REPUBLIC OF MALDIVES

Measles and Rubella outbreak preparedness and response plan

2017

HEALTH PROTECTION AGENCY

MINISTRY OF HEALTH, Male'

Republic of Maldives

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Measles and Rubella

outbreak preparedness and response plan

Maldives

Health Protection Agency, Male', Maldives

2017

1 Introduction:

Maldives has a long history of immunization and has successfully progressed in its fight against vaccine preventable diseases. High levels of immunization coverage have been achieved and maintained over the last two decades under the immunization program.

Following achievement of smallpox eradication and polio eradication, the most remarkable achievements in the past 2 years in regards to communicable diseases include Maldives being declared as a "Malaria Free Country" in 2015 by World Health Organization. This is an addition to other vaccine preventable diseases that have been controlled to such an extent that diseases like neonatal tetanus and diphtheria are non-existent in the country.

Maldives has now moved forward to achieving Measles elimination and rubella/CRS control. Very high national immunization coverage of MCV1 and MCV2 (>95%) has been achieved and sustained over the past several years.

In September 2013, the WHO Regional Committee of South East Asia Region resolved to eliminate measles by 2020 from the region. In line with the regional goal, Maldives developed an ambitious measles elimination strategy with a goal to achieve Measles elimination and seek WHO certification of the measles elimination by 2017. At the same time the country set targets to reduce rubella and CRS until it is no longer a public health problem.

With this background, even a single case of confirmed Measles and Rubella will be considered as an outbreak in the country. One of the key strategies to achieve this is to intensify surveillance and maintain the sensitivity through active searches and "zero reporting" and investigation of all suspected Measles and Rubella/CRS cases promptly. Maldives is following the broadened definition of "suspected measles case" and has revised the measles surveillance guidelines accordingly, and is implementing them from 2017. Early detection of cases through sensitive surveillance will prevent occurrence of outbreaks. The country identifies the need of having an outbreak preparedness and response plan, with responsibilities at different levels so as maintain measles and rubella free status

in the country and respond effectively and promptly in case of any outbreak situation due to importation.

2. Definitions specific to measles elimination:

a) **Measles elimination:** The absence of endemic measles transmission in a defined geographic area (e.g. region or country) for a period of 12 months or more, in the presence of well performing surveillance system. However, verification of measles elimination takes place after 36 months of interrupted endemic measles virus transmission.

b) **Measles or Rubella outbreak:** A **single confirmed case** is considered as an outbreak.

(confirmed case will be a laboratory confirmed case, epidemiologically linked case to lab confirmed case or in case of failed sample collection highly suspected case with clinical case definition will be considered as an outbreak)

c) **Measles imported case:** a case exposed outside the region/country during the 7-21 days prior to rash onset as supported by epidemiological and/or virological evidence.

d) **Measles import-related cases** are locally-acquired infection occurring as part of a chain of transmission originated by an imported case as supported by epidemiological and/or virological evidence.

e) **Chain of transmission:** when two or more confirmed cases are temporarily related (with 7-21 days between rash and onset of cases), and are epidemiologically and/or genetically linked.

f) **Endemic measles transmission in countries targeting elimination:** The existence of continuous transmission of indigenous or imported measles virus that persists for a period of 12 months or more in any defined geographical area.

g) **Re-establishment of endemic transmission:** This is a situation in which epidemiological and laboratory evidence indicates the presence of a chain of transmission of virus strain that continues uninterrupted for a period of 12 months or more in a defined geographical area (country or region) where measles or rubella has been previously eliminated

Case definitions for confirmed measles/ rubella case:

	Definition
Laboratory confirmed	Suspected case/fever and rash case tested at the laboratory (serology with or without virology) and confirmed as measles or rubella case
Epidemiologically confirmed (contact linked to confirmed case)	A suspected case/fever and rash case not tested at the laboratory but patient has close contact with a laboratory-confirmed measles case or rubella case [measles: contact history is 7–18 days (12-23 for rubella) before the onset of rash]
Clinically confirmed **Clinical case definition:**	A suspected case/fever and rash case has the clinical case definition but could not be tested at the laboratory and patient do not have a close contact history with laboratory confirmed measles/rubella case **Case with fever and maculopapular rash with at least one of Cough, Coryza (i.e. runny nose) or Conjunctivitis (i.e. red eyes)**

Consistent with the WHO/South East Asia Regional plans, Maldives has developed the following plan to maintain the country free of measles, rubella and CRS during post elimination period. The strategies include:

- Maintaining high level of population immunity:
    - MRCV coverage (>95%) for both doses (MRCV 1 and MRCV 2) at National and sub national (Atoll) levels
    - High risk targeted Supplementary Immunization Activities (SIA) as per need of risk assessment:
    - Strategies on traveller vaccination to minimize the risk of reintroduction of virus
- Maintaining effective and sensitive, strengthened surveillance to identify suspected measles/fever and rash cases, rubella and CRS cases, case based investigation and laboratory confirmation with appropriate response to all suspected cases/fever and rash

cases. *(as detailed in the "Measles, Rubella & CRS Surveillance Guidelines for health professionals - Maldives-2016")*

- Maintaining outbreak response preparedness.
- Early case detection and to mobilize the outbreak preparedness and response plan to contain the outbreak.
- Adequate patient/ case management and prevention of the transmission and mortality.

In this context: (a) maintaining preparedness for measles/ rubella outbreak and (b) early outbreak response plan is of great significance.

3. Preparedness for outbreak response:

Maintaining preparedness for outbreak response is one of the Key strategy in measles/ rubella elimination phase:

A) Objectives of outbreak preparedness:

a) To identify early and report the suspected Measles and Rubella cases and activate as early as possible an outbreak response for prevention of further transmission
b) To operationally guide the outbreak response (rapid response) teams to prepare, record, detect, verify, identify and control Measles/ Rubella case/s/outbreak on time
c) To ensure adequate stockpile of drugs and vaccines required for outbreak response at all levels.
d) To maintain the capacity of health care providers to respond and efficiently manage the outbreak
e) To guide the outbreak control rapid response teams to capitalize the lessons learned and improve plans and activities for future
f) To guide all stakeholders to clearly understand roles and responsibilities in Measles and Rubella outbreak situation to cooperate and collaborate with the national coordination mechanism.

B) Features of Outbreak Response:

a) Clear SOPs with roles and responsibilities well defined
b) Capacity building
c) Rapid Response Team

d) Stockpile
e) Active Surveillance
f) Earmarked funds for outbreak response

C) Role and Responsibilities for a response to measles and rubella outbreak:

For an effective response in case of an outbreak of measles or rubella, the role and responsibilities of health workers and authorities at different levels of health care system need to be defined.

a) Role of Ministry of Health

To provide a stewardship role and ensure all support required for the measles and rubella outbreak containment, the National Health Emergency Steering Committee under the chairmanship of hon'ble Minister of Health will mobilize other ministries for coordination and support and to monitor day to day progress.

National Health Emergency Steering Committee:

- Chairperson: Minister of Health, Maldives.
- Members:

– Secretary Health services/representative
– Director General of Public Health
– Director General of Health Services
– Chairperson of NVC and MTAGI
– Representatives from HPA and Health Service Division of MoH
    - Head of Communicable Disease Division
    - Head of Public Health Division
    - Epidemiologist form HPA
– Representative from Local Government Authority, Ministry of Education, Ministry of Tourism, Ministry of Housing and Infrastructure, Ministry of Transport, Ministry of Defence, Ministry of Islamic Affairs
– Representatives from WHO, UNICEF

b) Role of Health Protection Agency (HPA)

Public Health Surveillance Section of Health Protection Agency is the responsible body for co-coordinating the outbreak response with the main responsibility of monitoring the situation, coordinate outbreak response activities, social mobilization, related communications, partner

coordination, vaccine and logistic procurement, budget preparation, and arranging funds and outbreak investigations and report, whenever required. The HPA will form a National Task Force for coordination at the national level and with the field Health Units.

National Task Force:

- Chairperson: NVC Chair
- Coordinator: Manager/Immunization
- Members:
  - MTAGI member
  - Manager, Public Health Surveillance, HPA
  - HPA selected team
  - Health Focal Point in ministry of Education
  - Representative from National Laboratory (IGMH)
  - Representative, WHO
  - Representative, UNICEF
  - Representatives from Maldives Red Crescent, Police/MNDF.

HPA has the following roles:

- HPA is responsible for **coordinating measles and rubella surveillance** related field operations on regular basis when a suspected measles case/case with fever and rash is reported, for activities like case based investigation, active case search, ring vaccination (when necessary), monitoring the laboratory reporting etc. Support data management and electronic reporting of daily and weekly reports from atoll to national level and Monitor surveillance performance using standard indicators.

- HPA will activate the **Rapid Response Team (RRT)** at National level and 1-2 responsible officers will be mobilized and deployed immediately to the affected atoll/island in outbreak situation with identified responsibilities. The names and contact numbers will be available at each atoll and National level for coordination. The RRT members will be briefed by HPA and should be well acquainted with the needs of outbreak response and will coordinate, orient the local health staff, supervise and get the activity implemented at the field level to the highest quality with their supportive supervision.

- **Capacity Building:** HPA will plan to provide regular training and periodic refreshing of the health providers at atoll and island level. HPA will coordinate with the health services division and orient the clinicians/medical officers of peripheral institutions regularly in planned manner to maintain the sensitivity of surveillance and readiness to outbreak response. Since the expatriate clinicians working in the atolls and islands change very frequently, regular and frequent contact need to be maintained for their orientation and active involvement in public health programs.
- Ensure regular fortnightly meetings are held between the public health staff and the clinicians at atoll and island level for orientation and coordination.
- Once the case with fever and rash is confirmed by the laboratory as a case of measles or rubella, HPA will ensure recording and reporting of the outbreak cases, documentation, sample collection and will work together to identify possible transmission chains, contain possible outbreaks and will report to the national steering committee.
- Chairperson and the members of the NVC and MTAGI will coordinate with the Ministry of Health and monitor and evaluate the situation and function as an advisory body in containment of the outbreak, in enhancing the population level immunity and strengthening surveillance.
- HPA will keep adequate logistics at hand for immediate mobilization to the affected areas. It will also assess the stock of vaccine available at the local level and mobilize accordingly as per need from HQ.
- HPA will compile the line listing of outbreaks ***(Annexure-7)***
- Provide Supportive supervision
- Liaise with Laboratory and Public health units in facilitating sample collection and sending samples.
- HPA will prepare the outbreak analysis report ***(Annexue-6)*** and will summarize the outbreak on format ***(Annexure-8)***

c) Role of Atoll level public health units

Public Health units in Atolls and islands under the supervision of facility manager or incharge are responsible for overall coordination of measles, rubella and CRS surveillance related activities like carrying out active case searches on weekly basis to identify any unreported or missed suspected cases of measles, regular weekly reporting, and other surveillance related activities as described in the “Measles, Rubella & CRS Surveillance Guidelines for health professionals - Maldives-2016”

- Sensitivity of surveillance is to be maintained always so that all suspected cases of measles/cases with fever and rash are reported immediately and serum and throat swab samples are collected and shipped to the laboratory for investigation as per protocol.

Intensification of the surveillance with initial confirmed case/s

- Surveillance will include population groups at high risk of disease transmission and congregate settings, such as schools and day-care centres, quarters of uniform services, hotels or workplaces of adolescents and adults
- If there are high-risk groups such as migratory population, Industrial islands, construction sites in the area, special measures will be taken to identify cases and outbreak response vaccination to prevent further transmission
- Conduct contact tracing to identify the source of infection and determine whether other areas have been exposed or are also experiencing outbreaks. Identify all people the case had contact with during the time he/she was contagious; make a line-listing of these contacts, including their names and addresses.
- Conduct community survey to detect unreported cases in the community and to ensure that all cases are identified and reported. Such searches will be conducted in the entire island or a perimeter of an entire atoll.
- Review medical records and identify any case of fever and rash missed by the institution

Focal Point at the Atoll Public Health Unit: under the supervision of facility manager or in-charge will ensure:

- Adequate supply of vaccines, syringes and needles for measles /rubella "ring vaccination" are available and if there is any shortage, the same will be procured from the adjoining atoll or island in coordination with the HPA.
- Adequate cold chain capacity is maintained.
- Quality monitoring and evaluation of the Field level implementation: Vaccine safety monitoring- eligibility screening and precautions
- Trained staff who are able to administer the vaccine

d) Role of clinicians at health facilities

Clinicians have vital roles in establishing sensitive surveillance for measles, rubella and CRS and in maintaining preparedness for outbreak response.

- Identification of suspected measles cases (cases with fever and maculopapular rash)
- Notification- inform public health unit once a case is suspected so that active case search can be carried out by the public health unit in the community to find out more of similar cases;
- Investigation- fills up the relevant section of the case investigation form (CIF) at first contact. Date of investigation is when the case investigation form of measles, rubella/CRS is filled by the

clinician. Inform Public Health Unit to ensure that samples have been collected and sent to national laboratory at IGMH.

- Coordinate with the HPA and the local PH Unit for case contact tracing and examination as outlined above.

e) Role of peripheral/atoll laboratory

- Maintain adequate supplies for sample collection (serum and throat swab)
- Serum sample and throat swab sample collection of every case of fever and rash as per the guidelines
- Preparation of sample, storage and packaging for transport to central laboratory
- Liaison with HPA /IGMH laboratory for sample transport

f) Role of Central Laboratory

The central laboratory plays a pivotal role in the confirmation of suspected measles, rubella/CRS cases and outbreaks, and in the identification of circulating strains of measles and rubella viruses. Information regarding the circulating strains is useful to track importations of measles virus when a country is in the elimination phase. Laboratory at IGMH is WHO accredited and proficient laboratory for measles and rubella testing. All samples must be sent to IGMH Laboratory at the earliest.

Molecular analysis is important to provide information on the origin of virus and to distinguish between wild type virus infection and infection related to recent vaccination. The key roles of IGMH laboratory are:

- Testing of serum samples of suspected cases with fever and rash for detection of IgM.
    - While IgM ELISA tests for measles and rubella are more sensitive between days 4 and 28 after the onset of rash, a single serum sample obtained at the first contact with the health care system at any time **within 28 days after onset of rash** is considered adequate for surveillance purposes.
    - However, during the first 72 hours after the rash onset, the false negative rate may be as high as 30% for measles-specific IgM and 50% for rubella-specific IgM. For sporadic cases, a second serum sample may be required under the following circumstances:
        - IgM specific assay is negative for a specimen collected within four days of rash onset; and
        - IgM specific assay repeatedly gives an equivocal result.

    A second specimen for IgM testing may be collected anytime between 4 and 28 days after the rash onset.

- Laboratory will report all results of serology and virology to HPA but in case of any confirmed measles or rubella case, priority will be given and the intimation to HPA will be given promptly and simultaneously the result will be conveyed to the concerned Atoll.
- Packaging and liaising with HPA for transporting positive samples to Regional Reference Laboratory (RRL), Thailand for genotyping.

D) Training and Periodic Refreshing of health providers:

a) To build up or strengthen the capacity of health care service providers to efficiently manage Measles and Rubella case/s/outbreaks (even one confirmed case)

b) To guide the healthcare service providers on prevention of transmission of Measles and Rubella and create community awareness

c) To improve the technical capacity of managerial level staff through providing necessary technical guidance, in order to efficiently manage and coordinate situation of increasing cases (>1 case) of Measles or Rubella with available resources

Training plan of health care staff on outbreak preparedness and response:

- All Medical Officers/clinicians in hospitals will be oriented on the programmes on the Measles, Rubella Elimination programme and outbreak preparedness and response.
- Requirement of hospital readiness for patient case management and hospital infection control measures for the prevention of spread will be discussed.
- Cascade training will be conducted to train all Public Health unit medical personal on measles rubella outbreak prevention and preparedness for response
- Annual refresher trainings will be conducted for maintaining the surveillance and preparedness for outbreak response.

4. Measles and Rubella Outbreak Response Plan

The steps described below will be initiated for the management of measles and rubella cases/s/outbreaks, including their confirmation, investigation and response. The order of these steps does not necessarily indicate the chronological order of the implementation. Many of these actions will have to be undertaken concurrently as soon as the outbreak is suspected or confirmed.

The main objective of the outbreak detection and early investigation is to:

- Prevent establishment of transmission in the community in case of importation
- Helps in predicting potential outbreaks, detecting and investigating outbreaks
- Monitor the changing epidemiology of measles and rubella disease in community

- Identify high-risk population subgroups/geographic areas, and the immunity gaps, that call for targeted supplementary immunization strategies (SIA)
- Helps in the identification and correction of weaknesses in immunization programme and surveillance system.
- Raise awareness in community and health care professionals on measles, rubella diseases and prevention.

In the post elimination period, importations of measles and rubella viruses are common and can lead to outbreaks and reestablishment of endemic transmission even when the country has successfully interrupted the transmission. To prevent the risk of establishment of virus transmission following importations, rapid and appropriate investigation and response measures will be taken.

In fact, an outbreak of measles will be identified through the routine measles surveillance system by reporting any person with fever and maculopapular rash. In such cases, the response will be initiated as soon as the laboratory confirms it as a case of measles (IgM +ve). However, a clinician may come across a patient which is *clinically suspected measles case*, i.e. measles case as per definition mentioned above in section:2 (**fever and maculopapular rash with at least one of the Cough, Coryza i.e. runny nose or Conjunctivitis, i.e. red eyes),** for which the action will be initiated immediately as described in section 4.1 below.

HPA will coordinate with Atolls in detecting outbreaks on time and will start rapid response initiatives at atoll and national level to investigate and contain outbreaks.

Thus, Outbreak response to measles and rubella will be based on the outbreak alert as follows:

Alert threshold for outbreak of measles and rubella	A single case of **clinically suspected Measles or Rubella** should be considered as an alert for Measles or Rubella outbreak and to be notified immediately with in 24hrs to the National level and investigation should begin immediately. Suspected Measles /Rubella should be notified • by all hospitals, Public Health Unit at atoll and island to Health Protection Agency (HPA) at Male' by telephone/ fax/e mail

4.1 Investigation of all clinically suspected measles cases:

Whenever a patient is *suspected of having measles clinically* (**fever and maculopapular rash with at least one of the Cough, Coryza i.e. runny nose, or Conjunctivitis i.e. red eyes),** outbreak control measures and a detailed investigation will be initiated in the area of patient's residence without waiting for laboratory confirmation. Care will be taken to not to label it as a case of measles unless confirmed by the laboratory, as this is a case of fever and rash and not yet confirmed by the laboratory as a measles case.

a) Health care provider/clinician or the PH Unit will obtain basic information, clinical data, a blood sample and nasopharyngeal sample during the first contact (as this could be the only contact with the patient). He will fill up the CIF with complete information and ship the samples to laboratory for investigation without any delay along with the CIF (Annexure:1) and laboratory request form (Annexure:5).

b) Inform the patient or the parent that someone from the health staff will visit their home for additional information.

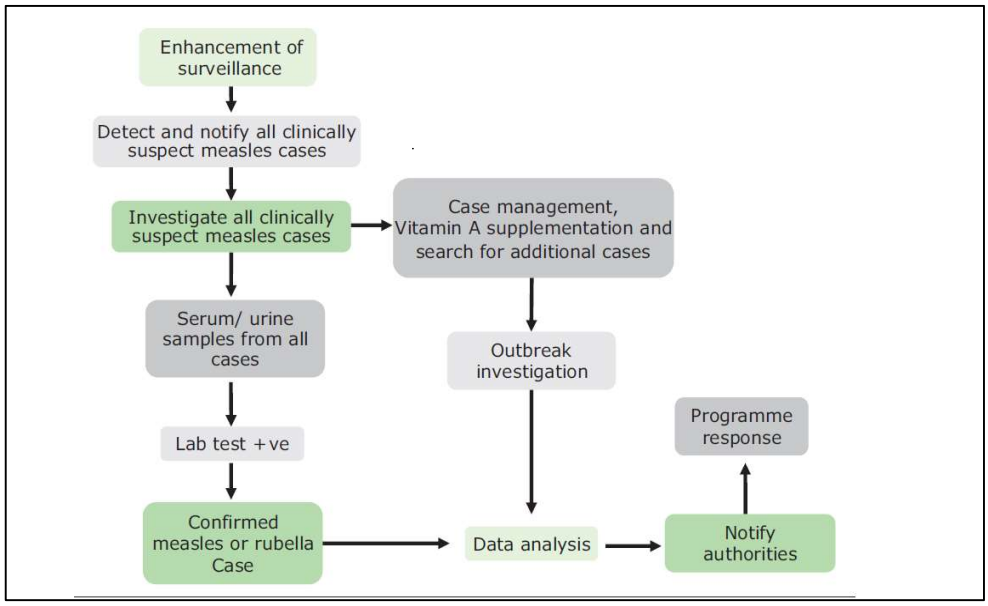
c) The local health focal person from the Atoll will visit the family immediately and determine whether the case meets the clinical case definition for measles, assign a case Epid number in consultation with the HPA and will fill up the CIF if not filled earlier or if filled incompletely.

d) Collect specimens (if it has not been done earlier) and sent to laboratory on priority. Coordinate with the laboratory for priority consideration.

e) **Active case search and community search**: The locality of the suspected measles case will be visited and detailed investigation initiated without waiting for laboratory confirmation. Additional cases will be searched (community survey -Annexure:3). If additional cases are found, then each will be investigated and specimens collected for serology and virus isolation. The source of infection should be epidemiologically linked whenever possible. *(Note: this action will only be initiated if it is a "clinically suspected case of measles" and not for routine "suspected cases/cases with fever and rash")*

- The laboratory will analyse the samples and the result is expected to be conveyed within four days of sample receipt in laboratory. If found positive for Measles (IgM) the information will be conveyed by the lab to HPA and the local Atoll so that **outbreak response measures are initiated** as per protocol, if not already initiated.

Figure: Flow chart of events under Measles and Rubella surveillance



4.2 Public health response to a single measles/rubella case

Every single case of measles is considered as an outbreak and evokes public health response. Similarly a single case of rubella is an outbreak and also evokes public health response on the same lines.

The outbreak response will be initiated in case the "clinical suspected measles case" (as mentioned in section above) is confirmed by laboratory as IgM positive, or a routinely reported "suspected measles case/case of fever and rash" is confirmed by laboratory as IgM positive for measles or rubella.

The local responsible health facility worker / surveillance focal point / Atoll hospital incharge will be activated immediately on confirmation of case by laboratory and within 24 hours of the alert the following summarized steps will be initiated and completed with minimum delay:

a. Verify the alert/s as mentioned under the section given above and proceed further (in case it was a "clinical suspected measles case").
b. Notify appropriately to the HPA if not done earlier.
c. Examine the suspected case
d. Collect necessary information from case, care takers or family members, neighbours and local clinicians
e. Complete the relevant component of the suspected measles case investigation form(CIF)
f. Collect serum and throat swab samples from suspected case at first contact *(refer and follow-Standard Operation Procedure for sample collection and shipment as given in*

measles surveillance guidelines) if not collected earlier and arrange to ship them to central laboratory at Male' without any delay:

i. the blood sample (5ml blood from older children and adults, 1ml from infants and younger children-within 3rd to 28th day of the onset of rash, preferably centrifuged to separate serum or serum from clotted blood): store and ship/transfer to IGMH lab at 4^0-8^0C in cold box/specimen carrier.
ii. virus isolation sample (throat swab in Virus Transport Media) preferably within first 5 days of the onset of rash) in cold box with Ice packs

g. Whenever sample collection facilities are not available, relevant referrals will be done to the nearest hospital with peripheral laboratory facility and will arrange for the sample collection and shipment to IGMH, Male' using the laboratory request form (Annexure-5).
h. For every confirmed measles or rubella case, carry out "contact tracing" in all household members, workers and regular visitors along with any other suspected cases on contact tracing form – Annexure-2. (for details refer section below and "measles & rubella surveillance guidelines")
i. Conduct Community survey within the radius of 100-1000 metres from the confirmed case to identify any unreported cases using format as given in Annexure-3. (for details refer section below and measles & rubella surveillance guidelines)
j. In all laboratory confirmed cases, outbreak response "ring vaccination" will be conducted: all households, contacts and population around 1 km radius or the whole island will be provided a single dose of Measles & Rubella Containing Vaccine (MR)
k. Will follow up with active case search and detection of additional cases for 14-28 days and will ensure the Atoll sends weekly reporting to national level
l. Monitor for time period elapse of 2 incubation period cycles from the last identified case (36-42days for both) with vigilant case detection to ensure that the community circulation has not been established or the transmission chain has been stopped
m. If any suspected case/s is reported from a different geographic area and if there is no clear epidemiologic linkage with the initial outbreak geography, such cases will be separately investigated for confirmation.
n. If the outbreak continues > 28 days, another 5–10 suspected cases will be tested every 2–3 months, to confirm that the illness in question is still measles or rubella and to monitor the implicated virus genotype/s.
o. Retrospective searches are done in the area until no further cases are identified: steps to identify cases retrospectively

- Review medical records in health facilities for measles or rubella-like illness.
- Review records in the laboratory for samples sent for other viral infections (with fever and/ or rash)
- Review workplace, school absentee logs in the area

4.3 Public health response to >1 or multiple measles/rubella cases:

There may be a situation when more than one case of measles or rubella is reported simultaneously or on community survey of a single reported case, multiple unreported cases are identified, or the number of cases increase in a short span in the outbreak situation.

The following actions under the outbreak response will be initiated:

a. Notify every suspected case to the HPA if not done earlier.
b. Examine all the suspected cases
c. Complete the relevant component of the suspected measles case investigation form(CIF) for every case. Special emphasis to be given to the travel history.
d. Collect serum and throat swab samples from first 5-10 suspected and arrange to ship them to central laboratory at Male' using laboratory request form (Annex-5):
e. **Contact tracing**: Conduct contact tracing of every case to identify the source of infection and determine whether other areas have been exposed or are also experiencing outbreaks. Identify all people the case had contact with during the time he/she was contagious; make a line-listing of these contacts, including their names and addresses, and determine whether they are or were ill (Use form in ***Annexure-2***). This could include school mates, frequent visitor to the family like maids, teachers, etc. who came to the house within the most infectious period (4 days before and after the eruption of rash). Follow-up should be done to determine if a contact subsequently became ill. If so, laboratory specimens should be collected from all suspected cases.
f. **Community survey** to Enhance case based surveillance and Active case-searches: In response to confirmed cases of measles or rubella active case searches should be conducted to detect unreported cases to ensure that all cases are identified and reported. Such searches should be conducted in the entire island or a perimeter of an entire atoll depending upon a local epidemiological assessment mostly within the radius of 100-–1000 meters from the confirmed case. In addition, health facilities should also be included for active case searches. In health facilities, health staff

interview and review registration records, discharge diagnoses, and hospital charts etc. should be performed to identify patients with fever and rash illnesses or to see if there are any other similar cases. Any cases that report to have measles or rubella in the last 30 days should be included as a case of measles in the community survey. (***Annexure-3)***

g. **Enhancing population immunity (Vaccination activity)** against measles and rubella: conduct an outbreak response immunization (ORI) or SIA based on epidemiological data. Carry out a safe and timely vaccination campaign in the targeted areas as soon as there is sufficient capacity (human and financial resources and vaccine and other supplies).

   All individuals (9 months to 45 years of age) not having documented evidence of having two doses of measles-rubella vaccine will be vaccinated with additional dose of measles and rubella containing vaccine (MR).

   The response will target both outbreak-affected areas and adjacent areas in which the risk- assessment shows a high risk of spread. Health staff should pay particular attention to ensure that **groups and areas with a high likelihood** of not being reached (i.e., with known low coverage) and at high risk for measles-related complications are reached during the vaccination activities, and any necessary supplemental measures such as the provision of vitamin A are provided. These vulnerable groups and areas include:

   • young children, particularly those under one year of age;

   • malnourished and vitamin A-deficient children;

h. Once the vaccination activities are conducted, it is important to carry out Rapid Coverage Monitoring (RCM) to estimate the coverage achieved, and to identify potential groups of missed children and ensure that they are vaccinated.

i. Follow up with active case search and detection of additional cases for 14-28 days

j. Monitor for time period elapse of 2 incubation period cycles (36 to 42 days for both) from the last identified case with vigilant case detection to ensure that the community circulation has not been established or the transmission chain has been stopped

k. If any suspected case/s is reported from a different geographic area and if there is no clear epidemiologic linkage with the initial outbreak geography, such cases will be separately investigated for confirmation.

l. If the outbreak continues > 28 days, another 5–10 suspected cases will be tested every 2–3 months, to confirm that the illness in question is still measles or rubella and to monitor the implicated virus genotype/s.

m. Retrospective searches are done in the area until no further cases are identified: steps to identify cases retrospectively

- Review medical records in health facilities for measles or rubella-like illness.
- Review records in the laboratory for samples sent for other viral infections (with fever and/ or rash)
- Review workplace, school absentee logs in the area

4.4 Survey of population immunity/gaps: review of coverage trend for MCV1 and MCV2, review coverage of MCV SIA, or other Periodic Intensification of Routine Immunization (PIRI) done in the area. Risk assessment should be done to Identify any immunity gaps, if any in the area, especially with focus on any hard-to reach population for appropriate interventions.

4.5 Managing suspected cases and contacts: It is important to ensure adequate clinical management of measles cases in order to reduce measles mortality. Children with mild illness may preferably be managed at home without compromising on access to health care and avoiding contact with other vulnerable children. Seriously ill children should preferably be hospitalized for proper management. Since measles virus is highly infectious, all hospitalized children with suspected measles should be cared in isolation facility. School going children and adults working should avoid public places and remain confined at home for at least five days after the onset of the rashes. Monitoring and follow-up of suspected cases includes the following measures.

• Limiting contact to only immediate family members who have been vaccinated or have prior history of measles. In particular, avoid contact with infants or young unimmunized children in the household.

• Suspected cases should not be hospitalized, unless they have complications or another condition requiring hospitalization, because of the high risk of intra-hospital transmission.

• Patients with measles who require hospitalization should, if possible, be isolated from onset of prodromal symptoms until five days after rash onset; health staff in contact with these patients should use respiratory precautions during this period

• Contact should be limited in outpatient departments (OPDs) such as waiting rooms, where there are suspected cases. For example, where feasible, separate segregated waiting areas and

examination rooms for suspected cases should be set up in outpatient clinics. Also, where feasible, officials must be prepared to identify persons who have had **contact with a confirmed measles case** and take the following actions to minimize spread.

• During the second week after exposure, and at the first sign of possible measles (fever, runny nose, cough or red eyes) the contact should be instructed to stay at home.

Information on suspected and confirmed measles cases, vaccination activities, and areas visited should be monitored and updated continuously during an outbreak. When no new cases are reported during a three week period, despite the presence of enhanced surveillance, the outbreak may be considered to be at an end.

At the end of outbreak, a report will be prepared describing the outbreak, time, place and person analysis, control measures taken, issues identified, conclusions and recommendations.

Virus isolation and genotyping should provide information on the origin of the infection and evidence of importation or endemic transmission.

4.6 Specimens for Serology:

1. If a refrigerator is available, put the blood samples in a refrigerator for 4-6 hours until the clot retracts, then pour off the serum the next morning. Don't freeze whole blood;
2. If a centrifuge is available, let the blood sit for 30 minutes, then centrifuge the specimen at 2000 RPM for 10-20 minutes and pour off the serum into a sterile test tube.

4.7 Specimens for Virus isolation:

Throat swab sample collection for measles virus isolation: Data on viral genotypes are critical for tracking transmission pathways, investigating suspected vaccine-related suspected cases, documenting the elimination of endemic strains, and supporting the hypothesis of importations from other Regions. Therefore, specimens for viral detection and isolation should also be collected on first contact with the patient. **Throat swabs are the preferred sample for viral detection/isolation for both measles and rubella viruses and are best if done within 5 days of the onset of rash.** For further genotyping, the samples should be sent to Regional Reference Laboratory in Bangkok.

The details of sample collection procedure are outlined in Annex 9.5 of surveillance guidelines.

5 Data collection and interpretation

The data will be systematically collected and compiled at every level and completed data will be made available for verification. It will cover case tracking and site reporting. At the national and atoll levels the system is capable of tracking all reported suspected cases/cases of fever and rash until they are either confirmed or discarded (case tracking). At the national level, essential information, as presented in the *Suspected Case Line-listing*, should be available for monitoring the basic surveillance indicators of the program. Weekly reporting from all atolls must be closely monitored for any suspected cases in other islands or locations.

At the Atoll level and island level, the public health units must effectively conduct active case searches and identify the unreported suspected measles cases.

At the national level the HPA will monitor the timeliness of weekly reporting and will maintain the line list of all the suspected measles/rubella cases reported. HPA will also ensure that the laboratory results are entered in the CIF and line listing and the cases are finally classified. They will be maintaining the distribution of suspected cases on spot maps.

Analyse data

Data collected will be analysed by Atoll-level PH Unit to gain a better understanding of the outbreak and use the information to guide the outbreak response activities. Atoll PH Unit will keep updated line listing of suspected measles cases/cases of fever and rash, identified and reported and will update the weekly reporting accordingly.

On the conclusion of outbreak response the PH Unit will compile and analyse the age specific outbreak data on Annexure-6 and Annexure-7 and forward the compiled date to HPA.

Below are important indicators that provide information on the severity of the outbreak.

For information on how these are calculated see ***Annexure-4***

a. Attack rate (AR)

The AR expresses the number of cases among the total population in a given area during a defined period of the outbreak. If population data by age group are available for the area affected by the outbreak, age-specific attack rates can be calculated. Age-specific attack rates help to identify the age ranges for priority vaccination.

AR allow for comparison of the extent of the outbreak between different populations

(e.g. by age group or by geographical location).

It should be emphasized that it is important to determine the place where the suspected case was infected rather than the place from where he/she may seek care, as patients may seek health care in a different area to where they live. This information helps to follow the geographical spread of the epidemic and identify areas at higher risk. Ideally, it is also important to determine the attack rate by age group.

b. Weekly incidence

Weekly incidence is the number of new cases of the disease by week in a specified population. Attack rates and weekly incidence numbers permit comparison between different geographical areas and monitor the progression of the outbreak over time.

c. Case-fatality ratio (CFR)

The case-fatality ratio measures the proportion of deaths among confirmed measles cases. It should be calculated for the community as a whole as well as hospitals.

d. Vaccine effectiveness (VE)

Vaccine Effectiveness measures the effectiveness of vaccination in conferring protection against measles. For a more detailed analysis, a case-control study is needed to elucidate more specific risk factors, such as age at vaccination, number of doses received, access to care and travel history. Cases and controls (persons without measles) are identified and then compared to determine to what extent they differ, e.g. by age, sex, vaccination status, etc. To obtain assistance for such a study, district officials should consult with epidemiologists at the provincial and national level.

Interpret data

Generally, the initial descriptive analysis of person, time and place will help define who is at risk of measles and which areas are affected. In addition, data on the age of cases and their vaccination status will help to identify causes of the outbreak and the population that is at highest risk. This information is needed to guide the response activities, for example, defining the population and the age groups to be targeted for vaccination. When interpreting data, it is important to take into consideration the

quality of the surveillance system generating the data, as reliable information is needed to guide action.

6 Adequate case management

- All acute serious cases will be managed in hospitals with adequate isolation facility to ensure infection control measures are implemented in prevention of hospital based transmission

- Mild cases are managed at outpatient treatment level, but with adequate advices to motivate for early health care seeking in worsening of the situation
- Supportive medical care will be provided for prevention of complications and mortality.

Administration of vitamin A to children with measles has been shown to decrease both the severity of disease and the case fatality rate, and WHO recommends that vitamin A be administered to all children with acute measles. One dose (50 000 IU for infants aged less than six months, 100 000 IU for infants aged 6-11 months, and 200 000 IU for children aged ≥ 12 months) should be administered on the day of measles diagnosis, and one dose should be administered the following day.
Supportive treatment should be provided for all cases, including additional fluids (such as oral rehydration solution) and antipyretics. Antibiotics should be used for cases complicated by otitis media or pneumonia, and nutritional therapy is indicated for children with malnutrition. Many children require four to eight weeks to fully recover their pre-measles nutritional status.

7 Media communication/ risk communication:

Communication and public awareness:
If >1 case from a geographical area or cluster of cases are reported and if confirmed by laboratory examination to be measles or rubella, there is likely to be widespread public concern and will require making public aware of the real situation to avoid panic reaction. One of the most important elements of a public health response will be the communication strategy to ensure that accurate information is provided to the media and the community, as release of inaccurate or premature information may have serious repercussions for the affected individual, their family, and the community.

- Minister of Health, Secretary Health, Director General of Public Health, Health Protection Agency are the responsible authorities for media communication
- The media will be considered as a useful partner in keeping the public informed through regular press releases and conferences.
- Messages to the community will be discussed and decided by the Ministry of Health/HPA. Messages will include:
    - Existence of an outbreak and the benefits of measles vaccination
    - Signs and symptoms of the disease
    - Encouraging parents whose children have/had a recent fever and rash illness to consult the health care facility

- Encouraging parents of unvaccinated children (less than 2 years of age) to get them vaccinated
- Information on locations and opening hours of health facility/vaccine centres.
- Enhance social mobilization activities to inform the affected communities about the suspected outbreak, which specific age group of previously unvaccinated children is targeted for measles vaccination, and where parents should bring their at-risk children for vaccination etc.

A representative from each local media will be invited to a special media brief at MOH. They will be presented with up to date and factual information to minimise speculation and public concerns. Any material that will be released to media will be prepared by the Health Protection Agency. The website of Ministry of Health and Health Protection Agency will provide up to date information and media releases.

For media inquiries, please contact:

Media Focal Point for the Disaster

8 Learning lessons from the outbreak

In case of a cluster of measles/ rubella cases, HPA through the Rapid Response Team will perform an evaluation of:

- measles surveillance and the timeliness of outbreak detection
- the cause of the outbreak (example, failure to vaccinate, vaccine failure, etc.)
- preparedness for the outbreak
- the management of the outbreak including an evaluation of the curative and vaccination intervention
- evaluation of costs, including impact on other health delivery programs
- the performance under immunization program
- the implications for developing appropriate response strategies for future outbreaks

9 Funding support and budget

Comprehensive epidemiologic investigation during outbreaks will require significant human and financial resources. Resource mobilization of existing resources and engagement of additional resources will be done without delay.

Annual budget allocations of the Ministry of Health will be available for provision of routine services in individual case based investigations and outbreak response immunization.

In case of increasing numbers and identified high risk pockets or categories to be vaccinated or in case of SIA to be conducted, fund assistance will be requested from Emergency trust fund in the Ministry of Health or from the partner organizations of WHO and UNICEF.

- The amount to be allocated will depend on the situation and the size of the outbreak. Funds from Government of Maldives can be allocated and mobilized depending on the situation.
- In requesting partner organization support, the Ministry of Health will make appropriate requests

Following will be taken into account in estimating the budget depending on the situation:

- personnel- salary, per diem and training
- vaccination: vaccines, cold chain, injection supplies
- sample collection and testing kits
- domestic and international shipping
- staff transportation: Speed boat (rentals), travel etc.
- other logistics and administrative supplies: vaccination cards, date stamps, tally sheets, training documents etc
- information, social mobilization, communication equipment (mobile phones, radio, TV messages)
- drugs and medical supplies
- Laboratory costs and consumables

10 Monitoring and Evaluation

Under the guidance of NVC and Measles elimination technical advisory (MTAGI), the HPA will be the main responsible body and will monitor and evaluate the measles, rubella outbreak preparedness and response plan regularly on day to day basis.

The HPA will coordinate with NVC and WHO in monitoring and evaluation of the progress and will provide updates on the outbreak preparedness and response for incorporation as per the needs of the programme.

HPA will ensure the implementation of the outbreak response as per the plan and will make adequate arrangements to monitor the activity. Trained individuals from the health staff or from the partner organizations should carry out the Rapid Community Monitoring (RCM) side by side in the areas where the vaccination has been completed so that the activity could be repeated timely in poor coverage areas.

11. Standard Operating Procedure (SOP) - Measles/Rubella

IGMH Laboratory

Confirms a measles/rubella case as IgM +ve & informs HPA & local health facility (Atoll/Island)

HPA

1. Seeks full information of the case from respective Atoll/Island
2. Informs MoH & NVC: Call for National Health Steering Committee Meeting
3. Holds National Task Force Meeting & initiates Outbreak Response action
4. Identifies and deploy 1-2 RRT members
5. Assess the availability of vaccine, throat swab kits and other logistics
6. Provides guidance to local Atoll/Island to initiate outbreak response
7. Mobilizes additional funds for the activity

Atoll/Island

1. RRT & Health facility Incharge holds local PH unit meeting and prepares logistics and assign jobs
2. RRT/clinician/PH focal person visit family to conduct detailed investigation
3. Carry out contact tracing using Annexure 2
4. Form teams and carry out community survey in the island/ atoll using Annexure 3
5. Conduct active case search in hospital and private clinics

No additional suspected cases of measles identified

1. Identifies the area and target population for vaccination
2. Carry out vaccination using MRCV

Suspected cases of measles/rubella identified

1. Examine in detail and fill CIF for each such case
2. Collect serum and throat swab from each case and ship to laboratory using annexure-5
3. Carry out contact tracing of every case- annexure2
4. Hold ORI in the area identified using MRCV
5. Watch the area for occurrence of fresh suspected measles cases up to 28 days of last case identified

Data compilation and analysis at Atoll level

1. Complete the suspected case line listing, weekly reporting of suspected cases and CIFs
2. Compile the outbreak data collected and analyse. Prepare outbreak analysis report-Annex. 6
3. Prepare age specific compiled information on the outbreak line listing format-Annex.7

HPA

1. Compile and review the data received from the Atoll on outbreak response
2. RRT prepares and submit the outbreak investigation summary -Annexure 8.
3. HPA holds the task force meeting and review the outbreak response. Identifies the weakness in the system for corrective measures
4. Briefs the MoH on the Out break response

Annexure 1: MEASLES/RUBELLA CASE INVESTIGATION FORM

Measles and Rubella Case Investigation Form
Health Protection Agency, Maldives

Part A: To be filled in by Clinicians reporting the case

This form should be completed for each case of fever and maculopapular rash on first contact

Reporting Institution:	**Case ID (HPA)** MAV- __ __- MR – 17 - __ __ __
Date of investigation: ___/____/_____	**Date of notification PHU/HPA:** ___/____/____

Patient National ID card Number Foreigners Passport number	**Date of Birth:** ___/____/_____ **,Age:** (yy/mm)	**Sex:** ☐ Male ☐ Female Pregnant: Yes ☐ No☐ NA☐ If Yes, No of weeks……..

Name of the patient: **Father's name:**	**Contact Number:**
Address:	**Atoll:** **Island:**
Criteria for suspected Measles/Rubella case: 1. Fever ☐Yes ☐No ☐Unknown 2. Date of onset of fever: ___/____/____ 3. Maculopapular rash onset date ___/____/_____	**Other findings if any;** 1. Cough ☐Yes ☐No ☐Unknown 2. Coryza ☐Yes ☐No ☐Unknown 3. Conjunctivitis ☐Yes ☐No ☐Unknown 4. Adenopathy ☐Yes ☐No ☐Unknown 5. Arthralgia ☐Yes ☐No ☐Unknown Any other _____

Vaccination History (by card/history):

Measles containing vaccine (MCV) ☐ Yes: ☐No: reason:_____ No of doses _____, Date of last ose:_____ **Vitamin A:** _____	**Rubella containing vaccine (MMR)** ☐ Yes: ☐No: reason:_____ No of doses _____, Date of last dose:_____ **Vitamin A:** _____
Travel History (7-21 days before the onset of rash): ☐Yes ☐No. If yes, place/country visited …… from…….. …… to ……..	**Hospitalization:** Yes☐ No☐ If Yes, Name of hospital…….. DOA……. DOD …….. **Final Status:**☐ Recovered ☐ Referred ☐ Died ☐Unknown

Case notified by: Name of the Notifier: **Position :**

Signature: **Date:**

Part B: To be filled by peripheral and IGMH laboratory

Serum Sample collection	**IGMH Lab ID:** _____	**Virology Sample collection**	**IGMH Lab ID:** _____
Specimen collected	☐Serum ☐No	Specimen collected	☐Throat swab ☐No
Collected at		Collected at	
Date of collection		Data of collection	
Date sent to IGMH lab		Date Sent to IGMH lab	
Date Received by IGMH lab		Date Received by IGMH lab	
Adequate sample	☐Yes ☐No	Adequate sample	☐Yes ☐No
Date of result		**Date of result**	

Result (IgM):		**Result :**	
☐Measles	**☐Rubella**	**☐Measles** ☐Negative ☐Positive	
☐Negative ☐Positive	☐Negative ☐Positive	**☐Rubella** ☐Negative ☐Positive	
☐ Equivocal	☐ Equivocal	**Genotype Result**	**☐Measles ☐Rubella**
☐Pending ☐not tested	☐Pending ☐not tested	**Date of result sent to HPA**	

Part C: To be filled by Health Protection Agency

Final Classification: ☐ Confirmed Measles ☐ Confirmed Rubella ☐ Discarded **Basis for classification:** ☐Laboratory ☐Epidemiological Linked ☐ Clinical **Source of infection:** ☐Endemic ☐ Imported ☐Import-related ☐Unknown Reason for discard…….	**FOLLOW UP for confirmed cases:** Contact tracing done? ☐Yes ☐No If yes, number of additional suspected cases detected: _____ Active case search done? ☐ Yes ☐No If yes, number of additional suspected cases detected: _____ Outcome at 30 days follow-up for confirmed cases: ☐Alive ☐Died ☐ Lost to follow-up

Contact Health Protection Agency Surveillance 3014496 or 3014333

Annexure 2: CONTACT TRACING FORM

Annex 9.2: Contact Tracing form

Atoll:_____ Health Centre:_____ Block:_____

Date of investigation:_____ Supervisor name:_____ Investigator name:_____

Outbreak ID:_____ _____ _____ ____ _____ Survey Dates: _____

ALL HOUSEHOLD MEMBERS / WORKERS AND REGULAR VISITORS						ONLY SUSPECTED CASES (Onset between _____ & _____)						
(1) Name	(2) Birth date	(3) Sex (M/F)	(4) Total number of measles vaccine doses	(4) Date of last dose	(5) Suspected measles case (Yes/No)	(6) Date of rash onset	(7) Samples taken: serum, naso-pharyngeal aspirate, throat swab, urine	(8) Places visited 7-21 days before rash onset (possible exposure sites)	(9) Date(s) of investigation of places described in column 8	(10) Places visited four days before to four days after rash onset	(11) Date(s) of investigation of places described in column 10	(12) Other information (e.g., death, occupation, contact with tourist)

NOTE: This form is to be used for contact tracing of every confirmed Measles/Rubella case.

Annexure 3: COMMUNITY SURVEY FORM

RESPONSE TO A CASE OF CONFIRMED MEASLES/RUBELLA : COMMUNITY SURVEY

Locality name: _____ **Date of search:** _____ **Team No.:** _____

Health Centre: _____ **Atoll:** _____

Search done by: _____ **Surveyors Names:** _____

Outbreak ID: _____ **Supervisor's Name:** _____

	House No. :											Total
Age Group	**Category**	**Vaccinated**										
<1 year	Measles											
	Non-measles											
1-4 years	Measles											
	Non-measles											
5-9 years	Measles											
	Non-measles											
10-14 years	Measles											
	Non-measles											
≥ 15 years	Measles											
	Non-measles											
Age Group	**Category**	**Unvaccinated**										
<1 year	Measles											
	Non-measles											
1-4 years	Measles											
	Non-measles											
5-9 years	Measles											
	Non-measles											
10-14 years	Measles											
	Non-measles											
≥ 15 years	Measles											
	Non-measles											
Age Group	**Category**	**Vaccination status unknown**										
<1 year	Measles											
	Non-measles											
1-4 years	Measles											
	Non-measles											
5-9 years	Measles											
	Non-measles											
10-14 years	Measles											
	Non-measles											
≥ 15 years	Measles											
	Non-measles											

Annexure-4

Note: 1) All persons who presently have measles or in the recent past (last 3 months) had measles should be recorded as measles case

2) Number of death due to measles should be counted as measles case also. Give details of deaths on the reverse of the form

3) This form should be used for selected outbreaks

Annexure 4: Calculation of Rates (Formulae)

Case fatality rate (CFR)

The case fatality rate measures the proportion of deaths among cases1. CFR should be calculated for the community and hospitals separately. The CFR is an indicator of the severity of the outbreak. The CFR can be calculated as follows:

$$\text{CFR} = \frac{\text{Number of cases who died of measles X100}}{\text{Total number of measles cases}}$$

1 A measles-related death is a death of an individual with confirmed (clinically, laboratory-confirmed or epidemiologically) measles in which death occurs within 30 days of rash onset and is not due to other unrelated cause e.g., a trauma or chronic disease.

In the community, the CFR may be underestimated, as many cases that die at home are not reported. In hospitals, the CFR may be high probably because only severe cases seek hospital care or due to poor case management. If a more accurate estimate of the CFR is required, a community-based study should be conducted focusing on CFR estimates by age groups.

Additional data analysis to determine the attack rate and the vaccine efficacy using population data need to be done

Attack rate (AR)

The AR expresses the risk of disease in population in a given area since the beginning of the outbreak. If population data by age groups are available, age-specific attack rates can be calculated, which can help identify priority age groups for vaccination.

$$\text{AR}_{\text{0-11 months}} = \frac{\text{Number of cases in children age 0 to 11 months X100}}{\text{Total number of children aged 0 to 11 months}}$$

AR allows the comparison of risk of outbreak between different populations.

Vaccine efficacy (VE)

The VE is estimated from outbreak and routine coverage data. The difference between attack rates among vaccinated persons (ARV) and those among the unvaccinated (ARU) is expressed as a fraction of the attack rate among unvaccinated persons (ARU):

$$\text{VE} = (\text{ARU}-\text{ARV})/\text{ARU}$$

If there is a greater proportional reduction of illness in the vaccinated group as compared to the unvaccinated group, then there is greater VE.

Vaccine efficacy can be estimated by plotting the percentages of measles cases occurring in vaccinated individuals (PCV %) and the percentage of the population vaccinated (PPV %) on a normogram, which
shows the relationship between PPV, PCV and VE

MEASLES LABORATORY REQUEST FORM AND RESULT FORM - FOR OUTBREAKS

Atoll: _____

Outbreak ID:_____

Part I: Case information									**Part II** (to be filled out by receiving laboratory)			
Patient name	**Patient ID Number**	**Case EPID number**	**Age**		**Date of rash onset**	**Date of last measles dose**	**Type of Specimen**	**Specimen collection date**	**Specimen identification number**	**Date of result**	**Test result**	
			Years	**Months**							**Measles**	**Rubella**

Date specimens sent:_____

Name of person sending the specimens:_____ SIGNATURE.....

Address:_____

Date specimens received:_____

Receiving laboratory name:_____

Comment:_____

Signature: _____

Note: Blood specimen should be collected between 4 and 28 days after the onset of rash

*** Case ID/ EPID number is the code given to each sample of blood which will be outbreak ID-B-patient number.**

Outbreak Analysis Report FORM:

Data analysis of outbreak investigation

Outbreak ID:_____

Age Group	Number of measles cases received measles vaccine	Number of measles cases not received measles vaccine	Number of measles cases with unknown vaccination status	Number of non-measles received measles vaccine	Number of non-measles not received measles vaccine	Number of non-measles with unknown vaccination status	Number of deaths due to measles (Deaths must be included in case counts)	Total population	Age specific attack rate	Age wise distribution of measles cases (%)	Attack rate among not vaccinated (ARU)	Attack rate among vaccinated (ARV)	Vaccine Efficacy (%)	Case Fatality rate (CFR)
	A	B	C	D	E	F	G	H = Sum(A:F)	J = ((A+B+C)/H) *100	K = (A+B+C)/(L+M+N) *100	ARU = B/(B+E)	ARV = A / (A+D)	(ARU-ARV) / ARU*100	CFR = G/(A+B+C) *100
< 1 year														
1 - 4 years														
5 - 9 years														
10 - 14 years														
>=15 years														
Total	(L)	(M)	(N)											

Annexure 7: LINE LISTING OF MEASLES OUTBREAK

Line listing of Measles outbreak

Atoll: _____ Report Date: _/_/___

Line List (year): ___ Reported by: _____

Sr. No.	Outbreak ID	Atoll	Island	Date of notification	Result of preliminary investigation*	Date onset of rash of first case	Date onset of rash of last case	Total measles cases				Measles cases by age and vaccination status																Deaths by age						Number of blood samples collected	Number of samples with lab result as					Class (for Central level)
								Total	Vaccinated	Unvaccinated	Unknown vaccination	<1 year				1 - 4 years				5 - 9 years				10-14 years				>=15 years				Total	<1 year	1-4 years	5-9 years	10-14 years	>=15 years		Measles confirmed	Rubella confirmed	Negative	Not done	Equivocal	
												Total	Vaccinated	Unvaccinated	Unknown vaccination	Total	Vaccinated	Unvaccinated	Unknown vaccination	Total	Vaccinated	Unvaccinated	Unknown vaccination	Total	Vaccinated	Unvaccinated	Unknown vaccination	Total	Vaccinated	Unvaccinated	Unknown vaccination											

Annexure 8: OUTBREAK INVESTIGATION SUMMARY

MEASLES/RUBELLA OUTBREAK INVESTIGATION: SUMMARY

Outbreak ID: _____

Notification

Source of notification: Weekly report / Active case search / Media / Other

Index case reported by:_____ **Name of Atoll Incharge:_____**

Date of notification of index case: _____ **Designation:_____**

Location of the outbreak

Island:_____ **Atoll: _____**

Name of Locality: _____

Preliminary investigation including desk review

Desk review: date_____ findings_____

Date/s of preliminary search:_____

Number of health facilities searched: _____ **Number of urban wards searched: _____**

Number of areas* searched:_____ **Total number of suspected measles cases:_____**

Date of Epidemic Response Team meeting: _____

Whether considered as an outbreak requiring house to house investigation: Yes / No

If No, reason:

If Yes, provide details of outbreak investigation below

Details of outbreak investigation

Date of outbreak investigation From:_____ To:_____

Number of health facilites involved:_____ **Number of urban wards involved: _____**

Number of areas* involved:_____ **Total population investigated:_____**

Total number of suspected measles/Rubella cases:_____ **Total number of deaths due to measles/rubella:_____**

Date of onset of first case:_____ **Date of onset of most recent case:_____**

Laboratory investigation details

Case ID / EPID number**	Age	Sex	Date of last measles dose	Date of collection	Date sent to lab	Date received in lab	Result Measles/ Rubella/ Negative/ Equivocal	Date of Result

Note:

**** Case ID number is the code given to each case from whom a sample of blood or urine is collected. If sample collected is blood, case ID/ EPID number will be outbreak ID-B-patient number or if the sample is urine, case ID/ EPID number will be outbreak ID-U-patient number.**