

RISK ASSESSMENT CATEGORIES, VARIABLES, AND SCORING: OUTBREAK SCENARIO

Population Immunity indicators	Cut-off criteria (risk points)	How the risk is calculated	Formula
MMR1 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+8) Total: 8	Calculate risk points per each coverage level a reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Percentage of neighboring municipalities with <95% of MMR1 coverage	<25% (+0) 25%–50% (+2) 51%–75% (+4) >75% (+8) Total: 8	Assess representativeness of immunity gap in surrounding area of a municipality. To calculate risk points, the tool will assess if any neighboring municipality has reported coverage of <95% in the previous year.	$\frac{\text{Number of neighboring municipalities with } <95\% \text{ MMR1 coverage}}{\text{Total number of neighboring municipalities}}$
MMR2 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+8) Total: 8	Calculate risk points per each coverage level a reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Coverage of last follow-up campaign	≥95% (+0) 90%–94% (+2) 85%–89% (+4) <84% (+6) No campaign (+8) Total: 8	Assess the administrative coverage reported from the last follow-up campaign a to assign risk point. If campaign is not part of national strategy, assign 0 risk points (e.g., high-income countries). If campaign is part of the national immunization strategy but has not been implemented since 2005, the tool will assign maximum score. Do not substitute coverage of the follow-up campaign with another non-indiscriminate vaccination activity (e.g., mop-up).	$\frac{\text{Number of vaccinated children}}{\text{Number of children to be vaccinated (target)}}$
Proportion of suspected measles cases who are unvaccinated or have unknown vaccination status	<20% (+4) ≥20% (+8) Total: 8	Calculate the proportion of unvaccinated children or those with unknown vaccination status from the most recent year to assign risk point. Limit calculation to only suspected cases who are eligible for MMR1 and older, according to the national immunization schedule.	$\frac{\text{Suspected cases who were unvaccinated + suspected cases with unknown vaccination status}}{\text{Total number of suspected cases who were age eligible for MMR1 vaccination b}}$
Subtotal risk points		40 points	

Case-Based Surveillance Quality	Cut-off criteria (risk points)	Comments	Formula
Reporting rate of suspected measles and rubella cases per 100,000 population	<p>If area population $\geq 100,000$ population:</p> <p>≥ 2 per 100,000 (+0) < 2 per 100,000 (+4) < 1 per 100,000 (+8)</p> <p>If area population $< 100,000$ population:</p> <p>< 1 per 100,000 (+8) ≥ 1 per 100,000 (+0)</p> <p>Total: 8</p>	<p>Assign risk point using data from most recent year. When a municipality has less than 100,000 population, assign 0 risk points if the municipality has reported at least 1 case during the most recent year.</p> <p>Assign 8 points if the municipality was epidemiologically silent (did not report any cases).</p>	$\frac{\text{Number of suspected cases X 100,000 population}}{\text{Total population of country}}$
Proportion of cases with adequate investigation	<p>$\geq 80\%$ (+0) $< 80\%$ (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. An adequate investigation is defined as a case investigated within 48 hours of notification and that includes 8 of the 11 core variables: 1) name and/or case identification; 2) date of birth/age; 3) sex; 4) place of residence; 5) vaccination status; 6) date of rash onset; 7) date of notification; 8) date of investigation; 9) date of blood sample collection; 10) presence of fever; and 11) travel history. If no investigations were conducted, then give maximum score. Asigne el punto de riesgo utilizando datos del año más reciente. Si no se recolectaron muestras, entonces dé la máxima puntuación.</p>	$\frac{\text{Number of suspected cases with adequate investigation}}{\text{Total number of cases reported}}$
Proportion of cases with adequate specimen collection within 30 days of rash onset	<p>$\geq 80\%$ (+0) $< 80\%$ (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. If no specimens were collected, then give maximum score.</p>	$\frac{\text{Number of cases with specimen collected within 30 days from date of rash onset}}{\text{Total number of cases reported}}$
Proportion of blood specimens received in laboratory in < 5 days	<p>$\geq 80\%$ (+0) $< 80\%$ (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. Blood specimens should have been received in the laboratory within 5 days of the date of collection. If no specimens were sent, then give maximum score</p>	$\frac{\text{Number of reported cases with specimens received } \leq 5 \text{ days from date obtained}}{\text{Total number of cases with specimens collected}}$
Subtotal risk points		20 points	

Program Delivery Performance indicators	Cut-off criteria (risk points)	Comments	Formula
Trends in MMR1 coverage	Increasing or same (+0) > -10% and <0% decline (+2) < -10% decline (+4)	Assess MMR1 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of $\leq 10\%$ or $> 10\%$ is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
Trends in MMR2 coverage	> -10% and <0% decline (+2) < -10% decline (+4) Total: 4	Assess MMR2 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of $\leq 10\%$ or $> 10\%$ is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
MMR1–MMR2 dropout rate c	$\leq 5\%$ (+0) $> 5\%$ (+4) Total: 4	Assign risk point using administrative coverage data from most recent year and using a dropout rate of 5%.	$\frac{\text{MMR1 coverage} - \text{MMR2 coverage}}{\text{MMR1 coverage}}$
Penta1–MMR1 dropout rate c	$\leq 5\%$ (+0) $> 5\%$ (+4) Total: 4	Assign risk point using administrative coverage data from most recent year and using a dropout rate of 5%.	$\frac{\text{Penta1 coverage} - \text{MMR1 coverage}}{\text{Penta1 coverage}}$
Subtotal risk points		16 points	

Threat Assessment indicators	Cut-off criteria (risk points)	Comments	Formula
≥1 confirmed or measles compatible case reported in a district within the past 12 months among children <5 years	Absence of case: (+0) Presence of case: (+2) Total 2	One or more confirmed measles or rubella case(s) reported in children <5 years, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically, or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases
≥1 confirmed or measles compatible case(s) reported in a district within the past 12 months among children aged 5–14 years old	Absence of case: (+0) Presence of case: (+2) Total 2	One or more confirmed measles or rubella case(s) reported in children aged 5–14 years old, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases
≥1 confirmed or measles compatible case(s) reported in a district within the past 12 months among young adults ≥15 years	Absence of case: (+0) Presence of case: (+2) Total 2	One or more confirmed measles or rubella case(s) reported in young adults ≥15 years old, during the last calendar year. Include cases confirmed by laboratory results, linked epidemiologically or by clinical symptoms. Exclude discarded cases or those that are pending classification.	Total of confirmed measles and/or rubella cases
Population density	> Quartile1 and < Quartile 2 : 1 > Quartile 2 and < Quartile 3 : 2 > Quartile 3 and < Quartile 4 : 3 > Quartile4: 4 Total 4	Municipality level data if available (check with national statistics office). The median of the population density of all municipalities of any given country will be obtained to establish the quartiles that will allow the allocation of risk points	Compound formula; not presented here
Presence of vulnerable groups	No vulnerable groups (+0) One risk point for each vulnerable group present (up to maximum of +8) Total: 8	Assign one risk point for each of the following vulnerable groups present in a municipality. Please note that the presence of single condition listed in each question provides a YES answer. 1) Presence of migrant population, internally displaced population, slums, or indigenous communities; 2) Presence of large influx of tourists or ecotourism destinations; 3) Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking); 4) Presence of calamities or disasters; 5) Limited access to health services due to terrain/transportation issues; 6) Presence of high-traffic transportation hubs, major roads (within and across countries) or zones bordering large urban areas; 7) Presence of border communities; 8) Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events).	Total of vulnerable groups
Subtotal risk points		18 points	

Rapid Response to Imported Cases	Cut-off criteria (risk points)	Comments	Formula
Presence of a trained rapid response team at the subnational level ^d	No rapid response team (+3) Presence of a rapid response team (+0) Total: 3	Assign risk point using data from most recent year.	
Proportion of subnational ^d hospitals with staff that are trained to do triage and isolation for measles/rubella highly suspected cases	80%-100% (+0) 50%-79% (+2) <50% (+3) Total: 3	Assign risk point using data from most recent year	$\frac{\text{Number of hospitals at subnational level with trained staff in triage and isolation}}{\text{Total number of hospitals at subnational level}}$
Subtotal risk points		6 points	

Total risk points: 100 points

- Notes:
- a. Coverage survey estimates available at municipality level, conducted within past five years and including birth cohorts of recent five years, can replace administrative coverage.
 - b. The denominator includes cases with no data available for vaccination status (blanks).
 - c. A negative dropout rate flags data quality issues and therefore, the tool will not assign maximum risk score. Negative dropout rates should be corrected, if possible, before importing these values into the tool.
 - d. State, province, department, or equivalent level

RISK ASSESSMENT CATEGORIES, VARIABLES, AND SCORING: NON-OUTBREAK SCENARIO

Population Immunity indicators	Cut-off criteria (risk points)	How the risk is calculated	Formula
MMR1 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+10) Total: 10	Calculate risk points per each coverage level a reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
MMR2 coverage	≥95% (+0) 90%–94% (+2) 85%–89% (+4) 80%–84% (+6) <80% (+10) Total: 10	Calculate risk points per each coverage level a reported in the past five years and then obtain the average of the risk score, to assign risk point at the municipality level.	Compound formula; not presented here
Coverage of last follow-up campaign	≥95% (+0) 90%–94% (+2) 85%–89% (+4) <85% (+6) No campaign (+10) Total: 10	Assess the administrative coverage reported from the last follow-up campaign a to assign risk point. If campaign is not part of national strategy, assign 0 risk points (e.g., high-income countries). If campaign is part of the national immunization strategy but has not been implemented since 2005, the tool will assign maximum score. Do not substitute coverage of the follow-up campaign with another non-indiscriminate vaccination activity.	$\frac{\text{Number of vaccinated children}}{\text{Number of children to be vaccinated (target)}}$
Proportion of suspected measles cases who are unvaccinated or have unknown vaccination status	<20% (+4) ≥20% (+10) Total: 10	Calculate the proportion of unvaccinated children or those with unknown vaccination status from the most recent year to assign risk point. Limit calculation to only suspected cases who are eligible for MMR1 and older, according to the national immunization schedule.	$\frac{\text{Suspected cases who were unvaccinated + suspected cases with unknown vaccination status}}{\text{Total number of suspected cases who were age-eligible for MMR1 vaccination}^b}$
Subtotal risk points		40 points	

Case-Based Surveillance Quality (information source)	Cut-off criteria (risk points)	Comments	Formula
Reporting rate of suspected measles and rubella cases per 100,000 population	<p>If area population ≥100,000 population: ≥2 per 100,000 (+0) <2 per 100,000 (+4) <1 per 100,000 (+8)</p> <p>If area population <100,000 population: <1 per 100,000 (+8) ≥1 per 100,000 (+0)</p> <p>Total: 8</p>	<p>Assign risk point using data from most recent year. When a municipality has less than 100,000 population, assign 0 risk points if the municipality has reported at least 1 case during the most recent year.</p> <p>Assign 8 points if the municipality was epidemiologically silent (did not report any case).</p>	$\frac{\text{Number of suspected cases} \times 100,000 \text{ population}}{\text{Total population of country}}$
Proportion of cases with adequate investigation	<p>≥80% (+0) <80% (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. An adequate investigation is defined as a case investigated within 48 hours of notification and that includes 8 of the 11 core variables: 1) name and/or case identification; 2) date of birth/age; 3) sex; 4) place of residence; 5) vaccination status; 6) date of rash onset; 7) date of notification; 8) date of investigation; 9) date of blood sample collection; 10) presence of fever; and 11) travel history. If no investigations were conducted, then give maximum score.</p>	$\frac{\text{Number of suspected cases with adequate investigation}}{\text{Total number of cases reported}}$
Proportion of cases with adequate specimen collection within 30 days of rash onset	<p>≥80% (+0) <80% (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. If no specimens were collected, then give maximum score.</p>	$\frac{\text{Number of cases with specimen collected within 30 days from date of rash onset}}{\text{Total number of cases reported}}$
Proportion of blood specimens received in laboratory in <5 days	<p>≥80% (+0) <80% (+4)</p> <p>Total: 4</p>	<p>Assign risk point using data from most recent year. Blood specimens should have been received in the laboratory within 5 days of the date of collection. If no specimens were sent, then give maximum score.</p>	$\frac{\text{Number of reported cases with specimens received} \leq 5 \text{ days from date obtained}}{\text{Total number of cases with specimens collected}}$
Subtotal risk points		20 points	

Program Delivery Performance indicators (information source)	Cut-off criteria (risk points)	Comments	Formula
Trends in MMR1 coverage	> -10% and <0% decline (+2) < -10% decline (+4) Total: 4	Assess MMR1 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
Trends in MMR2 coverage	Increasing or same (+0) > -10% and <0% decline (+2) < -10% decline (+4) Total: 4	Assess MMR2 administrative coverage trend from the last 5 years by using the slope of linear function. Risk points are assigned based on the slope of the trend line. A decrease of ≤10% or >10% is represented with negative numbers, and an increase with positive numbers. This means that for every 1 unit change in the year, the coverage will increase or decrease by 1 unit.	Compound formula; not presented here
MMR1–MMR2 dropout rate ^c	≤5% (+0) >5% (+4) Total: 4	Assign risk point using administrative coverage data from most recent year and using a dropout rate of 5%.	$\frac{\text{Cobertura SRP1} - \text{Cobertura SRP2}}{\text{Cobertura SRP1}}$
Penta1–MMR1 dropout rate ^c	≤5% (+0) >5% (+4) Total: 4	Assign risk point using administrative coverage data from most recent year and using a dropout rate of 5%.	$\frac{\text{Penta1 coverage} - \text{MMR1 coverage}}{\text{Penta1 coverage}}$
Subtotal risk points		16 points	

Threat Probability Assessment indicators	Cut-off criteria (risk points)	Comments	Formula
Population density	< Quartile 1: 0 > Quartile 1 and < Quartile 2 : 1 > Quartile 2 and < Quartile 3 : 2 > Quartile 3 and < Quartile 4 : 3 > Quartile 4: 4 Total 4	Municipality level data if available (check with national statistics office). The median of the population density of all municipalities of any given country will be obtained to establish the quartiles that will allow the allocation of risk points.	Compound formula; not presented here
Presence of vulnerable groups	No vulnerable groups (+0) One risk point for each vulnerable group present (up to maximum of +8) Total: 8	Assign one risk point for each of the following vulnerable groups present in a municipality. Please note that the presence of single condition listed in each question provides a YES answer. 1) Presence of migrant population, internally displaced population, slums, or indigenous communities; 2) Presence of large influx of tourists and ecotourism destinations; 3) Presence of security and safety concerns that hinders routine vaccination or epidemiological field investigation (e.g., drug trafficking); 4) Presence of calamities or disasters; 5) Limited access to health services due to terrain/transportation issues; 6) Presence of high-traffic transportation hubs, major roads (within and across countries) or zones bordering large urban areas; 7) Presence of border communities; 8) Presence of areas with mass gatherings (e.g., trade/commerce, fairs, markets, sporting events, religious events).	Total of vulnerable groups
Subtotal risk points		12 points	

Rapid Response to Imported Cases	Cut-off criteria (risk points)	Comments	Formula
Presence of a trained rapid response team at the subnational level ^d	No rapid response team (+3) Presence of a rapid response team (+0) Total: 6	Assign risk point using data from most recent year.	
Proportion of subnational hospitals with trained staff to do triage and isolation for measles/rubella highly suspected cases.	80%–100% (+0) 50%–79% (+2) <50% (+3) Total: 6	Assign risk point using data from most recent year.	$\frac{\text{Number of hospitals at subnational level with trained staff in triage and isolation}}{\text{Total number of hospitals at subnational level}}$
Subtotal risk points		12 points	

Total risk points: 100 points

- Notes:
- a. Coverage survey estimates available at municipality level (conducted within past five years and including birth cohorts of recent five years) can replace administrative coverage.
 - b. The denominator includes cases with no data available for vaccination status (blanks).
 - c. A negative dropout rate flags data quality issues and therefore, the tool will not assign maximum risk score. Negative dropout rates should be corrected, if possible, before importing these values into the tool.
 - d. State, province, department, or equivalent level.