



MEASLES ELIMINATION FIELD GUIDE



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Acronyms

AEFI	adverse events following immunization
AFP	acute flaccid paralysis
AFR	acute fever and rash
CHW	community health worker
cMYP	comprehensive multi-year plan for immunization
DBS	dried blood spots
DHS	Demographic and Health Survey
ELISA	enzyme-linked immunosorbent assay
EPI	Expanded Programme on Immunization
ERC	Expert Review Committee
GPS	global positioning system
ID	identification
IgG	immunoglobulin G
IgM	immunoglobulin M
MCV1	first dose of measles-containing vaccine
MCV2	second dose of measles-containing vaccine
MICS	Multiple Indicator Cluster Survey
ORI	outbreak response immunization
RCA	rapid coverage assessment
RT-PCR	reverse transcription polymerase chain reaction
SIA	supplementary immunization activity
WHA	World Health Assembly
WHO	World Health Organization





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The cover illustration is by Sophie Blackall who was commissioned by the Measles and Rubella Initiative, for the WHO Western Pacific Regional Office.



Foreword

I am pleased to introduce the Measles Elimination Field Guide, which offers countries and areas innovative approaches to finishing the job of measles elimination in the Western Pacific Region.

There has been remarkable success in the Western Pacific Region since 2003, when the Regional Committee resolved to eliminate measles. Measles has made many children extremely ill and caused high child mortality in the past. On the other hand, measles vaccine is extremely safe, and it is a great credit to all the countries and areas in the Region that they have already protected so many children through their immunization services.

Sadly, despite all the progress, there are still measles cases occurring in some unprotected populations; often those children whose families suffer from poverty, geographic remoteness and social marginalization. Identifying and reaching these vulnerable children is an issue of equity, which can be addressed by reaching every community on a regular basis, regardless of location or social characteristics. This is a challenge not only for measles, but for public health as a whole.

In September 2012, at the sixty-third session of the Regional Committee for the Western Pacific, a resolution was passed to accelerate progress towards measles elimination, calling for intensified efforts to overcome the remaining challenges. This field guide was developed by the WHO Regional Office for the Western Pacific to provide national immunization programmes with practical strategies and innovative approaches to eliminate measles.

This guide describes in detail the current challenges and activities needed to interrupt measles transmission, to prevent and respond rapidly to emerging measles outbreaks, and to ensure sensitive surveillance is in place. It is presented in a form that can be readily adapted by national immunization managers to suit country situations.

As the measles virus can rapidly spread across borders, close international partnership and cooperation is necessary to make the Western Pacific Region the second in history to achieve measles elimination. I welcome this opportunity to work with every country in the Region to secure our shared goal.



Shin Young-soo, MD, Ph.D.
Regional Director
WHO Western Pacific Region





Overview



RESPONDING TO THE FOUR MAIN CHALLENGES FOR MEASLES ELIMINATION



In September 2012, at its sixty-third session, the World Health Organization (WHO) Regional Committee for the Western Pacific adopted a resolution urging Member States to effectively address the four main challenges for measles elimination in the Western Pacific Region (WPR/RC63.R5, Annex 2). This field guide aims to provide practical strategies and innovative approaches in order to implement the Regional Committee resolution.

(1) Interrupting and preventing measles virus transmission

To interrupt all endemic measles virus transmission, and prevent future transmission, by [closing immunity gaps](#) with measles vaccine, especially among all underserved and marginalized communities.

(2) Outbreak preparedness and response

To enhance capacity for preparedness, rapid detection and [response to measles outbreaks](#) whether caused by an endemic or imported virus, to prevent the spread and re-establishment of measles virus transmission.

(3) Ensuring highly sensitive surveillance

To improve the sensitivity and performance of epidemiological [surveillance and laboratory capacity](#) to track changes in measles epidemiology, identify sources of infection, and provide evidence consistent with the absence of endemic transmission.

(4) Preparing for verification of measles elimination

To establish national verification committees which will develop regular progress reports for submission to the Regional Verification Commission. Further guidance on verification of measles elimination is provided in a separate document.

1. Introduction

1.1 PURPOSE OF THIS FIELD GUIDE

This Field Guide builds upon the remarkable progress already made towards measles elimination in the Western Pacific Region. It provides a range of options on how to implement the strategies and activities that are suitable for the current measles situation in the Region, in accordance with the 2012 Regional Committee for the Western Pacific resolution WPR/RC63.R5 (Annex 2). This field guide is not a policy document, and countries are free to adapt it to their own national situation.

A SPECIAL NOTE FOR USERS

The path to success in measles elimination in the Western Pacific Region starts with knowing the location of high-risk, underserved and marginalized communities and knowing their immunity gap, and then taking action to close the identified gap with immunization. In other words, the key is to reach every community with measles immunization. A few multipurpose forms are introduced in this Field Guide. Guidance on how to use the forms is provided in the Summary Table on page 37 and throughout the document. With minimal adaptation, these forms can be used for many tasks: risk assessment, health centre microplanning, monitoring of uptake of first and second doses of measles-containing vaccine (MCV1 and MCV2), and responding to outbreaks and routine immunization catch-up.

1.2 STRATEGIES TO ELIMINATE MEASLES

1.2.1 Achieve and maintain high levels of population immunity

Achieve and maintain 95% vaccination coverage with two doses of measles-containing vaccine (MCV1 and MCV2) through routine immunization, and add supplementary immunization activities (SIAs) when required.

1.2.2 Conduct high-quality, case-based measles surveillance

Ensure sensitive, complete and timely detection and reporting throughout the country, including active surveillance of suspected measles cases, supported by complete and timely investigation and specimen collection.





1.2.3 Ensure high-quality laboratory performance

Ensure a high-quality laboratory contribution to surveillance through accredited laboratories that are able to conduct timely and accurate testing of samples to confirm or discard suspected measles cases and detect measles virus for genotyping and molecular analysis.



1.2.4 Develop and maintain outbreak preparedness, rapidly respond to measles outbreaks and manage measles cases

In elimination settings, a single measles case indicates the presence of an outbreak requiring rapid investigation and response. The approach to outbreak response immunization will vary depending on the level of susceptibility in the population at various age groups in the affected areas.



1.3 CURRENT MEASLES SITUATION IN THE WESTERN PACIFIC

Rapid and remarkable progress towards measles elimination has been made in the Western Pacific Region. As a result of large-scale measles immunization campaigns in many countries, the total number of measles cases has dropped dramatically; between 2008 and 2012, measles cases fell by 93%. As of 2012, 33 out of 37 countries and areas may have interrupted endemic measles virus transmission, and measles incidence is at a historic low in the Region. While large-scale measles supplementary immunization has been a very effective strategy, at this stage in measles elimination, the Region should undertake more specific activities to finally interrupt endemic measles virus transmission and sustain the achievements.

1.4 IMPORTANT ISSUES TO CONSIDER BEYOND 2012

1.4.1 The 2012 measles elimination goal and its significance

The 2012 measles elimination goal, which was set by the Regional Committee in 2005 (WPR/RC56.R8), is a goal intended to reduce the burden of measles and create momentum for strengthening immunization service delivery, especially for the most underserved and marginalized children living throughout the Region. Today, measles still circulates in such high-risk communities of the Region.

Achieving the elimination goal requires three full years with no endemic measles cases under conditions of high-quality surveillance. By the end of 2012, endemic measles virus transmission persisted in a few countries and areas, with measles still circulating in high-risk communities. Therefore, the earliest year in which regional measles elimination can be verified will be 2016.

However, there is no need to change the year of the 2012 measles elimination goal. The WHO Region of the Americas has provided a precedent for dealing with measles elimination goals. In 1994, the Pan American Health Organization set a goal of 2000 for measles elimination in the Americas, and the last endemic measles case was reported on 12 November 2002.

1.4.2 How can momentum to achieve measles elimination be maintained beyond 2012?

It is also useful to refer to the precedent of the Western Pacific Region's experience with polio eradication. While the target year agreed by the WHO Regional Committee (WPR/RC46.R7) was 1995, polio transmission continued beyond this date, although at a greatly reduced rate. At that time, the Regional Committee emphasized that polio eradication should remain a high priority within the Region and urged all Member States to continue with their efforts. All countries did just that and the last polio case was reported in 1997, with polio-free status certified in 2000.

Similarly for measles elimination, from 2013 onwards, if all Member States increase their immunization and surveillance efforts, endemic measles virus transmission will cease and measles elimination can be verified after a three-year period. If endemic measles virus transmission continues in some countries, regional verification will be delayed.

Unlike polio eradication, countries can verify measles elimination independently, so that verification of measles elimination for different countries may be achieved at different times. However, it requires the absence of endemic measles virus transmission for at least three years under verification standards of surveillance. Individual country verification serves as recognition of their achievements and provides encouragement to other countries.

1.4.3 Measles elimination as an entry point for achieving health equities

There is a great opportunity for measles elimination in the Western Pacific Region to be understood as a means of reducing disparities and increasing equity in health services. The Global Vaccine Action Plan (WHA document A65/22), which was endorsed by the World Health Assembly in May 2012 (WHA65.17), includes "equity" as one of the six guiding principles under Strategic Objective 3: The benefits of immunization are equitably extended to all people.

The plan stipulates the following:

- Equitable access to immunization is a core component of the right to health.
- Progress towards greater equity can be evaluated by monitoring the percentage of





districts with less than 80% vaccination coverage.

- The strength of health systems can be evaluated based on dropout rates between the first dose of diphtheria–tetanus–pertussis-containing vaccine and the first dose of measles-containing vaccine.



The plan goes on to recommend the following actions:

- Develop and implement new strategies to tackle inequities.
- Recast “Reaching Every District” to “Reaching Every Community” in order to deal with inequities within districts.
- Engage underserved and marginalized groups to develop locally tailored, targeted strategies for reducing inequities.



In its endorsement of the Global Vaccine Action Plan, the Sixty-fifth World Health Assembly stressed: “... the eradication of poliomyelitis, the **elimination of measles**, rubella and maternal and neonatal tetanus cannot be met without achieving and sustaining high and **equitable** coverage”. The full text of WHA65.17 is attached as Annex 3.

This field guide incorporates new strategies for measles elimination, including increasing equity by reaching every community.

1.4.4 Knowing the “face of measles” in high-risk communities

In many countries, the last remaining areas of measles transmission, just as with poliomyelitis, are the most poorly served areas or the “high-risk communities”. Before services can be improved, however, children at risk and the communities in which they live must be clearly identified. This is what it means to know the “face of measles”.

It is often found that children in high-risk communities do not present at health facilities, and as such, close communication with village leaders and village health workers or volunteers on reporting suspected measles case is vital. In the twenty-first century, this communication can often be initiated by mobile phone.

This field guide instructs programme managers to get to know the “face of measles”, that is, the very children who suffer from measles. One way to do this is by describing the exact location of the communities and the community characteristics. Taking photographs of the children and pinpointing their global positioning system (GPS) location are encouraged (further details are provided on pages 17 to 19).

2. Monitoring Progress

Measles elimination is defined as the absence of endemic measles virus transmission in a defined geographical area (e.g. region or country) for at least 12 months in the presence of a surveillance system that has been verified to be performing well.

Achievement of measles elimination is verified through a well-defined regional verification mechanism. Accordingly, the Western Pacific Region will apply standards for monitoring progress towards achieving and sustaining measles elimination. Each country is encouraged to adopt the same standards since they will also be applied for verifying the achievement of measles elimination in the Region.

MEASLES INCIDENCE

For the purpose of achieving measles elimination, measles incidence **alone** is not sufficient to verify the achievement of elimination. **Achieving a target of less than one endemic measles case per million population is consistent with being near elimination, but it does not define measles elimination or confirm that it has been achieved.**

2.1 POPULATION IMMUNITY

The following levels of administrative coverage are targets that every country should strive to achieve in order to interrupt transmission and sustain population immunity from measles:

- administrative coverage of MCV1, national and by district: target $\geq 95\%$
- administrative coverage of MCV2, national and by district: target $\geq 95\%$
- administrative coverage of measles SIA, national and by district: target $\geq 95\%$.

In areas where the reliability of administrative coverage is a concern, survey data should be used, e.g. Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS) and WHO cluster surveys.



2.2 INDICATORS OF A WELL-PERFORMING SURVEILLANCE SYSTEM

Indicator	Description	Target
Completeness and timeliness of data reporting	Proportion of surveillance units reporting measles data to the national level (completeness) and on time (timeliness, e.g. by the 10th of every month)	≥ 80% for both
Reporting rate of non-measles non-rubella cases	Annual reporting rate of non-measles non-rubella cases at the national level	≥ 2 cases per 100 000 population
Representativeness of case reporting	Proportion of second-level subnational units reporting more than two non-measles non-rubella cases per 100 000 population Notes (1) Second level is equivalent to “province” or “state” in many countries. (2) If the administrative unit has a population < 100 000, then the rate should be calculated by combining administrative units to achieve a population of > 100 000, or combining reporting over a duration of more than one year.	≥ 80%
Adequate case investigation rate	Proportion of suspected cases with investigation initiated within 48 hours of notification, with collection of all 10 core variables Notes (1) The 10 core variables are: case identification, date of birth/age, sex, place of residence, vaccination status or date of last vaccination, date of rash onset, date of notification, date of investigation, date of blood specimen collection, and place of infection or travel history. (2) For any case, if information on any of the core variables is missing, the investigation will be considered inadequate.	≥ 80%
Adequate collection rate for blood specimens	Proportion of suspected cases (excluding epi-linked cases) with adequate specimen collection Note Adequate specimens are: minimum of 5 ml of blood sample for older children and adults and 1 ml for infants and younger children or dried blood sample with at least three fully filled circles on filter paper collected within 28 days of rash onset.	≥ 80%

Indicator	Description	Target
Timeliness of specimen transport	Proportion of blood specimens received at the designated laboratory within five days of collection Note Virus isolation samples should be transported to the laboratory within 48 hours.	≥ 80%
Timeliness of reporting laboratory results	Proportion of results reported by the designated laboratory within four days of specimen receipt Note This refers to serology results.	≥ 80%
Virus detection	Proportion of laboratory-confirmed measles virus chains of transmission with genotypic data available	≥ 80%
Infection source	Proportion of confirmed measles cases with known source of infection Note Known sources of infection can be endemic, imported or import-related.	≥ 80%

Note: Annex 4 provides definitions and formulas to facilitate calculation of surveillance indicators.

2.3 SUSTAINABILITY OF MEASLES ELIMINATION

The sustainability of a national measles elimination programme depends on the country having the following in place:

- documentation of regular programmatic risk assessment;
- national action plans for achieving and sustaining measles elimination;
- budgeted measles outbreak preparedness and response plans; and
- documentation of regular monitoring and reviewing progress against plans.



3. Addressing Challenge One: Immunity Gaps

INTERRUPTING AND PREVENTING MEASLES VIRUS TRANSMISSION

To interrupt all endemic measles virus transmission and prevent future transmission by closing immunity gaps with measles vaccine, especially among all underserved and marginalized communities.

Three activities are recommended for risk assessment and action for closing immunity gaps in high-risk, underserved and marginalized communities.

1. **Risk assessment:** Conduct regular risk assessment to identify high-risk communities with inadequate service delivery and immunity gaps where measles outbreaks or importations may occur.
2. **Microplanning at health centre level:** Develop microplans for high-risk areas to ensure every community is reached with immunization sessions, especially first and second routine doses of measles vaccine.
3. **Prioritization:** Prioritize high-risk communities for management action, including regular immunization sessions, supervision and monitoring.

3.1 RISK ASSESSMENT

3.1.1 Conduct regular risk assessment to identify high-risk communities where measles outbreaks or importations may occur

A high-risk area is any area where an immunity or surveillance gap can be found. This gap may be due to poor service delivery, poor access, poor management or exclusion of disadvantaged populations from the planning process for immunization and other health services.

It will not be sufficient to identify high-risk districts only; measles may continue to circulate in specific high-risk communities within a district. Risk assessment should be carried out at subdistrict level.

Underserved children are often concentrated in various types of high-risk communities, for example, urban slums, migrant workers, refugees, minority groups, rural and remote areas, and new settlements. Thus, it will be necessary to identify high-risk communities within a subdistrict or health centre population catchment area.

The level of risk for measles virus transmission may not be adequately identified by administrative coverage data because children living in high-risk communities may not be included in the population denominator for immunization. [Identifying and assessing risk status will require several steps in collecting data beyond what is available from administrative coverage.](#)

Risk Assessment Step 1: Identify high-risk community characteristics

Identify community characteristics that are likely to be associated with high risk for measles, based upon knowledge of local populations and previous measles outbreaks. Communities with characteristics such as urban slums, migrant workers, refugees, minority groups, rural and remote areas, and new settlements are often underserved and therefore at high-risk. Communities or villages with these characteristics should be identified, listed and marked on the map used by the health centre.

Risk Assessment Step 2: Measure access to immunization services among high-risk communities

Some high-risk communities may have better access to immunization services than others. In Risk Assessment Step 2, districts and health centres will be asked to use their local knowledge to determine the status of access to services among the communities with characteristics identified in Step 1. This will help to verify their status and prioritize the communities in most need.

Measuring access to fixed-site or outreach immunization sessions is one way of gauging the risk status of communities. This method avoids using administrative coverage data that may be unreliable at community level.

Form 1: Measuring community access to immunization services provides a method of measuring a community's access to fixed or outreach sites for immunization sessions. Using a community risk criterion of under four contacts for fixed or outreach sessions in one year, community access can be described according to the following risk categories:

- Risk Category 1. Partial fixed site and partial outreach
- Risk Category 2. No fixed site and partial outreach
- Risk Category 3. Partial fixed site and no outreach
- Risk Category 4. No fixed site and no outreach.

With the help of district supervisors, health centres can use their local knowledge to identify the communities that fall into these four risk categories. These communities with partial or no access to fixed and/or outreach services are therefore at increased risk for immunity gaps.





Alternatively, a district and its health centres may consider that their administrative coverage data at health centre level are very reliable and can be used to identify and list specific communities at high risk based upon coverage data alone.

Whatever method is used, it is essential to have lists of high-risk communities where action is needed to close immunity gaps. Form 2 assists health centres to prepare a list of high-risk communities according to high-risk characteristics.

Form 1: Measuring community access to immunization services

		FIXED-SITE ACCESS		
		Good	Partial	None
OUTREACH ACCESS	Good: >4 contacts per year			
	Partial: <4 contacts per year		Risk Category 1 Partial fixed site and partial outreach	Risk Category 2 No fixed site and partial outreach
	None		Risk Category 3 Partial fixed site and no outreach	Risk Category 4 No fixed site and no outreach

Form 2: Listing high-risk communities

#	Community name	Type of high-risk community*	Access risk category (1,2,3,4)	Total population	Infant population (0 to 11 months)

* Urban slums, migrant workers, refugees, minority groups, rural and remote areas, and new settlements

Risk Assessment Step 3: Measure the immunity gap at health centre level

Step 1 and Step 2 have generated lists of high-risk health centres and communities. Step 3 will help to measure the immunity gap in these high-risk areas so that action can be taken to close the gap.

In Risk Assessment Step 3, a visit to a health centre is needed. While at the health centre, complete Form 3 using health centre data to quantify the risk status and to make a [detailed analysis of villages and communities served by the health centre](#).

Here are some questions about the risk status that should be answered:

Are there immunity gaps? If so, in which communities?
What are the characteristics of these communities?
Why are there immunity gaps?
Is there poor demand or poor services or both?
Which communities are the highest priorities for action?

Guide for completing Form 3: Health centre risk status: Detailed analysis of villages and communities in health centre catchment area

- During the visit to the health centre, use their data for the last complete calendar year or previous 12-month period. The health centre data may not be entirely reliable but will likely be good enough to prioritize communities for visits to validate immunization status.
- Try to prioritize communities by the number of unimmunized children who have missed MCV1 or MCV2. However, the population data may be unreliable, so other factors such as immunization session completeness and recently reported measles cases will also need to be taken into account.
- When Form 3 has been completed, it will be possible to prioritize communities with immunity gaps for the next step, which is a community visit to determine the individual immunization status of children.

Form 3: Health centre risk status : detailed analysis of villages and communities in health centre catchment area

Name of village or community	Target population infants 0 to 11 months (year)	MCV1 doses (year)	MCV1 doses missed (year)	MCV2 doses (year)	MCV2 doses missed (year)	Distance from health centre (km)	Number of outreach visits planned (year)	Number of outreach visits done (year)	Measles cases reported in last 2 years	Prioritize communities 1, 2, 3	Name and mobile phone number for CHW ¹ or other contact person in village	Main community characteristics ² (m)
a	b	c	d	e	f	g	h	i	j	k	l	m

¹ CHW: Community health worker
² Characteristics: urban poor, semi-urban, rural, remote, migrant workers, minority, new settlements

Risk Assessment Step 4: Measure the immunity gap in the community

Guide for completing Form 4: High-risk community household assessment of immunity gap

Risk Assessment Step 4 requires a visit to communities that have already been identified as high-risk in Steps 1, 2 and 3. The purpose of Risk Assessment Step 4 is to know the true immunization status of children and define the immunity gap in a community **by going from house to house** to look for children aged zero to 23 months (or other age groups according to the MCV1, MCV2 schedule) and checking their immunization cards or immunization registers.

- Depending on the size of the community, a sample of 10 to 20 children will usually give a good idea of the risk status of a community.
- Visiting house to house, ask if there are any eligible children.
- Ask for immunization record cards or check the immunization register to see if children have received pentavalent vaccine doses 1, 2, 3 and MCV1 and MCV2. Record the data on Form 4: High-risk community household assessment of immunity gap.
- Compare the totals for full, partial and no immunization. Decide whether there is a significant immunity gap in this community. If so, the health centre microplan and management action may need revising.
- If the visiting team is also able to vaccinate with measles vaccine, they should do it on the spot according to immunization status.
- If it is not possible for the visiting team to provide missing doses, schedule a later outreach visit or fixed-site session, and inform the community of the dates and times.



Form 4: High-risk community household assessment of immunity gap¹

Name of community: _____ Date of assessment: _____

Name of eligible child ²	Date of birth	Check child's record						Full immunization = All doses including Pentavalent 1, Pentavalent 2, Pentavalent 3 recorded on card or registered according to age eligibility **Partial immunization = Missing one or more doses of Pentavalent 1, Pentavalent 2 and Pentavalent 3	Catch-up routine MCV doses where missing or no record										
		Pentavalent 1	Pentavalent 2	Pentavalent 3	MCV1	MCV2	Child status		Date given	MCV1	MCV2								
		✓	✓	✓	✓	✓	Full	✓											

¹ This form is designed for children aged between zero and 23 months (or other age groups according to measles schedule). It should be used during house-to-house visits in the community using immunization cards and registers as the source of information.

² The age group for assessment may depend upon the MCV1 and MCV2 schedule in the country concerned.

3.1.2 Knowing the “face of measles” in high-risk communities

THE FACE OF MEASLES

WHO are the unimmunized children?

WHERE do they live?

WHY have they missed immunization?

HOW can immunization systems effectively reach them?

Knowing the ‘face of measles’ is an expression which describes in a simple way the efforts needed to complete measles elimination in the Region. Measles is often a sensitive indicator of inequities; where there has been recent measles virus transmission, a detailed description of children’s communities and socio-economic conditions (the ‘face of measles’) will help to advocate for completing elimination especially among the underserved and marginalized communities. It can also be used as the basis for planning improved access to all health services.

Here is what can be done:

- In addition to a completed case investigation form, [gather details about the community](#) in which the child lives to describe his or her socioeconomic demographic and cultural, circumstances.
- [Take photographs](#) of the child and the surroundings when the case has been confirmed.
- [Describe the characteristics of the community](#), using terms such as urban slum, migrant workers, refugees, rural and remote, minority groups (ethnic and religious groups), new settlements, areas of insecurity, etc.
- If possible, use a GPS device (GPS-enabled mobile phones can be used) to [tag the location of the case and area](#) where an active search has been carried out so that it can be displayed on a map.
- Plan the outbreak investigation plus communication and immunization response in the community.
- Plan to deliver regular services to the community through updated microplans based upon an understanding of the local supply and demand situation.

Detailed description of characteristics of confirmed measles cases

For management purposes it is essential to know the community and socio-economic characteristics of confirmed measles cases, in addition to epidemiological data. This is an important lesson learnt from polio eradication. Having this information about the children with measles is what is known as the ‘Face of Measles’. The information can lead to specific action to interrupt transmission which is appropriate to the community. For example some communities may not be reached regularly by immunization services, even though they reside in a ‘high coverage’ district.





Take photographs



Describe the characteristics of the community



Tag the location of the case and area

The following table can be used to classify confirmed measles by community characteristics. It is simply a guide to help managers focus on the real problems that have led to measles virus transmission. The categories listed in the table are not mutually exclusive, so the best way to classify the communities is to **identify the main obstacle to access to immunization services**. For example, a new settlement may be populated by migrant workers, but the main obstacle to access is that the settlement is new and not included in the session plan, not that the people are migrants. As another example, a measles outbreak may start in an urban slum, but the cases are from a minority ethnic group who are underserved; their minority characteristic, not their place of residence, is their major obstacle to access.

COMMUNITY CHARACTERISTICS*	Number of cases by age group			Total number of cases
	0–4 yrs	5–9 yrs	10+ yrs	
Urban slum dwellers				
Migrant workers				
Refugees				
Minority groups (ethnic groups)				
Rural remote				
New settlements				
Areas of insecurity				
Middle-class urban				
Middle-class rural				
Other				

**It is suggested that countries include information on community characteristics in the case investigation forms and databases.*



3.2 MICROPLANNING AT HEALTH CENTRE LEVEL: Develop microplans for high-risk communities



OBJECTIVE

To ensure every community is reached for immunization, especially first and second routine measles vaccine doses



In many countries, measles cases are mainly confined to communities with under-immunized populations. While these communities may have the characteristics listed in the previous table, inadequate management and service delivery practices may contribute to poor immunization performance. For example, in some urban areas, slum community populations may not even be listed in the health centre catchment area even though they live nearby.

New microplans will be needed based upon corrective action by health centres to improve immunization service delivery for high-risk communities. The microplanning process should be prioritized according to areas of highest risk. Health centres will need support from district staff to conduct the microplanning process.

A good health centre microplan should include at least the following components:

- map with list of populations by community/village
- data analysis of recent performance to identify priorities
- immunization session plan to reach every community
- workplan with problem-solving activities
- monitoring system
- defaulter tracking system
- close involvement of community in immunization sessions.

Risk assessment, as described in the previous section, is the basis for microplanning.

3.2.1 Microplanning Step 1: Use Form 3 for microplanning

Each health centre should complete Form 3: Health centre risk status: detailed analysis of villages and communities in health centre catchment area. Each community served by the health centre will be listed, and various indicators of population, missed measles doses, and outreach sessions will lead to problem-solving action under the microplan.

3.2.2 Microplanning Step 2: Use Form 4 for microplanning

The immunity gap can be better defined by using Form 4: High-risk community household assessment of immunity gap, to make sure that valid problem-solving action is included in the microplan, including new immunization session plans and work plans.

Further detailed guidance on making microplans is provided in the document, *Immunization in Practice*, and a separate document entitled, *Microplanning to Reach Every Community: Operational Guide for District and Health Facility Level*, which is available through the WHO Regional Office for the Western Pacific.

3.3 PRIORITIZATION

Prioritize high-risk communities for action, including outreach sessions, supervision and monitoring

3.3.1 The basis for prioritization (Forms 3 and 4)

Prioritization Step 1: Use Form 3 for prioritization

Form 3 (see page 14) lists and orders the priorities of the communities within a health centre catchment area.

Prioritization Step 2: Use Form 4 for prioritization

Form 4 (see page 16) shows the magnitude of the immunity gap in specific communities, which will help to set priorities for immunization action.

Prioritization Step 3: Use prioritization data for action

- Plan [supervisory visits to priority high-risk health centres](#) and communities regularly.
- Ensure all priority reports are completed and sent on time to the district, and that [prompt responsive action is taken by the district](#).
- Closely [monitor immunization session plans](#) by the priority health centre especially outreach session completeness.
- Implement [monitoring charts for MCV1 and MCV2](#) in every health centre.
- Hold [monthly district meetings](#) to review progress in priority high-risk health centres and priority communities.



3.3.2 Monitoring



Monitoring Step 1: Maintain and monitor a high-risk district and health centre database



- At province level (second administrative level), a database can be used to track progress in high-risk districts.
- At district level (third administrative level), a database can be used to decide on priorities and monitor progress in high-risk health centres and high-risk communities.
- Districts can list and monitor high-risk communities within the catchment area of health centres in the district database.
- Health centres should monitor monthly coverage on a chart to show performance in each community. This chart should include doses of each vaccine given and active surveillance zero reports for suspected measles (and other diseases).
- Supervisory visits and regular reports can contribute to updating the database and tracking progress. Low-performing areas will need continued support.



Monitoring Step 2: Use Form 5 to monitor immunization status of children in high-risk communities at MCV2 visit

The delivery of MCV2 in the second year of life or later is often a weak point in immunization services. The MCV2 visit needs special attention in planning, particularly in health centre microplans, through close cooperation with communities (volunteers and health workers). The delivery of MCV2 is [an ideal opportunity to catch up with other missed routine doses that should have been given in the first year of life](#). The opportunity can also be used to identify high-risk communities by reviewing the immunization status of children. Form 5: Monitoring of high-risk community immunization status of children at opportunity of MCV2 visits shows an example of how the second routine dose of measles vaccine can be monitored during an immunization session.

Guide for completing Form 5: Monitoring of high-risk community immunization status of children at opportunity of MCV2 visit

Form 5 is used to monitor the immunization status of children in high-risk communities at the contact and when MCV2 is delivered. Form 5 is a specific monitoring form for one community, and is adapted from Form 4 so that it can be used during outreach sessions over a period of three months, while Form 4 can be used any time when a quick assessment of immunity gap is needed.

Form 5 is filled in during an immunization session in a high-risk community when MCV2 is given. The following steps are taken:

- (1) Enter the date when the MCV2 dose is given in the first column.
- (2) Enter the names of the child and mother in the second and third columns.
- (3) Review the child's immunization record of pentavalent vaccine doses and the MCV1 dose, either from a card or from the register, and place checkmarks in the appropriate columns.
- (4) Record the immunization status of the child as full, partial or none according to whether all, some or no doses of pentavalent vaccine and MCV have been given.

Form 5 can also be used to monitor the risk status of high-risk communities. Each form is specific to one community and data are entered at each outreach session for a period of three months. After three months, a new form is started. After one year, the four quarterly forms can be compared to track progress in immunization status in the high-risk community.



Form 5: Monitoring of high-risk community immunization status of children at opportunity of MCV2 visit
(Example: MCV2 given at 18-23 months) Form to be used continuously in one high-risk community over a period of 3 months.

MCV2 given at 18 months	Name of child	Name of mother	Penta 1 record on card	Penta 2 record on card	Penta 3 record on card	MCV1 record on card	IMMUNIZATION STATUS OF CHILDREN AT TIME OF MCV2 CONTACT		
							Child	Child	Child
Date			✓	✓	✓	✓	Full	Partial	None
							Total	Total	Total

* Full immunization = All doses MCV1, Penta 1, Penta 2, Penta 3 recorded on immunization card or register
 ** Partial immunization = Missing one or more doses of: MCV1, Penta 1, Penta 2, Penta 3 on card or register

4. Addressing Challenge Two: Outbreaks

OUTBREAK PREPAREDNESS AND RESPONSE

To enhance capacity for preparedness, rapid detection and response to measles outbreaks whether caused by an endemic or imported virus, and to prevent the spread and re-establishment of measles virus transmission.

4.1 DEFINING A MEASLES OUTBREAK

In the measles elimination setting, a single laboratory-confirmed case is considered as a measles outbreak, requiring proper investigation and response. In this guide, “outbreak” refers to either endemic or imported cases. The steps required for preparedness and response will be similar whether the case is endemic or imported.

4.2 OUTBREAK PREPAREDNESS

Four activities are recommended for outbreak preparedness.

1. Advocacy for government support: Obtain government support for measles elimination as a national priority.
2. Communication: Develop communication systems to alert all communities to report suspected measles cases rapidly and support full routine immunization.
3. Regular situation analysis: Regularly update the list of high-risk areas based upon progress with surveillance and immunization performance data.
4. Standard operating procedures: Develop and distribute standard operating procedures for outbreak investigation and immunization response.

4.2.1 Advocating for government support for measles elimination as a national priority

A [national task force for measles elimination](#) (and a subnational task force if applicable) can help to guide the National Immunization Programme, especially with respect to outbreak preparedness and response. The national task force should be managed by the ministry of health with participation of partners. When appropriate, senior ministry of health representatives should attend task force meetings. [The task force should be aware that a single laboratory-confirmed measles case is considered as an outbreak.](#)





A measles outbreak preparedness and response plan should be developed by the National Immunization Programme and should be reviewed and endorsed by the national task force (see Form 7). The plan should identify mechanisms to rapidly mobilize resources (human and financial resources), vaccine supply and logistics required once a measles outbreak occurs.



4.2.2 **Developing communication systems to alert all communities to report suspected measles cases rapidly and support full routine immunization**



The relationship between the local health centre and the community is vital to good outbreak preparedness. To support this relationship, communication systems should be developed to facilitate the sharing of information between the health centre and community:



- communities to report rash and fever cases to health centres by mobile phone, with reports verified by health centre staff when feasible;
- health centres to send regular messages to mobilize communities for immunization sessions and ensure full immunization with two doses of measles vaccine;
- health centres to report suspected measles cases to district; and
- health centre to prepare a guide describing key tasks for managing community health workers and volunteers including holding regular immunization sessions and community meetings.

4.2.3 **Regularly updating the list of high-risk areas based upon progress with surveillance and immunization performance data**

Once a high-risk community database has been created (see Section 3.3: Prioritization), it will be essential to update the database regularly with indicators of progress for each facility and/or community listed. Indicators may include:

- active surveillance with zero reporting from each facility listed in the database;
- standard indicators of service access and utilization; and
- completeness and timeliness of fixed-site and outreach immunization session.

4.2.4 **Developing and distributing standard operating procedures for outbreak investigation and immunization response**

Standard operating procedures for outbreak investigation and outbreak response including immunization response will help countries to take rapid action. The following table can serve as a guide.

Example of standard operating procedures for measles outbreak response, investigation and immunization

Activity	Level	Suggested timing
Visit community and conduct investigation of suspected cases: (1) look for additional suspected cases, (2) complete investigation forms, (3) collect blood samples, and (4) collect virus isolation samples.	District and health centre	- 4 to - 7 days
Confirm measles cases by serology.*	Laboratory	0
Search for additional suspected cases in area. Contact community volunteers in area and ask about new suspected cases.	District and health centre	<3 days
Measure risk status of health centre catchment area (Form 3).	District	<3 days
Visit high-risk communities to measure immunity gap (Form 4).	District and health centre	<6 days
Conduct community-wide routine catch-up measles immunization in index and high-risk communities in health centre catchment area.	District and health centre	<6 days
Request daily reports on suspected measles cases from health centres in affected districts.	Province	<7 days
If additional confirmed cases found, decide on magnitude and extent of outbreak response immunization (see ORI Table).	National, Province	<7 days
If outbreak requires non-selective measles SIAs, start SIA planning and resource mobilization.	National	From day 7 onwards
Conduct district-wide routine catch-up in outbreak-affected and neighbouring districts while awaiting SIAs (if needed).	District	From day 7 onwards
Develop communication plan for SIA targeted areas: community reporting, full immunization of all children, SIA dates and location.	National, Province	<10 days
Order vaccine and equipment and request funding.	National	<10 days
Conduct SIA microplanning in the districts.	Province, District	<10 days
Print training and communication materials.	National, Province	<10 days
Ensure measles vaccine and funds are in place in the districts.	National, Province	<10 days
Select teams.	District	<10 days
Ensure all equipment and supplies have arrived in the districts as per plan.	Province	<12 days
Train supervisors and vaccinators.	Province	<12 days
Start SIA.		<15 days
Perform daily reporting of SIA results and new suspected cases.	District	15 days and onwards
Carry out independent monitoring of SIA activities.	National	15 days and onwards
Compile all reports to fully document the outbreak, response and results.	National	15 days and onwards

* Communicate with relevant laboratory to confirm virus genotyping.



4.3 OUTBREAK RESPONSE



REMINDER: Every laboratory-confirmed measles case should be considered as an outbreak.



4.3.1 Outbreak investigation



The following steps should be taken by an investigation team:



Outbreak Investigation Step 1: Visit the community and conduct case investigation



The field investigation team is advised to visit the community concerned, conduct a case investigation, and take required specimens from suspected measles cases. A field investigation of every suspected measles case must be carried out within 48 hours of notification, with the case investigation form accompanied by collection of laboratory samples for testing. “Clinical confirmation” of measles cases is no longer allowed.



An adequate case investigation includes a complete case investigation form with full details where possible.¹ These details will help to establish the epidemiological situation for an appropriate immunization response. Details of recent travel and contacts will be very important for establishing epidemiological links and identifying possible sources of infection.



In addition, as described in Section 3.1.2, information on community characteristics should be sought and recorded carefully during the case investigation.

How many blood specimens should be taken when an outbreak is suspected?

Various guidelines suggest collecting five to 10 blood specimens from suspected cases during an outbreak investigation. From a management point of view, it is better to have too many than too few blood specimens. Field staff should not feel that there is a limit to the number of specimens and should aim for 100% of suspected cases because the extent of an outbreak can be better defined when as many specimens as possible from suspected cases are taken.

¹ The 10 core variables are case identification, date of birth/age, sex, place of residence, vaccination status or date of last vaccination, date of rash onset, date of notification, date of investigation, date of blood specimen collection, and place of infection or travel history.

Outbreak Investigation Step 2: Search for additional cases in the area

It is critical to actively search for additional suspected cases in the community. The investigation team should contact village health workers, volunteers, the village leader and families in the community to actively search for any unreported or new suspected cases. Active case searching should be extended to neighbouring communities as well as other high-risk communities served by the same health centre. If there is time, measure the immunity gap in the community of the suspected case using Form 4 (High-risk community household assessment of immunity gap).

Contact tracing

In some situations, in addition to the search for additional cases, it is possible to do more specific contact tracing. The team should identify all people who have been in contact with the measles case while contagious. A list of these contacts with their addresses can be made and then followed up to see whether they have become ill with measles for a time period up to 21 days from contact date. This may be difficult to do in situations where the case in question has been in contact with many people in crowded market or transport situations.

Outbreak Investigation Step 3: Use Form 3 to define health centre risk status

To measure the risk status of the health centre's catchment area, the following steps should be taken:

- The team should visit the health centre in the outbreak area and conduct a risk assessment of the catchment area of the health centre (see Form 3 for details).
- If the health centre risk assessment reveals the presence of high-risk, underserved communities, the investigation team should contact village health workers, village volunteers or the village leader to ask if any new suspected cases have been seen.
- If local health staff or volunteers are aware of other suspected measles cases in nearby communities or other high-risk communities, then these communities should be visited as a priority for "suspected measles cases" search and rapid coverage assessment (RCA) on the same day.
- If some communities are underserved or there are problems with the immunization services, new microplans with corrective action will be required at a later date.





Outbreak Investigation Step 4: Use Form 4 to measure the immunity gap in the community of the suspected case



Based upon information gained from Outbreak Investigation Step 3, the team should visit high-risk communities around the suspected case by checking at least 20 houses with children aged zero to 23 months (or other age group according to the MCV1 and MCV2 schedule) to determine immunization status for pentavalent vaccine doses 1, 2, 3 and MCV1 and MCV2, as described in Form 4. The results can later be used for routine catch-up immunization. The team should arrange a date with the community for missing MCV doses to be given at fixed-site and outreach sessions according to the findings.



4.3.2 Measles outbreak response immunization



Outbreak Response Immunization Step 1: A single laboratory-confirmed measles case triggers outbreak response immunization.



As mentioned earlier, in the measles elimination setting, a single laboratory-confirmed measles case (whether endemic or imported) is considered as an outbreak and will require response action including outbreak response immunization.

Outbreak response immunization can be minimal or large-scale, depending on the evidence of circulation, immunity gap, magnitude and extent of the outbreak. For example, a single imported case into a highly immunized community may require focus on only close contacts if detected early. On the other hand, a province-wide SIA may be needed if the measles virus spreads widely within one province.

Outbreak Response Immunization Step 2: Decide the magnitude and extent of the outbreak immunization response to a confirmed measles outbreak

When a measles case has been laboratory-confirmed, the key objective is to **provide measles vaccine to previously unvaccinated infants and children**. This may be carried out through selective or non-selective SIAs.

The real extent of a measles outbreak will not be known at first, so certain assumptions must be made to contain the outbreak at its early stage.

- Experience with outbreaks (both measles and polio) has shown that a rapid response, even with relatively low coverage, can avert more cases than higher coverage with a later intervention. Thus, the response should be as soon as possible and no later than two weeks after confirmation of the case.

- If the number of confirmed cases is small (e.g. less than 10 cases), there will not be enough data to analyse the characteristics of the outbreak, so assumptions should be made to ensure an effective response.
- Budgetary considerations may be foremost when deciding on the magnitude and extent of outbreak response, but they should not delay a response.
- Even if the laboratory-confirmed cases are among children older than five years or adults, there is a risk that measles will spread to infants and young children who should therefore be the priority consideration.

Guide for using the Outbreak Response Immunization Table (ORI Table)

The Outbreak Response Immunization Table, or ORI Table, shows some [options for minimal outbreak response immunization](#) based upon some examples or triggers.

- The ORI Table does not describe any immunization policy; it is designed to give practical guidance on a range of alternative immunization responses.
- The ORI Table presents an attempt to display practical suggestions in response to measles outbreaks. [Countries may wish to maximize the opportunity](#) to interrupt transmission by conducting large-scale SIA responses even following a single confirmed case; however, this will depend on available resources and immunity level findings from risk assessments.
- While there are countless scenarios in which a measles outbreak may present, there are a limited number of options for response, and these are displayed in the ORI Table.
- In every circumstance, some *routine catch-up* (also known as *selective SIA*) should be conducted, as described in the ORI Table.
- The decisions on magnitude, age group and extent can be made more specific by good epidemiological information, rapid notification and investigation.





DOCUMENTATION OF IMMUNIZATION RESPONSE AND ITS RESULTS

Whatever type of response is conducted, documentation of the outbreak response immunization is vital because it will provide lessons that will improve the quality of the response. Documentation should include: (1) the precise outbreak and response area (maps); (2) the target population and age groups; (3) the immunity gap and risk status of the population; (4) the number of children and age groups involved in routine catch-up; (5) the magnitude, timing and extent of any SIA; (6) the results of the SIA and independent monitoring; and (7) the dates of onset of all measles cases detected during and after the outbreak response immunization.

Nosocomial transmission of measles

In countries that have made considerable progress with measles elimination, a significant means of transmission of measles can be nosocomial (acquired at hospitals and other health facilities). In such situations, measles may be relatively rare, and health staff may not immediately recognize measles. In addition to direct contact between children attending hospitals, measles can be transmitted from patients to health care workers and then to other patients. Since measles can be highly infectious in the three days before the onset of rash, there can be considerable difficulties in separating suspected measles cases from other patients who, for example, may be attending a crowded hospital outpatients unit. The following control measures should be considered:

- Ensure awareness of measles transmission and provide measles vaccination of health facility staff, especially those newly employed.
- Maintain high population immunity among health workers and other hospital employees.
- Reduce missed vaccination opportunities by checking the immunization status of children attending hospitals and offering measles immunization.
- Reduce vaccination age to six months in outbreak situations.
- Isolate individuals with fever and rash. If possible, patients attending with fever and rash should be taken directly to a separate room in waiting and treatment areas, where feasible.

ORI Table: Magnitude and extent of minimal immunization response following measles outbreaks

TRIGGER FOR OUTBREAK RESPONSE IMMUNIZATION	MINIMAL RESPONSE OPTIONS FOR POPULATION	MINIMAL RESPONSE OPTIONS FOR AREA
<p>One confirmed measles case</p> <p>Priority is local containment within health centre catchment area.</p>	<p>1. Vaccinate all children with first and second doses of measles vaccine according to their immunization status and eligibility. The upper age limit will be according to the schedule for the second dose, but it will be safer to review all children under five years. Immunization cards and registers should be used (routine catch-up).</p>	<p>A. Routine catch-up for all high-risk communities in the health centre catchment area plus routine catch-up for bordering communities that are considered at risk</p>
<p>Two to nine confirmed measles cases per district in one or more districts</p> <p>A small number of confirmed measles cases (e.g. less than 10 cases) does not provide enough information on the epidemiology of the outbreak.</p> <p>It may be necessary to assume more cohorts are affected and widen the response magnitude and extent.</p>	<p>1. Vaccinate all children with first and second doses of measles vaccine according to their immunization status and eligibility. The upper age limit will be according to the schedule for the second dose, but it will be safer to review all children under five years. Immunization cards and registers should be used.</p> <p>2. Vaccinate all children from 9 to 59 months old regardless of immunization status (SIA).</p> <p>3. Vaccinate all children from nine months to 15 years of age regardless of immunization status (SIA).</p>	<p>B. Routine catch-up for all high-risk communities in affected districts.</p> <p>C. District-wide SIA in affected districts plus routine catch-up in high-risk communities of surrounding districts.</p>
<p>10 or more confirmed measles cases in one district</p> <p>An outbreak may be confined to one district because surrounding districts are better protected.</p>	<p>1. Vaccinate all children from 9 to 59 months regardless of immunization status (SIA).</p> <p>2. Vaccinate all children from nine months to 15 years of age regardless of immunization status (SIA).</p>	<p>C. District-wide non-selective SIA in affected districts plus routine catch-up in high-risk communities of surrounding districts.</p>
<p>10 or more confirmed measles cases per district in more than one district</p> <p>When more than one district is affected by a larger number of cases, a large-scale response is required.</p>	<p>1. Vaccinate all children from 9 to 59 months regardless of immunization status (SIA).</p> <p>2. Vaccinate all children from nine months to 15 years of age regardless of immunization status (SIA).</p>	<p>D. Province-wide non-selective SIA plus routine catch-up in high-risk communities of surrounding provinces.</p>

Note: During measles outbreaks, lower vaccination age eligibility to 6 months and provide vitamin A supplementation.



4.3.3 Conducting high-quality, routine immunization catch-up



ATTENTION TO QUALITY: Routine catch-up activities must be of the highest possible quality. It is often observed that the quality of routine immunization catch-up activities is inadequate, and many children who had missed their routine measles vaccination are missed again.



NOTE: In measles outbreak situations, it is desirable to lower the minimum age for measles vaccine eligibility from nine months to six months of age.



“Catch-up” in the context of measles elimination means that every child should receive the two scheduled measles vaccine doses according to their age and the national immunization schedule. Wherever feasible, other vaccines should be given to complete the whole scheduled series.



Routine immunization catch-up will be needed whenever a risk of measles virus transmission is detected. This may be in response to a confirmed measles case, or in response to a significant immunity gap.



Routine catch-up is a more precise way to provide doses to only those children whose immunity is incomplete. To ensure quality, great efforts should be made to identify the unvaccinated children (Form 4: High-risk community household assessment of immunity gap).



Managing the operations of a routine catch-up (selective SIA)

The most important factor is high quality. A catch-up requires adequate resources, especially vaccinators and volunteers. If a selective SIA catch-up operation misses even small groups of vulnerable children, it will not stop transmission.

Objectives of routine catch-up

- To protect vulnerable children from measles infection by giving measles vaccine MCV1 and MCV2 to children who have not received two routine doses of measles-containing vaccine.
- To search for unreported new suspected measles cases.
- To mobilize the community for routine immunization and reporting of suspected measles.
- To provide other scheduled vaccines where needed to complete the immunization series (optional depending on available resources).

Routine catch-up planning

- Always conduct a rapid house-to-house survey first. This will provide an idea of the magnitude of the immunity gap, and an estimate of the size of the target population.

- Make an operational plan for the area: estimate the target population (under two years or under five years) and the requirements for vaccine, supplies and staff. For an outbreak response, it will be desirable to lower the age of eligibility to six months. However, if the SIA is selective, perhaps only 50% or less of the target population will require vaccination, depending on the immunity gap.
- Provide enough vaccinators. One vaccinator is able to provide a maximum of 80–100 measles injections per day.
- In rural areas, use known outreach sites to reach communities.
- In densely populated urban areas, it will be necessary to set up mobile vaccination collection points on the streets of the community.
- Inform the community leader in advance of the visit. Ask volunteers to walk through the community to mobilize mothers and children aged nine to 23 months (or up to 59 months depending on national policy).
- Mothers and children should be informed to bring their immunization cards with them to the collection point.
- Check the MCV1 and MCV2 measles immunization status by card or recall. If in doubt, vaccinate. Use Form 4 or a similar form to record name, age, immunization status and doses given.
- Provide needed doses and record these on immunization cards and update the immunization registers.
- Report and conduct a case investigation of new suspected measles cases.

Supplies and logistics

- Secure sufficient doses of measles vaccine and other supplies to meet the expected needs of children from six or nine months to 23 months (or up to 59 months according to national requirement).
- Distribute social mobilization materials that promote immunization and reporting of suspected measles cases.
- Provide vitamin A capsules according to age: six to 11 months = 100 000 IU and 12 to 59 months = 200 000 IU.
- If possible (in rural areas this is easier than in urban areas), take immunization registers and update these during the immunization activity.
- Bring case investigation forms and blood sampling materials.

Routine Catch-Up Step 1

Use Form 3: Health centre risk status: detailed analysis of villages and communities in health centre catchment area

In the area at risk where routine catch-up is planned, visit the health centres and complete Form 3. This form will indicate the level of risk by community and the order of



priorities for catch-up. In the context of a new outbreak, the form may have already been completed as part of risk assessment or outbreak investigation.

Routine Catch-Up Step 2

Use Form 4: High-risk community household assessment of immunity gap

Carry out an assessment of the true immunity gap in high-risk communities. Visit the highest risk communities identified in Routine Catch-up Step 1 to determine the immunization status of children under two years in the community and provide measles vaccine to ensure all children are fully immunized according to age. Form 4 may already have been completed as part of an outbreak investigation.

4.3.4 Conducting a high-quality non-selective SIA

Most countries in the Western Pacific Region are experienced in conducting large-scale non-selective SIAs with measles-containing vaccine. They will already have their own SIA operational guidelines, so they will not be included in this document. Annex 5 provides some tips based on country best practices.

4.3.5 Collaboration across border areas in outbreak response

When a measles outbreak occurs in or near border areas (between districts, provinces, countries and even regions), good communication and joint actions between the two sides are critical to interrupt the ongoing measles virus transmission and prevent further spread of measles virus across borders. Joint action can include the following:

- As part of outbreak preparedness, a working mechanism and procedures for rapid information exchange can be established, with communication channels/means and focal points identified, and template/contents of the information exchange developed.
- Ideally, an updated line-list of suspected cases can be shared. If this is not feasible, an updated summary of confirmed measles cases can be shared, including names of cases, location, and dates of rash onset.
- Activate rapid information exchange immediately after a measles outbreak is confirmed near border areas (district, province, country) on a weekly basis, and if possible, on a daily basis when the situation is evolving rapidly.
- Joint border meetings can be organized to discuss how to coordinate immunization response activities, including case investigation and outbreak response immunization.
- For cross-border collaboration between countries or beyond, more steps will be needed to establish the collaboration mechanisms and information exchange procedures. WHO regional offices or WHO Headquarters may be involved in assisting countries with coordination.

Summary Table: Guidance on how to use five interactive forms (Forms 1–5)

CHALLENGE 1 Interrupting and preventing measles transmission	Risk assessment	Form 1 Measuring community access to immunization services	Form 2 Listing high-risk communities	Form 3 Health centre risk status: detailed analysis of villages and communities in health centre catchment areas	Form 4 High-risk community household assessment of immunity gap	Form 5 Monitoring of high-risk community immunization status of children at opportunity of MCV2 visit
		Identify access to immunization services by community	List high-risk communities by name and by health centre	Health centre to make risk analysis of every community	Visit high-risk communities to measure immunity gap	Monitor MCV2 and immunization status in high-risk communities
	Microplanning	Use list to ensure every community is included in microplan	Health centre to prioritize sessions and follow-up of unimmunized	Visit high-risk communities to monitor performance	Use MCV1/MCV2 data as a basis for prioritization	
	Prioritization		Use data to prioritize communities for supervision, monitoring sessions, new microplans	Visit priority high-risk communities to validate plan		
CHALLENGE 2 Outbreak preparedness and response	Outbreak preparedness		Regularly update situation analysis of every community	Regularly update status of immunity gap in high-risk communities		
	Outbreak response		Visit health centre in outbreak area to analyse high-risk community immunity situation	Visit high-risk communities to measure immunity gap and conduct routine catch-up		



5. Addressing Challenge Three: Surveillance

ENSURING HIGHLY SENSITIVE SURVEILLANCE

To improve the sensitivity and performance of epidemiological surveillance and laboratory capacity to track the changes in measles epidemiology, identify the source of infection, and provide evidence consistent with the absence of endemic measles transmission.

5.1 ROLE OF MEASLES SURVEILLANCE

- To detect measles virus transmission and describe measles epidemiology in a timely manner.
- To identify high-risk populations and areas, and take action to close immunity gaps.
- To guide rapid response by defining appropriate target population and geographic areas.
- To distinguish between endemic and imported/import-related transmission.
- To provide essential evidence for verification of measles elimination.

5.2 ADDRESSING CURRENT SURVEILLANCE ISSUES

Some common measles surveillance problems

■ **Completeness**

- | Suspected cases are underreported, particularly at health centre and community levels.
- | Core information is missing or incomplete during case investigation.

■ **Timeliness**

- | Feedback of laboratory results to district level and below is delayed or nonexistent.

■ **Laboratory specimen management**

- | Adequate blood specimen collection rate is less than 80%, and inadequate specimens are collected for virus identification. Specimen shipment is delayed.

■ **Epidemiological analysis**

- | Lack of skill in establishing epidemiological linkage.
- | Failure to link the measles epidemiological and laboratory databases.
- | Lack of regular data analysis and feedback from the higher levels of surveillance units.

■ **Surveillance system management**

- | Existing technical guidelines do not provide clear guidance on effective management of measles surveillance systems.

5.2.1 Enhancing active surveillance for suspected measles cases

Active surveillance requires health staff to visit health facilities to look for suspected measles cases on a regular basis. Active surveillance is the basis of acute flaccid paralysis (AFP) surveillance, and as such it has been used successfully in polio eradication throughout the world.

- Combine AFP and suspected measles surveillance in all active surveillance activities.
- Whenever possible, extend active surveillance sites to include health centres and private hospitals/clinics because many measles cases are present only at those health facilities.
- Manage active surveillance for measles by making a schedule of visits and monitoring the schedule and results of the visits.

5.2.2 Conducting community-based active surveillance for suspected measles cases

Many measles cases, unlike AFP cases, may not be present to any health facility. As such, community surveillance is also required. In some parts of the Region, measles is accepted as a natural part of childhood; children with measles do not necessarily attend health facilities during their illness unless complications occur.

Community health workers or community volunteers can be an excellent resource for measles surveillance. In all communities, especially those considered to be at high risk, the following activities should be considered:

- Community volunteers can report suspected measles cases to health centres using mobile phones or other rapid communication means.
- Community volunteers can request a visit from health centre staff to investigate a suspected case or encourage the suspected case to go to the health centre for investigation.
- Health centre staff should call community volunteers regularly to enquire about suspected measles case and other diseases.
- Health centre staff should enquire about suspected measles cases during every outreach visit and provide regular reports including zero reports from every community to the district.

5.2.3 Conducting an adequate case investigation

Investigation of any suspected measles case must be conducted within 48 hours of case notification.

All core variable data should be collected, including:

- (1) case identification
- (2) date of birth/age
- (3) sex
- (4) place of residence



- (5) vaccination status or date of last vaccination
- (6) date of rash onset
- (7) date of notification
- (8) date of investigation
- (9) date of blood specimen collection
- (10) place of infection or travel history.

For any suspected case, if information on any of those core variables is missing, the investigation will be considered INADEQUATE.

5.2.4 Establishing epidemiological linkage

A measles case confirmed by epidemiological linkage to a laboratory-confirmed case or epidemiologically-linked case is a suspected measles case with a credible mode of transmission from a laboratory-confirmed case or (in the event of a chain of transmission) to another epidemiologically confirmed case seven to 21 days prior to rash onset.

How should a “credible mode of transmission” be understood?

Cases must be linked geographically and temporally, although the contact details may not always be proven and sometimes must be assumed. Measles virus spreads very rapidly and people may be completely unaware that they have been in contact with infectious persons who have not yet developed a rash. The following situations are all credible and should be considered:

- a case in the same village or urban community;
- a case in a neighbouring community with contact occurring through schools, markets and social events;
- a case who has travelled to a country known to have measles circulating during the past seven to 21 days; and
- a case having visited a health facility where a confirmed case is known to have occurred.

5.2.5 Collecting specimens for confirmation and virus detection

Confirmation

Specimens for serological testing of measles or rubella by enzyme-linked immunosorbent assay (ELISA) should be collected at first contact with the health care system. Do not wait for serological confirmation to collect specimens for virus isolation.

Adequate specimens for serological testing include: (1) a blood sample by venepuncture in a sterile tube with a volume of 5 ml for older children and adults and 1 ml for infants and younger children; or (2) a dried blood sample with at least three fully filled circles on a filter paper collection device. An adequate blood specimen should be collected within 28 days after rash onset.



Dried blood spot collection

Virus detection

Collection of specimens for virus isolation

- The laboratory should agree in advance with the epidemiologists on the type and number of samples that are most appropriate for virus isolation. Since each type of sample has different requirements, the decision on the type of samples will depend on the local resources and facilities for transport and storage.
- Ideally, samples should be collected simultaneously with the blood samples for serological diagnosis and confirmation of measles or rubella virus as the cause of the outbreak.
- Throat or nasopharyngeal swabs, nasal aspirates or 10–50 ml of urine (first voided urine in the morning) should be collected as soon after rash as possible. The samples should be collected at the first contact with a suspected case of measles and at the same time as the serum sample for diagnosis is drawn.
- Measles virus isolation is most successful when samples are collected on the first through third day of rash and sometimes up to five days after rash onset. Rubella virus can be detected in nasopharyngeal secretions from a few days before onset of rash to several days afterwards.
- Both viruses are sensitive to heat, and ability to isolate viruses decreases markedly when samples are not kept cold. Therefore, specimens should be refrigerated and shipped to the laboratory with ice packs (4–8°C) to arrive at the testing laboratory within 48 hours or on dry ice in well-sealed, screw-capped vials.
- Urine must NOT be frozen before the concentration procedure is carried out. Whole urine samples may be shipped in well-sealed containers at 4°C, but centrifugation within 24 hours after collection is preferable. (See 'Manual for the Laboratory Diagnosis of Measles and Rubella Virus Infection,' WHO/IVB/07.01.)

Collection of specimens for molecular detection

- Measles and rubella virus often can be detected by reverse transcription polymerase chain reaction (RT-PCR) from virus isolation samples collected three to four days beyond the period after onset of rash for virus isolation.
- Any virus isolation sample collected and transported to the laboratory can be used for RT-PCR analysis. In addition, alternative samples (e.g. oral fluids and dried blood spots [DBS]), if collected within seven days of onset of rash, can be used for RT-PCR analysis.

5.2.6 Linking epidemiological and laboratory information

A unique case identification (ID) number should be applied to each suspected case and be identical in both the epidemiological and laboratory database.

(1) Assign a unique ID number to each suspected measles case before the



specimen is sent to the laboratory.

- (2) Write the unique ID number on the case investigation form, the laboratory request form and the specimen container.
- (3) Include the unique ID number in both the laboratory and epidemiological databases.
- (4) Link the laboratory and epidemiological databases by unique ID number at national level for analysis and reporting.

5.2.7 Providing rapid feedback

Measles cases

From 2013 onwards, every laboratory-confirmed measles case requires immediate feedback to the case reporting unit, the district, province and national levels. Rapid feedback of laboratory results to every level involved (including where the case is originally reported) will encourage timely reporting and investigation. Feedback of results on confirmed cases should also reach the community involved through the health centre by mobile phone or other rapid communication means available.

Measles situation updates

All countries should provide measles situation updates to subnational levels weekly or monthly through bulletins, newsletters or other approaches, including number of measles or incidence, surveillance performance and “issues to be addressed”. Regular monthly meetings of health staff and community health workers present a good opportunity to regularly discuss action required or raise attention needed in relation to enhancing measles surveillance.

5.2.8 Management of surveillance (see Surveillance Management Table)

All countries are encouraged to incorporate standard operating procedures for management of measles surveillance into their existing guidelines. The guidelines should clearly define the role, responsibility and requirements at each level of the surveillance system. The Surveillance Management Table on the following page shows an example of how surveillance tasks can be allocated to every administrative level from the community upwards.

5.2.9 Surveillance for adverse events following immunization

Surveillance for adverse events following immunization (AEFI) is an important component of the immunization system. As measles cases become a rare event, the public starts to pay more attention to AEFI than to the disease that the vaccine prevents. For full details, refer to the WHO document: Immunization Safety Surveillance: Guidelines for immunization programme managers on surveillance of adverse events following immunization.

Surveillance Management Table: Operational procedures for surveillance management

	COMMUNITY	HEALTH CENTRE	DISTRICT	PROVINCE	NATIONAL
CASE DETECTION	Community health workers or volunteers search and identify suspected cases.	<ol style="list-style-type: none"> 1. Visit community to verify if reported case meets case definition. 2. Conduct active search if there are any unreported cases. 	<ol style="list-style-type: none"> 1. Conduct weekly active surveillance visits. 2. Conduct active search for unreported cases. 	Conduct active surveillance visits, if applicable, and active search for unreported cases.	Conduct active surveillance visits, if applicable, and active search for unreported cases.
CASE NOTIFICATION	Community health workers or volunteers notify health centre of suspected cases immediately (e.g. by mobile phone).	<ol style="list-style-type: none"> 1. Immediately report to district by phone if suspected case is detected in community or health centre. 2. Inform community volunteers in neighbouring villages. 	<ol style="list-style-type: none"> 1. Notify province that district will investigate suspected measles case. 	Notify the national level.	
CASE INVESTIGATION		Search for more cases in community of origin.	Conduct case investigation within 48 hours of notification.	<ol style="list-style-type: none"> 1. Join district case investigation team when required or feasible. 2. Monitor case investigation completeness and quality. 	<ol style="list-style-type: none"> 1. Monitor case investigation completeness and quality. 2. Join case investigation (e.g. outbreak or importation occurs).
SPECIMEN COLLECTION			Collect blood specimen during case investigation, and other specimen (e.g. swab) if possible.	Monitor specimen collection rate.	Monitor specimen collection rate.
SPECIMEN SHIPMENT			Ship specimen(s) as soon as possible, and within 5 days of collection.	Facilitate and monitor specimen shipment and ensure specimen is received by designated laboratory within 7 days of collection.	Monitor timeliness of specimen shipment and monitor and prevent batching of blood specimens.
TESTING AND LABORATORY FEEDBACK		Immediately notify communities when case is laboratory confirmed.	<ol style="list-style-type: none"> 1. Immediately notify health centre when case is laboratory-confirmed. 2. Provide regular feedback to health centre on laboratory testing results (within 1 day of receiving laboratory result). 	<ol style="list-style-type: none"> 1. Immediately notify district when case is laboratory-confirmed. 2. Provide regular feedback to district on laboratory testing results (within 2 days of receiving laboratory result). 	<ol style="list-style-type: none"> 1. Immediately notify province when case is laboratory-confirmed. 2. Provide regular feedback to province on laboratory testing results (within 2 days of receiving laboratory result).
CASE CLASSIFICATION				For countries with adequate local capacity, review cases on monthly basis using case classification system.	Review cases on monthly bases using case classification system.
FEEDBACK TO ALL LEVELS		Provide monthly feedback to community about final classification of suspected cases reported.	Provide monthly feedback to health centre on final classification of suspected cases reported.	Prepare (if there is local capacity) and disseminate monthly surveillance bulletin (to districts).	<ol style="list-style-type: none"> 1. Analyse surveillance performance monthly. 2. Prepare and disseminate monthly surveillance bulletin (analysis by province, ideally by district).



5.3 CASE CLASSIFICATION

All suspected cases that meet the national case definition should be reported, investigated and classified.



Countries should be aware of the implications of their case definition for suspected measles cases. The relative advantages and disadvantages of different case definitions of suspected measles and rubella cases are outlined in the Surveillance Integration Table.

5.3.1 Laboratory-confirmed measles case

A laboratory-confirmed measles case is a suspected measles case with a positive laboratory test result for measles-specific immunoglobulin M (IgM) antibodies or other approved laboratory test method.

5.3.2 Classification of suspected measles case with equivocal laboratory test results for anti-measles IgM

Any case with equivocal laboratory test results should be classified as a laboratory-confirmed measles case, with the following considerations/steps:

- If the field investigation shows the case is epidemiologically linked to another confirmed measles case, then the case is epidemiologically confirmed.
- Active case search should be conducted to exclude ongoing transmission.
- If the field investigation does not identify other suspected cases, then the case can be discarded only if the specimen repeatedly tests negative for measles IgM, or additional specimens are obtained and further laboratory investigations are undertaken (such as negative serology for measles IgM on repeat blood collection, no change in immunoglobulin G [IgG] levels consistent with acute infection, negative affinity testing etc.).
- If the case was recently vaccinated and vaccine-like virus is identified through virus isolation, then the case can be classified as vaccine-associated.

5.3.3 Classification of measles vaccine-associated rash illness

A rash illness case can be classified as measles vaccine-associated only when the case meets all five of the following criteria:

- The case had a rash illness, with or without fever, but did not have cough or other respiratory symptoms related to measles infection at the time of the rash.
- The rash began seven to 14 days after vaccination with a measles-containing vaccine.
- The blood specimen, which was positive for measles IgM, was collected 8–56 days after vaccination.

- Thorough field investigation did not identify any secondary cases.
- Field and laboratory investigations failed to identify other causes.

Alternatively, a suspected case from which virus was isolated and found to be a vaccine strain (e.g. genotype A) should be considered as measles vaccine-associated rash illness.

NOTE: A measles vaccine-associated “case” is not counted as a non-measles non-rubella “case”.

5.3.4 Laboratory-confirmed rubella case

A laboratory-confirmed rubella case is a suspected case with a positive laboratory test result for rubella-specific IgM antibodies or other approved laboratory test method.

5.3.5 Epidemiologically-linked case (measles or rubella)

An epidemiologically-linked case is linked to laboratory-confirmed cases with a credible mode of transmission from a laboratory-confirmed case or another epidemiologically-linked case seven to 21 days (12–23 days for rubella) prior to rash onset.

5.3.6 Clinically measles compatible case

A clinically measles compatible case is a suspected case with fever and maculopapular (non-vesicular) rash and either cough, coryza or conjunctivitis, for which no adequate clinical specimen was taken and which has not been linked epidemiologically to a laboratory-confirmed measles case or any other laboratory-confirmed communicable disease.

Under the classification system for measles elimination and verification, it is no longer possible to confirm measles cases on clinical grounds alone.

5.4 MANAGING CLINICALLY MEASLES COMPATIBLE CASES

5.4.1 Discarding clinically measles compatible cases as non-measles

Clinically measles compatible cases for which the information is sufficient to make an alternative diagnosis can be reviewed by the Expert Review Committee (ERC) and discarded as non-measles. If the information is insufficient for the ERC to make a decision, the cases will remain as clinically compatible. Cases cannot be confirmed on clinical information only; confirmation requires adequate specimens and/or epidemiological linkage.





5.4.2 Reducing the number of clinically measles compatible cases

Given that the indicator for laboratory confirmation is 80% of suspected cases, it can be expected that a maximum of 20% of suspected cases could potentially become classified as clinically compatible due to inadequate information to confirm the cases. However, the following steps can be taken to reduce the number of clinically measles compatible cases.

- Take as many adequate blood specimens as possible (aiming for 100% specimen collection rate) to confirm measles or rubella cases or discard cases as non-measles and non-rubella.
- Conduct high-quality case investigation with detailed information on each suspected case in the case investigation form to enable confirmation by epidemiological linkage of measles or rubella cases when the situation is credible.
- Request a review of selected compatible cases by ERC to enable discarding when the information available may indicate an alternative diagnosis.



5.5 EXPERT REVIEW COMMITTEE

The National Immunization Programme can establish a new committee or use an existing committee to serve as the Expert Review Committee. The purpose of the ERC is to review compatible cases to determine if they may have a diagnosis other than measles and can therefore be discarded as non-measles. Committee members should include health professionals from a variety of backgrounds, such as paediatricians, virologists, and physicians from the national public health department.

Cases for review: The Expert Review Committee should review a subset of clinically measles compatible cases that may have a diagnosis other than measles. The committee may not review all clinically measles compatible cases, since this will be too time-consuming. The committee can assign a diagnosis other than measles to clinically measles compatible cases where there is enough information to discard them as non-measles. This may not be the situation for all clinically compatible cases, many of which will remain classified as clinically compatible.

The default position will be “clinically measles compatible cases” unless the Expert Review Committee can find convincing evidence to discard a case.

The presence of clinically measles compatible cases represents a surveillance failure; it does not necessarily imply the presence of measles virus circulation.

Examples of screening considerations applied by the Expert Review Committee:

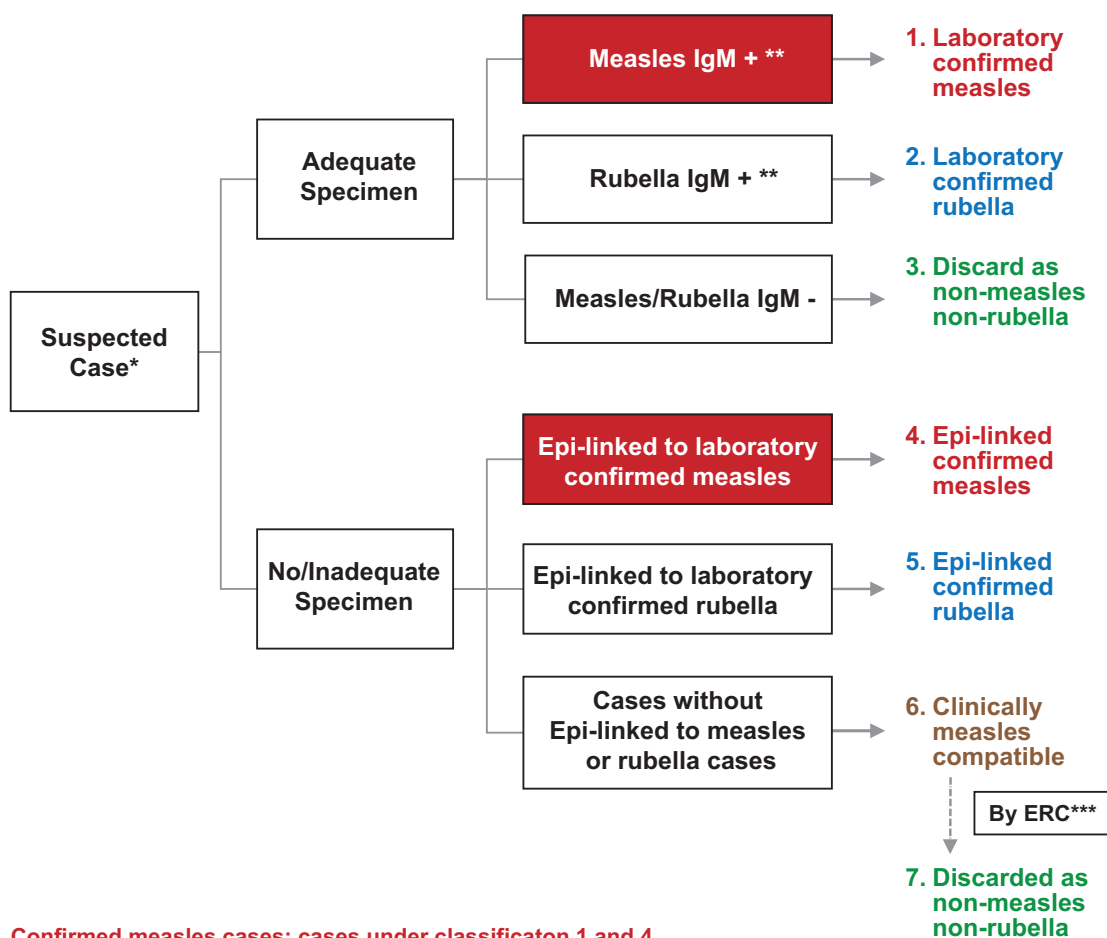
- Location of case in relation to any known outbreaks in that area
- Measles vaccination status of suspected case
- Symptoms: fever, rash, cough, coryza, conjunctivitis
- Any measles complications: diarrhoea, pneumonia
- Any other diagnosis stated by the attending paediatrician/physician
- Alternative laboratory diagnosis, e.g. dengue

Figure 1: Flow Chart for measles case classification

* Based on the national case definition of measles surveillance

** Includes other laboratory confirmatory tests

*** Expert Review Committee (ERC)





5.6 DETERMINING WHETHER A CASE IS LOCALLY ACQUIRED OR IMPORTED



Whether a case is considered locally acquired or imported, an outbreak investigation, risk assessment and response are always required.



5.6.1 Definitions

Endemic measles virus transmission: The existence of continuous transmission of indigenous or imported measles virus that persists for at least 12 months in any defined geographic area.

Endemic measles case: A laboratory- or epidemiologically-confirmed measles case resulting from endemic transmission of the measles virus.

Imported measles case: A case with virological and/or epidemiological evidence of exposure outside the concerned country prior to rash onset.

5.6.2 How to decide whether a new confirmed measles case is locally acquired or imported

Let us assume that we are in Country A trying to decide whether a recently confirmed measles case is locally acquired or imported (Figure 2). Two questions must be asked in establishing this:

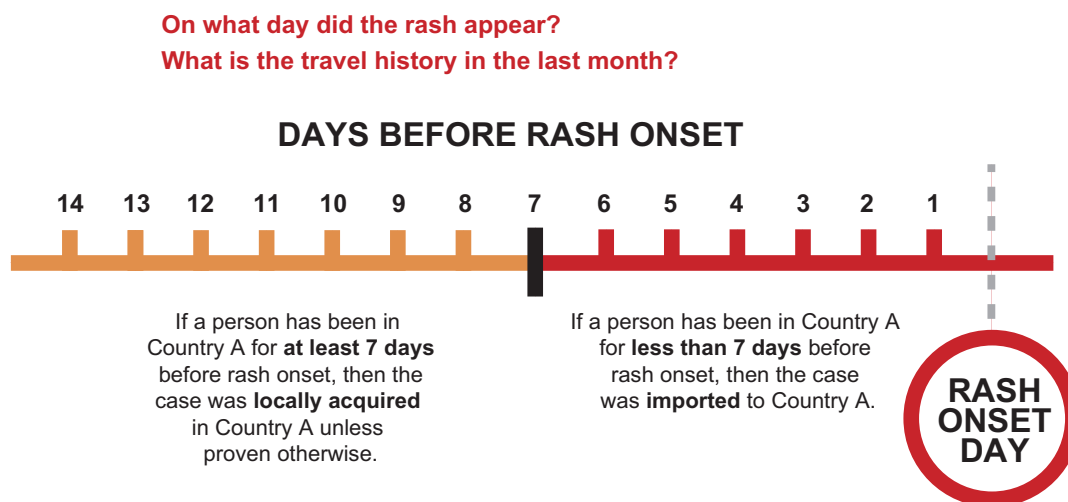
- (1) On what day did the rash appear?
- (2) What is the travel history of the person in the last month? Meaning, how long has the person been in this location, and where was he/she before?

If a person has been continuously residing in Country A for **at least seven days** before rash onset, then the case was **locally-acquired** in Country A unless proven otherwise.

If a person has been in Country A for **less than seven days** before rash onset, then the case was **imported** to Country A.



Figure 2: Determining whether measles cases are locally acquired or imported based on days spent outside Country A before rash onset



SCENARIO 1:

Let us assume that the answer to Question 1 is: “The rash appeared on 25 May.”

Let us assume that the answer to Question 2 is: “I have been in Country A since 1 May.”

Since this person has been in Country A for 24 days before the rash appeared, it is unlikely this person brought the measles infection with them. The person must have been infected in country A; therefore, the case was locally acquired in Country A unless proven otherwise.

SCENARIO 2:

Let us assume that the answer to Question 1 is: “The rash appeared on 15 May.”

Let assume that the answer to Question 2 is: “I have been in Country A since 10 May; before that date I was in Country B.”

This person has been in Country A for only five days before the rash appeared. Since five days is not enough time for infection and incubation inside Country A, this person brought the measles infection with them. The case was imported into Country A, possibly from Country B, unless proven otherwise.



What additional information might help to establish whether a measles case is locally acquired or imported?

- For persons who live near land border areas and frequently cross the border, more detailed investigation will be necessary.
- A clear history of contact with other measles cases or travel from an area where there is known measles virus transmission (epidemiological linkage) may be needed.
- A person without a travel history, but with contact with travellers from measles-endemic areas, may be classified as import-related but could not be considered to be imported.
- Information on virus strains that are consistent with importation or endemicity may be needed.



Making the default situation endemic virus transmission

The cut-off for imported transmission described above is a history of travel outside the country at seven days before rash onset. This means that only cases with very recent travel outside a country will be considered as imported. All others with a travel history of more than seven days before rash onset will be considered as locally acquired transmission unless proven otherwise. In other words, the default situation will be locally acquired transmission. However, countries are encouraged to carefully investigate all cases in order to gather evidence that cases with > 7 days history of travel are in fact imported and not locally acquired.

From a management point of view, under this system, countries will be encouraged to:

- make a careful investigation of all cases with travel history to understand the source of infection; and
- take appropriate action within their own borders with timely outbreak investigation and response to prevent or interrupt further transmission.

Virological strain data may not provide enough information to determine whether a case is locally acquired or imported.

A case of measles may be shown epidemiologically to have been imported, but the virological strain of the imported case may be the same virus strain that has been associated with endemic transmission in the country of importation.

Can an imported case be said to have come from Country A into Country B?

When there is clear evidence that a case has originated from an area in a country that has known measles transmission (for example, a person crossing a land border directly from Country A to Country B), it could be said that a case has been imported from Country A to Country B. This information should be shared by Country B with Country A. Sharing epidemiological data is of advantage to both countries as they can plan preventive measures immediately, and even coordinate their responses.

When there is no clear evidence that a case has originated from an area in a country that has known measles transmission (for example, a person arriving at an airport in Country B), the case cannot be said to have originated from Country A because the infection could have been contracted from persons from other countries with whom the case has had contact in transit. In these circumstances, unique virological strains may provide an indication of the likely origin of infection. **However, a virus strain may be shared by more than one country, and does not necessarily indicate the country of origin of the virus.**

5.7 INTEGRATION OF MEASLES AND RUBELLA SURVEILLANCE

Countries should integrate their measles and rubella surveillance, while acknowledging that measles is already targeted for elimination and subject to a verification process, while rubella does not yet have an elimination goal in the Western Pacific Region.

5.7.1 Integrated surveillance system

An integrated surveillance system should include the following:

- case definition for measles and rubella
- regular reporting of both measles and rubella cases
- integrated case investigation
- integrated laboratory testing of blood samples for measles and rubella
- integrated case classification to include both measles and rubella.

5.7.2 Different case definitions and their programmatic implications

Both measles and rubella will present with fever and maculopapular rash, but because of the differences between the two in other symptoms and signs, it will be difficult to have a case definition that is sensitive and specific to both measles and rubella. The consequences of various levels of sensitivity and specificity for case definition and investigation are described in the Surveillance Integration Table.

5.7.3 Integrated case investigation

Many countries have incorporated the clinical symptoms related to rubella and even congenital rubella syndrome into the case investigation form that was originally designed for measles. All countries are encouraged to do so.

5.7.4 Integrated laboratory testing

Given the priority of achieving the regional measles elimination goal, it is recommended that countries should first test samples for measles IgM, and if negative, should test for rubella. However, since combined measles and rubella infection is



possible, countries may consider testing samples for both measles and rubella for every suspected case, although this will be slightly more expensive.

5.7.5 Integrated case classification

Figure 1 provides a flow chart for classification of suspected measles and suspected rubella cases. Measles and rubella cases are classified using the same system of confirmation by laboratory testing and epidemiological linkage. Twenty per cent of all suspected measles cases could end up as clinically measles compatible if only 80% of suspected cases have adequate specimens according to the indicator. In order to reduce the number of clinically measles compatible cases, countries should make strong efforts to collect as many specimens as possible and establish epidemiological linkage for measles and rubella cases wherever applicable. This will require good case investigation with full details recorded in the case investigation forms.

Surveillance Integration Table: Options of case definitions and programmatic implications

Case definition and investigation	Advantages	Disadvantages
<p>Option 1: Suspected measles case</p> <p>Fever, maculopapular rash and any of the following: cough, coryza, conjunctivitis; or any case for which a health worker suspects measles infection</p>	<p>Sensitive and specific to measles.</p> <p>Presents less workload than Options 2 and 3, and thus suits surveillance systems with relatively limited resources (human and financial).</p>	<p>Not sensitive to rubella so more rubella cases will be missed compared to the other two options.</p> <p>May present a challenge for community or health centre staff to apply compared with a simpler case definition of acute fever and rash (AFR).</p>
<p>Option 2: Acute fever and rash case</p> <p>Fever, maculopapular rash or any case for which a health worker suspects measles or rubella infection</p>	<p>Sensitive to both measles and rubella.</p> <p>Simple and easy to use at every level of the health system.</p>	<p>Low specificity for both measles and rubella.</p> <p>More resources will be needed to manage surveillance systems as a higher number of suspected cases will be reported. It can present a challenge to surveillance systems with limited resources.</p>
<p>Option 3: Suspected measles or rubella case</p> <p>Fever, maculopapular rash and any of the following: cough, coryza, conjunctivitis, cervical and/or suboccipital and/or postauricular adenopathy, or arthralgia/arthritis, or any case for which a health worker suspects measles or rubella infection</p>	<p>More specific to measles and rubella than with AFR; meanwhile potentially excludes other fever and rash diseases.</p> <p>Can capture both measles and rubella cases; meanwhile prevents overload of surveillance systems.</p>	<p>This definition is complex and thus is likely to be challenging to apply at some levels of the health system (particularly at health centre and community level).</p>

6. Developing and Implementing a National Action Plan

Every country should develop and update a national plan of action for achieving and sustaining measles elimination, based upon regular programmatic risk assessment.

6.1 PROGRAMMATIC RISK ASSESSMENT

The risk assessment should:

- (1) highlight the strengths and weaknesses of the National Immunization Programme that are linked to maintaining high routine and/or supplementary immunization coverage and high-quality surveillance; and
- (2) encourage the preparation of budgeted preparedness plans for needed responses to measles outbreaks caused either by endemic or imported measles virus.

The sources of information can include the annual Joint Reporting Form on Immunization, comprehensive multi-year plans (cMYP) for immunization, national Expanded Programme on Immunization (EPI) reviews and other sources. Every risk assessment activity should be documented with detailed findings emphasized, serving as a good basis for references.

6.2 KEY ELEMENTS OF THE PLAN

While it is not necessary to develop new plans for measles elimination, it will be useful for countries to undergo an assessment of their current situation with identification of problems and corrective action that will be taken.

The national action plan would include detail on activities for achieving high population immunity sufficient to sustain measles elimination, conducting adequate outbreak preparedness and response, and ensuring appropriate surveillance and laboratory performance. A budget with line items for supplies and operational costs needed for outbreak response should be part of the national plan of action.





For operational purposes, the measles elimination plan would be a plan of action with prioritized activities, updated regularly on the basis of programmatic risk assessment.



Form 6 gives an example of how a situation analysis can be carried out in preparation for making a national plan of action, while Form 7 provides a template for a national action plan to achieve and sustain measles elimination. Form 6 is designed to provide a picture of the current situation in a country and the actions that will be taken to improve the situation and achieve elimination. The form is not exhaustive in its scope, but may be sufficient to serve as a checklist while not requiring a new plan to be developed. Having completed this table, the actions proposed can be translated into activities and placed in the template of the country action plan to achieve measles elimination.



There should be system or mechanism in place to monitor and review progress made against planned activities. Monitoring and review should be conducted regularly and documented.



Form 6: Situation analysis: Preparing for a national measles elimination action plan

Programmatic area		Strengths	Weaknesses	Action
Routine immunization	MCV1 coverage at district level			
	MCV2 coverage at district level			
Supplementary immunization	Planned SIAs and their extent			
High-risk community	Districts have identified high-risk communities			
	Health centre microplanning to reach high-risk communities for routine immunization			
	Monitoring and supervision system in place for high-risk communities			
	Household assessments conducted in high-risk communities			
Outbreak preparedness, prevention and response	Standard operating procedures for outbreak preparedness and response developed and distributed			
	Rapid communication system established for notifying suspected cases			
	Funding mechanism identified for supplies needed in outbreak immunization response			
	Evaluation of outbreak response if outbreak occurs			
Measles surveillance	Timeliness of data reporting			
	Sensitivity of surveillance at national level			
	Representativeness of case reporting			
	Case investigation			
	Specimen collection and shipment			
	Case classification			
Laboratory performance	Laboratory accreditation status			
	Adequate laboratory management including staff and supplies			
	Virus detection and genotyping results			
	Timeliness of testing/reporting within 4 days			
	Timely feedback reports			
Advocacy	High-level political support for measles elimination			
	National measles task force established			
	Province- and district-level awareness and support for measles elimination			
	Partner involvement and support			
	Community and health centre awareness and support for measles immunization			
Communication	Communication material available to support measles elimination			
	Media messages developed for outbreak response			
	Budget line items for vaccine, injection safety and operational costs			
Monitoring and evaluation	Monitoring of surveillance quality at 1st and 2nd administrative level			
	Monitoring health centre microplans for high-risk communities			
	Monitoring charts display MCV1 and MCV2 coverage			
	Availability of maps of high-risk communities			
Verification	Prepare for progress report			
	Two meetings of national verification committee per year with minutes available			

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8. Annexes

Annex 1: Definitions


Word or phrase	Definition
Measles eradication	Worldwide interruption of measles virus transmission in the presence of a surveillance system that has been verified to be performing well.
Measles elimination	The absence of endemic measles transmission in a defined geographical area (e.g. region or country) for ≥ 12 months in the presence of a well-performing surveillance system. <i>Note: verification of measles elimination takes place after 36 months of interrupted endemic measles virus transmission.</i>
Endemic measles virus transmission	The existence of continuous transmission of indigenous or imported measles virus that persists for ≥ 12 months in any defined geographical area.
Endemic measles case	Laboratory-confirmed or epidemiologically-linked cases of measles resulting from endemic transmission of measles virus.
Re-establishment of endemic transmission	Occurs when epidemiological evidence, supported where possible by laboratory evidence, indicates the presence of a chain of transmission of a virus strain that continues uninterrupted for ≥ 12 months in a defined geographical area (region or country) where measles had been previously eliminated. <i>Note: A measles virus strain is identified by sequencing the WHO standard 450 nt region of the N gene for measles.</i>
Measles outbreak in an elimination setting	A single laboratory-confirmed case
Suspected case of measles	A patient in whom a health-care worker suspects measles infection or a patient with fever and maculopapular (non-vesicular) rash
Laboratory-confirmed measles case	A suspected measles case that has been confirmed by a proficient laboratory. <i>Note: A proficient laboratory is one that is WHO accredited and/or has an established quality assurance programme with oversight by a WHO accredited laboratory.</i>





Word or phrase	Definition
Epidemiologically-linked measles case	A suspected measles case that has not been confirmed by a laboratory but temporally and geographically related, with dates of rash onset occurring between 7 and 21 days apart, to a laboratory-confirmed case or, in the event of a chain of transmission, to another epidemiologically-linked measles case.
Clinically measles compatible case	A case with fever and maculopapular (non-vesicular) rash and one of cough, coryza, or conjunctivitis, for which no adequate clinical specimen was taken and which has not been linked epidemiologically to a laboratory-confirmed measles case or another laboratory-confirmed communicable disease.
Non-measles non-rubella case	A suspected case that has been investigated and discarded as a non-measles and non-rubella case using (1) laboratory testing in a proficient laboratory or (2) epidemiological linkage to a laboratory-confirmed outbreak of another communicable disease that is neither measles nor rubella.
Measles vaccine-associated rash illness	A person with all five of the following criteria: (1) the patient had a rash illness, with or without fever, but did not have cough or other respiratory symptoms related to the rash; (2) the rash began 7–14 days after vaccination with a measles-containing vaccine; (3) the blood specimen, which was positive for measles IgM, was collected 8–56 days after vaccination; (4) thorough field investigation did not identify any secondary cases; and (5) field and laboratory investigations failed to identify other causes. Alternatively, a suspected case from which virus was isolated and found on genotyping to be a vaccine strain (e.g. strain A).
Imported measles case	A case exposed outside the region or country during the 7–21 days prior to rash onset and supported by epidemiological or virological evidence, or both. <i>Note: For cases that were outside the region or country for only a part of the 7–21 day interval prior to rash onset, additional evidence including a thorough investigation of contacts of the case, is needed to exclude a local source of infection.</i>
Importation-related measles case	A locally acquired infection occurring as part of a chain of transmission originating from an imported case as supported by epidemiological or virological evidence, or both. <i>Note: If transmission of measles cases related to importation persists for ≥ 12 months, cases are no longer considered to be import-related; they are endemic.</i>
Unknown source measles case	A confirmed case for which an epidemiological or virological link to importation or to endemic transmission cannot be established after a thorough investigation.

Annex 2: Regional Committee Resolution on Measles Elimination, 2012 (WPR/RC63.R5)



WORLD HEALTH ORGANIZATION ORGANISATION MONDIALE DE LA SANTÉ

R E S O L U T I O N

REGIONAL COMMITTEE FOR THE WESTERN PACIFIC COMITE RÉGIONAL DU PACIFIQUE OCCIDENTAL

WPR/RC63.R5
27 September 2012

ELIMINATION OF MEASLES AND ACCELERATION OF RUBELLA CONTROL

The Regional Committee,

Recalling resolutions WPR/RC54.R3 that called for measles elimination, WPR/RC56.R8 that established the target year of 2012, and WPR/RC61.R7 that reaffirmed the 2012 measles elimination goal and called for acceleration of rubella control;

Recalling the May 2012 resolution WHA65.17 endorsing the Global Vaccine Action Plan that calls for achieving and sustaining high and equitable vaccine coverage;

Acknowledging the dramatic decline in the number of measles cases from almost 146 000 in 2008 to 21 000 (an 86% reduction) in 2011; and that measles transmission continues in few countries in 2012 and continues to decrease;

Recognizing the Region is now on the verge of eliminating measles and could be the second Region to achieve measles elimination;

Noting the Western Pacific Regional Verification Commission on Measles Elimination has been established, and the verification mechanism has been elaborated in consultation with Member States;



WPR/RC63.R5
page 2

Aware that three years will be required for national and regional verification from the last endemic measles case, to demonstrate the achievement is sustainable;

Mindful of various opportunities to synergize measles elimination and rubella control activities,

1. REAFFIRMS its commitment to eliminate measles and accelerate rubella control in the Western Pacific Region;
2. URGES Member States:
 - (1) to interrupt all residual endemic measles virus transmission as rapidly as possible, through ensuring high population immunity with measles vaccine;
 - (2) to implement effective immunization strategies to identify and reach all vulnerable underserved communities in both rural and urban settings;
 - (3) to enhance systems and capacity for preparedness, rapid detection and response to measles outbreaks whether caused by an endemic or imported virus, to prevent the spread and re-establishment of measles virus transmission;
 - (4) to improve sensitivity and performance of epidemiological surveillance and laboratory capacity to identify the source of infection, and demonstrate the absence of endemic transmission, for eventual verification;
 - (5) to establish national verification committees that develop regular progress reports for submission to the Regional Verification Commission;
 - (6) to further accelerate control of rubella and prevention of congenital rubella syndrome through integration of measles and rubella immunization and surveillance activities;

WPR/RC63.R5
page 3

REQUESTS the Regional Director:

- (1) to continue supporting Member States in their efforts to eliminate measles;
- (2) to continue advocating for measles elimination, seek additional resources to achieve and sustain measles elimination and accelerate rubella control;
- (3) to enhance international collaboration in measles elimination across regions and national borders;
- (4) to report progress to the Regional Committee.

Sixth meeting, 27 September 2012





Annex 3: World Health Assembly Resolution on Global Vaccine Action Plan, 2012 (WHA 65.17)

SIXTY-FIFTH WORLD HEALTH ASSEMBLY

WHA65.17

Agenda item 13.12

26 May 2012

Global vaccine action plan

The Sixty-fifth World Health Assembly,

Having considered the report on the draft global vaccine action plan;¹

Recognizing the importance of immunization as one of the most cost-effective interventions in public health, which should be recognized as a core component of the human right to health;

Acknowledging the remarkable progress made in immunization in several countries to ensure that every eligible individual is immunized with all appropriate vaccines, irrespective of geographical location, age, gender, disability, educational level, socioeconomic level, ethnic group or work condition;

Applauding the contribution of successful immunization programmes in achieving global health goals, in particular in reducing childhood mortality and morbidity, and their potential for reducing mortality and morbidity across the life-course;

Noting that the introduction of new vaccines targeted against several important causes of major killer diseases such as pneumonia, diarrhoea and cervical cancer can be used as a catalyst to scale up complementary interventions and create synergies between primary health care programmes; and that beyond the mortality gains, these new vaccines will prevent morbidity with resulting economic returns even in countries that have already succeeded in reducing mortality;

Concerned that, despite the progress already made, disease eradication and elimination goals such as the eradication of poliomyelitis, the elimination of measles, rubella, and maternal and neonatal tetanus cannot be met without achieving and sustaining high and equitable coverage;

Concerned that low-income and middle-income countries where the adoption of available vaccines has been slower may not have the opportunity to access newer and improved vaccines expected to become available during this decade;

Alarmed that globally routine immunization services are not reaching one child in five, and that substantial gaps persist in routine immunization coverage within countries;

Recalling resolutions WHA58.15 and WHA61.15 on the global immunization strategy,

¹ Document A65/22.



WHA65.17

1. ENDORSES the Global Vaccine Action Plan;
2. URGES Members States:
 - (1) to apply the vision and the strategies of the Global Vaccine Action Plan in order to develop the vaccines and immunization components of their national health strategy and plans, paying particular attention to improving performance of the Expanded Programme on Immunization, and according to the epidemiological situation in their respective countries;
 - (2) to commit themselves to allocating adequate human and financial resources to achieve the immunization goals and other relevant key milestones;
 - (3) to report every year to the regional committees during a dedicated Decade of Vaccines session, on lessons learnt, progress made, remaining challenges and updated actions to reach the national immunization targets;
3. REQUESTS the Director-General:
 - (1) to foster alignment and coordination of global immunization efforts by all stakeholders in support of the implementation of the Global Vaccine Action Plan;
 - (2) to ensure that the support provided to the Global Vaccine Action Plan's implementation at regional and country level includes a strong focus on strengthening routine immunization;
 - (3) to identify human and financial resources for the provision of technical support in order to implement the national plans of the Global Vaccine Action Plan and monitor their impact;
 - (4) to mobilize more financial resources in order to support implementation of the Global Vaccine Action Plan in low-income and middle-income countries;
 - (5) to monitor progress and report annually, through the Executive Board, to the Health Assembly, until the Seventy-first World Health Assembly, on progress towards achievement of global immunization targets, as a substantive agenda item, using the proposed accountability framework to guide discussions and future actions.

Tenth plenary meeting, 26 May 2012
A65/VR/10

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Annex 4: Definitions and calculation formulas for surveillance indicators



1. Completeness and timeliness of data reporting

Proportion of surveillance units reporting measles data to the national level (completeness) and on time (timeliness, e.g. by 10th every month)

$$\text{Completeness of data reporting} = \frac{\text{Number of reports received (by end of a subsequent month)}}{\text{Number of expected reports for the current reporting period}}$$

$$\text{Timeliness of data reporting} = \frac{\text{Number of reports received by a defined date (e.g. 10th of a subsequent month)}}{\text{Number of expected reports for the current reporting period}}$$

2. National reporting rate of non-measles non-rubella case

Annual reporting rate of non-measles non-rubella cases at national level

$$\text{National reporting rate of non-measles non-rubella case} = \frac{\text{Cases classified as non-measles non-rubella}}{\text{Total population}} \times 100\,000$$

See **Page 47** for Case Classification System.

3. Representativeness of case reporting

Proportion of second-level subnational units reporting ≥ 2 non-measles non-rubella cases per 100 000 population.

$$\text{Representativeness of case reporting} = \frac{\text{Number of second-level units reporting } \geq 2 \text{ non-measles non-rubella cases per 100 000 population}}{\text{Total number of second-level reporting units}}$$



4. Adequate case investigation rate

Proportion of suspected cases with investigation initiated within 48 hours of notification, with collection of ALL 10 core variables

$$\text{Adequate case investigation rate} = \frac{\text{Number of suspected cases investigated within 48 hours of notification with all 10 core variables available}}{\text{Total number of suspected cases}}$$

Ten core variables include: (1) case identification; (2) date of birth/age; (3) sex; (4) place of residence; (5) vaccination status or date of last vaccination; (6) date of rash onset; (7) date of notification; (8) date of investigation; (9) date of blood specimen collection; and (10) place of infection or travel history. If information on any of those core variables is missing, investigation will be considered inadequate.

5. Adequate collection rate for blood specimens

Proportion of suspected cases (excluding epidemiologically-linked cases) with adequate specimen collection

$$\text{Adequate collection rate for blood specimens} = \frac{\text{Number of suspected cases with blood specimens collected within 28 days after rash onset}}{\text{Total number of suspected cases – Epi-linked cases}}$$

6. Timeliness of blood specimen transport

Proportion of specimens received at the designated laboratory within 5 days of collection

$$\text{Timeliness of specimen transport} = \frac{\text{Number of specimens transported within 5 days of collection}}{\text{Total number of specimens collected}}$$



7. Timeliness of reporting laboratory blood specimen results

Proportion of results reported by the designated laboratory within 4 days of specimen receipt

$$\text{Timeliness of reporting laboratory results} = \frac{\text{Number of specimens with laboratory results reported within 5 days of specimen receipt}}{\text{Total number of specimens received}}$$

8. Measles viral detection rate

Proportion of laboratory-confirmed measles virus chains of transmission with genotypic data available.

$$\text{Measles virus detection rate} = \frac{\text{Number of chains of transmission with genotypic data}}{\text{Total number of chains of transmission}}$$

9. Infection Source

Proportion of confirmed measles cases with known source of infection (endemic, imported, or import-related).

$$\text{Infection Source} = \frac{\text{Number of confirmed measles cases with known source of infection}}{\text{Total number of confirmed measles cases (laboratory-confirmed and Epi-linked cases)}}$$

Annex 5: Tips on conducting high-quality, non-selective supplementary immunization activities

Component	Some best practices for measles SIAs
Service delivery	<ul style="list-style-type: none"> • Identify high-risk communities and give them special attention including more teams and house-to-house action. • Connect teams to supervisor by mobile phone. • Make posts convenient for population and volunteers, not just for staff. • Define roles for village volunteers: making posts, lists, crowd management, communication and mobilization. • Carefully screen children for age. • Review immunization cards for recording status.
Communication	<ul style="list-style-type: none"> • Make a communication plan well in advance to suit all media. • Use well-known personalities to promote SIA. • Use village volunteers and leaders for local promotion.
Cold chain logistics supply	<ul style="list-style-type: none"> • Plan supplies well in advance. • Use highest population estimate for vaccine supply to avoid shortage. • Take daily supply plus contingency 20% in each vaccine carrier. • Separate waste and store safely before transport to central incineration area. • Keep diluent in fridge overnight before placing in vaccine carriers
Planning management supervision	<ul style="list-style-type: none"> • Ensure microplans include all communities, especially high-risk communities that may have been missed for routine immunization. • Provide all teams with clear maps and daily workplans. • Ensure supervisors are fully mobile all day. • Connect supervisors with all managers by mobile phone. • Supervisors correct problems on the spot using simple checklists. • Hold daily meetings to review progress and correct problems before the next day. • Ensure close supervision of supervisors and replace poor performers.
Monitoring and reporting	<ul style="list-style-type: none"> • Report results daily to central data manager to identify weak areas for more attention. • Conduct rapid reporting and investigation of AEFI. • Conduct wide-range RCA especially in high-risk areas. • Use RCA data as indicator of quality. • Report progress daily to national senior management. • Disseminate daily reports to province and district levels.





Annex 6: Samples for virus isolation



Recommendations for the measles and rubella session of the Fourth Meeting on Vaccine-Preventable Diseases Laboratory Networks in the Western Pacific Region, 13–14 March 2013

- (1) It is recommended that throat or nasopharyngeal swabs, nasal aspirates or 10–50 ml of urine samples should be collected as soon as possible after rash appears. Measles virus isolation is most successful when samples are collected on the first day of rash through three days following rash onset but no later than five days following rash onset.
- (2) Rubella virus can be detected in nasopharyngeal secretions from a few days before onset of rash to several days afterwards.
- (3) Samples for virus isolation should be collected at the first contact with a suspected case of measles when the serum sample for diagnosis is drawn.
- (4) It is important to transport the samples to the laboratory with cold packs as soon as possible following sample collection since both measles and rubella viruses are sensitive to heat.
- (5) For urine sampling, it is preferable to obtain the first urine passed in the morning. About 10–50 ml should be collected in a sterile container and held at 4–8°C before centrifugation and must not be frozen before the concentration process.

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