Measles and Rubella Elimination Initiatives in the Americas: Lessons Learned and Best Practices

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Countries in the World Health Organization Region of the Americas successfully interrupted endemic measles virus transmission 8 years after setting a regional measles elimination goal and have sustained this achievement since 2002. The vast experience from the region clearly demonstrates that measles elimination can be accomplished and maintained over time. This brief report summarizes the lessons learned and the best practices that evolved in the Americas during 3 measles elimination phases (ie, preelimination, elimination, and postelimination phases), as well as the contribution of rubella elimination to strengthening and maintaining measles elimination. The effective measures that have been implemented and adapted by the countries of the Americas to eliminate endemic measles and rubella will serve as an example to other countries and regions embarking on this endeavor.

In 1994, all countries of the Americas, through Resolution CSP24.R16 of the Pan American Sanitary Conference, established the goal of measles elimination by 2000 [1]. This same year, the World Health Organization Region of the Americas was declared polio free by the Commission for Certification of Poliomyelitis [2]. At that time the reported annual incidence of measles was 100 cases/1 million population, regional coverage with the first dose of measles-containing vaccine was 80%, and several countries had implemented pioneering strategies that had interrupted or nearly interrupted endemic measles transmission [3]. In November 2002, 8 years after calling for measles elimination, the region interrupted transmission of the last endemic strain of measles virus (genotype D9). Measles elimination efforts in the Americas were further strengthened and maintained by the adoption of Resolution CD44.R1 in 2003, urging member states to eliminate rubella and congenital rubella syndrome from their countries by the year 2010 [4].

The experience in the Region of the Americas demonstrates that measles elimination can be achieved and sustained. A safe and affordable combined measles-rubella vaccine is available, and the countries of the Americas have documented strategies to eliminate rubella as well, while consolidating measles elimination. This brief report summarizes the lessons learned during measles elimination in the Americas, in the preelimination, elimination, and postelimination phases.

PREELIMINATION PHASE

Although the countries of the Americas introduced the measles vaccine in the 1960s, it was only with the establishment of the Expanded Program on Immunization (EPI) in the Americas in 1977 that the region set the goal of reducing morbidity and mortality due to measles and 5 other vaccine-preventable diseases, by providing immunization services to all children aged <1 year. In 1977, the EPI was created in the Americas by a Resolution of the Directing Council of the Pan American Health Organization (PAHO), after a resolution of the World Health Assembly in 1974 [5].

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Before the EPI, in 1971–1977, 28 countries of the Americas were reporting an average of 258,634 measles cases per year and interepidemic periods of 2–3 years [6]. With the widespread use of measles vaccine, the intervals between epidemics were prolonged and tremendous reductions in measles cases were observed in several countries, including Canada, parts of Brazil, Chile, Costa Rica, Cuba, Mexico, and the United States. The United States had set elimination goals as early as 1966 and 1978. Given these remarkable reductions in measles morbidity and mortality, the potential for measles eradication was discussed during the 1982 International Symposium on Measles Immunization, hosted by PAHO in Washington, DC [7].

Cuba initiated a measles elimination strategy with a “catch-up” campaign in 1986. This campaign aimed at interrupting measles transmission by vaccinating children aged 1–14 years in a short period of time, regardless of their previous vaccination or disease history. In addition to the catch-up campaign, Cuba’s elimination strategy included maintaining routine coverage of ≥95% with measles-containing vaccines and setting up rash-fever surveillance measures to detect and respond to suspected measles cases. The English-speaking Caribbean countries and territories launched a measles elimination initiative in 1988, vaccinating >90% of children aged 9 months to 14 years and interrupting measles transmission in 1991. Brazil and Chile followed with catch-up campaigns in 1992 [5]. The efforts of these pioneering countries proved successful in stopping viral transmission. At the same time, the devastating consequences of measles were brought back to light after measles resurgence in several countries of the Americas in 1988–1991 [8, 9]. These events inspired other countries of the region, as well as international donors, to take up the goal of measles elimination. The regional measles elimination goal was established by the Pan American Sanitary Conference in 1994.

In May 1985, after the successful experience of the Americas in pioneering smallpox eradication, PAHO proposed to eradicate polio from the region by 1990; this initiative was endorsed by all countries in the Americas a few months later. The polio eradication initiative was proposed as a vehicle to reach the EPI goals of universal vaccination against childhood vaccine-preventable diseases by 1990 [10]. The eradication of polio in the Americas, achieved in 1991, created a platform for building measles elimination strategies. The regional polio initiative gave governments, health care workers, and the public experience with mass campaign vaccine delivery; close monitoring of immunization program performance at the local level; and active surveillance with weekly negative reporting (reporting even if no cases have been notified) and investigation of suspected cases, including specimen collection, specimen transport, and laboratory confirmation with genetic sequencing of viral isolates. The measles elimination initiative was announced as the region was certified polio free in 1994 [2].

**MEASLES ELIMINATION PHASE: 1994–2002**

Strong political commitment and regional cohesion have been key elements to the success of the measles elimination initiative. The initiative was endorsed by all countries of the Americas during the 1994 Pan American Sanitary Conference, the supreme governing authority of PAHO, which meets every 5 years to determine the general health policies for the region. The highest political levels have actively supported and become involved in the implementation of the elimination strategies. Support from presidents, prime ministers, and high-level politicians has been important to ensure high visibility for measles elimination activities and help obtain necessary financing. During the Fifth Conference of the Wives of Heads of State and of Government of the Americas, in 1995, the First Ladies of the Western Hemisphere made an official declaration specifically supporting measles elimination in the Americas [11]. Country ownership of the elimination initiative has been evidenced by resources allocated by governments and local institutions for measles elimination activities, and it has been essential for the success of the initiative. Intense, ongoing advocacy efforts have been required to ensure political commitment and the mobilization of resources at all levels.

A clear elimination strategy for measles elimination was recommended by PAHO. This strategy includes a one-time “catch-up” vaccination campaign to interrupt transmission, conducted within a short period and targeting all children 9 months through 14 years of age, regardless of previous vaccination status or measles disease history. The catch-up phase is followed by improvements in routine vaccination services aiming to reach high routine coverage levels with measles-containing vaccines (“keep-up”), complemented by periodic mass vaccination campaigns to provide a second vaccination opportunity (typically every 4 years and targeting children aged 1–4 years, regardless of previous vaccination status) and the implementation of fever-rash surveillance to detect cases promptly and respond to minimize disease transmission [12]. The strategy was widely disseminated. Strong and accountable monitoring methods and tools have been used to improve the assessment of vaccination and surveillance efforts, particularly at the local level. A national plan of action for each county has been critical for mapping out strategies and activities needed to reach the goal. PAHO has provided technical support to countries for drafting and implementing plans of action.

The reemergence of measles in 1997 in Sao Paulo and in 2001–2002 in Venezuela and Colombia illustrated the dangers of not fully implementing the elimination strategy [13]. The experiences have been openly and transparently shared by the countries and PAHO in an effort to avoid similar problems in other countries or regions.

Several lessons have been learned from the campaigns implemented as part of the measles elimination strategy.
Organizing large-scale national immunization campaigns requires careful planning and management [14]. A planning period of at least 6 months has proved best for implementing a successful campaign. This planning period allows better organization and logistical support, including the procurement of sufficient vaccines and supplies through PAHO’s Revolving Fund. Administering measles-containing vaccine to all individuals in the target group, regardless of their previous history of measles vaccination or measles disease, facilitates logistics, monitoring, and evaluation in campaigns, while improving overall population immunity.

Measles surveillance and close coverage monitoring have allowed countries to identify groups that may be at particular risk or need to be targeted using tailored strategies. High coverage levels can prevent the spread of measles virus should it be introduced; therefore, “mop-up” activities have delivered measles vaccine on a house-to-house basis in many high-risk areas. These areas are usually selected on the basis of coverage results, though other criteria have included poor measles surveillance; failure to report suspected fever or rash; limited access to health services; large concentrations of urban poor, especially with frequent migration; tourist centers; and large concentrations of indigenous populations. Densely populated and underserved periurban areas with high rural-to-urban migration are at highest risk for measles outbreaks, primarily because of the accumulation of large number of susceptible persons, especially unvaccinated young children. Border populations are highly transient and often excluded from vaccination interventions in their countries of origin. Such exclusion can lead to pockets of susceptible individuals who travel between countries, increasing the risk of secondary spread of measles and threatening the success of measles elimination. Coordinated intercountry efforts have been organized to vaccinate these vulnerable populations.

Health care workers (including administrative, medical, and security personnel) are also at special risk. These workers have the responsibly to avoid transmitting measles, because they are not only likely to be exposed but are also likely to expose others to measles. Proof of measles immunity has been recommended for employment in any health care facility. Given the potential high turnover in personnel, public health officials have needed to conduct a formal process of verification of this requirement at regular intervals. When active case searches for vaccine-preventable diseases are done, the vaccination status of employees could be checked against personnel lists reporting measles vaccination dates for each staff member. As measles has been eliminated from countries of the Americas, personnel from the tourism and transportation industries—including hotel and airport workers, security personnel, baggage handlers, and taxi drivers—have become a special risk group for the reintroduction of measles into the country, because they have more contact with foreigners. They are being targeted for selective vaccination during measles and measles-rubella vaccination campaigns. Groups not routinely accepting vaccination may also be at increased risk of measles. Some of these groups have been persuaded to change their views and receive immunization. Mennonite leaders in Bolivia, Central America, and the Dominican Republic supported measles vaccination once they understood the risks. Discussions with the leadership of specific communities that reject vaccination may therefore be useful. Some groups will not accept measles or any other vaccination, however, and they therefore constitute a potentially large pool of susceptible individuals. [11]

Measles surveillance has been a key component of the elimination strategy in the Americas. All countries are conducting case-based surveillance with laboratory confirmation. Surveillance data and indicators are published weekly in the Measles Weekly Bulletin to provide periodic feedback to countries [15]. The surveillance indicators have evolved over the elimination period according to changes in circumstances or regional needs. For example, new indicators for monitoring viral detection have been proposed. The former indicator of the percentage of cases with a home visit within 48 h has been replaced by a compound indicator of adequate investigation that includes home visits but also adds a minimum set of other required variables.

**POSTELIMINATION PHASE: 2003 ONWARD**

Since the interruption of endemic measles transmission in November 2002, importations of measles into PAHO countries have not generated sustained epidemics. In most instances, measles outbreaks have been quickly controlled. Surveillance data for measles, combined with the results of molecular epidemiology studies, indicate that the countries of the Americas are continually exposed to measles viruses from other regions of the world where measles continues to be endemic [13]. Since 2003, most measles cases in the Americas have been related to importations from Europe (Figure 1).

In 2003, countries of the Americas embarked in an initiative to eliminate rubella by 2010 [4]. This new initiative builds on the measles vaccination and surveillance strategies. All countries of the Americas include measles- and rubella-containing vaccines in their routine immunization schedule, are using measles-rubella–containing vaccine for their follow-up campaigns, and have integrated measles-rubella surveillance, with the laboratory testing of rash-fever cases for both antigens. The implementation of “speed-up” campaigns in the 2000s, which provided a dose of measles-rubella vaccine to adolescents and adults, has enhanced measles herd immunity and provided protection against the reintroduction of measles virus in the region. Mass vaccination activities now conclude with rapid coverage monitoring to ensure the vaccination of all persons in the targeted area. In the context of the speed-up campaigns,
a "field consultant team" of individuals was created with technical expertise and leadership skills obtained from organizing mass vaccination campaigns for adolescents and adults in their own country. This team traveled from country to country in the region, assisting local PAHO staff and National Immunization Program staff with logistics and planning for adolescent and adult campaigns. This expanded consultation helped address the challenge of reaching the target population of persons <40 years old.

An important focus of the measles and rubella elimination activities in recent years has been the monitoring of the vaccination status of each cohort and surveillance with close follow-up of suspected measles or rubella cases. Countries have carried out analyses of vaccinated population cohorts to identify populations to target with measles-rubella vaccination interventions. In the postelimination era, one case is considered an outbreak. Therefore, quality surveillance should be able to detect an importation early on so that appropriate interventions can be implemented to stop transmission, including vaccination while conducting contact tracing. Every effort is made to trace all potential contacts of imported measles cases and follow them up for 30 days after exposure. Owing to international travel, contact tracing may require intercountry and even interregional collaboration. Detecting imported cases has emphasized the need for the surveillance system to include facilities providing health care to tourists and private providers, because those who can afford intercontinental travel are more likely to seek care through the private sector. Improved coordination with the private sector also allows for more accurate assessment of vaccination coverage and the completion of immunization schedules.

Considering the substantial number of international travelers to the Americas each year, PAHO has issued special global alerts to advice persons attending international sporting events to be vaccinated against measles. If the events are held in the Americas, participants are advised to receive measles-rubella vaccines before visiting. If they are held outside the Americas, residents of the Americas are advised to receive measles-rubella vaccines before traveling.

As the rate of routine serologic testing of patients with suspected measles or rubella has improved and is close to 100%, the focus has shifted to collecting pharyngeal and urine specimens for virus isolation. Genetic sequencing of identified measles viruses is essential after elimination, because molecular epidemiology can help identify the sources of viruses from other regions. However, the number of urine and/or nasopharyngeal specimens submitted for virus isolation has been suboptimal, and further improvements are needed to complete thorough investigations of chains of transmission [11]. A suspected measles or rubella case can be confirmed or discarded only after thorough review of the epidemiologic, laboratory, and clinical data. This requires joint consultation of the responsible laboratory and epidemiology teams [16]. Systematic active and retrospective searches are being implemented for timely identification of suspected measles cases in silent areas.

To maintain the interest of the public and political leaders, and to motivate health care workers, the many achievements and lessons learned from implementing measles (and rubella) elimination initiatives are being widely disseminated. These experiences have been documented in 3 PAHO publications: "Compendium of Measles Articles," "Compendium of Rubella and Congenital Rubella Syndrome Articles," and "Images that Inspire: The Mobilization of the Americas to Eliminate Measles and Rubella"[11, 17, 18]. A fundamental lesson learned from the experience of the Americas in the era after measles elimination is that delays in reaching measles elimination targets can translate into much higher costs and declining motivation among health care workers. The successful implementation of elimination strategies in the Americas has helped create a culture of prevention among the population, strengthening the fundamental pillars of primary health care by expanding health services to vulnerable populations, empowering people to make informed health-related decisions by providing them with credible sources of information, strengthening health care systems, and maintaining the integrity of immunization programs [19]. To maintain the gains in the Americas, it is imperative to work toward global eradication of measles and rubella, as quickly as possible.

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**References**


