

Vaccine-preventable diseases (diphtheria, measles, poliovirus) in the context of the COVID-19 pandemic: implications for the Region of the Americas

29 October 2020

Summary

Date of assessment: 2 October 2020

Overall risk and confidence (based on information available at the time of assessment)

Level of confidence in the available information: **High**

Level of overall risk: **Very High**

Risk Assessment

After more than eight months of the ongoing COVID-19 pandemic in the Region of the Americas, with all of the countries in the North America, Central America, and South America (with the exception of Uruguay) subregions presenting with community transmission, health systems are being challenged and routine immunization activities are being postponed in most of countries. The pandemic has jeopardized compliance with the indicators for integrated measles/rubella and acute flaccid paralysis (AFP) surveillance. Furthermore, imposed restrictions on movement as well as concerns due to the pandemic have limited primary healthcare activities, including preventive services such as vaccinations. The restrictions on movement had also an impact in the occurrence of vaccine-preventable disease (VPD) outbreaks and/or contributed to the interruption of virus transmission. However, the re-opening of the economy and borders may increase the risk given the impact of COVID-19 on the capacity of the healthcare systems. Therefore, considering these factors, the occurrence of new outbreaks of VPDs of varying magnitude in the Americas cannot be ruled out and the Regional risk is assessed as **Very High**.

Risk Assessment Questions

Risk Question		Assessment		Risk	Rationale
		Likelihood	Consequences		
Potential risk for human health?	Regional	Highly likely	Major	Very high	<p>There is a greater risk due to the increase in the susceptible population as a result of low vaccination coverage. There has been increased morbidity due to measles in at least 9 countries in the Region of the Americas in the last three years. Currently, in Brazil, there is an ongoing outbreak that can potentially lead to exported cases to other countries within the Region with inadequate measles vaccination coverage. Additionally, several countries within the Region have reported inadequate compliance with surveillance indicators for vaccine-preventable diseases (VPDs), thereby increasing the risk of not detecting an event or an outbreak in a timely manner. The context of the COVID-19 pandemic has hampered the provision of immunizations and primary healthcare services and strained resources particularly in healthcare settings.</p> <p>In 2019, 3-dose diphtheria, tetanus, pertussis (DTP3) vaccination coverage of $\geq 95\%$ was not achieved in 24 countries/territories in the Region of the Americas, and 6 countries (Argentina, Bolivia, Brazil, Haiti, Paraguay and the Bolivarian Republic of Venezuela) had $< 80\%$ coverage for DTP3. For 1-dose measles, mumps, rubella (MMR1), vaccination coverage of $\geq 95\%$ was not achieved for 22 countries/territories in the Region, and 4 countries (Bolivia, Haiti, Mexico, and Paraguay) had $< 80\%$ coverage. For MMR2, vaccination coverage of $\geq 95\%$ was not achieved in 29 countries/territories in the Region, and 14 countries/territories (Anguilla, Barbados, Bolivia, British Virgin Islands, Brazil, Dominican Republic, Ecuador,</p>



					Guatemala, Haiti, Mexico, Peru, Saint Lucia, Suriname, and Venezuela) had <80% coverage. For 3-dose oral poliovirus vaccine (OPV3), vaccination coverage of ≥95% was not achieved in 25 countries/territories in the Region, and 6 countries (Argentina, Bolivia, Guatemala, Haiti, Paraguay, and Venezuela) had <80% of coverage.
Risk of event spreading?	Regional	Highly likely	Major	Very high	The risk of VPDs is increased due to low vaccination coverage. As vaccination coverage is inadequate in most of the countries/territories in the Region of the Americas, the risk of outbreaks due to VPDs and subsequent spread is Very High in the event of importation. In addition, it is likely that transmission of measles in Brazil and diphtheria in Haiti and Venezuela will continue until adequate vaccination levels are reached. Indigenous populations living along the borders of Venezuela, Brazil, and Colombia in particular, as well as the Argentina, Brazil, Bolivia, Paraguay, and Peru borders, are also particularly at-risk due to the difficulty in reaching these populations and due to the limited access to essential health services and immunizations.
Risk of insufficient control capacities with available resources?	Regional	Likely	Major	High	In 2020, low performance in the surveillance indicators and strained capacity of healthcare services, in addition to limitations in reaching undocumented unvaccinated immigrants as well as local vulnerable unvaccinated populations, has been observed in most of the countries in the Americas. Therefore, the risk of insufficient control capacities with available resources is High. A total of 8 countries have committed to conduct their follow-up campaigns against measles and rubella in 2021 (these campaigns were scheduled for 2020), and PAHO/WHO Headquarters has mobilized additional resources to support the planning process in each of these countries. However, the control capacities will be affected mainly by the COVID-19 pandemic as well as concomitant outbreaks (e.g., dengue, malaria), malnutrition, and increases in HIV and tuberculosis (TB) cases, which can overwhelm capacities of the healthcare system and limit availability of resources.

Supporting Information

Hazard assessment

Diphtheria

Diphtheria is an infectious disease caused by the bacterium *Corynebacterium diphtheriae*, which primarily infects the throat and upper airways and produces a toxin affecting other organs. The incubation period for diphtheria is 2-5 days. The disease is spread through direct physical contact or from breathing in aerosolized secretions from coughing or sneezing of infected individuals. The illness has an acute onset and the main characteristics are sore throat, mild fever and swollen glands in the neck; in severe cases, the toxin may cause myocarditis, renal failure, or peripheral neuropathy. Diphtheria is fatal in 5-10% of cases, with a higher case-fatality rate (CFR) among young children; however, in Latin America, previous outbreaks have shown >10% CFR. Treatment involves administering diphtheria antitoxin (DAT) to neutralize the toxin, as well as early treatment with antibiotics.

Measles

Measles continues to cause death and severe disease in children worldwide being a leading cause of death and disability adjusted life years in developing countries, despite the availability of a safe and effective vaccine. Transmission from person-to-person is airborne, as well as by direct or indirect contact of secretions (nasal, throat) of an infected person. Initial symptoms, which usually appear 7-21 days after infection, include high fever, runny nose, bloodshot eyes, cough, and tiny white spots on the inside of the mouth. Several days later, a rash develops, starting on the face and upper neck and gradually spreads



downwards. A patient is infectious 4 days before the start of the rash to 4 days after the appearance of the rash. While there is no specific antiviral treatment for measles, vitamin A is recommended by the WHO for all children infected with measles regardless of their country of residence, as it is associated with reduced morbidity and mortality. Most people recover within 2-3 weeks. In populations with high levels of malnutrition and a lack of adequate healthcare, up to 10% of measles cases result in death; the CFR can be as high as 30% in displaced groups. Among malnourished children and people with greater susceptibility, measles can also cause serious complications, including blindness, encephalitis, severe diarrhea, ear infections, and pneumonia. Serious complications are more common in children under the age of 5, or adults over the age of 30. Women infected while pregnant are also at risk of severe complications and the pregnancy may end in miscarriage or preterm delivery. Measles can be prevented through vaccination with two doses of the measles, mumps, rubella (MMR) vaccine. The goal for immunization coverage for MMR1 and MMR2 doses is 95%.

Poliovirus

Poliovirus is a human enterovirus called poliovirus. There are three serotypes of poliovirus: type 1, type 2, and type 3; wild poliovirus was the cause of thousands of cases of acute flaccid paralysis (AFP) and deaths for many years; however, after the introduction of the polio vaccines, only one type of wild poliovirus (WPV) (type 1) continues to circulate. The last WPV type 2 was isolated in 1999 and declared eradicated in 2015; meanwhile, the last WPV type 3 was isolated in 2012 and declared eradicated in 2019. Immunity to one serotype does not confer immunity to the other two. Polio is spread through the fecal-oral route, entering the body through the mouth and multiplying in the intestine. Infected individuals shed poliovirus into the environment for several weeks, causing rapid spread in areas of poor sanitation.

The incubation period is commonly 7–21 days (range 4–40 days). Infection with poliovirus can cause minor illness with mild symptoms to infections that include the central nervous system and may lead to paralysis. Approximately 90% of infections are asymptomatic or present with nonspecific fever. Other symptoms could include aseptic meningitis, fever, malaise, headache, nausea, and vomiting. If disease progresses to major illness, severe muscle pain and stiffness of the neck and back with flaccid paralysis may occur. The paralysis usually presents asymmetrically, with fever present at onset. Paralysis of respiratory muscles can be life-threatening. Although some improvements in paralysis may occur during convalescence, paralysis still present after 60 days is likely to be permanent.

All cases of AFP among children under 15 years of age must be reported and stool specimens are tested for viral isolation in cell culture and, if there is any positive isolation, intratypic differentiation for RT-qPCR assays is performed. The assays permit an initial characterization of either Sabin-like or non Sabin-like poliovirus. If there is a suspicion of vaccine-derived poliovirus (VDPV), sequence testing and genetic characterization of the virus is the final confirmatory test. The diagnosis of paralytic poliomyelitis is supported by: (i) clinical course, (ii) virological testing, and (iii) residual neurologic deficit 60 days after onset of symptoms.

Two types of vaccines are commercially available for routine immunization: a live, attenuated oral poliovirus vaccine (OPV) and an injectable inactivated poliovirus vaccine (IPV). In rare circumstances adverse events associated with OPV could result in a case of vaccine-associated paralytic poliomyelitis (VAPP), which can occur in vaccinated individuals or their contacts, and the emergence of vaccine-derived polioviruses. The incidence of VAPP has been estimated at 2–4 cases/million birth cohort per year in countries using OPV.

The live attenuated viruses in OPV vaccines (Sabin viruses) may, through prolonged replication in an individual or in a community, re-acquire the neurovirulence and transmissibility characteristics of WPV. Through genetic mutations, they may become VDPVs that cause isolated cases or outbreaks of paralytic poliomyelitis. VDPVs are genetically divergent forms of the original Sabin vaccine virus conventionally defined by >1% genetic divergence (or >10 nucleotide [nt] changes) for PV1 and PV3 and >0.6% (or >6 nt changes) for PV2, in the VP1 region of the viral genome. These viruses are further classified into 3 categories: (1) cVDPVs, when evidence of person-to-person transmission in the community exists; (2) immunodeficiency-associated VDPVs (iVDPVs), which are isolated from a person with primary B-cell or



combined immunodeficiency disorders; and (3) ambiguous VDPVs (aVDPVs), which are either clinical isolates from persons with no known immunodeficiency, or sewage isolates of unknown origin.

Exposure assessment

In 2020 in the Region of the Americas, 12 different countries/territories have reported confirmed cases due to the following 2 vaccine-preventable diseases (VPDs): diphtheria (4 countries) and measles (9 countries).

In 2019-2020, one country has reported the detection of 3 VDPVs isolated through environmental surveillance (not genetically linked).

Diphtheria

In 2020 as of 22 September, 4 countries have reported a total of 160 suspected cases of which 33 were confirmed, including 9 deaths of diphtheria in the Region of the Americas: Brazil (12 suspected cases including 2 confirmed cases), the Dominican Republic (2 fatal confirmed cases), Haiti (92 suspected cases including 24 confirmed cases and 5 confirmed deaths), and the Bolivarian Republic of Venezuela (54 suspected cases including 5 confirmed cases and 2 deaths). (9)

Between 2010 and 2016, there was an annual average of 26 confirmed cases within the Region reported to PAHO/WHO each year. However, in December 2014 an outbreak began in Haiti, and in July 2016, an outbreak began in Venezuela. In 2017, the number of reported confirmed cases increased to 872 with the majority (90%) reported by Venezuela, followed by Haiti (9%), where the disease is considered endemic. (27) In 2019, 5 countries (Brazil, Colombia, the Dominican Republic, Haiti, and Venezuela) reported a total of 231 cases including 34 deaths (9, 10).

Measles

In 2020 as of 19 September, a total of 22,098 suspected cases have been reported in 20 countries in the Region. Of these, a total of 8,323 confirmed cases have been reported in 9 countries: Argentina (61 cases including 1 death), Bolivia (2 cases), Brazil (8,046 cases including 5 deaths), Canada (1 case), Chile (2 cases), Colombia (1 case), Mexico (196 cases), the United States of America (12 cases), and Uruguay (2 cases). (11)

Between 2010 and 2017, there was an annual average of 728 confirmed cases within the Region reported to PAHO/WHO each year. In 2017, an outbreak began in Venezuela, with cases exported to other countries, and in 2018, the number of reported confirmed cases increased to 16,699, with the majority (62%) reported by Brazil, followed by Venezuela (34%). (27) In 2019, between 1 January and 21 December, a total of 21,674 confirmed cases of measles, including 18 deaths, were reported in 14 countries/territories (16, 35).

Poliovirus

In 2019, the detection of 3 VDPVs in environmental samples in Guatemala was notified to PAHO/WHO. One VDPV3 and one VDPV1 were identified through environmental surveillance in samples collected in January and December 2019, respectively, in Aldea Cruz Blanca, San Juan Sacatepéquez Municipality, Guatemala Department. Additionally, one VDPV1 was isolated in Rio Platanitos, Villa Nueva Municipality, which is also in Guatemala Department. These are 3 genetically different polioviruses, unrelated to each other. Active case search is ongoing, and to date, no cases of AFP associated with these VDPV have been reported. However, the expected rate of 3 cases of AFP per 100,000 is yet to be achieved as recommended in the case of high-risk events or an outbreak. Laboratory results of the samples collected during the following 6 months indicated no evidence of circulation of VDPV1. (18, 35)

Regarding AFP cases due to VDPVs in recent years, Argentina reported one case of iVDPV2 in 2016 and one case of iVDPV3 in 2018; Colombia reported one case of AFP due to iVDPV1 in 2018; and Venezuela reported one case of AFP due to VAPP in 2018. In 2019, there were 4 compatible cases of polio reported in Venezuela (2), Brazil (1), and Guatemala (1) (24).

In 2019, the Regional Certification Commission (RCC) certified that the Region of the Americas has been free of WPV3 for almost 30 years, with the last endemic case of WPV3 occurring in October 1990 in Mexico. In



July 2019, the RCC updated the regional risk assessment for polio; the results indicated that 3 countries are at high risk of having an importation or emergence of polio (Guatemala, Haiti, and Venezuela), 17 countries/territories are at medium risk, and the remaining 24 are low risk. (34, 35)

Context assessment

Vaccination coverage

In 2019, according to WHO and UNICEF estimates of national immunization coverage (WUENIC)¹, vaccination coverage for VPDs has been low within the Region of the Americas.

Diphtheria

In 2019, the 3-dose diphtheria, tetanus, pertussis (DTP3) vaccination coverage of $\geq 95\%$ had not been achieved in 24 countries/territories in the Region of the Americas, and 6 countries (Argentina, Bolivia, Brazil, Haiti, Paraguay, and Venezuela) had $< 80\%$ coverage for DTP3.

Measles

In 2019, MMR1 vaccination coverage of $\geq 95\%$ had not been achieved in 22 countries/territories in the Region of the Americas, and 4 countries (Bolivia, Haiti, Mexico, and Paraguay) had $< 80\%$ of coverage. For MMR2, vaccination coverage of $\geq 95\%$ had not been achieved in 29 countries/territories in the Region of the Americas, and 14 countries/territories (Anguilla, Barbados, Bolivia, Brazil, British Virgin Islands, Dominican Republic, Ecuador, Guatemala, Haiti, Mexico, Peru, Saint Lucia, Suriname, and Venezuela) had $< 80\%$ coverage.

Poliovirus

In 2019, OPV3 vaccination coverage of $\geq 95\%$ had not been achieved in 25 countries/territories in the Region of the Americas, and 5 countries (Bolivia, Guatemala, Haiti, Suriname, and Venezuela) had $< 80\%$ coverage.

Currently, 33 of the 54 countries/territories in the Region use two or more doses of IPV, including Ecuador and Cuba, who introduced two fractional doses of IPV following recommendations from the Technical Advisory Group (TAG). However, 19 countries/territories are still using only one dose of IPV. This is of concern because population immunity against type 2 polioviruses continues to decrease, as the cohort of children born after the withdrawal of OPV2 grows, and the potential risk of importation of cVDPV2 increases (34).

Effects of COVID-19 pandemic on healthcare systems and services

In 2020, all 54 countries/territories in the Region have reported COVID-19 cases. Although not yet quantifiable, the negative social and economic impact of the COVID-19 pandemic in the short, medium, and long term, at the local, national, and global levels, is believed to be unprecedented (33). In addition to the morbidity and mortality directly due to COVID-19 in the Region of the Americas, the pandemic has, in general, also affected the provision of healthcare services, healthcare seeking behaviors, resources, and outbreak response capacity.

Since the beginning of the COVID-19 pandemic, 27 Member States have activated or established health sector emergency administrative structures and measures to strengthen country health systems. However, those are coexisting with the chronic health systems' challenges as fragmentation, inequitable access to comprehensive health services, weaknesses related to human resources for health, inequitable access to health technologies, limited capacities for essential public health functions (EPHF), underfunded infection prevention and control (IPC) programs, and limited compliance with IPC practices. These have become a priority for immediate action to rapidly scale up and expand public health and individual health care services to respond to the COVID-19 pandemic, while maintaining other essential services, which is the main challenge. (33)

¹ WHO/UNICEF Estimates of National Immunization Coverage. Available at: <https://bit.ly/349293G>

The continuity of essential services provided at the first level of care has been affected in all the areas but mainly in peri-urban and rural areas and among indigenous populations. This relates to the already existing deficit of healthcare workers along with social distancing measures, infected healthcare workers, and the closure of various primary care facilities in these areas. (33)

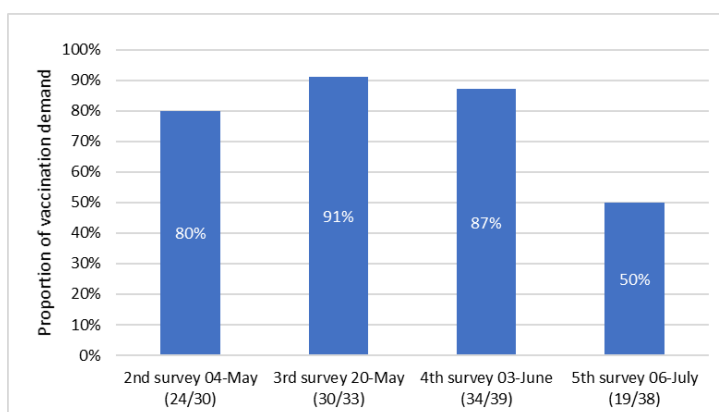
The main limitations faced by the first level of care include the human resources gap as well as the lack of incentives; difficulties in connectivity; shortages of medicines, supplies, medical devices, and personal protective equipment (PPE); and the logistics for conducting case investigation and contact tracing, testing, triage, home care, management of call centers, and teleconsultations. The main reasons for disruption of essential services include cancellation of elective care services (14 of 24 countries, 58%), reallocation of clinical staff to the COVID-19 response (12 of 24 countries, 50%), and patients not presenting (12 of 24 countries, 50%). (33)

Vaccination as an essential health service, has also been affected, with a decreased in the demand of vaccination services, the number of doses of DTP1, DTP3, and MMR1 vaccines administered to children and the postponement of vaccination campaigns due to the pandemic. Measles vaccination campaigns have been postponed for Bolivia, Colombia, Chile, Dominican Republic, Honduras, Paraguay, and Mexico. Similarly, Bolivia and Colombia have delayed their yellow fever vaccination campaigns. (32, 35)

Considering the aforementioned situation, the PAHO/WHO Comprehensive Family Immunization (IM) Unit has conducted 5 surveys that were completed by the PAHO Country Immunization Focal Points for 38 countries/territories in the Region of the Americas in 2020, in order to monitor the functioning of immunization services and identify the main problems they face because of the pandemic. (32)

According to the surveys conducted by the PAHO/WHO IM Unit, the COVID-19 pandemic and containment policies in the countries in the Region have affected the demand for vaccination services (**Figure 1**). The main cause cited for decreased demand has been public concern about the risk of exposure to COVID-19 if they seek vaccination services. Other causes include difficulties due to limitations in public transport, and to lockdown or physical distancing. These are consistent with the results of a similar survey conducted by WHO². (32)

Figure 1. Proportion of vaccination demand in countries/territories that responded to the PAHO/WHO Comprehensive Family Immunization Unit Surveys. Region of the Americas. May-June 2020.



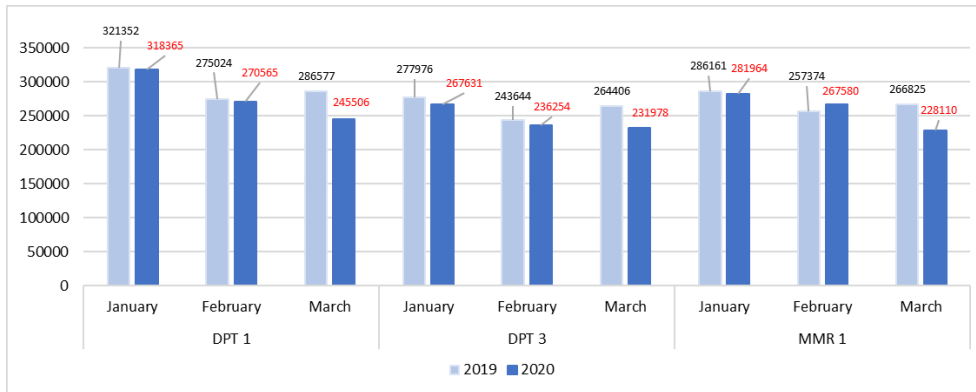
Source: PAHO/WHO. Summary of the Status of National Immunization Programs during the COVID-19 Pandemic, July 2020.

Available at: <https://bit.ly/36jiNA9>

Similarly, the number of doses of DTP1, DTP3, and MMR1 vaccines administered to children in 2020 showed a decrease compared to the same period in 2019, particularly in March (**Figure 2**).

² World Health Organization. Pulse Polls and regional data collection to get a sense of the spread and magnitude of immunization. Geneva: WHO; 2020. Available at: <https://bit.ly/2Sa0aGx>

Figure 2. Distribution of the number of DTP1, DTP3, and MMR1 vaccines administered in countries/territories that responded to the PAHO/WHO Comprehensive Family Immunization Unit Surveys (N=23). Region of the Americas. January-March 2019 and January-March 2020 (as of 31 March 2020)

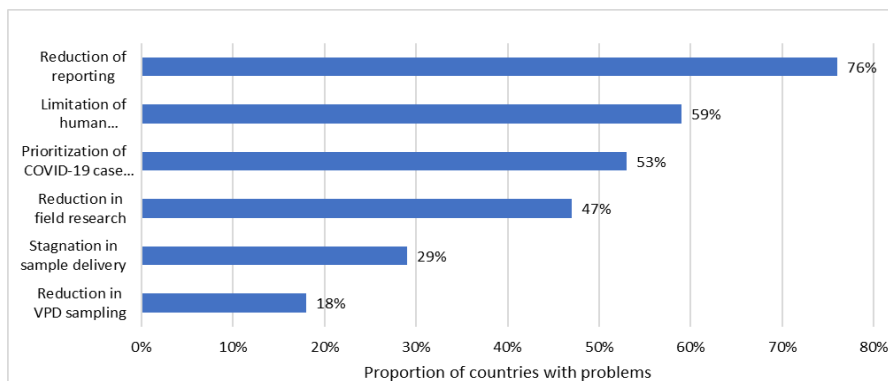


Source: PAHO/WHO. Summary of the Status of National Immunization Programs during the COVID-19 Pandemic, July 2020. Available at: <https://bit.ly/36jiNA9>

Of the total number of countries where the survey was conducted, 18 countries (47%) responded that they had encountered difficulties in the delivery of vaccines and supplies for national immunization programs (NIPs). Of these 18 countries, 16 reported problems with vaccine delivery and 5 reported problems with other supplies such as syringes. Countries also indicated that these difficulties were due to the closure of international borders and to problems with international transport.

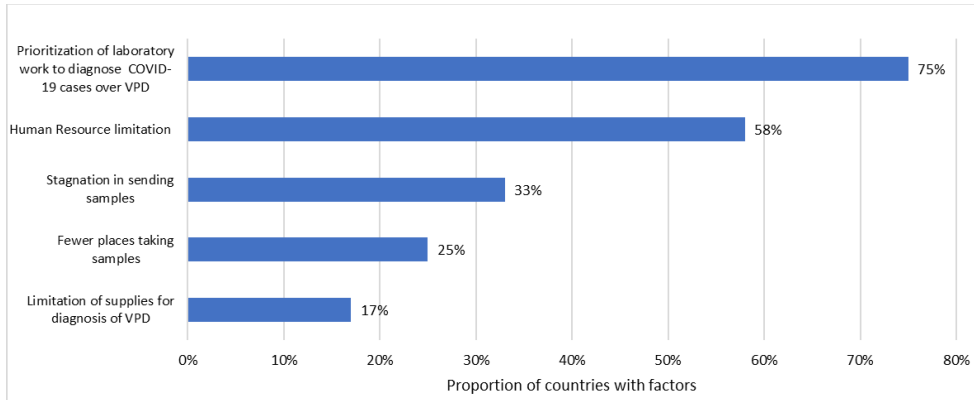
According to the surveys, 17 countries have reported that epidemiological surveillance has been affected by the pandemic; in most countries, this is due to the change in priorities, which have focused on COVID-19 cases. Countries also indicate that case reporting has decreased significantly. Other factors hindering epidemiological surveillance include limited human resources, reduced field investigations and screenings for VPDs, as well as a halt in the shipment of samples for analysis (**Figure 3**). Of the 38 countries that responded to this survey, 12 emphasized that laboratory services and activities to support surveillance of VPDs have been affected. The main reason for this disruption, as with surveillance, has been the prioritization of work aimed at diagnosing COVID-19 cases (**Figure 4**).

Figure 3. Issues identified related to the epidemiological surveillance of vaccine-preventable diseases (VPDs) in countries/territories that responded to the PAHO/WHO Comprehensive Family Immunization Unit Surveys (N=17). Region of the Americas. July 2020.



Source: PAHO/WHO. Summary of the Status of National Immunization Programs during the COVID-19 Pandemic, July 2020. Available at: <https://bit.ly/36jiNA9>

Figure 4. Factors that hinder laboratory surveillance of vaccine-preventable diseases (VPD) in countries/territories that responded to the PAHO/WHO Comprehensive Family Immunization Unit Surveys (N=12). Region of the Americas. July 2020.



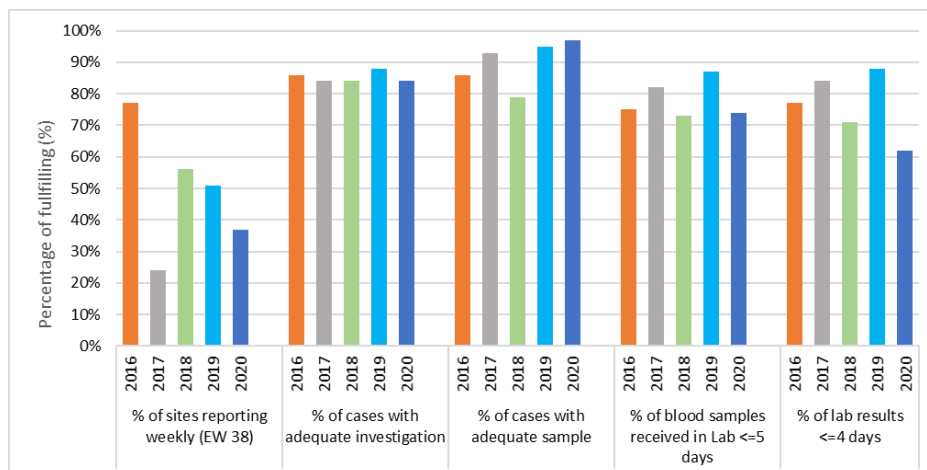
Source: PAHO/WHO. Summary of the Status of National Immunization Programs during the COVID-19 Pandemic, July 2020. Available at: <https://bit.ly/36jiNA9>

Surveillance indicators

Indicators of integrated measles/rubella surveillance

Several factors have contributed to the outbreaks of measles in the Americas occurring between 2018 and 2020, including lack of compliance with 2-dose measles vaccination coverage and now influenced by the COVID-19 pandemic. During 2018-2020, 3 of the 6 international indicators for integrated measles/rubella surveillance were met: 1) Notification rate of suspected cases per 100,000 population; 2) the percentage of cases with adequate blood samples; and 3) the percentage of cases with adequate investigations. However, 3 indicators related to the percentage of sites reporting weekly, percentage of blood samples received by the laboratory in ≤5 days, and the percentage of laboratory results in ≤4 days, have not been met (**Figure 5**). Therefore, considering these gaps among the indicators, the low vaccination coverage in many countries, and the wide circulation of viruses in other Regions, the occurrence of new outbreaks of VPDs of varying magnitude in the Americas cannot be ruled out.

Figure 5. Distribution of 5 of the 6 international indicators of integrated measles/rubella surveillance. Region of the Americas, 2016 to 2020 (as of EW 38)



Source: PAHO/WHO Weekly bulletin. Measles, Rubella, and Congenital Rubella Syndrome. Available at: <https://www.paho.org/en/measles-rubella-weekly-bulletin>



AFP reporting rates

With the exception of Costa Rica, Cuba, Honduras, and Mexico, the remaining countries have not met the AFP notification rate among <15 years of age or have not shared this information with PAHO recently. Given this, and due to the aforementioned factors, there is a risk that a cVDPV event or outbreak will occur and that it will not be detected in time. In 2020, the expected number of reported AFP cases is 1,648; however, as of EW 39 of 2020, only 857 AFP cases have been reported. (24, 35)

Regarding surveillance, only 4 countries in 2019 met all 3 AFP surveillance indicators (Costa Rica, Mexico, Nicaragua, and Paraguay). Additionally, there is a lack of compliance with the standards for the final classification of AFP cases. (34, 35)

Countries are not conducting the 60-day follow-up of AFP cases, which is a major concern, particularly for cases that an adequate stool sample was not obtained.

Vulnerable populations and indigenous communities

Special attention should also be placed on specific at-risk groups and notably among ethnic minorities. Of special concern are the Warao people (54,686 in Bolivar State and 41,543 in Delta Amacuro State), and the Yanomami people who live in remote areas of the Amazon jungle along the border of Venezuela and Brazil. Additionally, along the Colombia–Venezuela northern border area (La Guajira Department, Zulia State), there are up to 443,544 Wayu people (2011 Census). According to press reports, the flow of Warao people abandoning their villages and migrating from Venezuela to Brazil, Guyana, and possibly to Suriname, has increased dramatically since mid-2017. The populations in these indigenous communities are especially susceptible to developing diseases because of the limited access to healthcare and vaccinations, and therefore have an increased risk of developing life-threatening complications that could result in fatality. Additionally, cultural and language barriers create a challenge in the implementation of vaccinations and medical treatment.

For diphtheria, the most at-risk populations are unvaccinated children under 5 years of age, school-aged children, healthcare workers, military service personnel, inmate communities, and persons who, due to the nature of their occupation, are in contact with a large number of persons on a daily basis.

For measles, unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated pregnant women are also at risk. Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected. Measles outbreaks can be particularly deadly in indigenous communities with malnutrition and in countries with lack of access to appropriate health services experiencing or recovering from a natural disaster or conflict. Damage to health infrastructure and health services interrupts routine immunization and overcrowding in residential camps greatly increases the risk of infection. (4)

Table 1: Capacities and vulnerabilities related to vaccine-preventable diseases (VPDs) in the context of the COVID-19 pandemic for countries/territories within the Region of the Americas, by subregion. October 2020.

Southern Cone Subregion ³
Capacities
<ul style="list-style-type: none"> • In 2019, 3 of the 5 countries in the subregion had multi-year strategic immunization plans (8). • In 2019, for 3 countries, 95%-100% of districts had micro-plans for activities to increase vaccination coverage (8). • At least 2 countries are considering the possibility of resuming measles vaccination campaigns by the end of 2020 (32). • MMR1 vaccination coverage for 2019 was >80% for all 5 countries and ≥95% in 2 of the countries (25). • MMR2 vaccination coverage for 2019 was >80% for 4 of the 5 countries and ≥95% in one of the countries (25). • OPV3 vaccination coverage for 2019 was >80% for all 5 countries and ≥95% in 2 of the countries (25).
Vulnerabilities
<ul style="list-style-type: none"> • An active measles outbreak is ongoing in one of the 5 countries in the subregion (30). • In 2020, cases of diphtheria have been reported in one of the countries of the subregion (9). • MMR1 and MMR2 vaccination coverage decreased between 2018 and 2019 in 3 of the 5 countries (25). • In all 5 countries, the number of AFP cases notified as of EW 41 of 2020 was below the expected estimate (24). • Measles vaccination campaigns have been postponed in at least one of the countries of the subregion (32, 35). • In 2019, 2 countries had between 95%-100% of districts with DTP3 coverage of ≥80% (8). • Health system and epidemiological surveillance system overwhelmed by the COVID-19 pandemic and other public health events occurring simultaneously (for example: dengue, malaria, amongst others). • Migratory movements and challenges to reach unvaccinated immigrants. • Vulnerable and susceptible populations: unvaccinated migrant children and indigenous populations. • Overcrowding with inadequate sanitation and waste management in temporary and residential shelters and rural and peri-urban areas. • Challenges in the implementation of infection prevention and control measures in overcrowded healthcare settings. • Challenges to maintain the cold chain in rural and peri-urban areas.
Andean Subregion ⁴
Capacities
<ul style="list-style-type: none"> • In 2019, 3 of the 5 countries in the subregion had 100% of districts with micro-plans of activities to increase vaccination coverage (8). • MMR1 vaccination coverage for 2019 was >80% in 4 of the 5 countries and ≥95% in 2 of the 5 countries (25). • MMR2 vaccination coverage for 2019 was >80% in 4 of the 5 countries (25).
Vulnerabilities
<ul style="list-style-type: none"> • In 2019, 2 of the 5 countries in the subregion had multi-year strategic immunization plans (8). • OPV3 vaccination coverage for 2019 was >80% for 3 of the 5 countries; none had coverage ≥95% (25). • MMR1 vaccination coverage decreased by approximately 11% between 2018 and 2019 in one of the countries (25). • MMR2 vaccination coverage for 2019, none of the countries had coverage ≥95% (25). • For all 5 countries, the number of AFP cases notified as of EW 41 of 2020 was below the expected estimate (24). • Measles vaccination campaigns were postponed to 2021 due to the COVID-19 pandemic in 2 of the countries (32, 35). • An active measles outbreak is ongoing in one of the bordering countries (30). • In 2020, cases of diphtheria have been reported in one of the countries of the subregion (9). • Indigenous communities move along the border between Brazil, Venezuela, and Colombia.

³ Argentina, Brazil, Chile, Paraguay, and Uruguay.

⁴ Bolivia, Colombia, Ecuador, Peru, and Venezuela.

- Health system and epidemiological surveillance system overwhelmed by the COVID-19 pandemic and other public health events occurring simultaneously (for example: dengue, malaria, amongst others).
- Migratory movements and challenges to reach unvaccinated immigrants.
- Vulnerable and susceptible populations: unvaccinated migrant children and indigenous populations.
- Overcrowding with inadequate sanitation and waste management in temporary and residential shelters and rural and peri-urban areas.
- Challenges in the implementation of infection prevention and control measures in overcrowded healthcare settings.
- Challenges to maintain the cold chain in rural and peri-urban areas.

North America Subregion⁵

Capacities

- MMR1 vaccination coverage was $\geq 90\%$ in the 2 countries in the subregion (25).
- MMR2 vaccination coverage increased slightly between 2018 and 2019 in one of the countries (25).
- OPV3 vaccination coverage for 2019 was $>90\%$ in the 2 countries (25).

Vulnerabilities

- MMR1 vaccination coverage decreased between 2018 and 2019 in one of the countries in the subregion (25).
- Health system and epidemiological surveillance system overwhelmed by the COVID-19 pandemic.
- Migratory movements.

Latin Caribbean Subregion⁶

Capacities

- In 2019, all 3 countries in the subregion have multi-year strategic immunization plans (8).
- MMR1 and OPV3 vaccination coverage increased slightly between 2018 and 2019 in one of the countries (25).
- MMR1 vaccination coverage for 2019 was $>95\%$ for 2 countries (25).
- OPV3 vaccination coverage for 2019 was $>90\%$ for 2 countries (25).

Vulnerabilities

- In 2019, one of the countries had 100% of districts with micro-plans for activities to increase vaccination coverage (8).
- In 2020, cases of diphtheria have been reported in one of the countries of the subregion (9).
- For all 3 countries, the number of AFRP cases notified as of EW 41 of 2020 was below the expected estimate (24).
- Measles vaccination campaigns postponed to 2021 due to the COVID-19 pandemic in one of the countries (32, 35).
- In one country, 100% of AFP cases are pending classification for >90 days since onset of paralysis (24).
- Health system and epidemiological surveillance system overwhelmed by the COVID-19 pandemic and other public health events occurring simultaneously (for example: dengue).
- Migratory movements.

Non-Latin Caribbean⁷

Capacities

- MMR1 vaccination coverage for 2019 was $>80\%$ in 11 of the countries/territories in the subregion (25).
- MMR2 vaccination coverage for 2019 was $>80\%$ in 9 countries/territories (25).
- OPV3 vaccination coverage for 2019 was $>80\%$ in 11 countries/territories (25).

Vulnerabilities

- Diphtheria is considered endemic in one of the countries in the subregion (9).
- In 2019, only 2 of the countries/territories had multi-year strategic immunization plans (8).
- In 2019, only 4 of the countries/territories had 100% of districts with micro-plans for activities to increase vaccination coverage (8).
- MMR1 vaccination coverage decreased between 2018 and 2019 in 4 of the countries (25).
- In one of the countries, 80% of AFP cases are pending classification for >90 days since paralysis onset (24).
- For all countries/territories in the subregion, the number of AFP cases notified as of EW 41 of 2020 is below the expected estimate (23).

⁵ Canada and the United States of America.

⁶ Cuba, Dominican Republic, and Puerto Rico.

⁷ Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bermuda, Bonaire, Sint Eustatius, and Saba, British Virgin Islands, Cayman Islands, Curacao, Dominica, French Guiana, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, Montserrat, Saint Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Sint Maarten, Suriname, Trinidad and Tobago, Turks and Caicos, United States Virgin Islands.



- Health system and epidemiological surveillance system overwhelmed by the COVID-19 pandemic and other public health events occurring simultaneously (for example: dengue).

Central American Isthmus and Mexico⁸

Capacities

- Five of the 8 countries in the subregion have multi-year strategic immunization plans (8).
- In 2019, 5 of the 8 countries had 100% of districts with micro-plans for activities to increase vaccination coverage (8).
- MMR1 vaccination coverage for 2019 was >80% for 7 of the 8 countries (24).
- MMR2 vaccination coverage for 2019 was >80% for 6 of the 8 countries (24).
- OPV3 vaccination coverage for 2019 was >80% for 6 of the 8 countries (24).
- One of the countries continues to examine the possibility of resuming measles vaccination campaigns in early 2021 (32, 35).
- In 2 of the countries, the number of AFP cases notified as of EW 41 of 2020 was above the expected estimate (24).

Vulnerabilities

- MMR1 vaccination coverage decreased slightly between 2018 and 2019 in 4 of the 8 countries in the subregion (25).
- In 4 of the countries, the number of AFP cases notified as of EW 41 of 2020 was below the expected estimate (24).
- In one of the countries, 100% of AFP cases are pending classification for >90 days since paralysis onset (24).
- During the COVID-19 pandemic, measures to drastically limit the flow of incoming international travelers and means of transport or completely prohibit incoming and outgoing flows were not implemented in 2 countries in the subregion (33); this could have a potential impact on the importation of disease.

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