2. *Responsibility for sending data from each reporting site*

A person should be designated at each reporting site as being responsible for sending surveillance data in accordance with a clearly specified schedule. This person should not only have access to the data but should also have the resources necessary for sending them.

3. *Data to be fed-forward*

In AFP surveillance, case-based data (i.e. detailed information on each case) are collected and reported, this being necessary for the planning of routine and supplementary immunization to eradicate polio. Where measles is still endemic, detailed case-based data are unnecessary, as it may be logistically impossible to fully investigate all measles cases, and, indeed, there is no good reason for doing so. See reference 6 for further information. When measles is rare and the objective is its elimination the collection of case-based data is appropriate.

4. *Frequency of forwarding data*

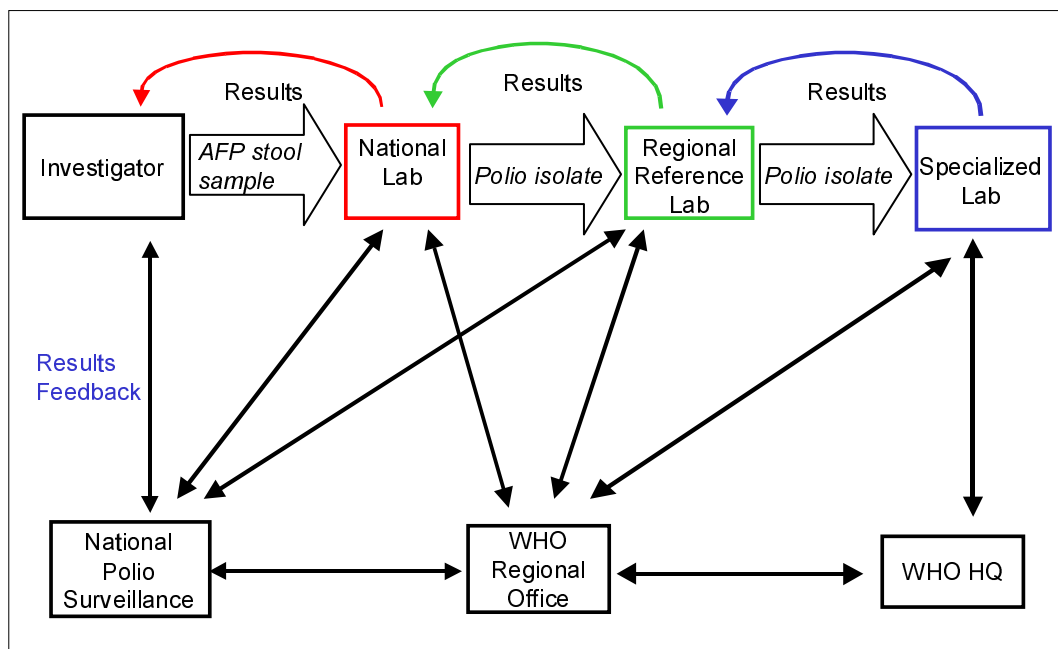
The frequency with which data are sent depends on the level of reporting, the epidemiology of the disease and the needs of the disease control initiative. For instance, data on AFP cases should be sent immediately from the point of contact to the next higher level so that arrangements can be made for the investigation and collection of adequate stool specimens. In the early stages of measles control, weekly or monthly reporting is adequate, but at later stages a more sensitive system is necessary and the immediate reporting of suspect cases is therefore required.

5. How to forward data

Data can be sent by mail, messenger, radio, fax, telephone and email. The method used depends on the resources and facilities available in the country concerned. Fig. 12 gives an example of data and specimen flow for AFP surveillance. The most reliable and cost-effective means of sending the data should be selected according to the circumstances. Data can be sent by voice (i.e. by fixed, mobile or satellite telephone or by short wave or FM radio) or in written form.

The use of radios requires a radio network system to be developed. The capital cost of this may be high but the operating costs are minimal. Such an approach may be appropriate in settings where the UN or the military already has a radio communications system in place. Satellite telephones involve high capital and operating costs. Careful consideration should be given to the selection and purchase of equipment and expert advice should be obtained beforehand.

Fig. 12. Data and specimen flow for AFP surveillance



Step 4. Define the ongoing supportive functions needed for good surveillance logistics

1. Resource management

The new technologies and resources available for surveillance cannot overcome poor resource management. Poor management of human resources results in high staff turnover. Poor management of equipment leads to premature breakdowns. Poor management of data may lead to the right information not being in the right hands at the right time to take action. Effective surveillance logistics depend on proper budgeting and resource management. The main budgetary items are indicated in table 4.

Table 4. Budget line items for disease surveillance

Budget line items	Subitems
Personnel (salaries/per diems)	<ul style="list-style-type: none"> • Case investigators • Active surveillance officers/field epidemiologists • Data managers • Laboratory staff
Workshops, meetings, training	<ul style="list-style-type: none"> • National training/planning workshops • Subnational training/planning workshops • Training of case investigators and surveillance officers • Training of laboratory staff • Coordination meetings
Social mobilization	<ul style="list-style-type: none"> • Clinician advocacy • Local meetings to involve the community and local leaders
Equipment (capital costs)	<ul style="list-style-type: none"> • Specimen carriers • Refrigerators/freezers • Vehicles, motorcycles, boats, bicycles • Laboratory equipment • Computer equipment • Communications/data transfer equipment
Operations and supplies (recurrent costs)	<ul style="list-style-type: none"> • Specimen kits • Specimen shippers • Laboratory consumables • Petrol • Vehicle maintenance (including spare parts) • Computer maintenance (including spare parts) • Maintenance of communication equipment • Creation/distribution of standard forms/feedback • Social mobilization/advocacy materials/activities • Ad hoc reimbursements for notifications • Freight costs for importing/transporting equipment

The budget should include the amount needed, the source of money already available to meet the need, and shortfalls (Annex 4). An explicit budget facilitates the process of identifying local and international partners with a view to addressing unmet technical and financial needs. Budgets, which are not static items, should be reviewed regularly and adjusted as necessary.

Tight financial control, auditing and monitoring of budgets should be implemented. This is especially important when large sums of money are being managed, as in the final years of polio eradication. Since this can involve a considerable workload the option of employing an outside accounting firm to manage, monitor and/or audit the implementation of the budget should be considered.

The management of recurrent costs (supplies, per diem) is often challenging, particularly at subnational levels. Resources are needed to cover ongoing transport and per diem costs for case or outbreak investigations, specimen collection, specimen dispatch, case-searching, follow-up visits and active surveillance. A means of monitoring and managing these resources, particularly at the peripheral levels, is also needed. With regard to AFP surveillance a means of transport is most important

at the level where case investigation and specimen collection have to be conducted, usually the district level. Transport from the central and intermediate levels for supervisory and active surveillance visits must also be included as a budget line.

The maintenance of equipment is another important aspect of good surveillance logistics, and the provision of spare parts should not be forgotten. It is frequently desirable to allocate 10% of the total capital costs of any equipment annually for the provision of spare parts and maintenance. This percentage should be increased during the later years of use since more spare parts and maintenance are required as equipment ages. This is especially true of vehicles, including motorcycles.

The cost of transporting equipment and supplies from manufacturers to countries may be high for some countries and should therefore be considered during planning and budgeting. Similarly, budget lines should include the transportation of equipment and materials within countries.

Recurrent costs and consumable supplies

The management of recurrent costs and the procurement of consumable supplies are usually among the weakest aspects of surveillance logistics. Staff managing these aspects of surveillance, particularly at subnational levels, must be carefully selected, trained and supervised to ensure that vehicles, computers and communication equipment receive regular maintenance and that supplies (e.g. petrol, specimen kits/carriers) are in the right place at the right time.

The management of human resources is an important part of surveillance logistics. Trained and supervised personnel are needed for surveillance at all levels. Suitable human resources should be clearly designated, trained, supervised and mobilized, i.e. given transport, supplies, per diem and other necessary resources. Table 5 shows the personnel required for surveillance functions and logistical needs.

Table 5. Personnel needs for surveillance

Surveillance function	Personnel needs*	Summary of logistical needs
Case detection, notification	Health worker or clinician (or other persons in contact with the health event in question); active surveillance officers	<ul style="list-style-type: none"> • Case definitions • Forms • Means of communicating with the appropriate official if a case is detected • Means of sending information • Transport (for active surveillance) • Per diems (for active surveillance) • Training; clinician advocacy
Investigation and confirmation (clinical and epidemiological)	Case/outbreak investigators	<ul style="list-style-type: none"> • Case/outbreak investigation forms • Specimen kits • Specimen carriers • Transport • Per diems • Training in investigation and specimen collection • Means of communication • Clear designation of a laboratory to receive specimens • Means of dispatching specimens to a national laboratory
Investigation and confirmation (laboratory) (receipt and processing of specimens, reporting results, forwarding viral isolates to intratypic differentiation laboratory)	Laboratory staff	<ul style="list-style-type: none"> • Supplies, equipment, reagents • Means of managing data • Means of communicating laboratory results • Means of dispatching isolates to intratypic differentiation laboratory
Data collection, consolidation, analyses, reports, feedback, feed-forward	Data managers	<ul style="list-style-type: none"> • Training in data management (on paper or by computer) • Means of receiving, managing and sending data/information (i.e. computer equipment, software, communication equipment, computer support, base maps) • Means of distributing information on paper (forms, paper, photocopying services, means of sending information) • Transport (if visits to different levels are needed)
Supportive functions: planning, budgeting, training, monitoring, supervision, follow-up, evaluations	Disease control programme staff, public health administrators, surveillance officer, logistician, field epidemiologist	<ul style="list-style-type: none"> • Transport • Appropriate forms • Appropriate training materials • Means of communicating with more peripheral and central levels

* The same person may perform many of these functions in small countries and at the more peripheral levels in any country.

Rationalizing and integrating resources

Mapping out the surveillance functions in accordance with the level of the health system for each health event under surveillance may help to identify gaps and show where resources could be shared (table 6).

Table 6. A matrix of yellow fever surveillance functions

Level	Function							
	Detection and notification	Collection and consolidation of data	Analysis and production of routine reports	Investigation and Confirmation			Feedback	Feedback
				Epidemiological	Clinical	Laboratory		
Central		Yes	Yes			Yes	Yes	Yes
Intermediate	Yes**	Yes	Yes	Yes	Yes	Yes		Yes
Contact*	Yes	Yes						Yes

* Point of contact with health event, e.g. sentinel site, community, hospital, laboratory, health centre, rehabilitation centre, pharmacy.

** Active surveillance.

Case and outbreak investigation could be implemented at the district level for a group of diseases, allowing integrated training in this aspect of surveillance at the district level. Active surveillance might be carried out by staff at the provincial level, not only for a single disease but for a selection of priority diseases requiring immediate action. Transport for supervisory visits and the ordering of supplies might be combined. Data might be collected, consolidated and managed for a group of diseases.

2. Training and supervision

Training and supervision in the matters indicated below must be provided by designated surveillance officers.

- For persons designated to detect and notify:
 - what and how to detect cases according to standard case definitions;
 - how to do active surveillance;
 - how to notify cases;
 - when to notify (immediately/weekly/monthly);
 - how to notify a case (verbal/sending a written form);
 - how to complete forms.
- For persons designated to investigate and confirm cases/outbreaks:
 - what and when to investigate;
 - how to complete the case or outbreak investigation form;
 - what type of specimen to collect;
 - when to collect specimens;
 - how many specimens to collect;

-
- how to collect a specimen;
 - how to store and dispatch a specimen.
 - For persons designated to conduct laboratory **investigation and confirmation**:
 - how to carry out laboratory procedures;
 - how to report results;
 - how to send proper and timely reports based on the results of analysis.
 - For persons designated to **collect and consolidate data** at all levels:
 - how to consolidate data and at what frequency;
 - how to complete data aggregation forms;
 - how to manage data.
 - For persons designated to **analyse and make routine reports**:
 - what analyses to perform;
 - how to perform analyses and at what frequency;
 - how to interpret and use analyses;
 - how to report analyses;
 - to whom the reports should be sent.
 - For persons designated to provide **feedback**:
 - what type of feedback to create;
 - how frequently to send feedback;
 - how to send feedback;
 - to whom feedback should be sent.
 - For persons designated to forward data to more central levels (i.e. **feed-forward**):
 - what data should be sent and in what data exchange format;
 - to whom data should be sent;
 - how often data should be forwarded;
 - by what means data should be forwarded (paper, telephone, radio, fax or email).

The training should clearly indicate what is required of each designated staff member, how tasks should be performed, and by when. Supplying written job descriptions and written standard operating procedures is a helpful complement to training. Once staff have been designated to carry out certain functions, trained and given the appropriate logistical support, supervision can help to reveal if the work is being accomplished. If it is not the supervisor should ask the following questions:

-
- Do the staff know WHAT they are supposed to do?
 - If yes, do they know HOW to do it?
 - If yes, do they have the MEANS to do it?
 - If yes, do they have the MOTIVATION to do it?
 - If yes, are there political or other impediments to task fulfilment?

Managerial tools that record the ongoing work of staff are helpful. For example, staff conducting active surveillance visits should maintain a log indicating where visits were made, the dates of the visits and how many kilometres were travelled. The logs should indicate the names and/or signatures of key hospital staff who were visited (Annex 5). Checklists can improve the effectiveness of supervisory visits (Annex 6).

Step 5. Monitor and evaluate the performance of surveillance

The progress of all surveillance plans should be monitored using standard performance indicators. If the performance of surveillance does not meet the necessary standards, action should be taken to improve it. The indicators should monitor the performance of field surveillance, data management and laboratory services. Examples are given below of monitoring for vaccine-preventable diseases.

1. Monitoring the performance of surveillance for polio eradication

One of the main purposes of monitoring the quality of AFP surveillance is to demonstrate to the Global Certification Commission on Polio Eradication that wild poliovirus transmission would be detected if it were to occur. Two key performance indicators are monitored: the non-polio AFP rate (target: at least 1 case per 100 000 children under 15 years of age) and the stool specimen collection rate (target: at least 2 adequate stool samples collected from 80% of AFP cases). Performance monitoring should also cover the completeness and timeliness of reporting at each administrative level. Performance indicators should be fed back to local staff so that the quality of surveillance in areas performing poorly can be improved.

2. Monitoring the performance of surveillance for accelerated measles control

For measles surveillance the following performance indicators are monitored:

- proportion of laboratory specimens received in good condition;
- proportion of specimens with properly completed laboratory forms;
- proportion of results reported within seven days after receipt of specimens in the laboratory.

On the basis of experience with AFP surveillance, measles surveillance should be implemented at the stages of control and elimination. The intensity of surveillance and performance indicators becomes greater as the elimination stage is reached. The following box summarizes surveillance performance indicators for the measles control stage.

Measles surveillance performance indicators for the control stage

Completeness of routine reports:

Percentage of all expected routine surveillance reports that are received.

Timeliness of routine reports:

Percentage of all expected routine surveillance reports that are received on time.

Completeness of data on suspected measles cases:

Percentage of cases with data on location, age and immunization status.

Outbreak investigation:

Percentage of outbreaks with laboratory confirmation of at least one case.

3. *Evaluating surveillance*

The surveillance system should undergo periodic evaluation, involving visits to each level of the system, particularly where the performance of surveillance may be weakest, in order to determine the causes of weaknesses so that appropriate corrective measures can be taken. Evaluation teams should comprise people from outside the area in question, i.e. staff from other regions. Evaluation may focus on the surveillance of certain diseases or may emphasize the general performance of the entire system. For further information see reference 7.

References

Note: Copies of WHO publications may be ordered from: World Health Organization, CH-1211, Geneva 27, Switzerland. A guide to WHO publications is available at <http://www.who.int>.

1. *Field Guide for Supplementary Activities Aimed at Achieving Polio Eradication, 1996 Revision.* Geneva, World Health Organization, 1996 (WHO/EPI/GEN/95.01 REV 1).
2. *Product Information Sheets, 2000.* Geneva, World Health Organization, 2000 (WHO/V&B/00.13).
3. *Manual for the laboratory diagnosis of measles virus infection.* Geneva, World Health Organization, 1999 (WHO/V&B/00.16).
4. *Making surveillance work. Data management,* Geneva, World Health Organization, 2001 (WHO/V&B/01.11).
5. *Information for Action: Developing a Computer-based Information System for the Surveillance of the EPI and other Diseases.* Geneva, World Health Organization, 1998 (WHO/EPI/GEN/98.15).
6. *WHO Recommended Standards for Surveillance of Selected Vaccine-preventable Diseases* Geneva, World Health Organization, 1998 (WHO/EPI/GEN/98.01 Rev.1). Additional updates to this document were made in 2000/2001.
7. *Making surveillance work. Rapid assessment of surveillance for vaccine-preventable diseases.* Geneva, World Health Organization, 2001 (WHO/V&B/01.11).
8. *Technet Consultation, Copenhagen, 16-20 March 1998.* Geneva, World Health Organization, 1998 (WHO/EPI/LHIS/98.05).

Annex 1:

Selected functions for AFP surveillance – the “what, who, when, where and how”

- What:** AFP case detection and notification - passive surveillance
- Who:** All clinicians and health workers
- When:** Cases should be notified immediately upon detection
- Where:** Notify the district health office
- How:**
- Clinician advocacy
 - Social mobilization to bring paralysed children to a health facility
 - Means of communication between clinicians and district staff
- What:** AFP case detection and notification – active surveillance
- Who:** Surveillance officer at provincial level
- When:** Every two weeks
- Where:** Every provincial and district hospital
- How:**
- Transport to visit hospitals every two weeks
 - Per diem
 - Active surveillance form
 - Means of communication between active surveillance officer and district and national levels if a case is discovered that was not previously notified or investigated
- What:** AFP case investigation
- Collect two stool specimens 24-48 hours apart and not more than 14 days after onset of paralysis
- Who:** District level staff
- When:** Immediately upon notification of an AFP case
- Where:** Throughout the country; investigate the case wherever notified; check for other cases in the same area; send specimen to a WHO-accredited polio laboratory

-
- How:**
- Transport to investigate the case
 - Transport to conduct 60-day follow-up examination
 - Per diem (if necessary)
 - Case investigation form
 - Specimen kit (leak-proof container large enough for 8 g of stool, label, laboratory request form, plastic bag)
 - Specimen carrier and ice packs (i.e. reverse cold chain)
 - Transport for dispatching specimens to laboratory
 - Possibly a shipper/courier service to send specimens to a laboratory in another country

A means of communicating between levels of the system as well as internationally is needed for transferring data, exchanging information and providing feedback and follow-up.

Annex 2:

Guidelines for safe transportation of infectious substances and diagnostic specimens

The material below has been adapted from a document prepared by:

Communicable Disease Surveillance and Response (CSR)
World Health Organization
CH-1211, Geneva 27, Switzerland

It may be downloaded as a PDF (Adobe Acrobat) file from
<http://www.who.int/emc-documents/biosafety/whoemc973c.html>

A. Introduction

These guidelines are applicable to the transportation of infectious substances and diagnostic specimens both nationally and internationally. They provide information for identifying and classifying the material to be transported and for its safe packaging and transportation. The guidelines stress the importance of developing a working relationship between the sender, the carrier and the receiver in order to provide for the safe and expeditious transport of the material.

People working for postal services, airlines and other transport organizations have concerns about the possibility of becoming infected through exposure to microorganisms that may escape from broken, leaking or improperly packaged material. The packaging of infectious materials for transportation must be designed to minimize the risk of such damage. It should also serve to ensure the integrity of the materials and the timely processing of specimens.

There are no recorded cases of illness attributable to the release of specimens during transportation, although damage to the outer packaging of properly packaged materials has been reported. The shipment of unmarked and unidentified infectious materials, improperly packaged, clearly increases the overall risk of human exposure to them.

The international regulations for the transportation of infectious materials by any mode of transport are based upon the Recommendations of the UN Committee of Experts on the Transport of Dangerous Goods. The Universal Postal Union (UPU) reflects these recommendations in its regulations, particularly those relating to packaging. The International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) have incorporated the UN Recommendations into their respective regulations (Annex 3), as have other international transport organizations. WHO serves these bodies in an advisory capacity. The present guidelines on compliance with international regulations will

be updated in the event of any modifications to the section of the above-mentioned UN Recommendations dealing with infectious substances and diagnostic specimens.

B. Definitions

For the purpose of describing transport safety measures the terms “infectious substances” and “infectious materials” are considered synonymous. The term “infectious substances” is used in the present document.

Infectious substances

An infectious substance is one containing a viable microorganism, such as a bacterium, virus, *Rickettsia*, parasite or fungus, that is known or reasonably believed to cause disease in humans or animals.¹

With respect to packaging and transport situations, infectious substances include:

- all cultures containing or suspected of containing an agent that may cause infection;
- human or animal samples that contain such an agent in quantities sufficient to cause infection, should exposure to them occur because of a transport mishap;
- a sample or samples from a patient with a serious disease of unknown cause;
- other specimens not included above and designated as infectious by a qualified person, e.g. a physician, scientist or nurse.

Diagnostic specimens

A diagnostic specimen is defined as any human or animal material including, but not limited to, excreta, blood and its components, and tissue and tissue fluids collected for the purposes of diagnosis, but excluding live infected animals.

Diagnostic specimens resulting from medical practice and research are considered to present a negligible threat to public health.

Diagnostic specimens obtained from patients with suspected infectious diseases may contain limited quantities of an infectious agent. There are very few agents that may be the source of an infection as a result of a transport mishap. *If exposure to a specimen caused by a transport mishap could result in an infection the diagnostic specimen must be packaged, labelled and transported as an infectious substance.* Diagnostic specimens collected during an investigation into an outbreak of a serious disease of unknown cause must be handled as infectious substances.

¹ This definition is taken from the current UN Recommendations on the Transport of Dangerous Goods. Prions are not included in this definition although they are considered to be infectious agents.

C. Packaging, labelling and documentation for transportation

Because of the distinction of risks between infectious substances and diagnostic specimens there are variations in the requirements for packaging, labelling and documentation. The packaging requirements are determined by the UN and are contained in ICAO and IATA regulations as packaging instructions (PIs) 602 and 650. The requirements are subject to change and upgrading by these organizations. The current packaging requirements are described below. UN-approved packaging systems are available commercially.

Basic triple packaging system

The system (Fig. 13) consists of three layers:

- *Primary receptacle.* The specimen is contained in a labelled, watertight, leak-proof receptacle, which is wrapped in enough absorbent material to absorb all fluid in the event of a breakage.
- *Secondary receptacle.* A durable, watertight, leak-proof receptacle encloses and protects the primary receptacle or receptacles. Several wrapped primary receptacles may be placed in one secondary receptacle. Sufficient additional absorbent material must be used to cushion multiple primary receptacles.
- *Outer shipping package.* The secondary receptacle is placed in an outer shipping package that protects it and its contents from outside influences such as physical damage and water while in transit.

Specimen data forms, letters and other types of information that identify or describe the specimen and identify the shipper and receiver should be taped to the outside of the secondary receptacle.

The basic triple packaging system is used with the following additional specifications and labelling and documentation requirements.

Infectious substances may only be transported in packaging that meets the UN Class 6.2 specifications and PI 602 (Annex 3). This ensures that strict performance tests, which include a nine-metre drop test and a puncture test, have been met. The outer shipping package must bear the UN packaging specification marking. UN-approved packaging supplier lists may be obtained from carriers or the appropriate government ministry or department.

Fig. 13. Requirements for infectious substances

Triple packaging system

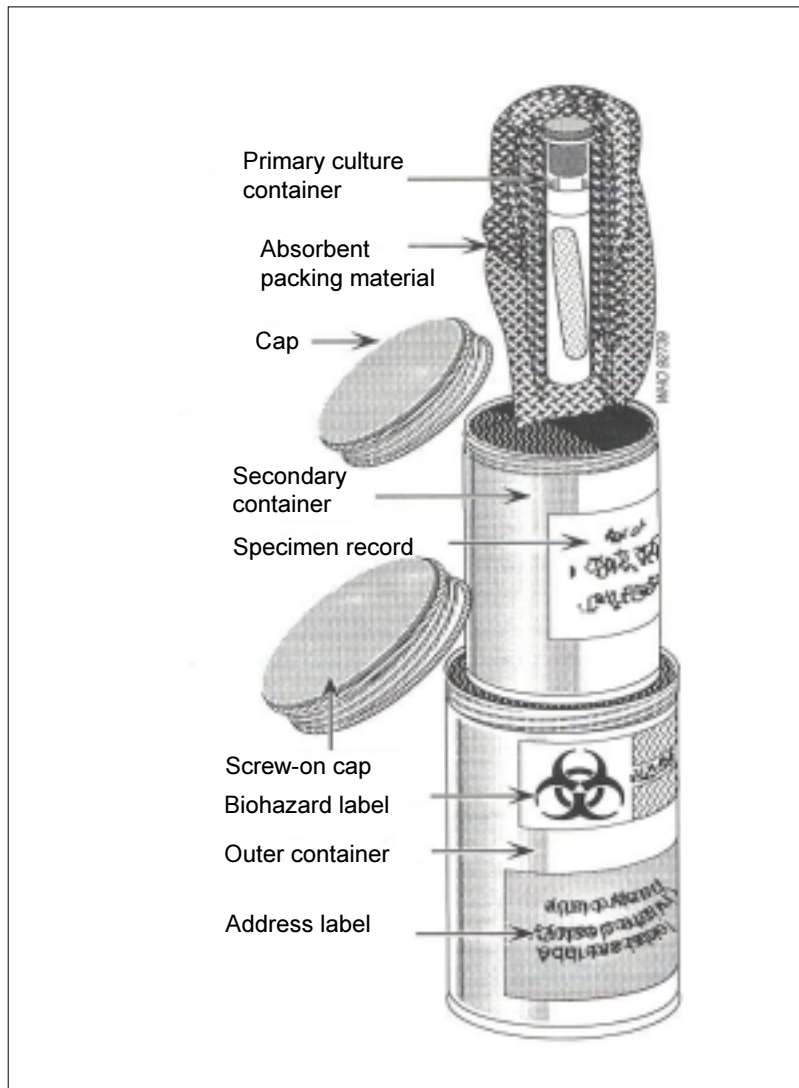


Fig. 14. Packaging specification marking



The packaging marking shows:

- the UN packaging symbol;
- the type of packing;
- the designation “Class 6.2”;
- the last two digits of the year of manufacture of the packaging;
- the state authority;
- the manufacturer’s code.

Hand carriage of infectious substances is strictly prohibited by international air carriers, as is the use of diplomatic pouches for this purpose.





The maximum net quantity of infectious substances which can be contained in an outer shipping package is 50 ml or 50 g if transportation is by passenger aircraft. For transportation by cargo aircraft or other carriers the limit per package is 4 litres or 4 kg. Primary receptacles exceeding 50 ml in combination packing must be oriented so that the closures are upward, and labels (black or red arrows) indicating the “UP” direction must be placed on two opposite sides of each package. A label reading “THIS SIDE UP” or “THIS END UP” is recommended on the top cover of any package with liquid substances.

The quantity limits for passenger aircraft do not apply to blood or blood products if there is no reason to believe that they contain infectious substances, provided that the receptacles do not exceed 500 ml each and that the total volume of the outer package does not exceed 4 litres.

Hazard label for infectious substances

For all dangerous goods to be carried by air, specific hazard labels must be affixed to the outside of each package. The following hazard label is used for infectious substances (Fig. 15).

Fig. 15. Hazard label for infectious substances

<p>Hazard Labels for infectious substances and for genetically modified microorganisms which meet the IATA definitions of an infectious substance:</p> <p>Name: Infectious substance Minimum dimensions: 100 x 100mm For small packages: 50 x 50mm (black and white)</p>	
<p>Hazard label of noninfectious genetically modified microorganisms and for carbon dioxide, solid (dry ice):</p> <p>Name: Miscellaneous Minimum dimensions: 100 x 100mm For small packages: 50 x 50mm (black and white)</p>	
<p>Hazard label for liquid nitrogen:</p> <p>Name: Non-flammable gas Minimum dimensions: 100 x 100mm For small packages: 50 x 50mm (green and white)</p>	
<p>Name: Package orientation Minimum dimensions: 74 x 105mm (black or red and white)</p> <p>For small packages of infectious substances dimensions may be halved.</p>	

To allow for the possibility that shipments include only freeze-dried cultures the quantity should be given in g or mg, not in ml.

The labelling of outer packages containing infectious substances for shipment must include the following elements.

1. The international infectious substance label.
2. An address label with the following information:
 - the receiver's (consignee's) name, address and telephone number;
 - the shipper's (consignor's) name, address and telephone number;
 - the UN shipping name (Infectious Substances Affecting Humans or Infectious Substances Affecting Animals, as the case may be) followed by the scientific name of the substance;
 - the UN number (for humans - UN2814; for animals - UN2900);
 - temperature storage requirements (optional).

If the outer package is further packed in an over pack (a specially designed insulated outer package containing dry ice), both the outer pack and the over pack must carry the above information, and the over pack must have a label stating “INNER PACKAGES COMPLY WITH PRESCRIBED SPECIFICATIONS”.

3. Required shipping documents - these are obtained from the carrier and are affixed to the outer package:
 - the shipper’s declaration of dangerous goods (Fig. 16);
 - a packing list/proforma invoice indicating the receiver’s address, the number of packages, the contents in detail, the weight and the value (“no commercial value”, as the items are supplied free of charge);
 - an airway bill if shipping is by air.
4. An import and/or export permit and/or declaration (if required).
5. If the outer package contains primary receptacles exceeding 50 ml in total, at least two “orientation labels” (arrows) must be placed on opposite sides of the package showing the correct orientation of the package.

Requirements for diagnostic specimens

The basic triple packaging system is used with the following specifications and labelling requirements.

Diagnostic specimens may be transported in packaging that meets PI 650. The UN specification marking is not required.

Primary receptacles may each contain up to 500 ml; the total volume in the outer package must not exceed 4 litres.

The labelling of the outer package for the shipment of diagnostic specimens must include the following:

6. An address label with the following information:
 - the receiver’s (consignee’s) name, address and telephone number;
 - the shipper’s (consignor’s) name, address and telephone number;
 - the statement “Diagnostic specimen, not restricted, packed in compliance with PI 650”.
7. Required shipping documents – these are obtained from the carrier and are affixed to the outer package:
 - a package list/proforma indicating the receiver’s address, the number of packages, the contents in detail, the weight and the value (“no commercial value”, as the items are supplied free of charge);
 - an airway bill if shipping is by air.
8. An import and/or export permit and/or declaration (if required).

Note: the infectious substance label and the shipper’s declaration of dangerous goods are not required for diagnostic specimens.

Requirements for airmail

Infectious substances and diagnostic specimens may be shipped by registered air mail. The basic triple packaging system is used with the same requirements as for other means of conveyance.

The address label must display the word “LETTRE” and the green customs declaration label for postal mail is required for international mailing. Diagnostic specimens must be identified with the violet UPU “PERISHABLE BIOLOGICAL SUBSTANCES” label. Infectious substances must be identified with the international infectious substance label (Fig. 15). Infectious substances must also be accompanied by a shipper’s “declaration of dangerous goods” form (Fig. 16. for standard form for shipment of infectious substances; Fig. 17. for form that involves shipment of infectious substance on dry ice).

Prior contact should be made with the local post office to ascertain whether the packaged material will be accepted by the postal service.

Refrigerants

If ice or dry ice is used in a shipment it must be placed outside the secondary receptacle. If wet ice is used it should be in a leak-proof container and the outer package must also be leak-proof.

The secondary receptacle must be secured within the outer package to prevent damage after the refrigerant has melted or dissipated. Dry ice must not be placed inside the primary or secondary receptacle because of the risk of explosion. An over pack may be used to contain dry ice. The outer package must permit the release of carbon dioxide gas if dry ice is used. UN PI 904 must be observed.

If dry ice is used for infectious substances the details must appear on the shipper’s declaration of dangerous goods. In particular, the outermost packing must carry the “MISCELLANEOUS” hazard label for dry ice (Fig. 15).

If liquid nitrogen is used as a refrigerant, special arrangements must be made in advance with the carrier. Primary receptacles must be capable of withstanding extremely low temperatures and appropriate packaging requirements of the carrier must be observed. In particular, the outermost packing must carry the “NON-FLAMMABLE GAS” label for liquid nitrogen (Fig. 15).

D. Local surface transportation

This includes the carriage of specimens from a doctor’s office/surgery to a laboratory, from a hospital to a diagnostic laboratory, and from one laboratory to another. The service may be operated by a hospital, a laboratory, a health service or some other approved agency or organization.

The principle of safe transport by this means is the same as for air or international transport: there should be no possibility of the material escaping from the package under normal conditions of transport.

The following practices should be observed.

- Specimen containers should be watertight and leak-proof.
- If the specimen container is a tube it must be tightly capped and placed in a rack so as to maintain it in an upright position.
- Specimen containers and racks should be placed in robust, leak-proof plastic or metallic transport boxes with secure tight-fitting covers.
- The transport box should be secured in the transport vehicle.
- Each transport box should be labelled in accordance with its contents.
- Specimen data forms and identification data should accompany each transport box.
- A spill kit containing absorbent material, a chlorine disinfectant, a leak-proof waste disposal container and heavy-duty reusable gloves should be kept in the transport vehicle.

Note: These practices are not intended to supersede local or national requirements.

E. Transport planning

It is the responsibility of the sender to ensure the correct designation, packaging, labelling and documentation of all infectious substances and diagnostic specimens.

The efficient transportation and transfer of infectious materials requires coordination between the sender, the carrier and the receiver (receiving laboratory) in order to ensure that the materials are transported safely and arrive on time and in good condition. Such coordination depends on well-established communication and an effective working relationship between the three parties.

All three have specific responsibilities in the transportation effort.

The sender:

9. Makes advance arrangements with the receiver of the specimens: this includes investigating the need for an import permit.
10. Makes advance arrangements with the carrier to ensure that:
 - the shipment will be accepted for appropriate transportation;
 - the shipment (direct transport if possible) is undertaken by the most direct routing, avoiding arrival at weekends.
11. Prepares the necessary documentation, including permits and dispatch and shipping documents.
12. Notifies the receiver about transportation arrangements once these have been made, well in advance of the expected arrival time.

The carrier:

13. Provides the sender with the necessary shipping documents and instructions for their completion.
14. Provides advice to the sender about correct packaging.
15. Maintains and archives the documentation for shipment and transport.
16. Monitors the required holding conditions of the shipment while in transit.
17. Notifies the sender of any anticipated (or actual) delays in transit.

The receiver:

18. Obtains the necessary authorization(s) from the national authorities for the importation of the material.
19. Provides the sender with the required import permit(s), letter(s) of authorization, or other document(s) required by the national authorities.
20. Arranges for the most timely and efficient collection on arrival.
21. Immediately acknowledges receipt to the sender.

Shipments should not be dispatched until:

22. Advance arrangements have been made between the sender, carrier and receiver.
23. The receiver has confirmed with the national authorities that the material may be legally imported.
24. The receiver has confirmed that there will be no delay incurred in the delivery of the package to its destination.

Detailed information on response and emergency safety measures in transport-associated accidents is given in reference 20).

Fig. 16. Standard form for the shipment of infectious substances

Shipper's Declaration for Dangerous Goods

Shipper: World Health Organization
20, Avenue Appia
CH-1211 Geneva
Switzerland

Air Waybill No. 117-4812-9550
Page 1 of 1 Page
Shipper's Reference Number (optional)

Consignee: Karolinska Hospital
Clinical Microbiology
Stockholm 17176, Sweden
Attn: Dr Göran Kronwall
Tel: +46-81-33-4810/Fax: +46-808-066

Transport details: This shipment is within the limitations prescribed for: Passenger and Cargo Aircraft Aircraft

Warning: Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

Shipment type: Infectious Non-Infectious Hazardous

Nature and Quantity of Dangerous Goods: Infectious substance, affecting humans (Streptococcus pneumoniae)

Proper Shipping Name	Class or Div. (6.1-6.5)	UN No.	Pack. (1-4)	Label (1-4)	Quantity and type of packing	Flash point (if any)	Substance
Infectious substance, affecting humans (Streptococcus pneumoniae)	6.2	2814	III		1 fibreboard box x 2g	502	

Additional Handling Information: Emergency contact: P Wenger - Tel: 4122 791 2179
Pilot arrangements as required by the IATA Dangerous Goods Regulations 1.3.3.1 have been made.

I hereby declare that the contents of this assignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled (as needed), and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Signature/Title of Shipper: P Wenger, Shipping and Logistics Unit
Place and Date: Geneva, 3 June 1999

Signature: (see stamp above)

Stamp: IATA Dangerous Goods Regulations, Geneva, Switzerland

Instructions: One copy to accompany consignment
One copy to be filed at airport of departure (with AHD 5000)

SPECIMEN

Fig. 17. Standard form for the shipment of infectious substances using dry ice

Shipper's Declaration for Dangerous Goods						
Shipper World Health Organization 20, Avenue Appia CH-1211 Geneva Switzerland				Air Waybill No. 117-4832*9330 Page 1 of 1 Page Shipper's Reference Number (optional)		
Consignee Karolinska Hospital Clinical Microbiology Söckholm 17176, Sweden Attn: Dr Göran Kravvill Tel: +46 81 77 4830/Fax: +46 308 090						
Transport details This shipment is within the limitations prescribed for:		Airport of Departure:		Warning Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.		
(Passenger and Cargo Aircraft)				Shipment type: (see sub-section 2.1)		
Airport of Destination:				Non-Radioactive <input checked="" type="checkbox"/>		
Nature and Quantity of Dangerous Goods (see sub-section 2.1 of IATA Dangerous Goods Regulations)						
Dangerous Goods Identification						
Proper Shipping Name	Class or Div. (see 2.2)	UN ID No.	Pack. Qty. (see 2.3)	Other Qty. (see 2.3)	Quantity and Unit of Packing	Pack. (see 2.4)
Infectious substance, affecting humans (Streptococcus Parasitica)	6.2	UN 2814			1 fibreboard box x 2g	602
Dry Ice	9	UN 1845	III		10 kg	904
OVERPACK SEE						
SPECIMEN						
Additional Handling Information Emergency contact: P Muger - Tel: 4122 791 2179 Price arrangements as required by the IATA Dangerous Goods Regulations 1.3.3.1 have been made.						
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/packaged, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.					Name/Title of Signatory P Muger - Shipper UNCT Place and Date Geneva, 3 July 1993	
Two completed and signed copies of this Declaration must be handed to the operator.					Signature (see marking above)	
Distribution: One copy to accompany AHB One copy to be filed at airport of departure with AHB copy						

Annex 3:

IATA regulations on safe transportation of infectious substances and diagnostic specimens

Technet recommendation

At the Technet Consultation, Copenhagen, 16-20 March 1998, the following recommendation was adopted to standardize and ensure the safe shipment of specimens. (8)

Technet priority activity 13: logistics management in surveillance

Specimen collection and transfer: Packaging for the international and national air shipment of polio specimens should meet IATA and UN regulations on the transfer of infectious materials. WHO should work with courier services and packaging companies to assure that all countries have access to the means for shipping specimens at the lowest cost.

Introduction to the IATA Dangerous Goods Regulations

Dangerous goods can be transported safely by air provided that certain principles are strictly followed. The IATA Dangerous Goods Regulations comprise an easy-to-use manual based on the ICAO Technical Instructions. The manual incorporates additional operational requirements giving a harmonized system whereby airlines can accept and transport dangerous goods safely and efficiently. Users of the IATA Dangerous Goods Regulations are assured that they are meeting all legal requirements for the international shipping of dangerous goods.

The Regulations include a detailed list of individual articles and substances, and specify their UN classification, their acceptability for air transportation, and the conditions for their transportation. Furthermore, there are many generic or “not otherwise specified” entries which assist in the classification of articles or substances not listed by name.

Some goods are too dangerous to be carried on any aircraft under any circumstances; others are prohibited under normal circumstances but may be carried with specific approval from the countries concerned; some are restricted to carriage on all-cargo aircraft; most, however, can be safely carried on passenger aircraft if certain requirements are met.

Packaging is the essential factor in the safe transportation of dangerous goods by air. The IATA Dangerous Goods Regulations provide packaging instructions for all dangerous goods acceptable for air transport with a wide range of options for inner, outer and single packaging. These instructions normally require the use of UN performance-tested specification packaging. However, this does not apply when dangerous goods are shipped in limited quantities under a provision called “limited quantity” packaging instructions. The quantity of dangerous goods permitted under these instructions is strictly limited so as to minimize the inherent risk presented by dangerous goods should an incident occur. The main difference with limited quantity packaging is in the testing. The limited quantity packaging must be capable of withstanding a 1.2 metre drop test (as opposed to a 9 metre drop test under UN Class 6.2 specifications) without leakage, and a 24-hour stacking test without breakage or leakage.

Training is also essential for the maintenance a safe regulatory regime. It is necessary for all individuals involved in the preparation or transportation of dangerous goods to be properly trained to carry out their responsibilities. Depending on the job function, this may entail only familiarization training or may include more detailed training in the intricacies of the Regulations. It is important to remember that dangerous goods are very unlikely to cause problems if they are prepared and handled in compliance with the IATA Dangerous Goods Regulations.

The proper declaration of dangerous goods by the shipper ensures that all links in the transportation chain know what dangerous goods they are transporting, how to handle them properly and what to do if an incident or accident occurs either in flight or on the ground. The pilot in command of an aircraft must know what is on board in order to be able to deal correctly with any emergencies that may occur. If possible, the pilot should convey this information to air traffic services so that aid will be forthcoming in the event of an incident or accident. Information regarding “hidden dangerous goods” must also be conveyed to passengers to assist them in recognizing such items, which they are not permitted to carry on their persons or in their baggage and which may not be readily recognizable as dangerous.

Lastly, accidents or incidents involving dangerous goods must be reported so that the authorities can establish causes and take corrective action. If it emerges that changes are required in the Regulations, appropriate steps can be taken without delay.

IATA packaging instructions 602 and 650

Because of the distinction of risks between infectious substances and diagnostic specimens there are variations in the packaging, labelling and documentation requirements. The packaging requirements are determined by the UN and are contained in the ICAO and IATA regulations as PIs 602 and 650. The requirements are subject to change and upgrading by these organizations. The current packaging requirements are described in Annex 2.

Sources of further information on IATA Dangerous Goods Regulations

IATA dangerous goods web site: <http://www.iata.org/cargo/dg/dgr.htm>

Email address for ordering IATA Dangerous Goods Regulations: sales@iata.org

Geneva:

IATA Centre, Route de l' Aeroport 33
P.O. Box 416, 15 – Airport
CH-1215 Geneva, Switzerland
Tel.: +41 22 799 2525
Fax: +41 22 798 3553

Montreal:

IATA, 800 Place Victoria
P.O. Box 113, Montréal, Québec, H4Z 1M1, Canada
Phone: +1 514 874-0202
Fax: +1 514 874-9632

Singapore:

IATA, 77 Robinson Road
#05-00 SIA Building
Singapore 068896
Phone: +65 438-4555
Fax: +65 438-4666

Annex 4:

Sample budget template for surveillance

Budget category	Budget item	Unit cost	Quantity	Currency used	Net cost	Freight cost (if applicable)	Total cost including freight	Total cost including freight in US\$	Met needed in US\$	Unmet needed in US\$	Comment
Personnel (salaries, per diem)	Field surveillance										
	Data management										
	Laboratory staff										
	Other, specify										
Workshops, meetings, training	Workshops										
	Laboratory training										
	Coordination meetings										
	Other, specify										
Social mobilization and advocacy	Local meetings										
	Clinician advocacy										
	Other, specify										
Equipment	Communication equipment										
	Computer hardware/software										
	Other, specify										
Recurrent costs - Supplies and operations	Forms										
	Supplies to create reports/feedback										
	Petrol										
	Reports/feedback										
	Other, specify										

Annex 5:

**Managerial tool for monitoring
implementation of active
surveillance visits:**

Vehicle logsheet and line list of cases

Instructions for completing the logsheet and management tool

1. Insert date of visit, preventive/repair work, refueling and changing/adding oil.
2. Insert name of the health facility visited and of the city/village in which it is located.
3. Insert names of clinicians contacted during each visit.
4. Insert number and types of all cases found.
5. Insert the km reading at the start and the end of the trip to each health facility.
6. Insert the difference between end and start km readings.
7. Insert cost of each preventive maintenance task performed on the vehicle.
8. Insert the cost of all repair work performed on the vehicle.
9. Insert cost of each refueling operation.
10. Insert cost of each operation of changing or adding oil.

Annex 6:

Supervisory checklist for surveillance

Staff at all levels of the surveillance system require careful supervision so that surveillance of good quality is maintained. Below is a suggested supervisory checklist for monitoring all essential components of a surveillance system. Personnel from the more central levels usually monitor those at the more peripheral levels. However, it is often helpful for staff from other regions, provinces and districts to undertake supervisory visits in order to exchange experience. Supervision should be performed regularly (e.g. monthly at the provincial hospital level) and the best results are often secured if the visits occur at random and unannounced.

Suggested supervisory checklist for surveillance/Part 1

Surveillance assessment checklist		Date: ____ / ____ / ____	
Level (e.g. central, provincial, district):	Catchment population size:		
Component	Yes	No	Comments
<i>Disease control objectives</i>			
Clear priorities and disease control objectives known at this level?			
Clear strategies identified for achieving objectives?			
Types of data analyses (outputs) defined at this level?			
<i>Standardization</i>			
List of reportable diseases available?			
Case definitions available (at this level)?			
Staff know designated feed-forward sites? (how many, where)			
Using standard identification codes (case-based data only)			
Using standard forms for monthly feed-forward			
Using standard forms for case investigations			
Implementing standard feed-forward procedures			
Implementing standard investigation procedures			
Conducting 60-day follow-up examinations of AFP cases			
Conducting standard response procedures			
Hierarchical flow of data (in a standard way)			
Consistency of data (compared to more central levels)			
Inpatient and outpatient registers list "disease"			
Most recent census data available			
Sending zero reports			
Receiving zero reports			
<i>Human resource capacity</i>			
Clearly designated who reports and how			
Persons designated, trained and mobilized for investigations			
Persons designated, trained and mobilized for specimen collection			
Persons designated, trained and mobilized for data analysis			
Evidence of good teamwork between surveillance partners			
Date last training received on surveillance			

Suggested supervisory checklist for surveillance/Part 2

Surveillance assessment checklist	Date: ____ / ____ / ____		
Component	Yes	No	Comments
<i>Evidence of a good reverse cold chain</i>			
Specimen kits available (if appropriate level)			
Specimen carriers available (if appropriate level)			
Frozen ice packs or ice available			
Means of dispatching specimens (e.g. transport) available			
<i>Health professionals informed of feed-forward procedures</i>			
Active surveillance conducted (if appropriate level)			
Evidence of unreported cases when visiting health facilities			
<i>Analysing/using data at this level</i>			
Producing standard outputs (graphs, maps, tables)			
Line listing for any priority diseases			
Maps drawn for any priority diseases			
Local analysis of data performed			
High-risk areas for neonatal tetanus identified			
High-risk areas for other priority diseases identified			
Example of using data for action at this level			
Completeness of feed-forward monitored? Specify			
Timeliness of feed-forward monitored? Specify			
Other performance indicators monitored? Specify			
Comparing data with those of other units/levels for consistency			
Are data at this level consistent with data from central level?			
<i>Follow-up/supervision</i>			
Regular supervisory visits conducted from this level			
Supervisory checklist used from this level			
Late or incomplete reports followed up from this level			
Date last supervisory visit received			
<i>Feedback and communication of data</i>			
Feedback information received from more central level			
Feedback information sent to more peripheral level			
<i>Infrastructure</i>			
Means of communicating with more peripheral level			
Means of communicating with more central level			
Adequate computer equipment/supplies at this level			
Adequate transport for surveillance at this level			