



REGIONAL FRAMEWORK
FOR THE MONITORING AND
RE-VERIFICATION OF
MEASLES, RUBELLA,
AND CONGENITAL RUBELLA
SYNDROME ELIMINATION
IN THE AMERICAS

Revised edition

PAHO



Pan American
Health
Organization



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REGIONAL OFFICE FOR THE
AMERICAS

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Congratulations go to the Governments of all 35 Member States for their historic efforts to sustain the gains, for being the first region in the world to have achieved measles and rubella elimination, and for reaffirming their commitment not to rest in their continued support for measles and rubella elimination in the Region of the Americas.

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Introduction

The Region of the Americas was declared free from rubella and measles by the International Expert Committee (IEC) for Documenting and Verifying Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas in 2015 and 2016, respectively, thereby becoming the first region of the World Health Organization (WHO) to achieve this distinction. In September 2017, the 29th Pan American Sanitary Conference approved a plan to maintain the Region free of measles, rubella, and congenital rubella syndrome (CRS). The plan lays out four strategic lines of action for countries to follow in order to sustain elimination, and the establishment of independent entities at the regional and national levels to monitor the maintenance of elimination (1).

While it was hoped that this milestone elimination achievement would be sustained, Brazil and Venezuela (Bolivarian Republic of) lost their elimination status in 2019 and 2018, respectively. In view of the reestablishment of endemic transmission of measles in Venezuela (Bolivarian Republic of) in 2018, the Region of the Americas was no longer considered free of measles (2). A new Regional Framework was needed in order to guide Member States of the Pan American Health Organization (PAHO) and the National Sustainability Committees (NSC) on the requirements and process for measles and rubella elimination monitoring and re-verification and sustainability.

PAHO convened a Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission (MRE-RVC) to this end in 2019 (3). The MRE-RVC replaces the former IEC. The newly appointed Commission reached consensus on the elements from the original 2011 Plan of Action for documenting and verifying elimination that should be maintained and those that needed updating. In July 2019, the Technical Advisory Group (TAG) on Vaccine-preventable Diseases endorsed the main components of the Regional Framework for the Monitoring and Re-Verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas (Regional Framework). Endemic countries will now have to document absence of measles or rubella virus transmission for more than one year to meet re-verification criteria (4). At present, 33 Member States of the Region are free of endemic measles, and all 35 Member States are free of endemic rubella.

This Regional Framework must remain **flexible** to adapt to country realities and to the measles and rubella epidemiological context, which can be reflected with the inclusion of new surveillance indicators approved by TAG and the availability of new laboratory diagnostic tests. As the Region of the Americas continues to gain experience in the sustainability of elimination of vaccine-preventable diseases, this revised edition of the Regional Framework has been produced accordingly.

1. Background

1.1 Epidemiological Status of Measles, Rubella, and Congenital Rubella Syndrome

After the Region was declared to be free of measles in 2016, an unusual and steady increase of confirmed measles cases was reported for the period 2017 to 2019. A total of 41,007 cases¹ were confirmed as measles in 18 countries of the Americas. The highest regional incidence rate was reported in 2019 with 21.5 cases per million inhabitants. The increase in reported cases was due to large outbreaks of measles in Brazil (39,695 cases) and Venezuela (Bolivarian Republic of) (7,054 cases), respectively, which accounted for 93% of the cases reported over the three-year period. In addition, 109 measles-related deaths were recorded in the following countries: Brazil (n=28), Colombia (n=1), and Venezuela (Bolivarian Republic of) (n=80). Venezuela (Bolivarian Republic of) controlled the 2017 measles outbreak, as more than 12 months with no new confirmed cases elapsed since onset of rash of the last confirmed case (11 August 2019) (5).

In 2020, confirmed measles cases had a 2.7-fold decrease in comparison with 2019, with only 8,734² cases reported, given the presence of novel coronavirus SARS-CoV-2, the causative agent of COVID-19 (6). Measles outbreaks were reported in Argentina (61 cases) and Mexico (196 cases), countries that successfully interrupted virus transmission amidst the coronavirus pandemic. However, endemic measles virus circulation in Brazil continues to present resulting in a total of 8,448 cases in 2020, since reestablishment of endemic transmission in February 2019. Eleven deaths were reported in 2020: one in Argentina and 10 in Brazil.

For the period 2017 to 2020, genotypes D8 and B3 were identified in 100% of confirmed cases with genetic sequence reported to the WHO Global Measles and Rubella Sequences Databases (Measles Nucleotide Surveillance – MeaNS)³ (7). Ongoing sequence analysis among the identified genotypes showcased distinct lineages, and therefore, the presence of multiple importations in countries such as Canada, Colombia, or the United States of America. This analysis also confirmed the uninterrupted transmission of measles virus for more than 12 months in countries such as Brazil and Venezuela (Bolivarian Republic of), where genotype D8, lineage MV_i/Hulu-Langat.MYS/26.11 and MV_s/Gir Somnath.IND/42.16/ became endemic.

¹ 2017 (n=895 cases), 2018 (16,839 cases) and 2019 (23,273 cases).

² Data as of epidemiological week 53 (ending 2 January 2021).

³ Data as of epidemiological week 08 (ending 27 February 2021).

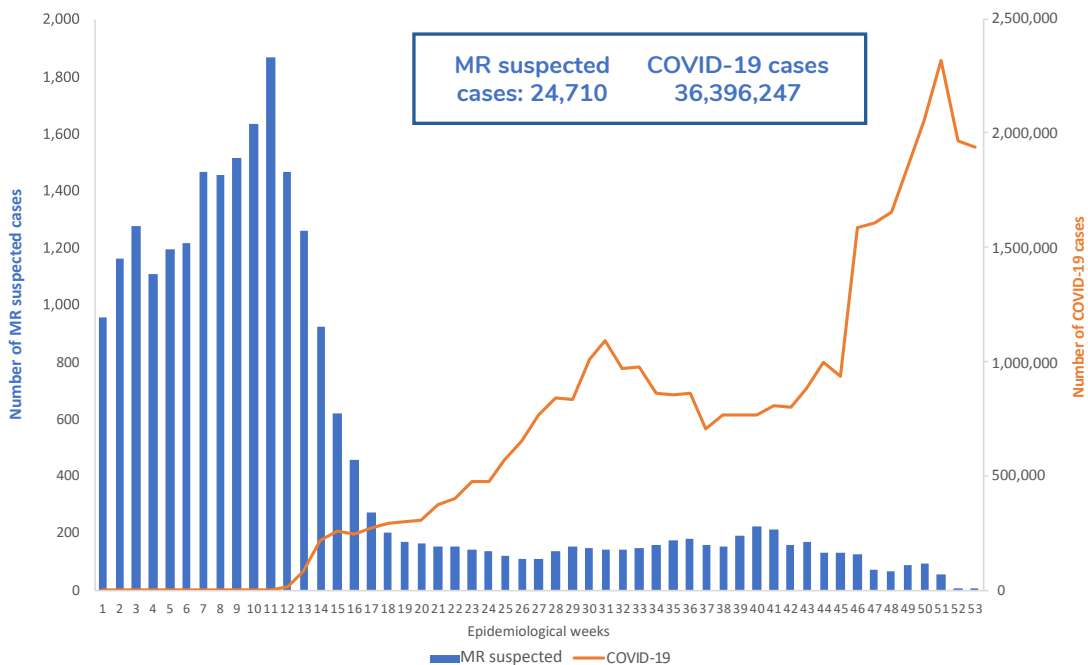
Risk factors for measles outbreaks resurgence include the presence of high migration from endemic to non-endemic areas; immunity gaps, particularly in older children and adults; and delayed outbreak response, including weak management to prevent nosocomial transmission. Failure to respond rapidly to a measles outbreak led to slow but steady transmission of the measles virus, which some experts have called “drop-by-drop” transmission. This type of transmission was seen in high-density areas, scenarios of population mobility, and communities with reported vaccination coverage of 95% or higher. The apparent occurrence of slower transmission may reflect a new epidemiological pattern in the post-elimination era (1).

In contrast, there were few reported confirmed cases of rubella during 2017–2020, with a total of 21 cases in five countries: Argentina, Canada, Chile, Mexico, and the United States of America. Cases of congenital rubella syndrome (CRS) were even fewer; only 2 imported cases were reported in Canada and the United States of America, respectively.

1.2 Impact of the COVID-19 Pandemic

The COVID-19 pandemic has significantly affected both surveillance and measles and rubella vaccination. Figure 1 highlights the sudden downward trend in reporting measles and rubella suspected cases, which coincides with the peak of the COVID-19 pandemic in the Americas region. To this end, the notification of suspected cases decreased 73% in comparison with 2019. Compliance with PAHO’s recommended surveillance indicators was also compromised due to the change in priorities that have focused on the notification of SARS-CoV-2 cases. However, the re-opening of the economy and borders may increase the risk of measles transmission given the impact of COVID-19 on the capacity of health care systems, including vaccination services (8).

Figure 1. Notification of measles, rubella (MR), and COVID-19 cases by epidemiological weeks, Region of the Americas, 2020



Note: Data as of epidemiological week 26, 2021.

Source: Surveillance country reports sent to PAHO. Canada and the United States of America only report total number of confirmed measles cases.

The COVID-19 pandemic has affected both availability and demand for vaccination services. Countries faced difficulties in the timely delivery of vaccines and supplies due to the closure of international borders and problems with international transportation. The demand for vaccination services decreased given people’s concern about their risk of exposure to COVID-19, limitations in public transportation, and lockdowns or physical distancing. To overcome these challenges, countries implemented innovative strategies including institutional drive-through vaccination, and vaccination with prior appointments or based on a person’s gender or identity card number, among others. At the same time, countries maintained social networking and digital media communication strategies to emphasize the importance of immunization to the population (8).

1.3 Plan of Action for the Sustainability of Measles, Rubella, and Congenital Rubella Syndrome Elimination, 2018–2023

In 2017, during the 29th Pan American Sanitary Conference, countries of the Americas approved the Plan of Action for the Sustainability of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas 2018–2023 (1). This Plan of Action establishes the following four strategic lines of action to ensure the sustainability of the elimination of these diseases:

- a) Guarantee universal access to measles and rubella vaccination services for the population targeted in the routine vaccination program and other at-risk age groups;
- b) Strengthening the capacity of epidemiological surveillance systems to quickly identify, investigate, and control outbreaks of measles and rubella;
- c) Developing national capacities to maintain measles and rubella elimination;
- d) Establishing standard mechanisms for a rapid response to imported cases of these diseases.

The success of the Region of the Americas in interrupting endemic measles and rubella virus transmission was a victory of partnerships. These same partnerships must sustain their commitment and collaborative efforts to keep the countries of the Americas free of endemic transmission.



Logo of the Government of Venezuela and the Ministry of Popular Power for Health.

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2. Regional Framework

This Regional Framework aims to provide guidance to PAHO's Member States and their national committees and subregional committee by standardizing the procedures to monitor progress made towards the sustainability and/or re-verification of measles, rubella, and CRS elimination. The Regional Framework is based on ongoing country experiences in sustaining disease elimination, as well as the Region's experiences in maintaining polio and smallpox elimination. Lessons from these experiences are highlighted below, with emphasis on their implications for maintaining measles and rubella elimination.

2.1 Lessons Learned

- The excellence in technical and operational implementation of the annual immunization plan of action must be supported by a **high political commitment** at all levels.
- In the post-elimination era, the **more quickly and well-organized a rapid response is implemented**, the more likely it is that measles virus transmission will be interrupted as soon as an imported case is detected. It is not enough to maintain high and homogeneous vaccination coverage with two doses of vaccine or to detect suspected cases through a passive surveillance system: these strategies should always be accompanied by a rapid response with appropriate interventions (9).
- **Homogenous coverage of >95% must be maintained at the national and local levels.** In particular, the measles virus's high infectivity and proclivity to seek out small pockets of susceptible individuals means that high homogenous coverage must be achieved in every municipality.
- **Sensitivity of surveillance systems should also be maintained to detect all suspected measles, rubella, and CRS cases, at least 2 suspected MR cases per 100,000 population.** As with coverage data, country experiences in detecting and limiting the secondary spread of importations demonstrate that surveillance must be sufficiently sensitive at the local, subnational, and national levels.
- **Molecular and epidemiological data should always be analyzed together** to better determine the source of the virus, as genotype data alone is not enough since each genotype can circulate in multiple countries and even in different regions of the world.

- The use of **standardized operational case definitions and well-defined surveillance indicators** to assess quality of the surveillance systems across the Region of the Americas has fostered regular and systematic monitoring of the elimination, while providing regular feedback for implementation of corrective measures.
- **Risk assessments** must be performed on an annual basis, if possible, to identify areas and populations susceptible to importations and import-related virus transmission.
- **Cross-border coordination** should be strengthened, especially regarding actions to increase vaccination coverage, epidemiological surveillance, and training of rapid response teams to prevent virus spread when it is detected in their territories (9).
- **National committees** should be reactivated to monitor the sustainability of elimination. These independent bodies can be very well positioned to advocate for the human and financial resources necessary to maintain elimination. These committees must benefit from political backing, be competent and committed, and coordinate country activities with regional and global efforts.

2.2 Basic Principles

The following are the basic principles for the sustainability and re-verification of measles, rubella, and CRS elimination:

- In order for the Region of the Americas to be re-verified as having eliminated measles and rubella, the focus will be on re-verifying the specific countries that have lost their status.
- The Regional Commission comprised of independent experts will provide guidance to the countries and will re-verify the achievement of elimination and sustainability.
- The national committees and the subregional Caribbean committee will continue to function in the post-elimination era with appropriately revised new terms of reference.
- Each country will revise annually their national plan of action and timeline for the sustainability of elimination.
- Documentation will be based on the achievement and sustainability of the components specified in the Regional Framework.
- The Regional Commission will identify lessons learned and encourage that all countries implement best practices.

2.3 Essential Criteria

The following are the essential criteria for the sustainability and re-verification of measles, rubella, and CRS elimination:

- Well-functioning national committee that meets at least annually.
- Interruption of endemic measles, rubella, and CRS cases in countries of the Americas for at least one year in the presence of well-performing surveillance.
- Absence of endemic measles and rubella virus strains through viral surveillance in countries of the Region of the Americas for at least one year.
- Prioritization of the 3-pronged approach of high vaccination coverage, high-quality surveillance sensitive enough to detect imported and import-related cases, and rapid outbreak response.
- Documentation of sustainability of elimination.

The Regional Commission’s responsibility is objectivity: A final determination will be based on data provided through country reports including information from site visits. No piece of evidence stands alone; all sources of evidence are important for reassuring sustainability and documenting re-verification of elimination.

2.4 Components of the Regional Framework

Countries will collect and analyze the following data comprising six main components that will then be reviewed by that country’s national committee:

1. Epidemiology of measles, rubella, and CRS.
2. Quality of measles, rubella, and CRS surveillance.
3. Molecular epidemiology of measles and rubella viruses and laboratory activities.
4. Measles and rubella vaccinated population cohorts.
5. Sustainability of measles, rubella, and CRS elimination.
6. Correlation and integration of the evidence.

Box 1. PAHO's surveillance indicators and operational case definitions

PAHO's defined surveillance indicators and case definitions are the result of a consensus between national programmatic experts and TAG members. Its compliance has allowed PAHO and an independent body of experts to track accountability towards reaching the elimination and sustainability of regional targets. Thus, it is highly desirable that countries use this set of indicators and operational definitions. If modifications are needed due to specific and temporary epidemiological scenarios, countries must document their use and report to PAHO.

Annexes 1 and 2 present the updated operational case definitions for measles and rubella, and the PAHO-defined surveillance indicators (Box 1) to support the epidemiological analysis and quality of surveillance systems. If these indicators are not met or their performance was not homogeneous across the subnational levels, supplementary data should be provided to allow assessment of the quality of the surveillance system. This assessment should include the identification and characterization of silent areas, high-risk communities,⁴ areas with endemic circulation of arboviral diseases, and areas with low vaccination coverage as it is specified in the template for the country report.

⁴ PAHO has defined high-risk communities as those presenting at least one of the following criteria: 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; 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 areas bordering large urban areas; 7) presence of border communities; and 8) presence of areas with mass gatherings/events.



Registro de
de niños, niñas
2018

NO.	NOMBRES Y APELLIDOS	EDAD	SEXO	ESTADO CIVIL	OCUPACION	FECHA DE NACIMIENTO	FECHA DE REGISTRO
1
2
3
4
5
6
7
8
9
10
11
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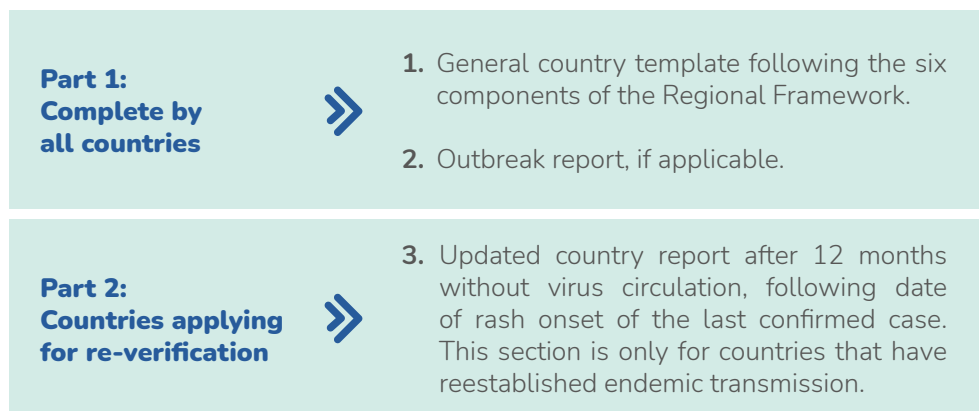
3. Tools of the Regional Framework

The following are the tools of the framework developed to support PAHO's Member States in documenting their evidence for sustainability and/or re-verification.

3.1 Template for Country Report

The **template for country report** (Annex 3) is the tool that operationalizes the technical guidance and standard procedures of the framework so that a concrete and compelling body of evidence can be submitted by the countries, following the main components of the framework. The template has two parts, to differentiate countries who are monitoring their sustainability status and those applying for re-verification of elimination (Figure 2).

Figure 2. Template structure for monitoring the sustainability of elimination and/or applying for re-verification



The template includes an **outbreak report section** that should be filled out by those countries that had reported measles and rubella outbreaks during the analysis period, whether they notified a single confirmed case, or hundreds or thousands of confirmed cases. The **criteria to verify outbreak interruption** should also be included in this report, regardless of whether the country has reestablished endemic transmission. If for some reason the country has not collected enough evidence to meet these criteria, then it must offer other equally robust evidence to demonstrate that virus circulation has been successfully interrupted (for example, establishing sentinel sites for active surveillance in national hospitals, operational investigations, and/or specific seroprevalence studies).

Box 2. Criteria to verify outbreak interruption

PAHO developed a set of criteria to verify when circulation of the measles or rubella virus can be considered interrupted. The criteria are grouped in three categories: 1) epidemiological surveillance; 2) vaccination coverage; and 3) laboratory surveillance. These criteria were first developed following a nationwide measles outbreak in Venezuela (Bolivarian Republic of) in 2007–2008. They have been improved and finalized following field implementation in different outbreaks occurring in the post-elimination era in the Americas. Currently, the Americas is the only region using standardized criteria to verify interruption of outbreaks.

Source: Sarmiento S, Barrezueta O, Morice C, Zapata R, Benitez M, Castillo-Solorzano C. Measles outbreak in Venezuela: A new challenge to postelimination surveillance and control? *JID* 2011;204 (Suppl 2). DOI: 10.1093/infdis/jir444

A progress outbreak report can be included if the outbreak is still ongoing by the time the country report should be sent to PAHO and the Regional Commission. This progress report will present the most recent and available data, and not final data as of 31 December (end of calendar year). The latter also applies to those countries who reported multiple outbreaks across two calendar years, but without reestablishment of endemic transmission. Finally, the Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission can request the submission of this outbreak progress report even before the country has finished documenting PAHO's outbreak verification criteria (Box 2).

3.2 Measles and Rubella Country Profile

The **measles and rubella country profile** (Annex 4) is a stand-alone document aimed to facilitate the data analysis for the country report. This profile was developed only for those countries who officially reported to PAHO vaccination coverage and case by case surveillance and laboratory information. Minor differences could be reflected in the country profile if the country has updated data not reported to PAHO. The country profile will be updated on annual basis.

During 2020, both the template for country report and the country profile were piloted with 12 countries of Latin America and the English-Speaking Caribbean subregion, yielding positive acceptance.

Requirements to submit the final report

The first report submitted in June 2021 will be covering the period 2016–2020.⁵ Starting in 2022, the report will be updated annually, only reporting data from the previous two years. There is no need to include the narrative of the analysis for the period 2016–2020 as this information was included in the first report. The template for country report will periodically be updated and shared with PAHO Member States.

All reports must be:

1. Approved and signed by the National Committees for the Sustainability of Elimination.
2. Signed and sent by the Minister of Health with an official letter submitted to the Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission, through PAHO's representation in the country.

PAHO/WHO will internally review the country reports to ensure that all components requested were included, before they will be shared with the Regional Commission for final revision and approval.

⁵ In 2016, all the countries of the Americas were requested to update their reports on the sustainability of measles, rubella, and CRS elimination, covering the period 2012–2015. For this reason, the period to be covered with this report is from 2016 to 2020.



MOVIMENTO
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da
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4. Structure and Function of the Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission (MRE-RVC)

The Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission (MRE-RVC or Regional Commission) will review the evidence submitted by the national committees to verify the sustainability of elimination in their territories and in the Americas. In addition, the Regional Commission will re-verify the achievement of measles and rubella elimination for individual countries and for the Region. The Regional Commission will provide recommendations when standard sustainability and re-verification data has not been enough or consistent. Terms of reference of the Regional Commission were developed and approved by the PAHO Director in 2019.

The principles of this Regional Commission are as follows:

1. Function as an independent commission and report to PAHO's Director.
2. Monitor the sustainability status of measles and rubella elimination in each PAHO Member State.
3. Re-verify measles and rubella elimination independently for countries and for the Region (after national committees submit their reports).
4. Work with national independent expert bodies engaged in monitoring and re-verification processes.
5. Document impact of the elimination initiative on strengthening national health systems.

Table 1 presents the five functions and working methodology of the Regional Commission:

Table 1. Functions and working methodology of the Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission

Function	Working methodology
Guidance	<ul style="list-style-type: none"> • To develop a regional framework to assess the sustainability of the elimination of measles and rubella. • The framework will establish the main objectives, basic principles, essential criteria, and main components that Member States will need to follow for sustaining or re-verification of their elimination status.
Re-verification	<ul style="list-style-type: none"> • To assess, upon request by a national committee, if a country is ready for re-verification. • To re-verify the achievement of measles and rubella elimination status for individual countries and for the Region. • To review, analyze, and approve, when necessary, the annual reports provided by the national committees in each country. The Regional Commission will provide recommendations when standard verification data is not enough or inconsistent.
Advisory	<ul style="list-style-type: none"> • To advise national health authorities and committees on the process for collecting and analyzing the data for maintenance of the sustainability or re-verification of the elimination in the country. • To conduct field visits when indicated, to monitor progress towards maintenance or re-verification of the elimination. • To review, analyze, and approve, when necessary, the annual sustainability plans provided by the Ministers of Health and national committees in each country. The Regional Commission will provide recommendations when standard sustainability data is not enough or consistent.
Advocacy	<ul style="list-style-type: none"> • To raise awareness on, and commitment to, measles and rubella sustainability, targeting high ranking health officials, health professionals, partners, and political leaders through multiple channels such as national health conferences, professional societies, scientific seminars, media, and personal contacts.
Leadership and management functions of the Regional Commission Chair	<ul style="list-style-type: none"> • To prepare a plan of action, schedule and preside over meetings to be held at least once a year. • To define internal operating procedures and members' responsibilities. • To prepare, approve, and submit annual meeting/re-verification reports to the PAHO Director, who will, in turn, share it with Member States for feedback.

4.1 Membership

The Regional Commission is comprised of eight members, including the chair. Membership will be for three years, with the possibility of extension at the discretion of PAHO's Director. Members cannot be involved in the managerial or operational aspects of the national immunization program, surveillance, or laboratory aspects. The composition of the regular members will be as follows:

1. International expert epidemiologist – (2);
2. International expert public health – (2);
3. International expert virologist – (2);
4. International expert clinical medicine/pediatrician – (1);
5. Representative PAHO Immunization Technical Advisory Group (TAG) – (1).

Chairs of the Regional Verification Committees for Measles and Rubella Elimination (or such equivalent committees) from other WHO Regions may be invited to attend the meetings as observers, at the discretion of the Regional Commission.

Termination of membership will occur under the following conditions:

1. Automatically at the end of the tenure, unless renewed by the PAHO Director;
2. By voluntary resignation of member of the Regional Commission; or
3. By decision of the PAHO Director.

The PAHO Immunization Unit at the regional level will serve as the technical secretariat for the Regional Commission.

SALA SITUACION

ZONA TERRITORIAL



Man in white shirt and glasses.

Person in blue shirt with logos:
Organización Panamericana de la Salud
Oficina Regional de la Organización Mundial de la Salud

Person in black shirt and cap:
VACUNADOR
Dirección de INMUNIZACIONES
Dirección General de Epidemiología

Handwritten notes on a whiteboard:
QUERBA
Federico G
List of items with checkboxes.

References

1. Pan American Health Organization. Plan of Action for the Sustainability of Measles, Rubella and Congenital Rubella Syndrome Elimination in the Americas 2018-2023 [Internet]. 29th Pan American Sanitary Conference document CSP29.R11. Washington, DC: PAHO; 2017. Available at: https://www3.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=41210&Itemid=270&lang=en. Accessed 11 November 2020.
2. Pan American Health Organization. Final report. Fourth ad hoc Meeting of the Technical Advisory Group (TAG) on Vaccine-preventable Diseases, Washington D.C. 10 July 2018. Washington, DC: PAHO; 2018. Available at: <https://www.paho.org/en/documents/04-ad-hoc-tag-final-report-2018>. Accessed 11 November 2020.
3. Pan American Health Organization. Regional Monitoring Commission on Measles and Rubella Post-Elimination Meets at PAHO. Immunization Newsletter, v.41, n.1, Mar. 2019. Washington, D.C.: PAHO; 2019. Available at: <https://www.paho.org/en/documents/immunization-newsletter-v41-n1-mar-2009>. Accessed 11 November 2020.
4. Pan American Health Organization. Final report. Twenty-Fifth Meeting of the Technical Advisory Group (TAG) on Vaccine-preventable Diseases, Cartagena, Colombia. 9-11 July 2019. Washington, D.C.: PAHO; 2019. Available at: <https://www.paho.org/en/documents/25-tag-final-report-2019>. Accessed 11 November 2020.
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6. Pan American Health Organization. Guidelines to Plan for COVID-19 Vaccine Introduction Version 1: 10 July 2020. Washington, D.C.: PAHO; 2020. Available at: https://iris.paho.org/bitstream/handle/10665.2/52532/PAHOFPLIMCOVID-19200014_eng.pdf. Accessed 11 November 2020.
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8. Pan American Health Organization. Summary of the Status of National Immunization Programs during the COVID-19 Pandemic, July 2020. Washington, D.C.: PAHO; 2020. Available at: <https://bit.ly/36jiNA9>. Accessed 11 November 2020.
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Annex 1. Measles, Rubella, and Congenital Rubella Syndrome Operational Case Definitions

Countries should indicate in their report whether they use a different operational case definition or if these definitions have been temporarily modified, explaining the reasons for any such modification.

Table A1.1. Measles and rubella operational case definitions

Suspected case:^a

A patient in whom a health care worker suspects measles or rubella infection or a patient with fever and maculopapular rash.

Laboratory-confirmed case or by epidemiological link:

A suspected measles or rubella case that has positive laboratory results^b or is epidemiologically linked to a laboratory-confirmed case.

Clinically confirmed measles case:

A suspected case with fever and maculopapular (non-vesicular) rash and at least one of cough, coryza, or conjunctivitis, but without an adequate clinical specimen or epidemiologic linkage to a laboratory-confirmed or epidemiologically linked case of measles or other communicable disease.

Clinically confirmed rubella case:

A suspected case with fever and maculopapular (non-vesicular) rash and at least one of arthritis/arthralgia or lymphadenopathy, but without adequate clinical specimen or epidemiologic linkage to a laboratory-confirmed or epidemiologically linked case of rubella or other communicable disease.

Vaccine related case:

A suspected case that meets all five of the following criteria:

1. The patient had a rash illness, but did not have cough or other respiratory symptoms related to the rash.
2. The rash began 7–14 days after vaccination with a measles-containing vaccine; for rubella-containing vaccine, the rash can appear 7–23 days after vaccination.
3. The blood specimen, which was positive for measles IgM and rubella IgM, was collected 8–56 days after vaccination.
4. A thorough field investigation did not identify any secondary cases.
5. Field and laboratory investigations failed to identify other causes, or genotype A was isolated from the suspected case (genotype A is only vaccine-related and does not occur as wild-type infection).

Discarded case:

A suspected case with adequate investigation and discarded when any of the following are true:

- Negative laboratory testing in a proficient laboratory on an adequate specimen collected during the proper time period after rash onset.
- Epidemiological linkage to a laboratory confirmed outbreak of another communicable disease that is not measles or rubella.
- Confirmation of another etiology.
- Failure to meet the clinical measles and rubella case definitions.
- The case was discarded by the National Sustainability Committee after reviewing the clinical and epidemiological evidence.

Endemic case:

A confirmed case which, as supported by epidemiological and virologic evidence, indicates that it is part of a chain of endemic transmission, meaning that the identified virus (same genotype and lineage) has been circulating within a country for a period greater than or equal to 12 months.

Imported case:

A confirmed case which, as supported by epidemiological and/or virologic evidence, was exposed outside of the country during the 7 to 21 days prior to rash onset for measles, or from 12 to 23 days for rubella.

Import-related case:

A locally acquired infection occurring as part of a chain of transmission originated by an imported case as supported by epidemiological or virological evidence, or both. (Note: If transmission of measles or rubella virus related to importation persists for greater than or equal to 12 months, cases are no longer considered to be import-related, they are considered to be endemic.)

Unknown source case:

A confirmed case for which the source of infection was not identified.

Reestablishment of endemic transmission:

Occurs when epidemiological and laboratory evidence indicates the presence of a chain of transmission of a virus strain (same genotype and lineage) that continues uninterrupted for ≥ 12 months in a defined geographical area.

Reestablished endemic transmission post-verification:

Countries that have evidence indicating the presence of a chain of transmission of a virus strain (same genotype and lineage) that continues uninterrupted for ≥ 12 months in a defined geographical area (region or country) following previous verification of elimination.

Measles-related death:

Any death occurring within 30 days of rash onset of a measles case (laboratory-confirmed, epidemiologically linked, clinically compatible) that is related to a complication of measles (such as pneumonia). Rare deaths from post-infectious encephalitis and subacute sclerosing panencephalitis (SSPE) occur months to years after measles infection and would not be detected by routine measles and rubella surveillance activities.

Sources:

1. Pan American Health Organization. Plan of Action for the Documentation and Verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Region of the Americas. Washington, D.C.: PAHO; 2011. Available at: <https://www.paho.org/hq/dmdocuments/2014/PoA-Documentation-Verification-MRCRS-Elimination-e.pdf>. Accessed March 2020.
2. World Health Organization. Surveillance standards for vaccine-preventable diseases, 2nd edition. Geneva: WHO; 2018. Available at: <https://www.who.int/publications/i/item/surveillance-standards-for-vaccine-preventable-diseases-2nd-edition>. Accessed March 2022.
3. World Health Organization. Guidance for evaluating progress towards elimination of measles and rubella. Weekly epidemiological record. No 41, 2018, 93, 541–552. Geneva: WHO: 2018.

^a Countries temporarily modifying their measles and rubella case definitions, such as during arbovirus outbreaks or outbreaks of other fever-and-rash-causing diseases, should document their use (4).

^b **Positive laboratory results:**

- Positive serologic test immunoglobulin M (IgM) antibody.
- Infant rubella IgG antibody level that persists at a higher level and for a longer period than expected from passive transfer of maternal antibody (i.e., rubella titer that does not drop at the expected rate of a twofold dilution per month).
- Isolation of rubella virus in cell lines.
- Detection of viral RNA by reverse transcription polymerase chain reaction (RT-PCR).
- Genetic sequencing of viral

Table A1.2. Congenital rubella syndrome operational case definitions

Suspected case:

An infant aged less than 1 year in whom a health care worker suspects CRS due to:

1. One or more of the following birth outcomes detected: congenital cataracts, congenital heart defects, purpura at birth, or hearing impairment, and/or
2. History of confirmed or suspected maternal rubella infection during pregnancy.

Laboratory-confirmed case:

A clinically consistent case that has positive laboratory results.^a

Clinically confirmed case:

A suspected case that is not laboratory confirmed and lacks evidence of any other etiology. This usually occurs due to a loss of follow-up or inadequate collection of specimens for laboratory diagnosis. This is considered a failure in the surveillance system.

Endemic case:

An infant with confirmed CRS whose mother acquired rubella in the Americas and, as supported by epidemiological and virologic evidence, indicates that it is part of a chain of endemic transmission, meaning that the identified virus (same genotype and lineage) has been circulating in the Americas for a period greater than or equal to 12 months.

Imported case:

A confirmed case whose mother acquired the rubella virus infection outside of the Americas or, in the absence of documented rubella infection, the mother was outside the Americas during the period when she may have had exposure to rubella that affected her pregnancy (from 23 days prior to conception or until week 24 of gestation).

Import-related case:

A confirmed case whose mother, as supported by epidemiological and/or virologic evidence, was exposed locally as part of a transmission chain that initiated with an imported case.

Congenital rubella infection (CRI):

An infant with ELISA IgM-positive results for rubella at birth who presents with no clinical signs of CRS.

- Case requires clinical assessment, including the ruling out of deafness by an adequate procedure.

Sources:

1. Pan American Health Organization. Plan of Action for the Documentation and Verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Region of the Americas. Washington, D.C.: PAHO; 2011. Available at: <https://www.paho.org/hq/dmdocuments/2014/PoA-Documentation-Verification-MRCRS-Elimination-e.pdf>. Accessed March 2020.
2. World Health Organization. Surveillance standards for vaccine-preventable diseases, 2nd edition. Geneva: WHO; 2018. Available at: <https://www.who.int/publications/i/item/surveillance-standards-for-vaccine-preventable-diseases-2nd-edition>. Accessed March 2022.

^a **Positive laboratory results:**

- Positive serologic test immunoglobulin M (IgM) antibody.
- Infant rubella IgG antibody level that persists at a higher level and for a longer period than expected from passive transfer of maternal antibody (i.e., rubella titer that does not drop at the expected rate of a twofold dilution per month).
- Isolation of rubella virus in cell lines.
- Detection of viral RNA by reverse transcription polymerase chain reaction (RT-PCR).
- Genetic sequencing of viral rubella genome.



Annex 2. Measles, Rubella, and Congenital Rubella Syndrome Surveillance Indicators

Countries should indicate in their reports if they use a different surveillance indicator or if they have made any variation, explaining the reasons for this change.

Table A2.1. Measles and rubella surveillance indicators

Criteria		Indicator	Minimum threshold
Reporting Rate		Annual rate of suspected measles and rubella cases at the national level	≥ 2 per 100,000 population
		Annual rate of suspected measles and rubella cases at the subnational level (state, province, or equivalent level) If the administrative unit has a population < 100,000, it is expected that at least 1 suspected case should be annually notified	≥ 2 per 100,000 population
Adequate Investigation	Suspected Cases	Percentage suspected cases with household visit within 48 hours following reporting Percentage suspected cases with 8 of 11 data points completed: name and/or identifier, place of residence, sex, age or date of birth, date of reporting, date of investigation, date of rash onset, date of specimen collection, presence of fever, date of prior MR vaccination, travel history	$\geq 80\%$
	Confirmed Cases	Percentage confirmed cases with contact tracing for 30 days	$\geq 80\%$

	Percentage suspected cases with blood specimen collected within 30 days of rash onset	≥ 80%
Laboratory Confirmation (adequate specimens)	At least one of the following specimens should be available at the laboratory for virologic testing: a) Percentage suspected cases with respiratory specimen collected within 7 days of rash onset, and up to 14 days after rash onset; b) Percentage suspected cases with urine specimen collected within 7 days of rash onset, and up to 10 days after rash onset	≥ 80%
Laboratory Confirmation (adequate testing)	Percentage suspected cases with adequate blood specimens tested in a proficient ¹ laboratory	≥ 80%
Viral Detection	Percentage outbreaks with genotype information available	≥ 80%

Sources:

1. Pan American Health Organization. Plan of Action for the Documentation and Verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Region of the Americas. Available at: <https://www.paho.org/hq/dmdocuments/2014/PoA-Documentation-Verification-MRCRS-Elimination-e.pdf>. Accessed March 2020.
2. World Health Organization. Surveillance standards for vaccine-preventable diseases, 2nd edition. Geneva: WHO; 2018. Available at: <https://www.who.int/publications/i/item/surveillance-standards-for-vaccine-preventable-diseases-2nd-edition>. Accessed March 2022.
3. World Health Organization. Guidance for evaluating progress towards elimination of measles and rubella. Weekly epidemiological record. No 41, 2018, 93, 541–552. Geneva: WHO: 2018.
4. Pan American Health Organization. Guidance for testing of measles and rubella in the laboratory network of the Region of the Americas. Washington, D.C.: PAHO; 2019. Available at: https://www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=44297&Itemid=270&lang=en. Accessed March 2020.

¹ Laboratory accredited by PAHO/WHO or has been recognized by external bodies (ISO, CLIA, or a WHO-accredited laboratory).

Table A2.2. Indicators of CRS surveillance quality

Criteria	Indicator	Minimum threshold
Reporting Rate	Annual rate of suspected CRS cases by country	≥ 1 per 10,000 live births
Adequate Investigation	Percentage suspected CRS cases with the following 8 data points completed: name and/or identifier, place of residence, sex, date of birth, date of reporting, date of investigation, date of specimen collection, and vaccination history of mother; also clinical examinations for deafness, blindness, and congenital cardiopathy	≥ 80%
Laboratory Confirmation	Percentage CRS suspected cases with blood specimen collected	≥ 80%
Viral Detection	Percentage CRS confirmed cases with genotype information	≥ 80%
Monitoring of Virus Excretion	Percentage CRS confirmed cases with at least 2 negative results for detection of RNA/viral isolation, after 3 months of age, with 1-month lapse between specimens	≥ 80%

Sources:

1. Pan American Health Organization. Plan of Action for the Documentation and Verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Region of the Americas. Washington, D.C.: PAHO: 2011. Available at: <https://www.paho.org/hq/dmdocuments/2014/PoA-Documentation-Verification-MRCRS-Elimination-e.pdf>. Accessed March 2020.
2. Centers for Disease Control and Prevention. Control and prevention of rubella: evaluation and management of suspected outbreaks, rubella in pregnant women, and surveillance for congenital rubella syndrome. MMWR 2001;50 (No. RR-12). Available at: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5012a1.htm>. Accessed March 2020.



Vacunación
Semana de Vacunación en las Américas

Vacúnate

Organización Panamericana de la Salud

Organización Mundial de la Salud
Américas

Annex 3. Template for Country Report per Component

1. Analysis of the Evidence

1.1. Epidemiology

Based on the country data provided, all countries will develop a summary describing the measles, rubella, and CRS epidemiology. If the country has reported measles or rubella outbreaks during the analysis period, such information should go in Section 2: Outbreak Report. The summary should include but not be limited to:

- Compliance with PAHO's definitions for suspected and confirmed cases for measles and rubella. If alternative definitions are used, clearly state and explain these definitions.
- Morbidity rates:
 - ▶ Analyses of suspected cases reported annually, including the median and range. For 2020 and further years, include a graph with the distribution of suspected measles/rubella cases and confirmed COVID-19 cases by epidemiological week, indicating the start and end dates of the confinement measures established in the country.
 - ▶ Trend analysis of the epidemiological curve of reported cases, indicating the main reasons that have affected this trend (e.g., decrease in case reporting due to a dengue outbreak or COVID-19 pandemic).
 - ▶ Case analyses per geographic location (e.g., subnational or local levels); or by sector (e.g., Army, private health facilities), if the information is available.
 - ▶ Analysis by case classification (confirmed [laboratory, clinical, and epi-linked], discarded, and pending).
- Temporal and spatial characteristics:
 - ▶ Characterize the municipalities that reported cases, using demographic, socioeconomic, and risk factors indicators.
- Demographic characteristics:
 - ▶ Distribution of suspected cases by age, sex, vaccination status, and geographic location (e.g., urban, rural, tourist area, etc.).

1.2. Quality of Surveillance

- Describe the trend in notification rates at the national and subnational level. This analysis can be done by health sector (e.g., Army), if the information is available.
- Trend analysis of the performance of surveillance indicators, indicating the reasons for suboptimal performance (for example, the COVID-19 pandemic).
- Explain the reasons why pending cases have not yet been classified during the analysis period.
- Document contact investigation of suspected cases during household visit in terms of vaccination status and clinical symptoms.
- Identify and characterize silent municipalities and high-risk areas using demographic, socioeconomic, and risk factors indicators.
- Explain the methodology and main results of the active case finding implemented in health facilities, community, and laboratory (table A3.1).¹
- Explain the results from your risk assessment exercise using the PAHO tool, if this information is available.

Table A3.1. Results from active case finding for measles-rubella (MR), and CRS

	Year	No. of medical records reviewed	No. of health units visited	No. of suspected cases	No. of confirmed cases		No. of discarded cases		No. of cases that were reported to the surveillance system	
					Measles	Rubella	Laboratory	Clinical/Epi-link	N	%
MR										
CRS										

¹ For further guidance, review section 4.2.1, page 16 of the document “Guidance for testing of measles and rubella in the laboratory network of the Region of the Americas.” Available at: https://iris.paho.org/bitstream/handle/10665.2/34932/9789275119976_eng.pdf.

1.3. Molecular Epidemiology and Laboratory Surveillance

- Analyze the performance of the following laboratory indicators:
 - a) % of suspected cases with adequate blood specimen;
 - b) % of suspected cases with respiratory specimen;
 - c) % of suspected cases with urine specimen;
 - d) % of suspected cases with blood specimens analyzed in a proficient laboratory.
- Indicate accreditation status of national reference laboratory for measles and rubella diagnosis.
- Describe how private laboratories are integrated into the national laboratory network, including the type of reagents used for serology testing.
- For the analysis of sporadic cases with positive IgM results, use Annex 3 (page 41) of the document Guidance for testing of measles and rubella in the laboratory network of the Region of the Americas.
- Consolidate the information in Table A3.2 and include a summary of the analysis based on the collected evidence: laboratory testing results, clinical and epidemiological data.

Table A3.2. Reasons to discard cases with positive IgM results for measles and rubella

Measles

Year	Number of cases with positive IgM results	Number of discarded cases as post-vaccine reaction	Number of discarded cases by:		
			Other laboratory testing	Clinical	Epidemiological

Rubella

Year	Number of cases with positive IgM results	Number of discarded cases as post-vaccine reaction	Number of discarded cases by:		
			Other laboratory testing	Clinical	Epidemiological

1.4. Analysis of Vaccinated Population Cohorts

- Analyze the trend of vaccination coverage with the first and second dose of the measles-mumps-rubella containing vaccine (MMR1 and MMR2, respectively) at the national, subnational, and municipal levels, including information from the private sector. This analysis must at least include:
 - ▶ Calculation of the number of susceptible children under 5 years old, considering the delayed applied MMR1 and MMR2 doses, the number of unvaccinated children due to vaccine failure, and those who only received one dose. This analysis must be presented by single age cohorts. If the country does not collect this information by single age cohorts, the analysis can be presented by age groups.
 - ▶ Calculation of the number and proportion of child cohorts older than 1 year old that were never vaccinated, based on reported administrative coverages and follow-up campaigns. This analysis must be presented by single age cohorts.
 - ▶ Dropout rates between MMR1 and MMR2 and DPT1/Penta 1 and MMR1 (minimum threshold: 5%).
 - ▶ Analysis of the applied doses (numerator) and of the target population (denominator) in relation to the achieved coverage, to assess whether there is an underestimation or overestimation of the population or the number of people vaccinated.

- ▶ Correlation of the MMR1 and MMR2 administrative coverage with demographic and socioeconomic indicators and risk factors.
 - ▶ Comparison of administrative coverage according to different denominators: population census versus nominal registry; and with the results of population surveys or seroprevalence studies, if the information is available.
 - ▶ Indicate if there were shortages of vaccines, syringes, or other supplies.
 - ▶ Coverage results from the last follow-up campaign, including stratification by single age cohort. Indicate how many first and second doses of the MMR vaccine were administered during the campaign, if the information is available.
 - ▶ Performance of indicators to monitor and assess quality in the planning and implementation of follow-up campaigns.
- Analyze the distribution of vaccination coverage at the municipal level, including the characteristics of municipalities with ranges < 80%, 80-89%, 90-94%, 95-100%, and > 100%. For those municipalities reporting coverage values greater than 100%, mention the causes of overestimation and corrective measures to ensure homogeneous vaccination.²
 - Indicate the year and month that the age of MMR2 was lowered to second year of life.
 - Document the implementation of vaccination strategies for high-risk groups such as ≤ 1 year, teenagers, young adults, travelers, health workers, migrants, tourism workers, among others.

² PAHO has developed a set of tools to monitor vaccination coverage and improve data quality, which is available at: <http://iris.paho.org/xmlui/bitstream/handle/123456789/34510/9789275119822-eng.pdf?ua=1>.

1.5. Sustainability of Elimination

- Document the capacity of the National Immunization Program, Directorate of Epidemiological Surveillance, and national reference laboratory to support elimination over time with the following evidence:
 - ▶ Organization chart and allotted budget for vaccine procurement, vaccination implementation, epidemiological surveillance, laboratory, and outbreak rapid response.
 - ▶ Based on an analysis of strengths, weaknesses, opportunities, and threats (SWOT), describe the actions implemented to cover the gaps in epidemiological surveillance, laboratory, and analysis of the vaccinated population, including barriers in accessing vaccination services. This SWOT analysis may include a qualitative assessment of the implementation of previous sustainability plans and the performance of rapid response teams.
 - ▶ Due to the impact of the COVID-19 pandemic, include the activities that will be implemented to close immunity and surveillance gaps.
 - ▶ Homogeneous and sustained vaccination coverage $\geq 95\%$ with two doses of the MMR vaccine for five continuous years.
 - ▶ Sensitive and efficient case-by-case surveillance system at the national level with participation from the private sector in detecting suspected cases.
 - ▶ Performance of the national reference laboratory and the national laboratory network to carry out serological tests and viral detection.
 - ▶ Official document of the constitution of rapid response teams at national and subnational levels, trained to respond to imported cases.
- Provide the most recent version of the Annual Action Plan, with a section designed to support the sustainability of elimination and a specific budget to finance these activities, as well as other sources to close immunity gaps. This plan must include resources to support the functional capacity of laboratory surveillance, including annual human resources plans, reagents, supplements, equipment, and transportation of specimens with a national budget.
- Provide the most recent plan for preparing rapid responses to measles outbreaks, including training in a case study on rapid response, the risk assessment tool, prevention of nosocomial transmission, guidance for testing of measles and rubella in the laboratory network of the Region of the Americas, and using other digital tools to follow-up on cases and contacts (for example, virtual situation rooms).
- Provide results from the evaluation of the different components in the National Immunization Program; and/or results from the more recent international evaluation if they are available:

- ▶ Coverage analysis to monitor susceptible individuals
- ▶ Monitoring of surveillance indicator performance
- ▶ Monitoring of cold chain and distribution logistics for vaccines and supply
- ▶ Quality of the information system at all levels, including the private sector

1.6 Correlation of the Evidence

The correlation of the evidence must answer the following questions:

- a) Has the country sustained the elimination of measles, rubella, and CRS since the Americas was declared a region free of these diseases in 2015 and 2016, respectively?
- b) Is the country ready to apply to the re-verification of the elimination of measles and/or rubella if it has reestablished the endemic transmission of either of these two diseases?

Annex 6 compiles some guiding questions developed with the objective of supporting the submission of sound and strong evidence through this report, to fulfill the essential criteria. These questions should not be answered in the report, rather they can serve as a verification checklist to be used by the technical teams responsible for preparing the report, so they can present their evidence in an orderly and systematic manner. Data from the outbreak report section should be part of the correlation of evidence.

2. Outbreak Report – Only for Countries That Reported Confirmed Cases

Countries are required to submit a report for each measles, rubella, or CRS outbreak reported during the analysis period. The description of each outbreak should include robust epidemiological and laboratory information (genotype and lineage), as well as the implementation of the criteria to close an outbreak.

2.1 Description of Epidemiological Situation

- Distribution of confirmed cases by epidemiological week and final classification (laboratory, epi-link, and clinical symptoms). Include date of rash onset of last confirmed case. This curve can be developed at the municipal level.
- Distribution of confirmed cases by age group, age-specific incidence rates, and vaccination status of cases (in the number of cases in which vaccination status is available: vaccinated, not vaccinated, unknown, and not eligible).
- Spatial case distribution of confirmed cases (classic spot maps).

- Distribution of confirmed measles cases according to source of infection and genotype/lineage (see example in Annex 7).
- Whenever possible, include a table with the following:
 - ▶ List of chains of transmission and number of cases per chain, indicating if cases are endemic, imported, related to importation, or have an unknown infection source.
 - ▶ Places where outbreaks occurred (schools, communities, airplanes, cruise ships, health centers, hotels, etc.).
 - ▶ Source of outbreak infection.
- Duration of outbreaks (e.g., number of weeks, months, etc.).
- Classification of confirmed cases at the national level, according to the infection source (imported, related to importation, endemic, or unknown).
- For each outbreak and based on last confirmed case, specify the number of contacts followed up on and investigated within the last 30 days.

2.2 Outbreak Response Activities

Description of the response should include but not be limited to:

Surveillance and laboratory

- Procedures used for epidemiological investigation of the cases
- Specimen collection to confirm the diagnosis and isolate the virus
- Census of contacts and follow-up
- Isolation of cases in health facilities or at home, to avoid both nosocomial transmission and spread of the virus into the community
- Results of institutional or community active searches

Vaccination

- Implementation of vaccination targeting contacts
- Results from mop-up or ring vaccination
- Mass/indiscriminate vaccination campaigns

- Proportion of vaccinated children aged 6–11 months (zero dose) and areas where it was implemented

2.3 Molecular Epidemiology

- Percentage of outbreaks (measles or rubella) with information on virus genotype/lineage (at least in 80% of the outbreaks).
- Distribution of measles genotypes and lineages identified in confirmed cases by epidemiological week (see example in Annex 7).
- Virologic surveillance of chains of transmission following PAHO's laboratory guidance.³
- Percentage of confirmed CRS cases with monitoring of virus shedding until at least two consecutive negative results.

Finally, the report must include a section documenting the lessons learned from the outbreak response amidst the COVID-19 pandemic.

3. Criteria to Verify Outbreak Interruption: Epidemiological, Vaccination, and Laboratory

Provide the following evidence according to the below criteria:

3.1 Epidemiological

- Absence of confirmed measles cases for 12 weeks following rash onset for the last confirmed case, in the presence of high-quality epidemiological surveillance.
- Final classification of all suspected cases reported in the last 12 weeks in those municipalities where the virus circulated.
- Documentation of contact tracing for all confirmed cases reported during the last 21 days (equivalent to 1 incubation period) of the outbreak. The follow-up period of the contacts is 30 days.
- Negative weekly reporting in 80% of reporting units, at the subnational level in which the outbreak was reported.
- Active case-finding of suspected measles and/or rubella cases in health facilities and communities located in:

³ Guidance for testing of measles and rubella in the laboratory network of the Region of the Americas: https://iris.paho.org/bitstream/handle/10665.2/34932/9789275119976_eng.pdf.

- ▶ silent municipalities at the subnational levels that reported measles or rubella cases;
 - ▶ municipalities within the 12 weeks following the last confirmed measles or rubella case.
- Homogeneous fulfillment of the surveillance indicators at the national and subnational levels (reaching $\geq 80\%$) in the current year.

3.2 Vaccination

- Results from Rapid Vaccination Monitoring (RVM) conducted by external supervisors, on high-risk municipalities that meet at least one of the criteria below:
 - ▶ High tourism flow, migration flow, marginal neighborhoods, or indigenous communities
 - ▶ Borders with high population mobility
 - ▶ Difficult to reach (geographically, culturally, etc.)
 - ▶ High population density
 - ▶ High commercial activity (fairs, markets, malls, etc.) or highly industrialized areas
 - ▶ Low vaccination coverage or high drop-out rates (MMR1 vs Penta1)
 - ▶ Epidemiological silence (not reporting suspected cases to surveillance system)
- Report on coverage goals with two doses of MMR vaccine for the current year at the national, subnational, and municipal levels.

3.3 Laboratory

- Results from active laboratory search following PAHO's Guidance for testing of measles and rubella in the laboratory network of the Region of the Americas.

4. Establishment of the National Sustainability Committee

- Official document for constitution of the National Sustainability Committee (NSC)
- Date report was approved and submitted to PAHO
- Names and signatures of NSC members
- Terms of reference for NSC
- Declaration of interests for membership nomination

4.1 Meetings of the National Sustainability Committee and Activities

- In Table A3.3, provide a summary of all committee meetings or any other activity conducted by the committee or where it has participated, as well as the proposed objectives and actions.
- Mention if there have been any changes in membership.

Table A3.3. Summary of National Sustainability Committee meetings

Date of meeting	Main objectives and challenges	Actions proposed by the committee

In Annex 5, you will find the Terms of Reference for Measles and Rubella Elimination National Sustainability Committees (NSC).

Annex 4. Example of a Measles, Rubella, and Congenital Rubella Syndrome (CRS) Country Profile



Measles, Rubella, and Congenital Rubella Syndrome (CRS) Country Profile **JAMAICA**



A. General Information

Total Population (2020)	2,961,161
Population 1 year of age (2020)	45,634

Source: United Nations World Population Prospect: The 2019 Revision.

Year of last MEASLES endemic case	1991
Year of last Rubella endemic case	2001
Year of last CRS endemic case	1998

Vaccination schedule

	1st Dose	2nd Dose	MMR2 Year Introduced
MMR	12 months	18 months	2002

B. Epidemiology and Quality of Surveillance

Figure 1. Distribution of suspected measles and rubella cases and notification rate at the national level, 2016-2020.

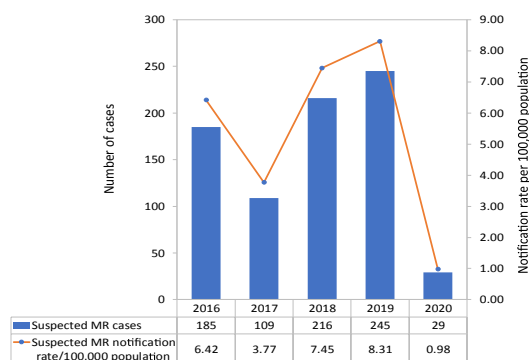


Figure 2. Distribution of suspected congenital rubella syndrome (CRS) cases and notification rate at the national level, 2016-2020.

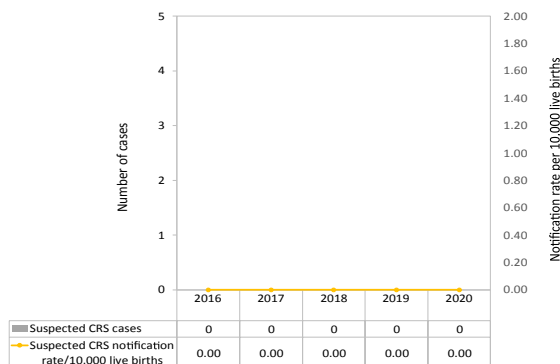
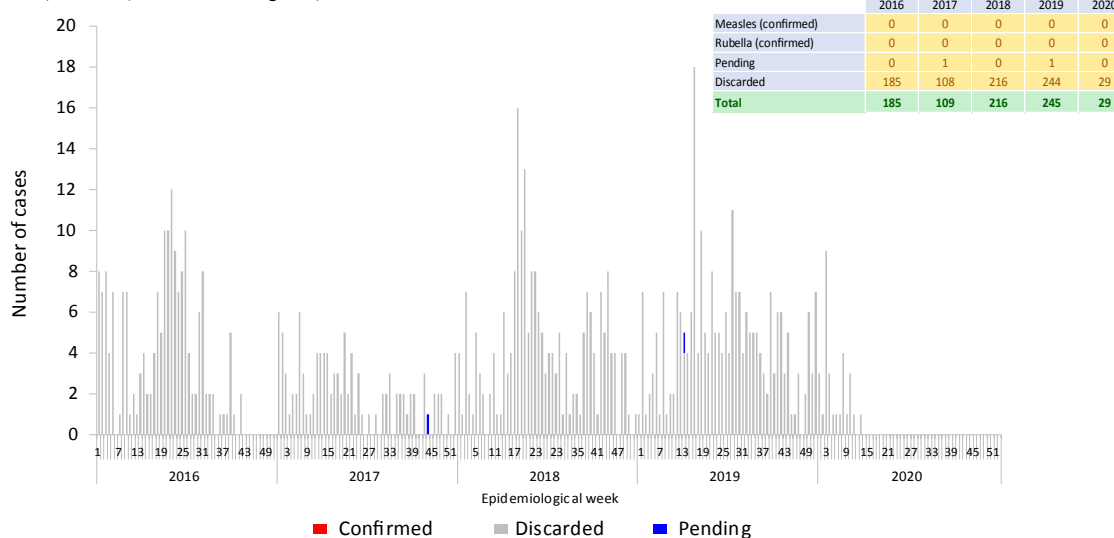


Figure 3. Reported cases of measles and rubella by epidemiological week and final classification: confirmed, discarded, and under investigation, 2016-2020.



Source: Profile developed with official surveillance and vaccination information submitted to PAHO by countries.

Figure 4. Distribution of suspected measles and rubella cases by age group and year, 2016-2020.

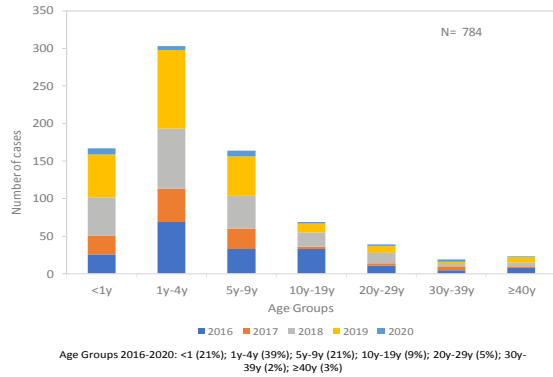


Figure 5. Distribution of confirmed measles cases and measles incidence rates by age group and year, 2016-2020.

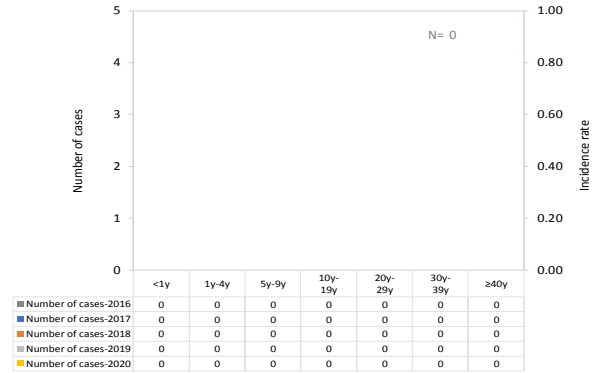


Figure 6. Performance indicators of measles and rubella surveillance by year, 2016-2020.

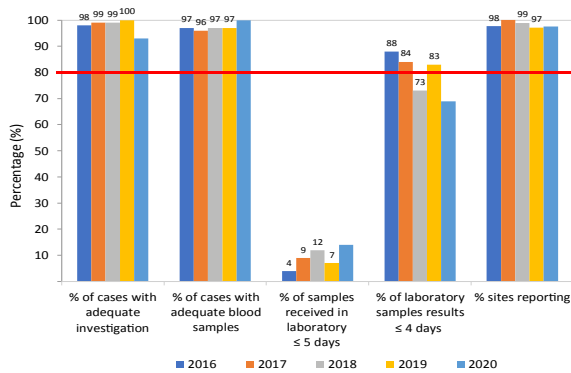


Figure 7. Number of measles and rubella cases pending final classification, 2016-2020.

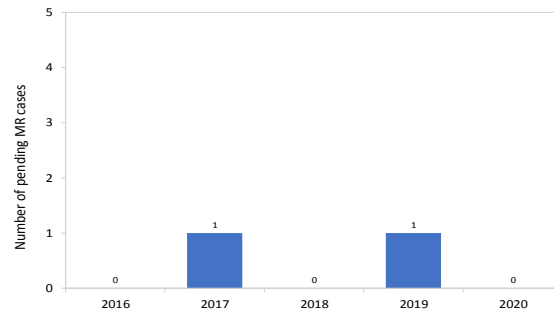
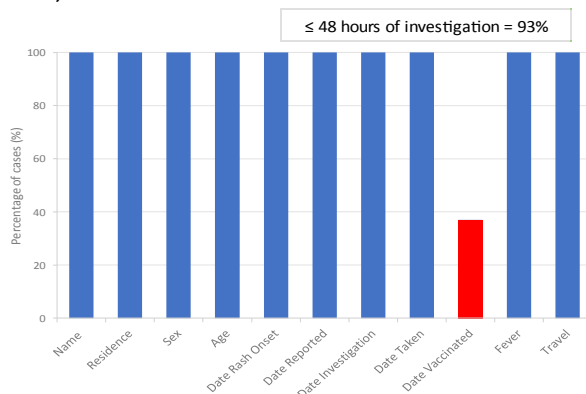


Figure 8. Proportion of the 11 variables reported for adequate investigation indicator, 2020.



Indicators are composed of the following:
% of suspected cases with home visit within 48 hours following notification and % of suspected cases with at least 8 of the 11 variables completed.

Table 1. Municipalities reporting measles and rubella suspected cases by year, 2016-2020.

	No. of municipalities reporting suspected cases	Total municipalities in the country	% of municipalities reporting suspected cases
2016	13	13	100
2017	10	13	77
2018	13	13	100
2019	13	13	100
2020	0	13	0

C. Laboratory Surveillance

Table 2. Criteria used to discard suspected measles and rubella cases by year, 2016-2020.

Year	No. of suspected cases reported	No. of discarded cases	Criteria for discarding			No. of cases discarded by other differential diagnosis					
			IgM Negative	No data	Others	Vaccine reaction	Dengue	Parvo virus	Herpes 6	Allergic reaction	Others
2016	185	185	178	0	7	6	0	0	0	0	1
2017	109	108	107	0	1	1	0	0	0	0	0
2018	216	216	213	0	3	2	0	0	0	0	1
2019	245	244	236	0	8	6	0	0	0	0	2
2020	29	29	29	0	0	0	0	0	0	0	0

D. Analysis of Population Cohorts

Figure 9. Coverage of the first dose of measles-mumps-rubella (MMR1) vaccine, number of doses administered, and number of children 1 year of age, 2016-2019.

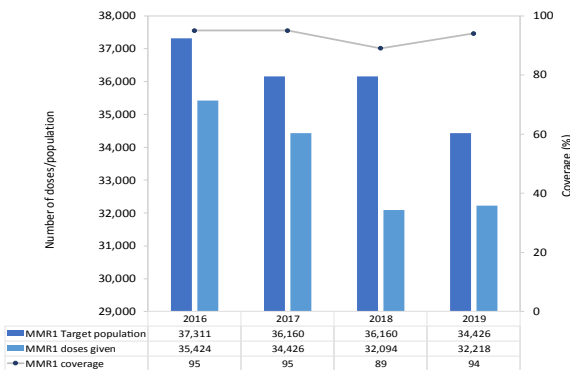


Figure 10. Coverage of the second dose of measles-mumps-rubella (MMR2) vaccine, number of doses administered, and number of children 15-18 months and/or 4-6 years of age, 2016-2019.

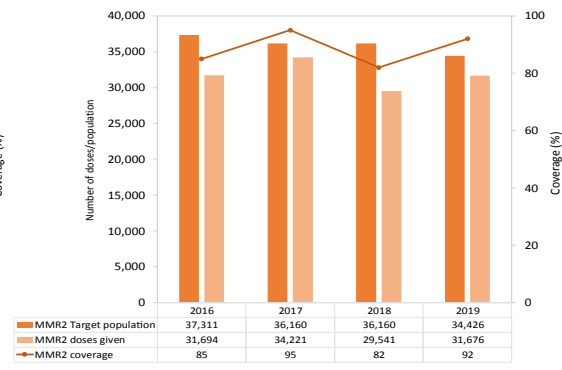


Table 3. Accumulation of susceptibles for measles and rubella.

Year of the last follow-up campaign	Vaccine used (M, MR, MMR)	Age group vaccinated	Number vaccinated (numerator)	Coverage of the follow-up campaign (B/C)*100	Number of susceptibles 1-4 years of age	Year of next campaign
2015	MMR	1-6 years	93,394	85	26,924	None planned

Figure 11. Portion of municipalities with different coverage range with the first dose of measles-mumps-rubella (MMR1) vaccine, 2016-2019.

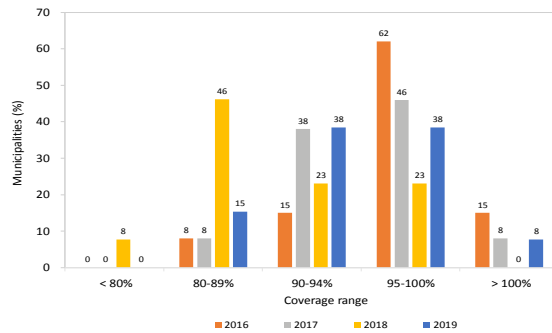


Figure 12. Portion of children living in those municipalities for the first dose of measles-mumps-rubella (MMR1), 2016-2019.

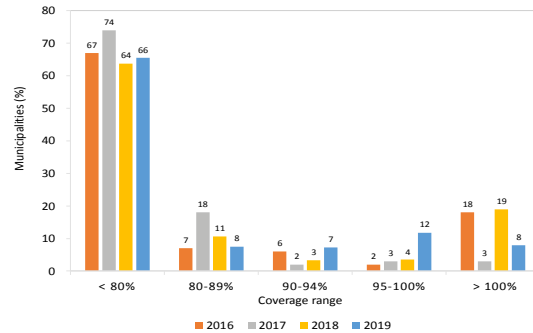


Figure 13. Portion of municipalities with different coverage range with the second dose of measles-mumps-rubella (MMR2) vaccine, 2016-2019.

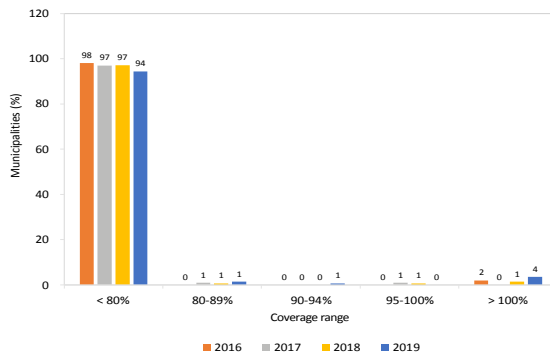
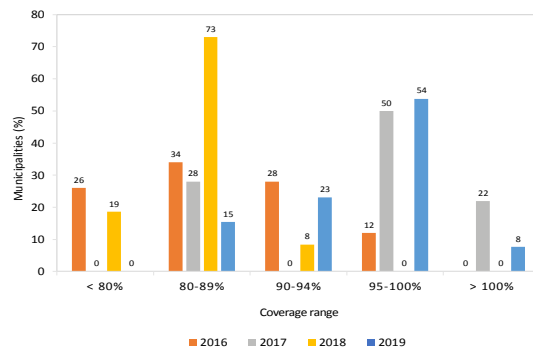


Figure 14. Portion of children living in those municipalities for the second dose of measles-mumps-rubella (MMR2), 2016-2019.



Sources: Country reports through the PAHO-WHO/UNICEF Joint Reporting Form (JRF), Integrated Surveillance Information System, Measles Elimination (MESS), and country reports to FPL-IM/PAHO. Data as of 15 October 2020.

Annex 5. Terms of Reference for Measles and Rubella Elimination National Sustainability Committees (NSC)

The National Sustainability Committees and the Subregional Committee for the English Caribbean Countries for Measles and Rubella Elimination are responsible for reviewing the body of evidence regarding the measles and rubella sustainability efforts at the country level. These independent entities can also be engaged in specific measles and rubella routine activities, such as classifying challenging suspected cases.

a. Composition

The members of the NSC will be senior persons familiar with the national immunization program, surveillance, and laboratory services. Members should be free of conflicts of interest.

The size of the NSC should range between 5–7 members including a chair, who should be a senior-level expert, recognized and respected by peers. He/she should be selected from among the core members with concurrence from the competent national authority. Gender equity will be desirable.

b. Expertise

The NSC should be multidisciplinary to include experts representing the following areas:

- Epidemiology (focusing on infectious diseases)
- Virology
- Pediatrics /internal medicine/gynecology–obstetrics
- Public health
- Vaccinology
- Other: neurology, pneumology, congenital birth defects, among others.

Representatives from the national immunization program or surveillance directorate, Ministry of Health, will provide the technical secretariat of the NSC. In addition, the Immunization Focal Point from the Pan American Health Organization (PAHO) at the Country Office will provide technical support to the NSC and the Ministry of Health.

c. Functions

The functions of the NSC are as follows (but are not limited to):

- Approve the country report on an annual basis and submit this report to the national health authorities, which will then officially present the documentation to the PAHO/WHO Representative in the respective country.
- Review and analyze the required data to sustain and/or re-verify the elimination of measles, rubella, and congenital rubella syndrome (CRS) at the country level. Ensure all main components of the Regional Framework for the Monitoring and Re-Verification of Measles, Rubella and CRS are met.
- Support the implementation of recommendations to address identified information gaps and inconsistencies necessary to achieve the vaccination and surveillance as per the following PAHO/WHO goals.
- Advocate for engagement and commitment with national health authorities, private and public sector partners to support collecting and analyzing the data for maintenance of the sustainability or re-verification of the elimination in the country.
- Maintain a dialogue with the Measles and Rubella Elimination Regional Monitoring and Re-verification Commission (MRE-RVC or Regional Commission during annual meetings and different activities at regional and national levels.
- Help ensure recommendations and feedback from the Regional Commission are implemented.

d. Selection of members

Members will be appointed by the Minister of Health through the official procedures of each country. An official resolution is desirable to give credit to the work of the NSC.

Members should sign a confidentiality agreement and a declaration of conflict of interest. Members will participate on a voluntary basis.

e. Term limits

Members can be appointed for a period of 3–4 years. To maintain continuity in the group, it is important to ensure that the terms of all members do not expire at the same time. In addition, members should actively participate in the NSC meetings and fulfill the working plan. Otherwise, members may be replaced.

Checklist of key functioning aspects for National Sustainability Committees (NSC)

The below checklist compiles key aspects for an adequate functioning of a National Sustainability Committee (NSC). This checklist was adapted from PAHO's Operational Guide for National Immunization Technical Advisory Groups (NITAG) and WHO's Review NITAG composition and functioning exercise.

Aspects of functioning	PAHO/WHO recommendation	Yes/No	If no, please specify
Establishment of NSC	Establishment of the NSC through a formal mechanism such as a ministerial decree or other appropriate means. If the NSC is a working group of the NITAG, then the formal mechanism of establishment should fall under NITAG.		
Development of terms of reference	Formulation in writing of national terms of reference.		
Independence of the NSC	NSC core members should not have any affiliation to government workers. As a minimum, NSC core members should not have affiliations with direct reports to the National Immunization Program, Surveillance Directorate and National Laboratory of Reference.		
Declaration of interests	Should be done in writing by all members before appointment and verbally before each meeting.		
Confidentiality agreement	Members and special invitees should sign agreement stating that they will keep information confidential.		
Meeting frequency	At least twice a year, with flexibility for additional meetings as needed.		
Process to review and share evidence	Prior to meetings, specific questions should be articulated to NSC. Agenda and background documents circulated at least 2 weeks in advance of the meeting.		
Decision by vote or consensus	The NSC need to decide if decisions of its core members will be made by majority vote or by consensus, and how many members need to be present (quorum) to formulate the recommendations. Having an odd number of members will allow one vote of difference to make a decision.		
Recordkeeping and communications	Summary minutes of each meeting focusing on main conclusions and recommendations should be available and endorsed by the NSC. Both the Ministry of Health and PAHO can serve as technical secretariat.		

Sources:

1. Pan American Health Organization. Operational Guide for National Immunization Technical Advisory Groups. Washington, DC: PAHO; 2020. [Accessed February 2021]. Available from: <https://www.nitag-resource.org/sites/default/files/2020-06/FIELDGUIDE-NITAG-JUNE8.pdf>.
2. World Health Organization. Review of NITAG composition and functioning exercise. Geneva: WHO; 2021. [Accessed February 2021]. Available from: https://www.nitag-resource.org/sites/default/files/2022-01/Group%20Exercises%20Sheet_NITAG%20Composition%20and%20Functions.pdf.



Annex 6. Guiding Questions to Support the Correlation of Evidence

The sixth component of the Regional Framework for the Monitoring and Re-verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas is the correlation of evidence, which should be developed based on the evidence submitted in the previous five components. To facilitate an adequate analysis, below there are some guiding questions.

1. Epidemiology of Measles, Rubella, and CRS

For each of the two viruses:

- Does the epidemiological and laboratory surveillance information, molecular epidemiology (genotypes and lineages), and vaccination coverage in the different age groups at the municipal level support that the country has maintained measles and rubella elimination in its territory?

If the country reestablished endemic transmission of measles or rubella:

- Present epidemiological surveillance evidence verifying the interruption of endemic transmission in the same or different geographical areas of the country for more than 12 months following rash onset for the last confirmed case.
- Present molecular epidemiology evidence that confirms that the same genotype and lineage has ceased for more than 12 months in the same or different geographical areas of the country, following rash onset for the last confirmed case.
- Present evidence on the increase in population immunity levels, as well as the identification and vaccination of susceptible individuals.
- Present evidence that secures the sustainability of elimination in the territory.
- Present evidence that the country had a rapid response plan to interrupt the endemic transmission.

If the country has reported measles outbreaks, but has not reestablished endemic transmission, it should present the same above-mentioned evidence.

2. Quality of Measles, Rubella, and CRS Surveillance

- If the country has not met the minimum established standard ($\geq 80\%$) on a sustained basis for all measles, rubella, and CRS surveillance and laboratory indicators during the analysis period, then the country would at least have to present the following data:

- ▶ Results from active community, institutional, and laboratory searches in silent municipalities, with outbreaks of arbovirus diseases or that have presented outbreaks of measles or rubella, to document the absence of cases.
- ▶ Results from sporadic analysis of cases with positive IgM results for measles or rubella, based on clinical, epidemiological, and laboratory information.
- ▶ If cases were confirmed through active/retrospective searches for measles/rubella, are there any evidences documenting the importation and the absence of secondary cases associated with this importation?
- ▶ If there are isolated measles/rubella cases reported after rash onset of the last case in which: i) the source of infection of these cases could not be identified; ii) no serum or viral detection specimens were taken; iii) an epidemiological link could not be established with the last confirmed measles or rubella case. In this situation, the country must confirm these cases following the clinical compatible definition, without ruling out the possibility that they are part of the same transmission chain, and therefore, the country must demonstrate that it has carried out control actions to successfully interrupt the transmission of the virus.

3. Laboratory Surveillance

- Does the report indicate that the national laboratory, with the person responsible for carrying out the required tests on the specimens, has been accredited/certified?
- Regardless of the accreditation status of laboratories, has the national laboratory obtained a 90% or greater score in the annual proficiency panels in serology and molecular testing submitted to a reference laboratory?
- If the country has a national network of laboratories to implement testing in blood specimens, does the national reference laboratory perform a quality control of its international performance during the analysis period?
- Has the laboratory timely reported the results to the National Immunization Program and/or Surveillance Directorate?

4. Analysis of Population Cohorts

- Has it been possible to determine if the routine program has achieved homogeneous coverage $\geq 95\%$ with MMR1 and MMR2 vaccines during the analysis period?
- Has it been possible to determine if the follow-up campaign(s) achieved homogeneous coverage equal or greater than 95% at the municipality level

and identified age groups that were not vaccinated, who may constitute a risk group for the importation of cases and the appearance of secondary cases?

- Have the immunity gaps (in routine or campaign), interventions carried out (mop-up interventions or RVM), and interventions in high-risk municipalities (low coverage, high population density, tourism, high influx of migration, border communities, international airport, among others) been documented and presented in the report?
- Has the delayed administration of MMR1 and MMR2 doses been considered in the calculation and analysis in the identification of the immunity gaps in case the information system allows it?
- Has RVM been implemented in municipalities with low administrative coverage and those reporting more than 100% coverage post-campaign and during the regular vaccination program?

5. Sustainability

- Can the country sustain elimination at the national, subnational, and municipal levels during the current administration, which is reflected in a budget allocation for sustainability actions to be implemented and in the operational capacity of the National Immunization Program, Directorate of Surveillance, and National Laboratory?
- Is there a fast-track mechanism to access emergency financial resources to implement the national rapid response plan for imported cases to ensure that the elimination of these diseases can be maintained?

Annex 7. Examples of Molecular Epidemiology Data Visualizations in the Context of an Outbreak

Table A7.1. Distribution of confirmed measles cases by subnational level according to source of infection, D8 genotype and lineage MVs/Osaka.JPN/29.15 (fictional data example)

Subnational level	Municipal level	2017												2018											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
State A	Municipality A1	1																							
	Municipality A2						1																		
	Municipality A3														1										
	Municipality A4																2	2							
	Municipality A5				1	2													2				1	1	
State B	Municipality B1		1																						
	Municipality B2				1	4																			
	Municipality B3				3	4														2					
	Municipality B4						1																		
	Municipality B5					1	4																		
	Municipality B6																				1				
State C	Municipality C1																		1						
	Municipality C2																				3		2		
	Municipality C3																						2		
	Municipality C4																					1	1		
	Municipality C5			1																					

Unknown source case
 Import-related case
 Imported case (with travel history)

Note: Fictional data from country X, year 2017 and 2018. Total number of cases 47 (25 for 2017 and 22 for 2018).

Table A7.1 shows the distribution of confirmed measles following source of infection by subnational and municipal levels, where only the genotype D8, lineage MVs/Osaka.JPN/29.15 was identified, for the period 2017 and 2018. No other genotypes or lineages were identified during the above-mentioned period. The numbers placed in each cell represent the number of confirmed cases associated with the genotype D8, lineage MVs/Osaka.JPN/29.15. According to the table, genotype D8, lineage MVs/Osaka.JPN/29.15 circulated in a scattered way in country X. Multiple importations of this genotype and lineage are observed in State A. For State B and State C there are imported-related cases where an epi-link with a confirmed case was identified; and cases with unknown source of infection. However epidemiological links between these reported cases (circled in red) were not detected. In addition, more than 12 months elapsed between the last case with an unknown source of infection reported in 2017 and the first case reported in 2018. Therefore, it was unlikely that an endemic transmission chain with genotype D8, lineage MVs/Osaka.JPN/29.15 had occurred in country X.

Table A7.2. Distribution of measles genotypes and lineages identified in confirmed cases by epidemiological week

Measles genotype	Epidemiological weeks (EW)																																																			
	2017																										2018																									
	1	8	12	25	27	28	35	41	43	44	45	46	49	52	1	4	6	8	9	12	14	20	21	28	30	33	34	35	38	41	42	43	44	45	46	47	48	49	52													
D8		1		3		3	1		2		2		3					1	1		2		1	1	2	2	3	7	8	1	2			1	4					4	2	1										
B3															1																														1							

Lineage D8	1	8	12	25	27	28	35	41	43	44	45	46	49	52	1	4	6	8	9	12	14	20	21	28	30	33	34	35	38	41	42	43	44	45	46	47	48	49	52								
MVi/Hulu Langat.MYS/26.11/				1		2	1		1		1		1																																		
MVs/Osaka.JPN/29.15		1																																												2	
MVi/Delhi.IND/01/14/06				1														1		1																											
MVs/Osaka.JPN /29.15						1			1		1		2						1		1		1	1	2	2	3	7	8	1	2			1	4					2	2	1					

Note: Fictional data from country X, year 2017 and 2018. Total number of cases 60 (15 for 2017 and 45 for 2018).

Table A7.2 shows the distribution of measles genotypes and lineages by epidemiological week in Country X. The table is a visual aid of the implementation of virologic surveillance in the context of measles outbreaks. As such, the table presents two genotypes, D8 and B3, that were reported in 2017 and 2018, respectively. Genotype D8 was identified in the majority of the confirmed measles cases with genetic sequence (97%). Four lineages were identified from genotype D8, of which only lineage MVs/Istanbul.TUR/28/18 circulated across 2017 and 2018 on a continuous basis, highlighting the presence of an ongoing outbreak. In this country, the surveillance system was sensitive enough to detect multiple genotypes and lineages among the outbreaks reported.

This revised edition of the Regional Framework for the Monitoring and Re-verification of Measles, Rubella, and Congenital Rubella Syndrome Elimination in the Americas includes an additional Annex regarding the Terms of Reference for Measles and Rubella Elimination National Sustainability Committees (NSC). The Regional Framework aims to guide Member States, as well as the National Sustainability Committees of the Pan American Health Organization, on the requirements and procedures for monitoring and re-verifying measles and rubella elimination. The Regional Framework maintains some elements from the original 2011 Plan of Action for documenting and verifying elimination, while providing sound and updated guidance adjusted to the new epidemiological scenarios. Endemic countries will now have to document absence of measles virus transmission for more than one year and the national capability to sustain measles and rubella elimination, to meet re-verification criteria. The Framework was developed and critically reviewed by the Measles and Rubella Elimination Regional Monitoring and Re-Verification Commission, a new body of independent experts appointed in 2019 that will guide the process for re-verifying and monitoring sustainability of elimination.

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