

Republic of Iraq
Ministry of Health
Expanded program on immunization

Measles & Rubella Surveillance Field Manual



For Communicable Diseases Surveillance Staff
WHO-MOH IRAQ 2009





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Acknowledgment

It is a great honor for WHO and the Iraqi MoH to present the measles elimination field guide. The guide deals with measles as a matter of public health importance and maps out set goals and strategies for outbreak response and prevention and control. It also highlights the use of MCV (measles-containing vaccine) to mitigate the risks of a large-scale outbreak.

The WHO guidance on measles outbreak response published in 1999 emphasized that most outbreaks were either detected too late or had spread too rapidly to allow for an effective immunization response. This guide reviews the validity of this recommendation along with recent evidence concerning the impact of early outbreak response and the positive impact of rapid intervention and nationwide MCV campaigns in averting large-scale outbreaks.

The monitoring of routine MCV coverage accompanied by a well established case-based surveillance system for all fever & rash cases and prompt laboratory investigations for suspected cases will be sensitive enough to detect early outbreaks and to coordinate early outbreak response.

We acknowledge that although routine immunization plays an integral part in building herd immunity, with the current low measles vaccine coverage, we will continue to face infrequent outbreaks due to accumulation of susceptible. Nonetheless, concurrent follow up nationwide campaigns every 34- years and the RED (reaching every district) strategy will help to booster the immunity level and minimize the risk of a 'wild' measles virus circulation.

This manual, therefore, aims to provide guidance to all surveillance staff on how to detect, report, investigate, respond and analyze measles cases and outbreaks and initiate rapid and early intervention programmes with the aim of achieving national goals. Despite working in extremely difficult circumstances, MoH staff at all levels should be commended for their active role in seeking to attain measles elimination and eradication goals.



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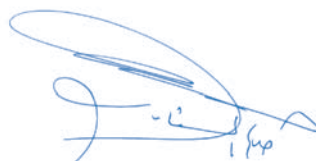
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Abbreviations

- DOH** Directorate of Health
- ELISA** Enzyme Linked Immunosorbent Assay
- EPI** Expanded Program on Immunization
- MOH** Ministry of Health
- NIDs** National Immunization Days
- ORI** Outbreak Response Immunization
- PCR** Polymerase Chain Reaction
- RT-PCR** Reverse Transcriptase Polymerase Chain Reaction
- RRL** Referral Regional Laboratory
- RPM** Round Per Minute
- WHO** World Health Organization.
- MMR** Measles Mumps and Rubella Vaccine
- MCV** Measles Containing Vaccine CRS Congenital rubella syndrome
- NML** National Measles Laboratory

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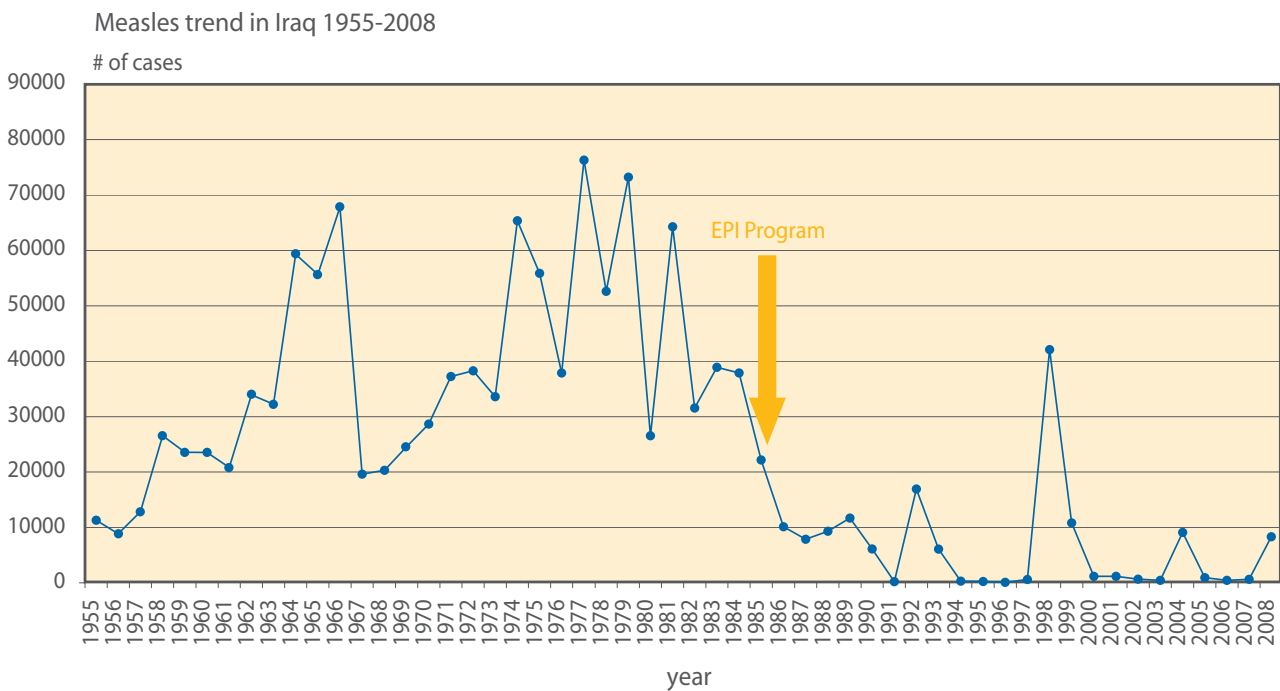


1. Introduction

Measles, rubella and congenital rubella syndrome (CRS) remain important preventable causes of infectious disease morbidity and mortality. Globally, measles accounts for more than 30 million cases and 0.9 million deaths every year. In the Eastern Mediterranean Region (EMR) nearly 11000 Measles cases and a similar number of Rubella were reported during 2007. In 2004, 70,000 deaths resulting in an estimated case fatality rate of 3%.

During the last 50 years 1,331,021 measles cases were reported from Iraq with an average of 25,114 measles cases and 7501250- measles related death every year (in an estimated case fatality rate of 3%-5%). The below figure, shows measles incidence during the period 1955 up 2008.

Measles trend in Iraq 1955-2008-



The inception of the EPI program in the early Eighties of the last century reduced the average number of measles cases from 39000 every year to 9400 cases annually. In 1997, EMRO Regional Committee set the measles elimination target “Eliminate measles virus transmission” in EMR by 2010. In May 2005, the 58th World Health Assembly adopted the WHO/UNICEF Global Immunization Vision and Strategy (GIVS). GIVS calls on countries to reduce global measles deaths by 90% by 2010 compared to 2000 estimates. The United Nations Millennium Declaration also set a child survival target: to reduce the under-five child mortality rate by two-thirds by the year 2015 compared with 1990 levels. Routine measles vaccination coverage is an indicator for this target.

Following Iraq adoption and implementation of measles Elimination Strategies in 2004 the average annual reported measles cases dropped from 9400 cases to around 1000 cases annually. Iraq despite all the current upheavals is fully committed to the measles elimination goal and is determined to eliminate the indigenous transmission of measles by 2010. One of the strategies for reducing measles mortality is enhancing measles surveillance with integration of epidemiological and laboratory information. As the number of cases of measles declines, the importance of surveillance will become even greater. It will be more and more crucial that all

suspected cases of measles be reported, and samples from cases be submitted for full laboratory investigation. Specific performance indicators were developed to regularly monitor the program progress and sensitivity. This manual provide mid-level and field staff with step by step guidance for planning and running a surveillance system for measles elimination.

2. The diseases

2.1. Measles

The organism: Measles is an acute illness caused by a virus of the genus *Morbillivirus* of the *Paramyxoviridae* family, humans are the only reservoir for measles virus.

The virus is antigenically stable (there is no evidence that the viral antigens have significantly changed over time). The measles virus is sensitive to ultraviolet light, heat, and drying.

Transmission: Transmission is primarily person-to-person via aerosolized droplets or by direct contact with the nasal and throat secretions of infected persons. Individuals with measles are infectious 2 -4 days before through 4 days after rash onset. Measles is highly infectious (with >90% secondary attack rates among susceptible persons) and the disease spreads easily in areas where infants and children gather, for example in health centers and schools. The virus can remain suspended in the air of the room contaminated by a case for 2 hours following departure of the case. Health facility and surveillance staff should be aware of this fact. Conditions, such as high birth rates, overcrowding and the influx of large numbers of susceptible children from rural areas can facilitate measles transmission.

Clinical features: After an *incubation* period of about 10 to 12 days (range 7-18 days), prodromal symptoms of fever, malaise, cough, coryza (runny nose), and conjunctivitis appear in non-immune persons exposed to the virus. Koplik spots may occur on the buccal mucosa shortly after the onset of rash and for about 12- days after. Within 2 -4 days of the prodromal symptoms, a rash made up of large, blotchy red spots (maculo-papular rash) appears behind the ears and on the face accompanied with a high fever. The rash spreads to the trunk and extremities and typically lasts 3-7 days and may be followed by a fine desquamation. An asymptomatic carrier state has not been documented. Measles-specific immunoglobulin antibodies (IgM) usually appear within four days after onset of the rash and can persist up to 12- weeks. Modified forms of measles, with generally mild symptoms, may occur in infants who still have partial protection from maternal antibody, and occasionally in persons who only received partial protection from the vaccine.

can be safely and effectively administered to children with mild acute illnesses, such as low fever, diarrhea, and upper respiratory tract infections. However, severely ill children with high fevers should not be vaccinated until they have recovered.

There are only two contraindications to measles vaccination:

- People who have experienced an anaphylactic or severe hypersensitivity reaction to a previous dose of MMR vaccine or its component vaccines or who have experienced an anaphylactic reaction to neomycin should not be vaccinated.
- In countries where human immunodeficiency virus (HIV) infection is prevalent, infants and children should be immunized with the EPI antigens according to standard schedules. However, patients with severe immunosuppression caused by HIV infection or another condition (e.g., congenital immunodeficiency, hematologic or generalized malignancy) should not be vaccinated. Since MMR vaccine and its component vaccines contain live viruses, they should not be administered to pregnant women. This contraindication is based on theoretical reasons, as there is currently no evidence to suggest that children born to pregnant women who received these vaccines during pregnancy are adversely affected.

Iraq routine immunization schedules recommend that the first dose of measles vaccine be administered to children age ≥ 9 months. All infants vaccinated before their first birthday must receive another dose of measles-containing vaccine at 15 months of age and at least one month after the first dose of measles vaccine. If an importation or an outbreak occurs and a significant proportion of the cases are among infants aged less than 9 months, consideration may be given to lowering the age of measles vaccination to 6 months. The combined measles-mumps-rubella (MMR) vaccine is preferred to ensure that immunity is obtained against all three viruses. The use of MMR vaccine in measles campaigns will result in the reduction of rubella and mumps circulation among children and decrease the incidence of CRS if the coverage is high. If the coverage is low, it may increase the risk of CRS.

Immunity: Natural infection produces lifelong immunity. Infants born to mothers who have either had measles or been vaccinated are protected by trans-placentally acquired maternal antibodies. This passive immunity protection lasts six to nine months on average.

Changing Epidemiology:

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries in the following aspects:

- As vaccine coverage has increased, there has been a marked reduction in measles incidence.
- The average age at which infection occurs has increased.
- There is increase in the number of years between epidemics.
- Even in areas where vaccine coverage rates are high, outbreaks may still occur. Periods of low incidence (the "honeymoon" effect) may be followed by a pattern of periodic measles outbreaks. Outbreaks are generally due to the accumulation of persons susceptible to measles virus, including both unvaccinated persons and those who were vaccinated but failed to seroconvert. Approximately 15% of children vaccinated at 9 months of age and 5%–10% of those vaccinated at 12 months of age fail to seroconvert, and are thus not protected after vaccination.

Treatment: There is currently no specific treatment for measles infection. Administration of vitamin A to children with measles has been shown to decrease both the severity of disease and the case-fatality rate, and the World Health Organization (WHO) recommends that vitamin A be administered to all children with acute measles. One dose (50,000 I.U. for infants aged less than 6 months, 100,000 I.U. for infants aged 6–11 months, and 200,000 I.U. for children aged ≥ 12 months) should be administered on the day of measles diagnosis and one dose should be administered the following day.



2.2. Rubella and congenital rubella syndrome

The organism: Rubella is an acute illness caused by an RNA virus of the family *Togaviridae*. Transmission: The rubella virus, while less contagious than that of measles, is also transmitted by respiratory droplets and by direct contact with the nasal and throat secretions of infected persons. While individuals with rubella may shed virus from 7 days before to 14 days after the onset of rash, 25% to 50% of infections are asymptomatic.

Clinical features: Rubella is a common cause of maculo-papular rash illness with mild fever. Symptoms in children and adults are often mild: up to 50% of infections may be sub-clinical or unapparent. In children, rash is usually the first manifestation and a prodrome is rare. In older children and adults, there is often a 15-day prodrome with low-grade fever, malaise, lymphadenopathy, and upper respiratory symptoms preceding the rash. The rash of rubella usually occurs initially on the face and then progresses from head to foot. It lasts about 3 days and is occasionally pruritic. The rash is fainter than measles rash and does not coalesce. Lymphadenopathy may begin a week before the rash and last several weeks. Post-auricular, posterior cervical, and sub-occipital nodes are commonly involved.

The disease has few complications unless it is contracted by a pregnant woman. The outcome of a primary rubella infection during pregnancy includes: spontaneous abortion; stillbirth/fetal death; infant born with CRS; infant born with congenital rubella infection without congenital defects; and birth of a normal infant. Joint symptoms are seen in up to 60% of adult women with rubella.

Differential diagnosis: The differential diagnoses include measles, dengue, parvovirus B19, human herpesvirus 6, Coxsackie, Echo, Ross River, Chikungunya, enteroviruses, adenoviruses, and *Streptococcus* group A (Beta hemolytic).

Immunity: Rubella-specific IgG is a long-term marker of previous rubella infection; IgG begins to rise after the onset of the rash, peaks about four weeks later, and generally lasts for life. Immunity can be acquired through immunization as well and it has been presumed to be life long. Infants born to immune mothers are ordinarily protected for 69 months depending on the amount of maternal antibodies acquired transplacentally.

The vaccine: The rubella vaccine widely used around the world is based on the live attenuated virus. Rubella antibody develops in 95% or more of vaccinees 2128 days after vaccination. One dose of rubella vaccine probably provides lifelong immunity in more than 90% of people immunized. The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection. Two approaches are recommended for CRS prevention – prevention of CRS only (through immunization of adolescent girls and/or women of childbearing age), and elimination of rubella as well as CRS (through universal vaccination of infants with/without mass campaigns, surveillance, and assuring immunity in women of childbearing age).

Congenital Rubella Syndrome: A rubella-infected fetus carried to term may be born with CRS. Infection with rubella virus can be disastrous in early gestation. The virus may affect all organs and cause a variety of congenital defects. Up to 85% of infants infected in the first trimester of pregnancy will be found to be affected if followed after birth. While fetal infection may occur throughout pregnancy, defects are rare when infection occurs after the 20th week of gestation. Some defects associated with CRS may be recognizable at birth, while others are detected months or even years later.

CRS manifestations may be transient (e.g. purpura), permanent structural manifestations (e.g. deafness, central nervous system defects, congenital heart disease, cataract), or late-emerging conditions (e.g. diabetes mellitus). At birth, the serum of an infant with CRS contains maternally derived rubella-specific IgG antibodies as well as

IgG and IgM antibodies synthesized by the fetus. Maternal rubella-specific IgG is also found in normal infants born to women who are immune to rubella. Infected infants also shed virus and can transmit rubella virus causing outbreaks. Infants with CRS may shed RV from body secretions for up to 27 months, although most infants no longer shed after one year of age (Infants that shed RV are infectious, and rubella outbreaks have occurred among health-care workers caring for infants with CRS).

3. Regional strategy for measles elimination, rubella and CRS control

3.1. Strategy for measles elimination

The strategies have evolved over time and include the following key elements:

- Strengthening routine infant immunization and achieving >95% coverage with first dose of measles containing vaccine (MCV1) in all districts.
- Second opportunity for measles immunization including:
 - A one time catch-up campaign for all susceptible age cohorts
 - Follow-up campaigns every 3 to 4 years, Or
 - Introduction of a second dose of measles vaccine into the routine EPI schedule (for countries that can achieve > 90% of MCV1 coverage for three years is now).
- Strengthening surveillance for measles
In order to achieve regional measles elimination goals, one of the important strategies is establishing effective surveillance for measles including lab confirmation of cases and outbreaks, and monitoring vaccine coverage. Focus is on interruption of virus circulation.
- Optimal case management for children with measles

3.2. Regional strategy for rubella and CRS control

Countries were encouraged to use measles control activities as an opportunity to prevent CRS. However, a regional strategy for the prevention of CRS was not developed and specific recommendations for use of rubella vaccine were not elucidated. Many countries followed recommendations of the Regional Committee to prevent CRS (<1 case of CRS per 100 000 live births) by including rubella containing vaccine into measles elimination activities including 17 countries that have included rubella vaccine into the EPI schedule. Many of these countries have introduced rubella vaccine into EPI without national goals or a well-defined strategy to prevent CRS.



4. Measles and rubella/CRS surveillance objectives

A sensitive surveillance system is essential to monitor progress toward and to sustain measles elimination. The highly contagious measles virus is frequently imported into any country by persons from other countries. Each imported measles case could start an outbreak, especially if under-vaccinated groups are exposed. Surveillance and prompt investigation of cases and contacts help to halt the spread of disease. Surveillance data are used to characterize persons, groups, or areas in which additional efforts are required to reduce disease incidence. A surveillance system must be maintained even after endemic measles virus transmission has been interrupted. Besides the rapid detection of imported cases, a surveillance system that has a satisfactory record over several years will be paramount for the eventual certification of measles elimination.

4.1. Measles surveillance objectives

Surveillance data are essential for:

- Describing the characteristics of measles cases in order to understand the reasons for the occurrence of the disease and develop appropriate control measures.
- Detecting and investigating outbreaks so as to ensure proper case management, and determining why outbreaks have occurred (e.g. failure to vaccinate, vaccine failure, accumulation of susceptible persons)
- Monitoring progress towards achieving disease control and elimination goals

Measles surveillance and its objectives are:

- Identifying high-risk populations
- Determining when the next outbreak may occur because of a build-up of susceptible persons and accelerating activities beforehand
- Providing evidence that, in countries with low measles incidence, the absence of reported cases is attributable to the absence of disease rather than to inadequate detection and reporting
- Detecting any importation of virus into a community and determining whether transmission is sustained following an importation from the size, nature and duration of clusters and the genotypic diversity of circulating viral strains
- Using performance indicators to identify areas where it is necessary to strengthen surveillance

4.2. Rubella/CRS surveillance objectives

Surveillance of rubella becomes a priority when the country has set a rubella control/elimination or CRS prevention target. Usually, this occurs at the time that the country establishes a measles elimination target. Rubella /CRS surveillance objectives include:

- Identifying populations at risk and guiding vaccination strategies
- Determining where the virus is circulating
- Detecting timely cases in order to carry-out outbreak control and CRS prevention measures ° Providing evidence of the impact of interventions

5. Establishing and strengthening an integrated measles/rubella surveillance system in Iraq

Effective surveillance systems are necessary at the district, provincial and country levels. Such systems need to be country wide, sensitive and case-based. In Iraq measles reporting is mandatory, DOHs are required to utilize infrastructure of the polio eradication program to develop measles/rubella surveillance systems. Surveillance strategies should be integrated with existing disease surveillance for vaccine preventable diseases. Measles surveillance should be part of the comprehensive CDs reporting system. Core surveillance functions are case detection, reporting, investigation (including confirmation of diagnosis by timely collection of blood samples), analysis including final classification of cases, interpretation and control activities.

The National level has established standards for surveillance to achieve maximum efficiency and ensure that data are comparable throughout the country. These standards include:

- Case definitions
- Identification and reporting of measles/rubella cases
- Type of surveillance to be conducted
- Data to be collected
- Minimum data analysis
- Procedures and indicators for monitoring surveillance quality
- Routine reports to be produced
- Surveillance data dissemination and the use of data in decision-making

The Annex 1 is algorithm outlines the steps to be taken during identification, notification, investigation of suspected measles and rubella cases

5.1. Case definitions

Measles: Case definitions according to which measles cases can be classified are presented in Box 1

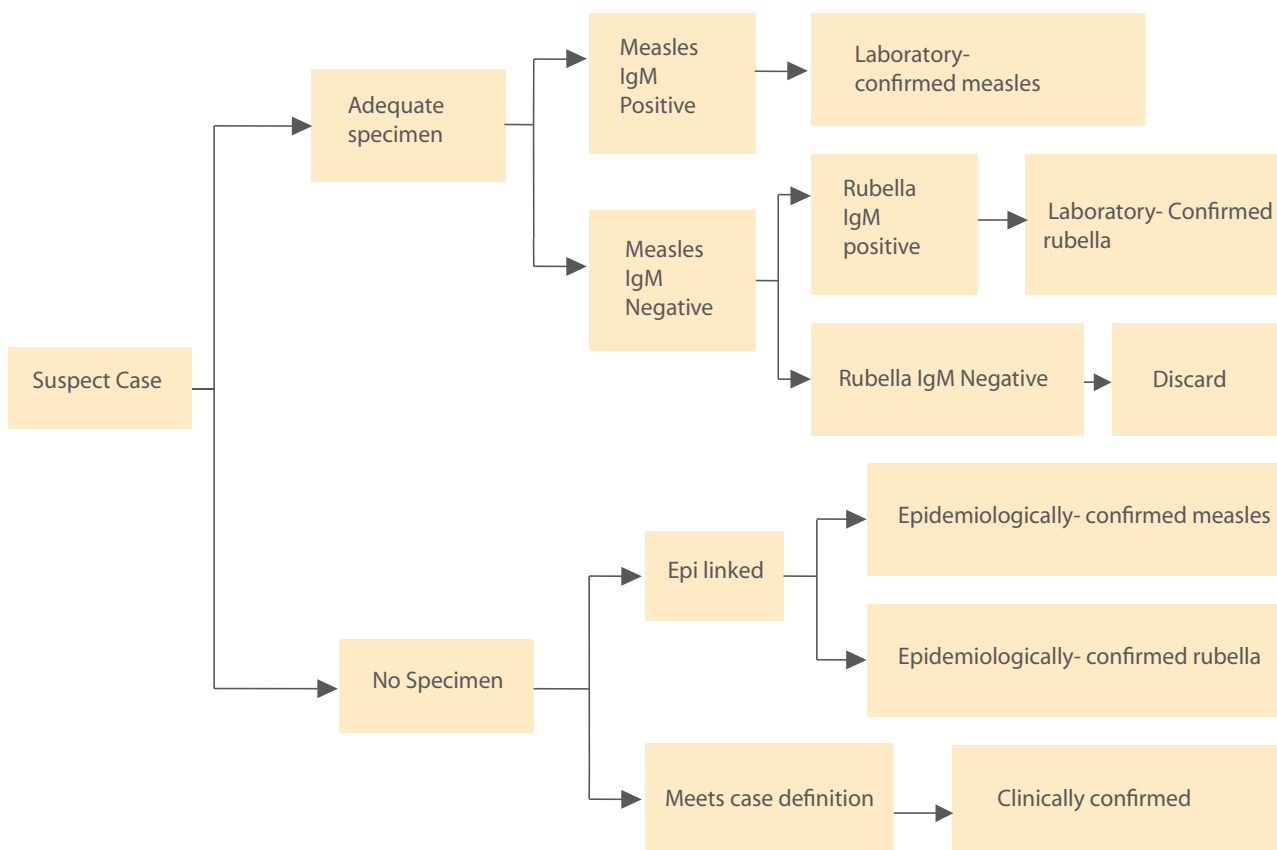


Box 1. Measles case definition

- Measles clinical definition: Any person in whom a clinician suspects measles infection Or Any person with fever and maculo-papular rash (i.e. non-vesicular), and one or more of the following: cough, coryza (i.e. runny nose) or conjunctivitis (i.e. red eyes)
- Measles laboratory criteria for diagnosis: Presence of measles-specific IgM antibodies
- Measles case classification: Clinically confirmed: A case that meets the clinical case definition Laboratory confirmed: (Only for outbreak confirmation and during the elimination phase): A case that meets the clinical case definition and that is laboratory confirmed. Epidemiologically confirmed: A case that meets the clinical case definition and that is linked epidemiologically to a laboratory-confirmed case. Epidemiologically linkage is defined here as direct contact with another laboratory confirmed measles case with rash onset occurred 718- days before the present case. Discarded: A suspect case that does not meet the clinical or lab definition

All suspected cases should be classified into one of three mutually exclusive categories, i.e., laboratory-confirmed cases, clinically confirmed cases, epi-linked cases or discarded cases by using the laboratory classification of measles/rubella (Figure I). May be discarded suspected cases that have no specimen or equivocal lab results but are also confirmed as another disease. Also, cases that are epi-linked to confirmed cases of other communicable diseases should also be discarded as non-measles (example during a rubella outbreak).

Figure I. Laboratory classification of measles/rubella scheme



The case definition given above has a high sensitivity for measles. However, suspected cases may not be “true measles cases” particularly in areas of low measles prevalence. As the incidence of measles decreases individuals meeting the case definition will increasingly have rash illnesses other than measles, such as rubella, roseola infantum, scarlet fever, etc. For these reasons, WHO recommends enhanced measles surveillance based on the serological confirmation of all suspected cases of measles once the case-load has been brought down through the implementation of effective measles control interventions.

For surveillance purposes, a **measles death** is defined as any death from an illness that occurs in a confirmed case of measles within one month of the onset of rash. The immediate and delayed complications of measles, like pneumonias, persistent diarrhea, which are mostly responsible for measles death may manifest and lead to death much later after the disappearance of the rash.

Rubella: The following case definitions are recommended for the surveillance of rubella.

Box 2: Rubella case definition

- Suspected rubella case: Any patient of any age in whom a clinician suspects rubella. The clinician should suspect rubella when a patient presents with; fever, maculopapular rash; and cervical, sub-occipital, or post-auricular adenopathy or arthralgia/arthritis
 - Clinical confirmation: Rubella cannot be confirmed clinically: laboratory confirmation is required
 - Laboratory confirmed rubella case: A laboratory confirmed case is a suspected case with a positive blood test for rubella-specific IgM. The blood specimen should be obtained within 28 days of rash onset
- Epidemiologically-confirmed rubella case: Epidemiologically linkage is defined here as direct contact with another laboratory confirmed rubella case with rash onset occurred 1223- days before the present case. Discarded: A suspect case that does not meet the clinical or lab definition.



CRS: The following case definitions are recommended for the surveillance of CRS.

Box 3. CRS case definition

- Suspected CRS case: Any infant less than one year of age in whom a clinician suspects CRS. the clinician should suspect CRS when an infant (011- months of age) presents with heart disease and/or suspicion of deafness and/or one or more of the following eye signs: cataract, diminished vision, nystagmus, squint, microphthalmus, or congenital glaucoma. A clinician should also suspect CRS when an infant's mother has a history of suspected or confirmed rubella during pregnancy, even when the infant shows no signs of CRS.
- Clinically-confirmed CRS case: An infant in whom a qualified physician detects two of the complications listed in (a) below or one in (a) and one in (b):
 - (a) Cataract(s), congenital glaucoma, congenital heart disease, loss of hearing, pigmentary retinopathy
 - (b) Purpura, splenomegaly, microcephaly, mental retardation, meningocephalitis, radiolucent bone disease, jaundice the onset of which is within 24 hours after birth
- Laboratory-confirmed CRS case: An infant with clinically-confirmed CRS who has a positive blood test for rubella-specific IgM; (100% of such infants will be positive at age 05- months, 60% at age 611- months). Where special laboratory resources are available, detection of rubella virus in specimens from the pharynx or urine of an infant with suspected CRS provides laboratory confirmation of CRS (60% of such infants shed rubella virus at age 14- months, 30% at 58- months, 10% at 911- months)
- Congenital rubella infection (CRI): When a mother has suspected or confirmed rubella in pregnancy, her infant should have a rubella-specific IgM blood test. An infant who does not have clinical signs of CRS but has a positive rubella-specific IgM test is classified as having CRI

5.2. Detecting and reporting sites

Reporting sites: the reporting sites to include in surveillance system for measles/rubella, CRS, or for vaccine-preventable diseases in integrated disease surveillance system resources. The following are suggested sites:

- Primary healthcare centers.
- Hospitals, inpatient and outpatients.
- Public health clinics. ° Private clinics and hospitals.
- Private and public laboratories.

Health facilities should detect and report cases and outbreaks using the standard case definitions. Consistent identification and notification of suspected cases is the backbone of a surveillance system, and relies on health care workers. Every health care worker should not only be familiar with the clinical presentation of measles and rubella, but with what action is required when faced with a patient suspected of measles/rubella. Health workers have three main responsibilities:

- to identify suspected measles/rubella cases,
- to secure specimens for laboratory testing,
- to notify health authorities about the suspected cases.

In order to identify CRS, reporting sites may include antenatal clinics that women visit during the first 16 weeks of pregnancy, as the risk of CRS is low in women infected after the first trimester. Surveillance for CRS should be also initiated in reference facilities treating children with cataracts, deafness or congenital heart disease, maternity hospitals, pediatric hospitals, neo-natal intensive care units, etc. CRS surveillance should be enhanced in the outbreak setting, particular in the timeframe of 612- months post-outbreak to identify births to women who may have been infected during the outbreak. Up to 50% of rubella cases may be asymptomatic so the pregnant women may not know that they had rubella.

5.3. Surveillance activities and procedures:

In establishing and conducting measles and rubella surveillance activities, the roles and responsibilities of health workers and authorities at different levels of the health care need to be defined and reporting procedures developed.

EMRO Measles Elimination indicators: Measles suspected cases reported within 7 days of onset \geq 80%

Health facilities:

- Designate one individual and one or two alternates to be responsible for keeping track of suspected measles and rubella cases and immediately reporting all new suspected measles cases.
- Investigate all suspected measles and rubella cases (Section 6). If the patient meets the case definition for measles or rubella, use the immediate notification form, case investigation algorithm, forms and line list forms (Annexes 1, 2, 3,4) and submit these forms weekly to district and/or province surveillance coordinators. Weekly reporting should be maintained using the Zero weekl report form (Annex 5) even if there are zero cases. The monthly communicable report should be used for regular reporting of cases seen.(Annex 6,7,8).
- Ensure appropriate Management of suspect measles and rubella cases by the clinicians according to (Annex 2).



- Conduct case-based measles and rubella surveillance. Case-based means that the surveillance system collects a minimum data set at national level on each case, including but not limited to information on age, gender, vaccination status, place of residence, travel history, date of rash onset, disease outcome, etc. Case-based surveillance allows for analysis of measles and rubella epidemiology to guide control efforts.
- Case-based measles and rubella surveillance implies laboratory support for confirmation at appropriate levels (510- per outbreak, all cases when approaching elimination) of the clinical diagnosis via identification of measles-specific or rubella specific IgM-antibodies and/or identification of measles or rubella virus in appropriate clinical specimens.
- Health facilities should record all suspected measles or rubella cases in communicable diseases registry book with the age and vaccination status for each case. This information should be tallied each month and sent to the district.
- The home of the suspected measles or rubella case and the surrounding area should be visited by a team from PHCs and within 48 hours from date of notification to:
 - trace the source of infection;and search for further cases
 - to conduct containing measures.

Districts:

- Respond to the needs of the reporting units and assist and supervise their work and resolve any technical problem as soon as possible by notifying the problem to the Provincial Surveillance Unit.
- Conduct periodic active case-searches to ensure that all suspected cases are identified and notified.

Active case-searches are important mainly during outbreaks and particularly important in:

- areas that do not notify cases (i.e., "silent" areas) and
- high-risk areas (large cities/slum areas/areas with low measles vaccine coverage/unreachable areas..).

Active case-searches are mainly conducted in:

- health facilities (clinics, hospitals and labs),
- institutions, schools,
- in the community.

In health facilities, registration records, discharge diagnoses, and hospital charts are reviewed to identify patients with fever and rash illnesses, such as rosela infantum and scarlet fever. In any local laboratory, the logbook should be also checked to ensure that all suspected cases are being reported promptly. If potential cases are spotted, medical records should be reviewed carefully and/or the physician or nurse who provided care to the individual should be interviewed to determine whether the patient met the criteria of a suspected measles/rubella case. If that was the case, it must then be determined if it was reported and was the object of an adequate investigation.

- Notify the provincial surveillance unit.
- Send the zero weekly and monthly report to the provincial surveillance unit and generate report based on the basic analysis applied and send it.
- Investigate and document outbreaks of measles or rubella.
- Do intense search for pregnant women exposed and potentially infected with rubella. For women that have been infected, their pregnancies need to be followed to document the outcome.

Provinces:

- Ensure adequate and proper supervision and provide technical support for Districts in their jurisdiction for guidance and corrective actions.
- Notify the national surveillance section.
- Send the zero weekly and monthly report to the surveillance section and generate report

based

on the basic analysis applied and send it.

- Coordinate with the EPI Unit to determine high risk districts and direct the needed containment measures.
° Monitor the surveillance performance using standard indicators (See section 9) and assess the surveillance program as whole by every three months.

National level:

- Supervise and provide technical support to district and provincial level activities. It will provide training, guidelines and logistic support to all levels of the surveillance program, including assistance with budgeting and finance and managerial support for all levels.
- Coordinate and integrate national surveillance activities and provide reliable surveillance data and reports to responsible public health officials.
- Confirm cases and outbreaks using IgM serologic testing (the National Measles laboratory), and organize possible shipment of specimens for viral isolation and genotyping. The national level needs to coordinate epidemic preparedness at all levels, and to be the central point for response for reported or identified outbreaks or rumored outbreaks.
- Generate a weekly and monthly reports about the current situation of vaccine preventable diseases under surveillance.
- Surveillance staff at national level should conduct monthly meetings regarding analysis, issues related to surveillance and discuss the situation and progress in all provinces and districts (such meeting can be conducted quarterly/year with staff at each province and District).
- Monitor the surveillance performance using standard indicators (Section 9). In case of delays in data transfer from any site, the coordinator has to contact the province by phone/email to urge them to send data and solve any technical problems causing delay.
- Provide surveillance data and summaries to relevant Ministry of Health's Disease control programs and officials, i.e. EPI diseases, other Communicable diseases, Control Department, Public Health Laboratories, and feedback to DOHs.



6. Investigating cases and outbreaks

Prompt recognition, reporting, and investigation of measles are important because the spread of the disease can be limited with early case identification and vaccination of susceptible contacts. In the initial stages of measles elimination efforts, the primary purpose of measles surveillance is to detect in a timely manner all areas where the measles virus is circulating, not necessarily to investigate every suspected measles case. However, once endemic transmission has become rare or has been interrupted, the surveillance goal becomes to detect and investigate all suspected measles cases and outbreaks, including those imported, and to implement activities that prevent or limit secondary transmission.

6.1. Measles case investigation

EMRO Measles Elimination indicators: % Suspected measles cases investigated within 48 hours \geq 80%

- Suspected measles or rubella cases should receive a case identification number to aid in case tracking. This case number should begin with one or more three-letter combinations to designate the geographic location, followed by the year and the case number. For example, the following case identification number (IRQ/BA/08001/) refers to case number one of 2008 for the province of Babylon in Iraq. All communications and forms related to the case should cite the identification number.
- A suspected case of measles or rubella needs to be investigated. Epidemiologists or other specially trained staff should be in charge of the investigation. Plans should be made to visit the home of the patient within 48 hours of notification and information should be collected according to the case investigation form (Annex 3).
- Serologic specimen need to be collected within the 28 days of the onset of rash. It is recommended that sample be taken at first contact with the suspected patient regardless of the day following rash onset. Investigators should collect specimens and arrange for transport of the specimen to be sent to the national reference laboratory. Serum specimens must arrive at the laboratory within five days of collection. Lab request Form should be used for each specimen completely (Annex 3).

EMRO Measles Elimination indicators: cases with blood specimen collected (exclude epidemiologically linked cases from denominator) \geq 80%

- Active case searches should be conducted. Contact tracing may identify the source of infection and determine whether other areas have been exposed. The surrounding area should be visited to find additional cases. Inquiries should be made to determine whether cases are occurring in places visited by the 'case under investigation' between 7 and 18 days prior to the onset of the rash, such as a day care center, school, or another town or village. Surveillance staff in nearby areas should be informed that a suspected case has been identified and the public should be kept well informed and community leaders should be asked to assist in case finding. Investigators should call local private medical doctors to inform them about the suspected measles/rubella outbreak and about the mandatory notification of any suspected patient, and to ask if they have seen any cases of fever and rash illness.

EMRO Measles Elimination indicators: % identification of source of $\geq 80\%$

Based on the infection source, confirmed cases should further be classified into one of four mutually exclusive categories (Box 4):

Box 4: Classification of a measles case based on the infections source

- An indigenous measles is a confirmed case which, as supported by epidemiological and/or virological evidence, was exposed as part of a chain of transmission from another indigenous case,
- An imported measles case is a confirmed case which, as supported by epidemiological and/or virological evidence, was exposed outside of country during the 718- days prior to rash onset. For rubella, the time frame is 1223- days.
- An import-related case is a confirmed case which, as supported by epidemiological and/or virological evidence, was exposed locally as part of a transmission chain initiated with an imported case.
- A case with unknown source of infection is a confirmed case for which the source of infection was not identified.

6.2. Outbreak investigations

Measles: Health facilities will be responsible for investigating clusters and conducting a good quality outbreak investigation with active case finding in the community, maintaining the line list, bringing and implementing public health measures.

- WHO-EMRO defines outbreak threshold of measles as the occurrence of 4 or more reported clinical cases of measles in a health facility OR in a given geographical area within one week. A confirmed outbreak of measles is defined as 3 or more cases of the suspected outbreak, laboratory confirmed based on positive measles IgM. However, for countries at the elimination phase, a single laboratory-confirmed measles case is considered to be a confirmed measles outbreak. This threshold value should trigger an outbreak investigation to determine the true size and reason for the outbreak.
- All outbreaks should be reported and thoroughly investigated using WHO guidelines outbreak investigations.

EMRO Measles Elimination indicator: investigating all suspected measles outbreaks

- The health facility surveillance focal person should notify the district team about the occurrence of clusters of cases using the quickest available means of communication (phone, fax, e-mail etc).
- The district team should conduct the outbreak investigation. All cases need to be investigated to confirm that cases meet clinical case definition and to assess the extent of the suspected outbreak and identify the population at risk. This is best done by health workers (trained to identify clinical measles cases) using a standard form, seeking details on cases and contacts (Annex 3). If there are more than 10 suspected cases in each single area, the household visits should be reduced or eliminated, depending upon the availability of investigators. However, the Suspected Case Line-listing (Annex 4) should be filled out for each suspected case and particular attention paid to obtaining basic demographic data, including the age and vaccine history of the patient.



- Laboratory investigation of all suspected measles cases is mandatory. Blood specimen should be collected from 5–10 patients for IgM confirmation and urine or nasopharyngeal specimens collected from 5–10 patients for viral isolation or detection and genotyping. This information will be valuable in tracking measles virus circulation and establishing virus importation.
- Once outbreak is confirmed (or before, if circumstances indicate), surveillance staff should immediately notify other health facilities, clinicians, surveillance staff in near-by areas and surveillance staff at district and provincial level. Active surveillance and case-finding need to be intensified in the area and near-by areas. The district team needs to create a line-listing of all subsequent cases to record the age, vaccination status, address, date of rash onset, outcome, and case ID number (Annex 4). Provincial staff should notify national authorities about the outbreak, and inform the community with public health messages regarding appropriate treatment of cases, immunization and other control measures.
- Outbreak confirmation should trigger appropriate responses:
 - 1 immediate case management,
 - 2 isolation of cases,
 - 3 vaccination in near by and surrounding areas where disease yet not reached,
 - 4 Contacts who have not received two doses of vaccine should be considered susceptible. Susceptible contacts should be vaccinated immediately, and investigators are urged to consider whether to isolate them and prevent them from attending school, work, or other large gatherings, such as mosques, churches, clubs, and baby-sitting groups.
- Outbreak response immunization may be justified only in enclosed communities like in schools, refugee camps, barracks, etc. Priority during outbreaks is to provide appropriate treatment, bring control measures, and reduce mortality and morbidity. In a confirmed epidemic, a systemic plan can be best done in consultation with other key players. It is essential to convene a response team (e.g. epidemic committee or rapid epidemic response team) and to ensure quality decisions and co-ordinations. The response will need to be monitored regularly and must ultimately be subjected to formal evaluation after the outbreak.
- The collected data should be analyzed locally and rapidly to determine the extent of the outbreak and consequently the population at risk. This can be done by analyzing line listing of cases with key variables (Annex 4) or, more efficiently by entering the data into a computer programs such as Excel and pivot table, EPI-INFO, Access and SPSS.
- The district team should also complete and send the person analysis, spot map and “epidemic curve” to the provincial level within 2 weeks. A more comprehensive documentation needs to be done at the end of the outbreak.
- An outbreak of measles or rubella in a district is said to have come to an end when there has not been any new suspected case of measles seen for more than 3 weeks, and when all neighboring districts have also not reported any case for a similar period of time. Step-by-step guidelines for measles or rubella outbreak investigation are presented in Box 5.

Box 5: Step-by-step guidelines for measles or rubella outbreak investigation

1. Confirm the diagnosis
 - a. Serological testing for suspected measles or rubella cases
 - Collect one blood specimen at first contact
 - b. Appropriate specimen for viral isolation
 - Collect throat swab/nasopharyngeal swab and urine (510- specimens from each affected district)
 - c. Establish epidemiological link to a laboratory-confirmed case
2. Identify and investigate suspected measles and rubella cases
 - a. Basic surveillance variables
 - Age, Gender, residence
 - Date of rash of onset
 - Date of last measles vaccination/number of doses received
 - Date of collection of blood specimen
 - Possible source of exposure 78- clays prior to rash of onset for measles and 1223- days for rubble
 - Exposure to another laboratory-confirmed measles case
 - Travel to foreign country with known measles virus circulation
 - Possible transmission to others three days prior to rash of onset to four days after onset of rash
 - b. Questions to be asked?
 - Where is the patient original residency?
 - When did patient move to current residence?
 - Have there been other cases within the household?
 - Where does patient work/study?!
 - How does the patient travel to work/school?
 - Are there other cases in theca workplace/school
 - Where does the patient socialize (e.g. market, club. school)?
 - Are there other cases in these social groups, mosques, places of worship?
3. Describe the outbreak
 - a. What was the total number of suspected and confirmed cases?
 - b. What were the age distribution and vaccination status of confirmed measles or rubella cases?
 - e. what are the geographical distribution of measles or rubella? (map).
 - d. In each affected household, determined the first case?
 - e. How long did the epidemic last? (epi-curve)
4. Determine the source outbreak
 - a. Classical epidemiology (who acquired infection from whom)
 - b. Molecular epidemiology via genotyping analysis of measles virus isolates



5. Determine risk factors for measles infection (analytical epidemiology)

- a. Age and vaccination status of cases
- b. Place of exposure (school, office, etc.)
- c. Attack rates
- d. Possible risk factors
 - Age group and vaccination status
 - Travel to areas where measles is endemic
 - Occupation (e.g. health care, tourism industry)
 - School/daycare attendance
 - Visit to health facility
 - Risk factors: HIV, immuno- suppressed

- The National level, in collaboration with the provincial and district levels should document the outbreak. Careful investigation of measles or rubella outbreaks can provide useful information regarding factors that may have facilitated measles or rubella virus circulation. The investigation may help to identify risk factors for measles or rubella infection and provide information that can be used to refine and improve the measles elimination program. To benefit from the investigation and outbreak control activities, data and conclusions from the outbreak need to be published. The report should include the following sections: introduction; surveillance methods; description of the outbreak; analysis of the outbreak; control measures; problems; and conclusions and recommendations

6.3. Rubella/CRS outbreak investigation

There is special emphasis on investigation of rubella outbreaks; as such outbreaks may provide an opportunity to accumulate information on the CRS disease burden. CRS cases are likely to be underreported in areas and among populations where a high proportion of births occur at home and where neonatal and childhood deaths are often unreported. In such settings, outbreak investigations can help to identify CRS cases. Because rubella outbreaks tend to persist several months or more and because CRS is a late outcome of these outbreaks, there is time to conduct active surveillance for CRS. When a rubella outbreak is detected, conduct investigations, including laboratory tests. All febrile rash illnesses in pregnancy should be investigated. If rubella cases are reported in individuals > 15 years of age, active surveillance should be conducted until nine months after the end of the outbreak to identify suspected CRS cases in infants 0-11 months of age. All pregnant women infected with rubella should have their pregnancy followed to document the outcome. CRS surveillance should be established at the hospitals where these women will be delivering and also at the specialty hospitals and clinics or specialist who will diagnose or treat these infants.

7. Information systems and data analysis

It is necessary to have an information system that provides program managers and health workers with the information they need for taking appropriate actions. Information from the surveillance system is used to produce regular summary reports, which are distributed to the personnel responsible for taking actions on identified problems. All surveillance information should be standardized. Detailed analysis is recommended for all cases of measles that are confirmed by laboratory or by epidemiologic linkage, or are clinically compatible. Data should be analyzed at all levels on a monthly basis and be used to refine program strategies.

7.1. Health facility level

- Health facilities, where there is capacity of entering the data into a data base, then initial data can be analyzed at facility level and further case based data can be sent to District level.
- Case investigation form to be transferred immediately with the specimens to the higher level. Weekly report of CD including Measles & Rubella to be send at the end of each International Week to the district level which collect these reports and send a compiled report to the surveillance Unit at DoH.
- Health facilities should detect early all suspected outbreaks, through looking into the distribution of cases by area and reporting unit.

7.2. District level

- The District officials should analyze data regularly. Data should be entered into database of all reported cases from all reporting site within 3 days.
- Data transferred immediately from district level to provincial level using adapted forms through internet or by sending hard copies.
- The district should analyze the disease patterns and trends, interpret data, and produce routine reports. Surveillance data should be interpreted in conjunction with routine immunization coverage data.
- Surveillance staff at district health offices should review any areas that do not report cases for extended periods. If there are such areas it is important to identify at least one reporting site, e.g. a hospital or large clinic, and include it in training programs and prompt reporting procedures.
- Analyses should be aimed at understanding the reasons for the occurrence of measles or rubella, obtaining guidance for control strategies, predicting potential outbreaks in order to implement vaccination strategies for the prevention of outbreaks, and planning measles elimination strategies. A few simple graphs can provide the essential data (i.e. time, place and person):
 - Number of cases by month of report comparing two consecutive years
 - Number of cases reported by health facility (spot map)
 - Number of cases by age group and vaccination status (cumulative for the year)
- In addition and where information on vital status/deaths is available, analysis of number of deaths by age group and vaccination status (cumulative for the year) is recommended. Such data are essential for the measurement of progress towards measles mortality reduction and for targeting appropriate control measures.



7.3. Provincial level

- Provincial level should review and clean up data received from the District before merging and transferring it to the National level. In case of delay in data transfer, the coordinator has to contact the district by phone to urge them to send the data. Transfer data to the national level could be done through uploading or by sending through storage device.
- Provincial officials should analyze disease patterns and trends, interpret surveillance data in conjunction with routine immunization coverage data, and produce routine and activity reports and share the results with the district, provincial and national staff. The calculation of incidence rates, i.e. the number of measles cases divided by the population at risk, is especially useful at the provincial or national level for comparing the occurrence of disease at different places and times. In order to calculate rates accurately it is important to obtain accurate population figures. Population data can be obtained from the census bureau or can be assessed by special surveys performed by various institutions .

7.4. National level

- National level should develop and support software to be used at the provincial and district level, including data entry screens, report generators, and electronic reporting from province to the central level. ° National level should receive and merge data transferred from all provinces on a weekly basis and ensure consistency and validity of national data. National officials should analyze disease patterns and trends, interpret surveillance data in conjunction with the routine immunization coverage data, and produce routine reports. They should conduct in-depth epidemiological analysis (disease trends, high-risk groups, high-risk areas and progress towards elimination) from national surveillance data.
- Measles and rubella surveillance data should be used to evaluate national objectives and to direct the control program. Data should be provided to the Regional Office and other related programs at country. Reporting to the regional office includes monthly reporting of case counts according to an agreed-upon standardized format (Annex 8).

8. Laboratory support in measles/rubella surveillance

Laboratory testing to confirm a clinical diagnosis of measles and rubella is an essential part of the surveillance system. Each country needs to establish a system and procedures for collecting and testing blood samples from cases of measles and rubella suspected cases following the WHO/EMRO guidelines.

8.1. Measles/rubella serology

Any suspected measles and rubella case should have a laboratory test undertaken.

EMRO Measles Elimination indicator: % cases with blood specimen collected (exclud epidemiologically linked cases from denominator) \geq 80%

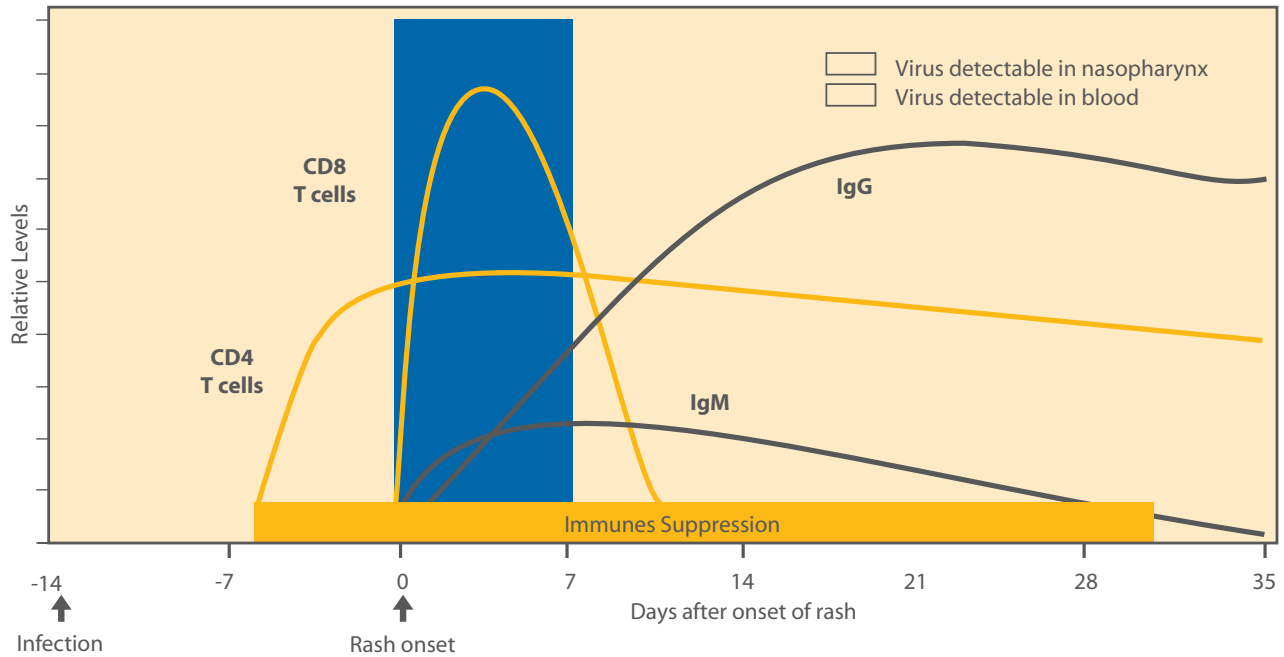
- The most common technique used to confirm the diagnosis of measles is ELISA test for the presence of measles or rubella -specific IgM antibodies in sera collected from suspected cases. For measles and rubella surveillance, a single blood specimen obtained 328- days after rash onset may be sufficient to confirm or discard suspected measles or rubella cases, However, in the first 72 hours after rash onset, up to 30% of tests for measles and rubella specific IgM may give false-negative results. Specimens taken on days of rash may be IgM negative and a repeat serum may be needed.
- The laboratory may request a second sample for repeat IgM testing given the probability of false negatives on early samples;• the IgM ELISA gives a repeatedly equivocal result; the clinician needs to make a definitive diagnosis on an individual patient with an initial negative result. A second sample for IgM testing may be collected anytime between 3 and 28 days after rash onset. Collection of a second sample 10-20 days after the first will permit the laboratory not only to retest for IgM but, if a suitable quantitative method is available, test for an increase in IgG antibody level.
- Once specimen collected, they must be shipped to an NML as soon as possible; blood specimens must arrive at the laboratory within 3 (maximum 7) days of collection. If specimens for viral isolation are not shipped along with the blood specimen, adequate storage of these specimens must be verified. Procedures for collecting, handing and shipping specimen for measles/rubella are presented in (Annex 9)

EMRO Measles Elimination indicator: % lab results available within 7 days of receiving samples \geq 80%

- Laboratory testing should be conducted using ELISA to detect IgM class antibody to measles. IgM antibodies appear first and can be detected shortly after rash onset. They attain peak levels approximately one week later, then gradually decline and are rarely detectable at six weeks after rash onset (Figure 1). IgG antibodies peak about two weeks following rash onset and are detectable for years after infection.

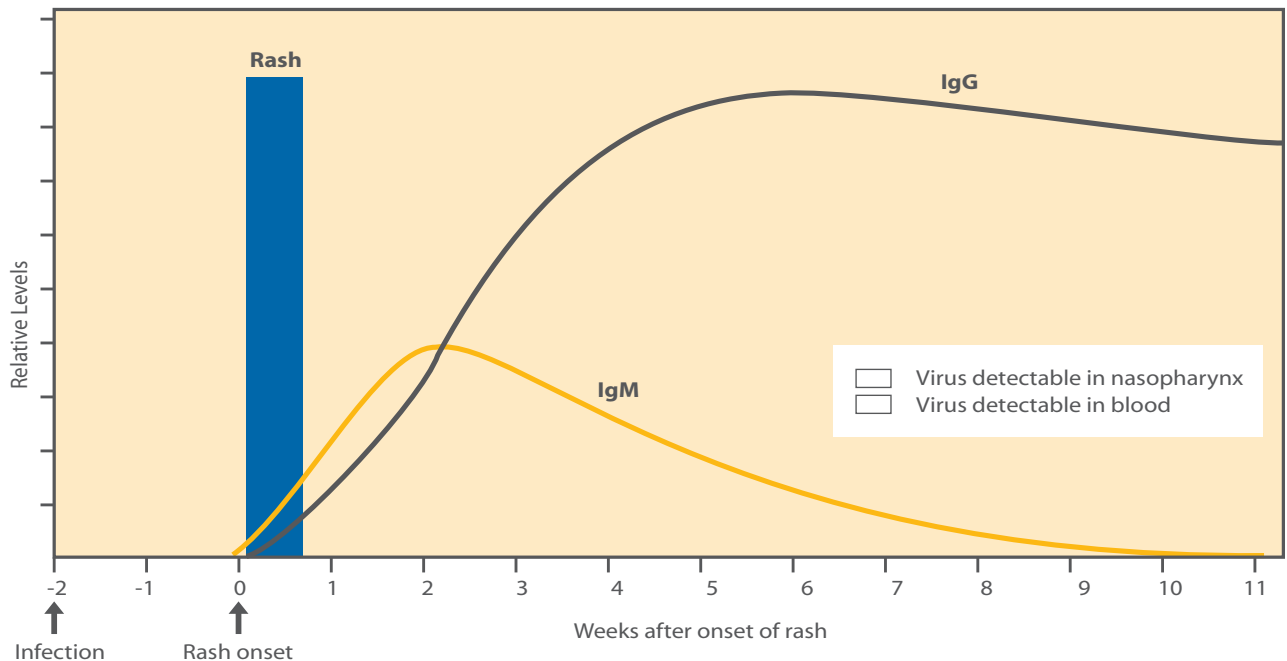


Figure 1 immune response in acute measles infection



- Serum samples that are negative for measles IgM should be tested for rubella (Figure 2). Rubella can be confirmed only by laboratory testing.. it is recommend to obtain a second serum if rubella is suspected and rubella IgM is negative within the first 45- days after rash onset. This is especially true for pregnant women.

Figure 2 immune response in typical rubella infection



- Blood specimens must be sent with the case investigation form for suspected measles and rubella (Annex 3).

8.2. Viral detection/isolation

- Ideally, samples for virus isolation should be collected simultaneously with the blood samples for serological confirmation of measles or rubella as the cause of the outbreak. Collection of specimens for virus isolation should not be delayed until serological laboratory confirmation of a suspected case is obtained. Nasopharyngeal, throat and urine specimens for virus isolation must be collected as soon as possible after onset and not longer than 5 days after the appearance of the rash, when the virus is present in high concentration.
- Genomic sequencing of wild-type measles virus isolates from laboratory-confirmed cases will distinguish the origin of measles viruses as indigenous or imported and thus will corroborate whether the transmission of indigenous measles strains have been fully eliminated or not.

8.3. Measles/rubella laboratory network

The WHO global Measles /Rubella Laboratory network has organized four levels of Laboratories network. The network's structure and functions at each level are described (Annex 10).

National Measles & Rubella Laboratory

Iraq has a national laboratory for measles and rubella being accredited for measles and rubella by WHO since 2006. The national laboratory has:

- Strong links to the immunization and surveillance programmes at the Ministry of Health.



- Accredited capability to perform testing
- Well trained scientists and technicians
- Adequate laboratory facilities and resources to cover running costs
- Suitable equipment to conduct routine serological assays

The national laboratory does the following:

- Confirmation of the diagnosis of clinically suspected measles and rubella using commercial IgM ELISA kits.
- Performing virus isolation and dispatch the isolates and PCR products to the RRL in Oman for genotyping
- Quality assurance: Performing annual proficiency test; referring selected specimens to reference laboratory for validation and performance of epidemiologically essential serological survey
- Training activities

9. Surveillance monitoring and feedback

All provinces should assess the capacity of their surveillance to ensure it is of sufficient quality to monitor, measure and report on measles and rubella and the prevention target for CRS. Feedback should be provided to other levels and local staff.

9.1. Indicators for achievement of measles elimination

Excellent measles/rubella surveillance could be monitored by using indicators to monitor performance. The main indicators as cited below:

- **Sensitivity of reporting system:** (this is indicator No. 1 in algorithm below)
 - At national & provincial level, a rate of 2 non-measles, non-rubella suspected cases per 100,000 populations / year should be considered a minimum. These cases must have been investigated and discarded as non-measles and non-rubella cases using laboratory testing in a NML and/or epidemiologic-linkage.
 - At district level, a rate of 1 non-measles, non-rubella suspected case per 100,000 populations / year should be considered a minimum. These cases must have been investigated and discarded as non-measles and non-rubella cases using laboratory testing in a NML and/or epidemiologic-linkage.
- **Adequacy of laboratory testing:** Serum samples adequate for detecting measles IgM collected in at least 80% of suspected measles cases (excluding from the denominator cases that are epidemiologically linked to a laboratory-confirmed case). This is indicator 2 in the algorithm below.
- Viral isolate obtained from every sporadic case or confirmed chain of transmission for genotyping to help identify source of virus (indicator 3 in the algorithm below)
- At least 80% of all reported cases should have had an adequate investigation within < 48 hours of notification (indicator 4 in the algorithm below). An adequate investigation includes at a minimum the suspect cases with all of the following data elements; date of rash onset, specimen collection, date of specimen collection, vaccination status, date of last vaccination, age, and district.

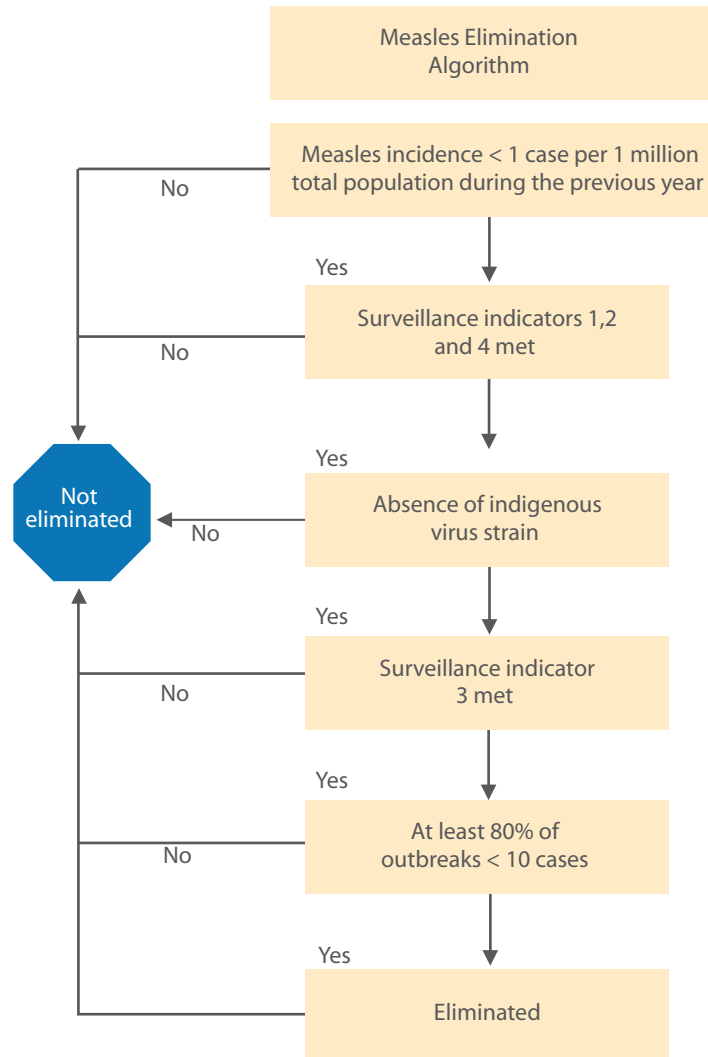
Other surveillance and laboratory indicators:

- Completeness of reporting: > 80% of districts reporting on a monthly basis .At the regional level, completeness of reporting is defined as >80% of monthly reports being received by WHO; timeliness is defined as >80% of monthly reports being received by WHO before the 20th of the following month.
- % of specimen arrived at lab within 3 (maximum 7) days of being taken (>= 80%)
- % of cases with adequate specimens (328- days after rash onset) (>= 80%)
- % of blood/serum specimens arrived at national lab in good condition (adequate volume, no leakage, not turbid, not desiccated) (>= 80%)
- % cases for whom lab results were sent within 7 days (>= 80%) Formula for the calculation of these indicators is given in Annex 11.

A country would achieve measles elimination when surveillance indicators are beyond the performance target and the country recorded less than one measles case per million total populations (Figure III).



Figure III. Algorithm of the measles Elimination validation process



9.2. Feedback

Regular feedback to everyone involved in the surveillance system is important to assure sustainability and refinements to the system are implemented as necessary. Feedback may be given in writing by sending weekly measles and rubella surveillance bulletins or verbally during on-site supervisory visits and during the periodic surveillance review meetings. Feedback includes providing surveillance participants with the following:

- The number and location of reported cases
- An assessment of promptness and accuracy of their surveillance reports
- Information on the effectiveness of vaccination and control activities
- Specific recommendations on how to solve common problems
- Commendations for personnel doing excellent work
- Feedback can be provided effectively by sending weekly measles and rubella surveillance bulletins to the reporting sites and to all partners

To encourage reporting, it is important to respond to all reports with at least acknowledgement for the report.

Annex 1

العدد

جمهورية العراق

التاريخ

وزارة الصحة

استمارة الإخبار الفوري عن مرض انتقالي

Communicable Diseases Notification Form

القطاع (district):
دائرة صحة محافظة:

اسم المؤسسة الصحية:
Name of Health Facility

	Name	الاسم الكامل
	Age	العمر
Female أنثى	Sex	الجنس
Male ذكر	Diagnosis	التشخيص
	Full address & Tel.	العنوان الكامل الهاتف
	Date of diagnosis	تاريخ التشخيص
	Date of notification	تاريخ الإخبار
	Immunization status	الموقف التلقيحي وعدد الجرع
		تاريخ آخر جرعة لقاح

اسم وتوقيع الطبيب المعالج

يشمل الأمراض التالية:

- ١- الكوليرا (cholera) / الحمى النزفية (hemorrhagic fever) / الملاريا (بكافة أنواعها) / الخناق (diphtheria) / السحايا السحائي (meningococcal meningitis) / الكزاز الولادي (neonatal tetanus) / الحصبة (measles) / HIV / AFP / اشتباه حالات انفلونزا الطيور والأنفلونزا البوائية / داء الكلب (Rabies) / الحصبة الألمانية (Rubella)
- ٢- عند حصول تفشيات بأي مرض انتقالي ومنها التسمم الغذائي
any communicable diseases including food poisoning outbreak
- ٣- حوادث صحية غير اعتيادية unusual heal



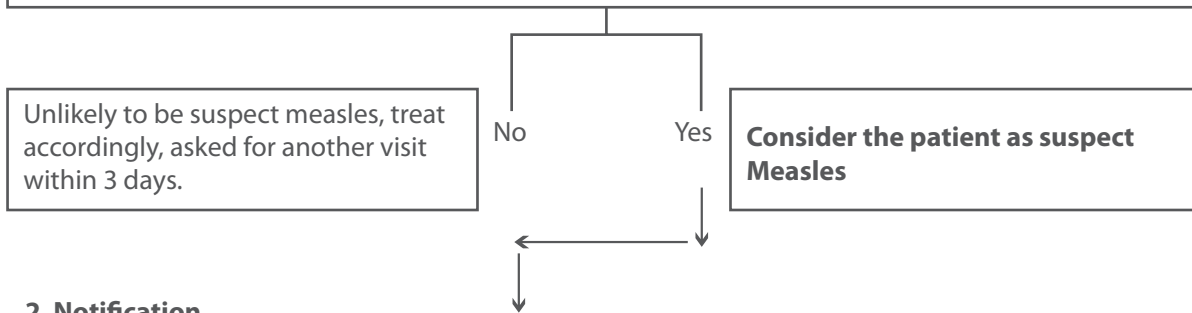
Annex 2

Flow chart algorithm for identification, investigation & treatment of suspected Measles cases

1. Identification:

Patients presenting to a health care facility with:

Fever, Maculop rash and any one of the following: 1-cough 2-coryza(running nose)
3-conjunctivitis(red eyes) or any person in whom clinician suspects measles infection



2. Notification

Notify (using the standard notification form) the district or DoH surveillance focal point within 24 hours, using the most swift method (telephone, e-mail, or direct contact).

3. Investigation

- Filling the case investigation form by treating clinician and the surveillance focal point
- Collection of 5 ml blood specimen (within 0-28 days or rash onset) and throat swab or urine in cases presenting within 5 days of onset for measles virus isolation
- Don't freeze whole blood; cause hemolysis
- Label with case name and date of collection
- If the blood specimen obtained during the first 3 days, obtain another specimen after 2 weeks.
- Separate serum from red blood cells within 6 hours (if at room temperature) if 24 hours (if in refrigerator or cold box with ice).
- Then; centrifuge the specimen and transfer serum to a sterile tube & store in the fridge (4 degrees Celsius) till transport to laboratory
- Serum or any other samples; throat swab or urine, should be sent to laboratory continuously refrigerated (between 4-8 C°) within maximum of 48 hours from time of collection.
- Avoid freezing serum as well as throat swab or urine sample before it reaches the National Measles Laboratory (NML), samples likely thaw during transport; thawing then freezing destroys IgM antibodies and cells for the virus isolation.

4. Treatment of suspected cases

Vitamin A therapy & reduction of fever with antipyretics

Age	Dose given immediately	Dose given on next day
Infant < 6 months	50000 I.U.	50000 I.U.
Infant 6-11 months	100000 I.U.	100000 I.U.
Children ≥ 12 months	200000 I. U.	200000 I. U.

Advice mother to bring child back if the illness worsen (rapid breathing, diarrhea, continues high fever)

Fluids & nutritional support for malnutrition and diarrhea

Antibiotics for secondary infection (pneumonia, ear infection.. etc)

Respiratory isolation for hospitalized cases

5. Classification of cases

Lab confirmed: Lab confirmed: suspected measles case with blood sample [+] for measles IgM antibody, not recently vaccinated (4-8 weeks ago)

Confirmed by epidemiologic linkage: Suspected measles case with no blood sample but with history of contact (*lives in same or adjoining district with plausible transmission*) with a lab- or epi-confirmed case who had rash onset during the previous 30 days.

Clinically confirmed: any case meet the clinical description but without evidence of epidemiologically linked.

Surveillance focal point and treating clinician should finally diagnose all cases; discard as measles or rubella by lab and send the final diagnosis to the CDC/EPI measles national focal point.

6. Further investigation

- DoH surveillance team will follow up examine the case one month later and finally diagnose cases
- Discarded as measles and conducted whether measles cases have recovered without sequel
- Hospitalized for pneumonia, diarrhea or whether patient died or lost to follow up
- Surveillance officer should identify the source of infection for all measles confirmed cases.



Annex 3

Case Investigation Form for suspected Measles/ Rubella

EPID#		Date of investigation				Day	Month	Year
Patient's Name					Mother's name			
Adress	Province		District					
	Zukak / vellege		House #			Tel. No.		
	Mokhtar's name					Food ration distributor's name		
Date of birth	Day	Month	Year		If birth date unknown , age in months			
					Sex	Male	Female	
Date of the case was first reported to a governorate or private health office					Day	Month	Year	
Name of notification site:					Name and specialty of treating doctor :			
Provisional Diagnosis :								
Date of onset of fever						Day	Month	Year
Type of rash:						Date:		
If the patient died / date of death								
Clinical manifestation :								
Is cough present						Yes	No	Unk
Is coryza present						Yes	No	Unk
Is conjunctivitis present						Yes	No	Unk
Pneumonia						Yes	No	Unk
Arthralgia and / or arthritis						Yes	No	Unk
Gastro –enteritis						Yes	No	Unk
Pregnant						Yes	No	Unk
Adenopathy:			Cervical		Sub occipital		Post-auricular	
Hospitalized					Name of Hospital:			
Contact with suspected or confirmed measles or rubella case in month prior to onset						Yes	No	Unk
If yes Specify the place			Address					
Date of visit			dd/mm/yy		/ /	Name of Measles case		
Confirmed cases measles or rubella in area prior to onset				Yes	No	Name Of Case:		
Travel of of patient out side country in month prior to onset				Yes	No	Where		
Date of return:				Suspected importation		Yes	No	

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Contact with pregnant women in month prior to onset :	Yes	No	
Source of infection identified:	Yes	No	Case number of possible source :
Part of outbreak ID:	Yes	No	
Immunization History			
Vaccination status information collection:	mother recall		from vaccination card
Is he vaccinated for measles	Yes	No	Unk
Type of vaccine	Number of doses		Date of Last vaccination
Measles			/ /
MR			/ /
MMR			/ /
Rubella			/ /

S-No	Type of sample	Date of sample collection	Date sent to NML	Condition *	Receiving date	
	Blood sample No 1			Good	Poor	
	Blood sample No 2			Good	Poor	
	Dried Blood Filter			Good	Poor	
	Gum swab			Good	Poor	
	Respiratory sample			Good	Poor	
	Urine sample			Good	Poor	
	Specimen for viral identification			Good	Poor	

Lab Result

Date of result available in lab 1 Date of result received by EPI	/ /	Measles IgM	Rubella IgM
	/ /	Other positive disease	
Date of result available in lab 2 Date of result received by EPI	/ /	Measles IgM	Rubella IgM
	/ /	Other positive disease	
Date of result available in lab V Date of result received by EPI	/ /	Result V	Virus geno type Other
	/ /	positive disease	

Final Classification

Date of final classification	2008		Final classification		
If discarded , Final diagnosis					
Imported case	Yes	No	Unk		

* To be filled by the NML Name of investigator:				signature



Annex 4

Line-Listing Form for measles

Case ID	Name	District	Address	Sex	Age		Date seen at health facility	Date of rash onset	No. of doses received*	Date blood sample collected	Results IgM	outcome
					Y	M						

*Exclude doses given within 14 days of onset of the disease.

Annex 5

وزارة الصحة
دائرة الصحة العامة

دائرة صحة
اسم المؤسسة الصحية

استمارة الاحصائية الاسبوعية للأمراض الانتقالية

الى من الاسبوع week

		الفئات العمرية											
Total	المجموع الذكور الانثى	أكثر من ٤٥ سنة		من ٤٥-١٥ سنة		من ١٤-٥ سنة		من ١-٤ سنة		أقل من سنة		الامراض	
		الذكور	الانثى	الذكور	الانثى	الذكور	الانثى	الذكور	الانثى	الذكور	الانثى		
												الشلل الرخوي الحاد AFP	
												Diphtheria	
												susp.Measles	اشتباه حصبه
												Tetanus.N	الكزاز الاولادي
												Haemorrhagic fever	الحمى النزفية
												Coetaneous Kala-azar	الليشمانيا
												Rabeis	داء الكلب
												M.Meningitis	داء السحايا السحائي
												Pertusis	السعال الديكي
												susp.Rubella	اشتباه حصبه المانية
												Influenza like illness	الأدفونزا
												Malaria	الملاريا
												Acute Diarrhea	الاسهال الحاد
													نماذج البراز المفحوصة للكوليرا
													عدد نماذج الماء لمفحوصة بكتريولوجياً
													عدد مواقع التزسد التي ارسلت التقرير الاسبوعي
													عدد مواقع التزسد الكلي في المحافظة
													النسبة المئوية



Annex 6 A

وزارة الصحة
دائرة الصحة العامة

احصائية الامراض الانتقالية المبلغة حسب العمر والجنس

السنة
الشهر

دائرة صحة
اسم المؤسسة الصحية

المرض	اقل من سنة		١-٤		٥-١٤		١٥-٤٥		٤٥+		المجموع	
	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	الكلبي
شلل الاطفال												
الشلل الرخو الحاد												
الخنناق												
السعال الديكي												
اشتباه حصبة												
اشتباه حصبة المانية												
النكاف												
الكزاز الولادي												
الكزاز												
الجدري المائي												
التدرن	رئوي											
	غير رئوي											
التيفوئيد												
الكوليرا	اصابة											
	حامل											
الحمى النزفية												
اللشمانيا	اللشمانيا											
	الجلدية											
	الحمى											
	السوداء											
داء المقوسات												
الاكياس المانية												
حمى مالطا												
داء الكلب												
عضة الحيوانات												
التيفوس بنوعيه												
التهاب	A											
	B											
	C											
	E											
التهاب الكبد الفيروسي	سريري											
	السحائي											
	الفيروسي											
	الجرثومي											
السحايا												
الملاريا												
البلهارزيا												
الجدام												
الزحار الباسيلي												
التسمم الغذائي												
ذات الرئة												
الانفلونزا ILI												
الجمرة الخبيثة												



Annex 7

استمارة الوفيات بالامراض الانتقالية

السنة
الشهر

دائرة صحة
مستشفى / قطاع

المرضى	اقل من سنة		١-٤		٥-١٤		١٥-٤٥		٤٥+		المجموع	
	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	ذكر	انثى	الكلبي
الشلل الرخو الحاد												
الخنناق												
السعال الديكي												
الحصبة												
الكزاز الولادي												
الكزاز												
التيفوئيد												
الكوليرا												
اصابة												
الحمى النزفية												
الحمى السوداء												
الاكياس المائية												
التيفوس بنوعيه												
A												
B												
C												
E												
التهاب												
الكبد												
الفيروسي												
سريري												
الملاريا												
البلهارزيا												
الغانغرين الغازي												
التسمم الغذائي												
ذات الرئة												



Annex 9

Laboratory procedures for measles/rubella

1. Handling of blood specimen for serologic confirmation

- Collect 5 ml blood by venipuncture into a sterile tube labeled with patient identification and collection date.
- To separate the serum from red cells, one of the following three methods described below can be employed. To prevent bacterial over-growth, ensure that the serum is poured into a clean glass test tube. The test tube does not to be sterile—just clean.
 - Let the blood sit at an angle for at least 60 minutes (without shaking or being driven in a vehicle), then pour off the serum into a clean glass tube.
 - If a refrigerator is available, put the sample in a refrigerator for 4 -6 hours until the clot retracts, then pour off the serum the next morning. Do not freeze whole blood.
 - If a centrifuge is available, let the blood sit for 3060- minutes, then centrifuge the specimen at 2000 RPM for 10 -20 minutes and pour off the serum into a clean tube.

2. Storage and shipment of serum specimens:

- Store serum at 4 -8°C until it is ready for shipment. The serum can be stored in the refrigerator for a maximum of 7 days. Serum must be frozen at -20°C if it is going to be stored for longer periods.
- Fill in case investigation forms completely. Three dates are very important
 - Date of rash onset
 - Date of collection of sample
 - Date of last measles vaccination
- Specimens must be shipped to the laboratory as soon as possible. Place specimens in plastic bags.
- Specimens from different patients should never be sealed in the same bag. Place specimen form and investigation form in another plastic bag and tape to inner top of the specimen transport box.
- If using ice packs (these should be frozen), place ice packs at the bottom of the box and along the sides, place samples in the center, then place more ice packs on top. When shipping arrangements are finalized, inform receiver of time and manner of transport.

3. Handling and transport of dried blood specimen using the filter paper method

- For the collection of a blood sample using the filter paper method, a skin puncture may be performed on the finger or heel (in infants and children). For the finger, the area with optimal vasculature and lowest sensitivity is the side of the finger tip about 3 mm from the nail bed. The middle and ring finger are best. The pulp on the tip of the finger should be avoided as it is very sensitive. For the heel the puncture should be performed on the lateral or medial edges of the heel rather than the centre of the heel
- Label the filter paper with necessary information for identification
- Make sure the patient sits comfortably. A baby should be held gently but firmly by the parent. For Finger prick, the hand should be warm and relaxed. The patient's fingers should be straight but not tense. Clean the puncture site with an alcohol wipe and allow to dry.
- Use thumb to lightly press the finger from the top of the knuckle to the tip. With the thumb's gentle pressure at the tip of the finger, place the lancet at the side of the fingertip. Press the lancet firmly against the finger or heel and allow the tip to penetrate the skin by 2 mm. Dispose the used lancet into a sharps container.

- Wipe away the first drop of blood with a clean piece of dry gauze. Allow one drop to fall onto each circle of the filter paper. Fill at least three circles and four if possible. Ensure that the blood soaks completely through the paper over the complete area of the circle. Do not hold the filter paper against the puncture site.
- Allow the filter paper to dry thoroughly (at least 1520- minutes) before enclosing in a bag or storing. Drying stabilizes the IgM and reduces the chance of microbiological contamination.
- Wrap each dried blotting paper in paper/foil/plastic to prevent possible cross contamination. Store each filter paper out of sunlight preferably inside a plastic bag to protect it from dust and moisture. Store if possible in a cool place and transport to the laboratory as quickly as possible under reverse cold chain.

4. Handling and transport of naso-pharyngeal swabs for viral isolation

- Nasopharyngeal specimens for virus isolation must be collected as soon as possible after onset and not longer than 5 days after the appearance of the rash, when the virus is present in high concentration.
- The patient is asked to open the mouth wide and say “ah”. The tongue should be depressed with a spatula, and a nasopharyngeal swab is obtained by firmly rubbing the nasopharyngeal passage and throat with sterile cotton swabs to dislodge epithelial cells. The swab is then placed in a labeled viral transport tube ensuring that the swab is immersed in the sponge containing the viral transport medium.
- The tube is transported to the laboratory at 4 – 8 °C, using frozen ice packs and appropriate insulated shipping container.

5-Urine for Measles virus isolation:

Samples of 1050- ml urine are adequate for this purpose. It is preferable to obtain the first urine passed in the morning. Most of the measles virus excreted in the urine is located in epithelial cells. The virus is concentrated by centrifugation of the urine and resuspension of the pelleted cells in a suitable viral transport medium. Urine should not be frozen before the concentration procedure is carried out.

Timing:

The isolation of measles virus is most successful if the specimens are collected as soon as possible after the onset of rash, and at least within 7 days after onset.

Collection and handling procedures:

- Urine should be collected in a sterile container
- It should be held at 4- 8 °C before centrifugation.
- Centrifugation should be performed within a few hours .

Storage and shipment of urine sample:

- Whole urine samples may be shipped in well sealed containers at 4°C, but centrifugation within 24 hours after collection is preferable.
- Centrifugation should be performed at 500 x g (approximately 1500 rpm) and 4 for 5 min.
- The supernatant should be discarded and the sediment resuspended in 1 ml viral transport medium or tissue culture media.
- Do not freeze the sediment if shipment is possible within 48 hr. do not freeze urine before the concentration



procedure has been carried out .

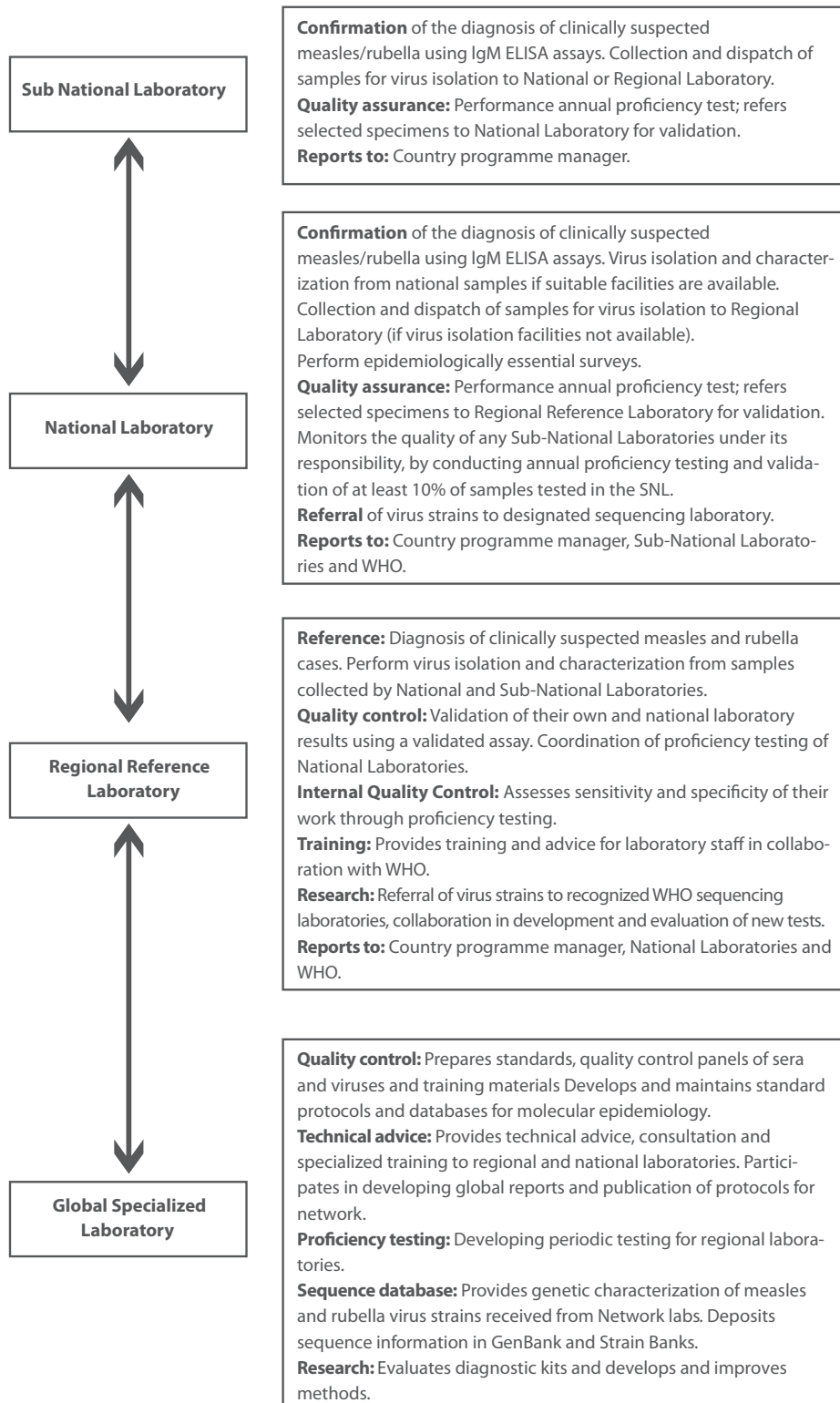
- The resuspended pellet may be stored at 4 °C and shipped within 48 hr.to a measles reference laboratory , Alternatively ,it may be frozen at – 70 °C in viral transport medium and shipped on dry ice in a well sealed screw – capped vial to protect against CO2 contamination.

6- Samples for RT-PCR:

Measles & Rubella virus can be often detected by RT-PCR; any sample collected and transported to the laboratory for virus isolation can be used for RT-PCR analysis.

Annex 10

Laboratory Network for Measles & Rubella





Annex 11

Formula for the calculation of measles surveillance performance indicators

The formulas for the calculation of the surveillance indicators are shown below. All the formulas are calculated as percentage points except indicator number four, which is a rate calculated as indicated.

- Timeliness of health facility surveillance reporting to the district level within the specified time period. (Target >80% reports submitted timely to next level)

Total number of weekly reports that have reached on time the district level
 Total number of reports expected for the period under consideration

- Completeness of weekly reported cases

Total number of weekly reports received that have reached on time the district level
 Total number of reports expected for the period under consideration

- Proportion of reported measles cases from whom blood specimens have been collected (excluding epidemiologically linked cases from the denominator): (Target; = / >80%)

Reported suspected measles cases with specimen
 Total reported suspected measles cases - measles cases confirmed by epidemiological linkage

- Proportion of measles outbreaks investigated with blood specimens from the first five cases: (Target; = / > 80% outbreaks investigated with blood specimen)

Number of measles outbreaks investigated with blood specimens from the first five cases
 Total number of measles outbreaks in the area in the time period under consideration

- Timeliness of suspected measles case investigation : (Target: >80% investigated within 3 days following notification)

Number of measles cases investigated within 3 days of notification
 Number measles cases reported in the area in the time period under consideration

- Timeliness of serum/ dried blood specimens arriving at lab (Target > 80% arriving at lab <3 days of being taken)

Number of serum / dried blood specimens that arrived at National lab within 3 day of collection
 Total specimen received at National lab

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- Timeliness of feedback of serology results from the laboratory: (Target: = / > 80% results received at National level within 7 days of specimen receipt at lab)

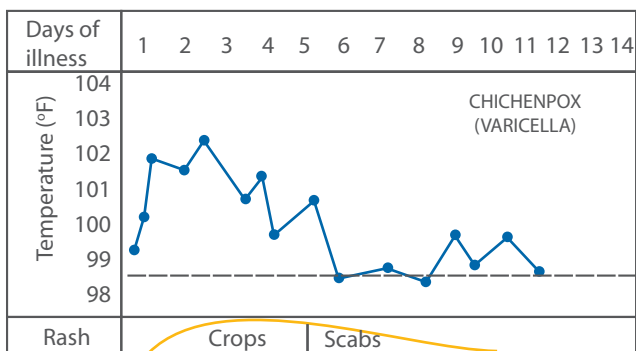
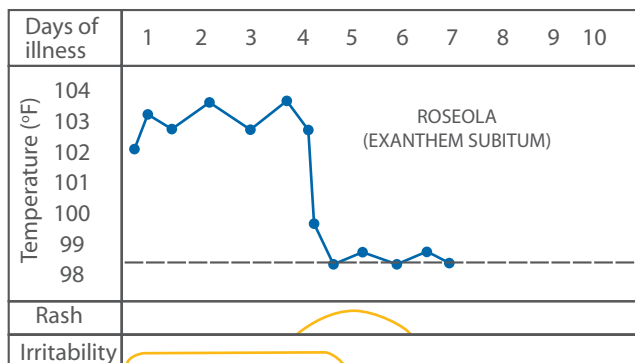
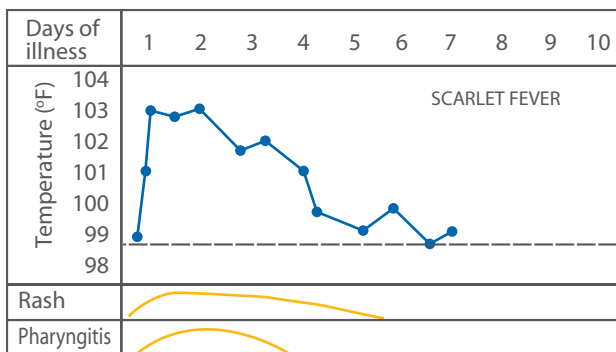
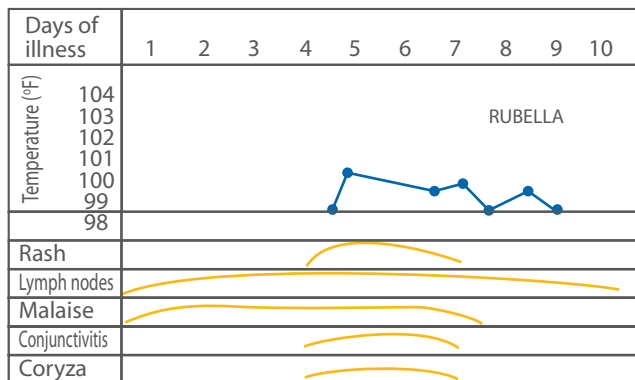
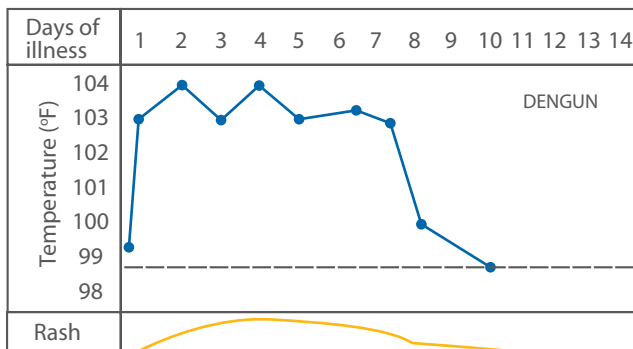
Number of results sent out by laboratory In the National level within 7 days of receipt of specimens lab
Total number of specimens received by lab

Proportion of districts that have reported at least 1 case of measles with a blood specimen per year: (Target; = / >80%)

Reported measles vaccine infant coverage, Iraq, 1986-2008-

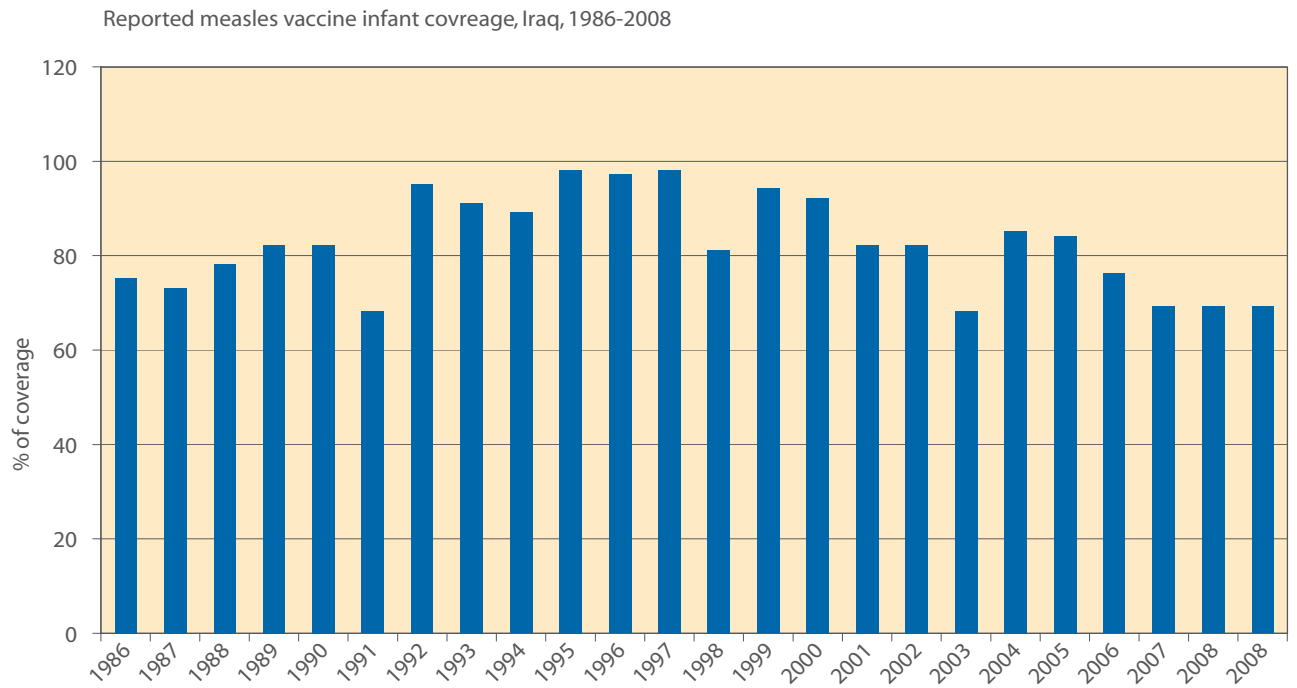


Typical Clinical course of rash illnesses that are differential diagnoses to measles



Source: Adapted from Krugman S. Diageosis of acute exanthematous. In: Gershon AA, Hotez PJ, Katz SL (eds.) *Krugman's Infectious Diseases of Children*, 11th ed. St. Louis: Mosby; 2004: Figure 451-, p.927, with permission from Elsevier.

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