STRATEGIES TO EXPAND VACCINATION IN THE COVID-19 PANDEMIC

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ABBREVIATIONS

EPI: Expanded Program on Immunization

WHO: World Health Organization

PAHO: Pan American Health Organization

VCI: Vaccine Coverage Indexes

MMR: Measles, Rubella, and Mumps

GPEI: Global Polio Eradication Initiative

PESA: Subacute Sclerosing Panencephalitis

CNV: National Immunization Schedule

PCV: Pneumococcal Conjugate Vaccine

UNICEF: United Nations Children's Fund

HBV: Hepatitis B Virus

MD: Meningococcal Disease

OBJECTIVES

1. Elaborate on a document on vaccination policy in the Americas, describing the structure and need for strategies for updating and updating vaccination coverage during and after the pandemic caused by COVID-19.

2. Include recommendations for vaccination and vaccination of children, adolescents, and adults in the Americas region.

1 INTRODUCTION

As a result of many years of investment in research and scientific and technological development, vaccination is considered one of the world's most important public health achievements. The vaccine has been responsible for increasing life expectancy in most countries, with safe drinking water and improved access to health services, contributing significantly to the decrease in infant mortality. According to World Health Organization (WHO) data, vaccination campaigns prevent 2 to 3 million deaths yearly[1].

The infant mortality rate is the number of children in a given location who die before completing their first year of life per 1,000 live births per calendar year. These data indicate the quality of health, basic sanitation, and education services in a municipality, country, or region. In virtually all parts of the world, a child born today has a greater chance of surviving to the age of five than in 1990. The under-five mortality rate declined by 59%, from 93 deaths per 1,000 live births in 1990 to 38 in 2019. On average, 14,000 children under age 5 died each day in 2019, compared with 34,000 in 1990[2].

However, in the early 1970s, mortality and morbidity rates caused by immunopreventable diseases were high in countries worldwide. The implementation of vaccination programs was inadequate due to the lack of consolidated programs; to give sustainability to vaccination actions, in 1974, the WHO proposed the creation of the Expanded Program on Immunization (EPI). After defining the fundamental bases for structuring the EPI, there was joint coordination of the nations of the world and several international organizations interested in supporting these actions, seeking to achieve universal vaccination coverage and, thus, establishing a strong political commitment to the goal of eradicating, eliminating and controlling immunopreventable diseases[3].

The EPI in the Region of the Americas has been a successful program for more than 40 years, being a world leader in eliminating and controlling various

vaccine-preventable diseases such as smallpox, poliomyelitis, rubella, congenital rubella syndrome, measles, and neonatal tetanus. Since the creation of the EPI, countries have gone from using six vaccines in their national immunization schedules to an average of more than 16 vaccines, expanding protection for the population[3].

The vaccination of children, in addition to directly reducing the cases of diseases in the population, a target established for vaccination contributes to the reduction of the circulation of infectious agents in the communities, positively impacting the health of adults and the elderly since they are indirectly protected (herd immunity). Therefore, the importance of vaccination is not only related to personal protection but also because it potentially prevents the massive spread of diseases that can cause death or serious sequelae, compromising the quality of life and health of the population in general.

Vaccine-preventable diseases are also one of the leading causes of illness and long-term disability among children in both developed and low- and middle-income countries. Implementing immunization programs to prevent paralytic poliomyelitis, averting hundreds of thousands of severe disabilities in children, emblematically characterizes the success of the Global Polio Eradication Initiative (GPEI)[4].

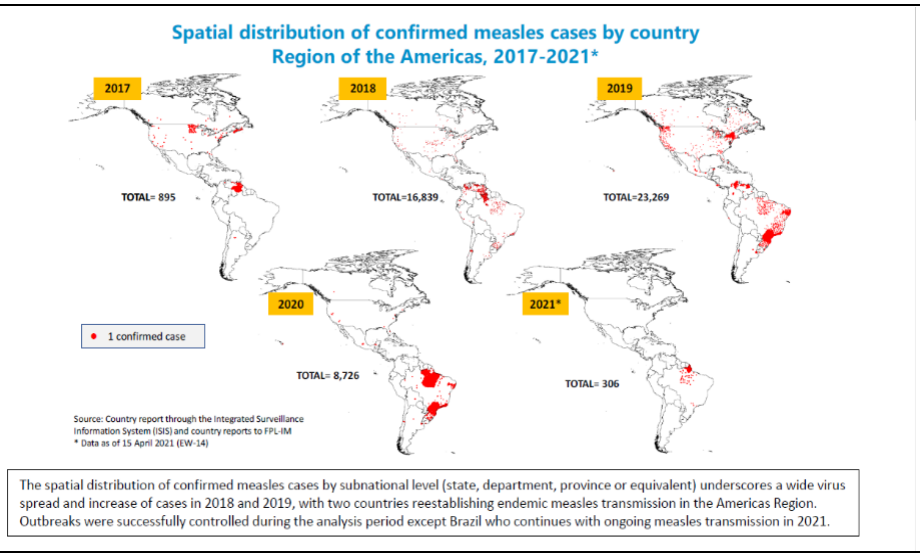
Although polio is a distant memory in most parts of the world, the disease is still endemic in Pakistan and Afghanistan, is associated with poliovirus type 1, and mainly affects children under five. In February this year, a poliovirus type 1 polio was confirmed in Malawi, the first wild poliovirus in Africa in over five years. In May 2022, health authorities in Mozambique declared an outbreak of polio caused by wild poliovirus type 1, the second this year in Africa and the first in Mozambique since 1982[5]. One in 200 infections causes irreversible paralysis (usually in the lower limbs). Among those with the paralytic form, 5% to 10% died[6]. In 2015, wild poliovirus type 2 was declared eradicated, and, in 2019, poliovirus 3[7]. However, there is still the challenge of eliminating poliovirus one

and preventing the emergence of vaccine-derived cases worldwide, especially in countries with low vaccination coverage.

Measles is a highly contagious viral disease. This event remains a significant cause of death among children worldwide, despite the availability of a safe and effective vaccine. Vaccination efforts have dramatically reduced measles deaths, with a 73% decrease worldwide between 2000 and 2018. However, the hard-won gains can easily be lost due to the low achievement of targets set for vaccine coverage rates (VCRs) in many countries in recent years. Regions have been affected by major measles outbreaks since 2017, causing significant deaths in children[8].

In 2016, the Region of the Americas had certified for measles elimination by the Pan American Health Organization (PAHO). However, due to low childhood vaccination rates with the MMR (measles, rubella, and mumps - MMR) vaccine that same year, there was an accumulation of susceptibles and a return of measles circulation. After more than two years of sustained transmission, Brazil has lost its title as an area free of indigenous virus circulation. The region has also been experiencing disease outbreaks during this period[9].

Figure 1: Spatial distribution of confirmed measles cases by country, Region of the Americas, 2017-2021*.



Source: PAHO Weekly Bulletin Measles-Rubella-Congenital Rubella Syndrome. Vol. 27. No. 14

In 2021, between Epidemiological Week 1 and 38, two countries in the Americas region confirmed measles cases: Brazil with 552 confirmed cases, including two deaths in 6 federative units; and the United States of America with 20 confirmed measles cases in 3 jurisdictions, including 18 cases reported among refugees recently arrived from Afghanistan.

In 2020, 9 countries reported measles cases and deaths in the Americas Meeting. With the resurgence of measles in Brazil, one of the characteristics observed was the high incidence of the disease in children under one year of age, being the most affected age group, with an incidence ratio of 39.1 and 110.7 per 100,000 population, for 2019 and 2020, respectively[10-11]. This fact points out that currently, passive immunity received from the mother is not sufficient to protect these children during the first year of life. It reinforces the importance of maintaining a high ICV in the vaccination target groups for creating collective immunity and, therefore, protecting those individuals who cannot be vaccinated or get included in the vaccination strategy, such as children under one year of age.

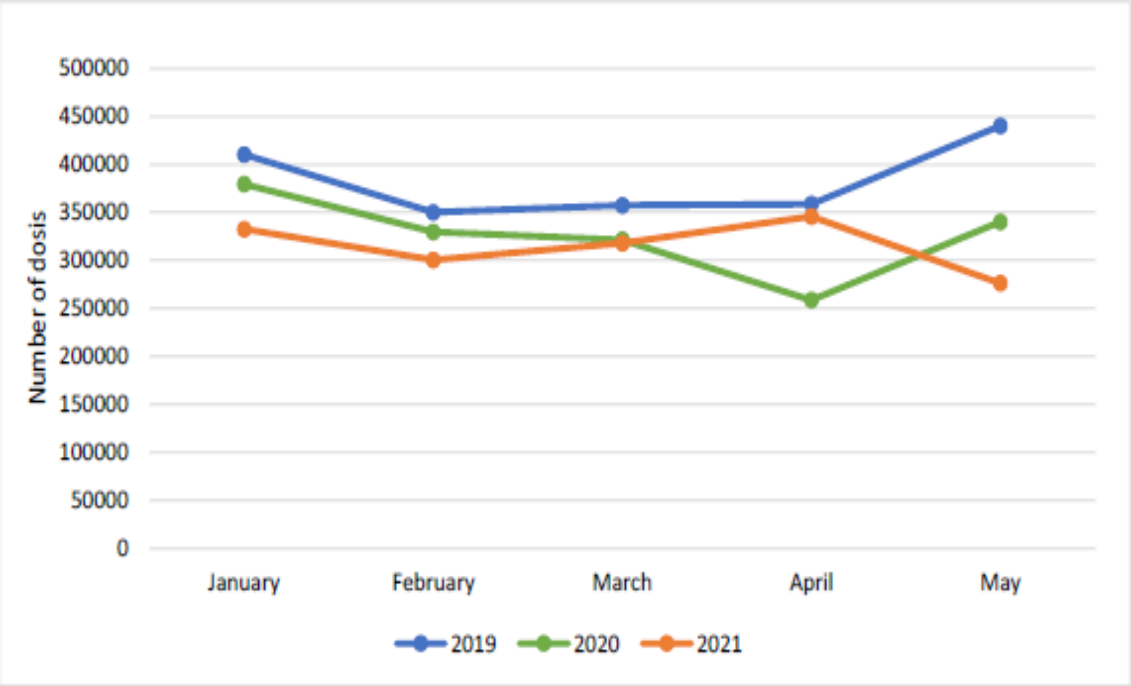
Even in previously healthy children, measles can have severe clinical manifestations, leading to hospitalizations. The most common complications of measles most often affect young children and immunocompromised people and include acute otitis media, bronchopneumonia, laryngotracheobronchitis, and diarrhea. Acute encephalitis, with estimates of one case per 1,000 measles patients, can cause severe and definite brain damage in those affected. Respiratory and neurological complications are estimated to cause one to three deaths in every 1,000 children affected by measles.

It is also important to mention the possibility of developing Subacute Sclerosing Panencephalitis (SSPE), a degenerative disease of the central nervous system characterized by behavioral, cognitive, and intellectual impairment and seizures, which generally occur within 7 to 10 years. After measles virus infection (the risk of developing SSPE, according to estimations, is 4 to 11 per 100,000 measles cases, with risk in instances where measles occurred before the age of 2 years).

Children younger than five years, adults older than 20, pregnant women, and patients with immunosuppression, such as leukemia patients and patients living with HIV/AIDS, are considered at increased risk of complications[10].

Figure 2 shows the decline in MMR vaccine doses administered when the World Health Organization (WHO) declared COVID-19 a pandemic in March 2020.

Figure 2: MMR1 doses administered in 25 countries in Latin America and the Caribbean, 2019-2021. (Between January and May)



Source: PAHO. Measles Epidemiological Update. Available at: https://iris.paho.org/bitstream/handle/10665.2/54998/EpiUpdate4October2021_spa.pdf?sequence=2&isAllowed=y

Pneumococcal disease is a significant cause of morbidity and mortality in its various clinical forms. The WHO estimates one million deaths yearly due to invasive pneumococcal disease, mainly in children under five[12]. Among children who survive an episode of pneumococcal meningitis, a significant proportion is affected by long-term disabilities such as hearing loss, language impairment, mental retardation, motor abnormalities, and visual impairment[13]. Since the introduction of the pneumococcal conjugate vaccine in the region's national immunization schedule (CNV) in 2010, a significant reduction in all disease outcomes was observed. In a systematic review evaluating the effectiveness and impact of vaccination in countries in the region, decreases of 8.8-37.8% were observed for hospitalizations for radiologically confirmed pneumonia; 7.4-20.6% for clinical pneumonia; 13. 3-87.7% for hospitalizations for meningitis and 56-83.3% for hospitalization for invasive pneumococcal disease, varying according

to age, the definition of clinical outcome, type of vaccine used (PCV10 vs. PCV13), and study design [14].

Another retrospective observational study evaluated, in eight countries that introduced PCV10 and PCV13 vaccines in the Latin American region (Argentina, Brazil, Chile, Colombia, Dominican Republic, Mexico, Paraguay, and Uruguay), the distribution of invasive pneumococcal disease isolates in children under five years of age before and after the introduction of the vaccines. Annual incidence rates of invasive disease isolates caused by vaccine serotypes showed a reduction from 82.5% (6.21 before vs. 1.09 after 100,000, 95% CI -61.6 to -92.0) to 94.7% (1.15 vs. 0. 06 per 100,000, -89.7 to -97.3) in countries using PCV10 vaccine, and from 58.8% (2.98 vs. 1.23 per 100,000, -21.4 to -78.4) to 82.9% (7.80 vs. 1.33 per 100,000, -76.9 to -87.4) in countries using PCV13. concurrently, there was an increase in nonvaccine isolates in all eight countries after the introduction of PCV10 and PCV13 vaccines[15].

Similarly, the results of studies evaluating the impact of rotavirus vaccination in Brazil, one of the first countries in the world to implement the vaccine in a routine immunization program for infants, have shown a reduction in thousands of deaths. Hundreds of diarrhea-related hospitalizations in children under five years of age in the first years after the implementation of immunization in Brazil corroborate the efficacy findings found in clinical studies. The rotavirus vaccine is currently implemented in 60% of the countries on the American continent[16, 17, 18, 19].

Therefore, although the impact on infant mortality alone is a sufficient argument for administering vaccines in children, the reduction of long-term disabilities and the savings achieved by reducing treatment costs and hospitalizations justify their use in this population worldwide[4].

However, after over two decades of achieving high vaccine coverage rates in all countries of the Americas, the EPI has identified a significant decrease in these rates in all vaccines that make up the childhood immunization schedule. Despite all the achievements, there are substantial challenges for EPI today.

Vaccines have somehow become orphans of their success. Many diseases have been controlled or even eliminated, causing new generations, not knowing them, to underestimate their potential seriousness, questioning the need to keep their children vaccinated against these diseases, with the consequent risk of reintroduction or resurgence of conditions controlled or in the process of elimination in the country.

On January 30, 2020, WHO declared the new coronavirus outbreak a public health emergency of international concern (PHEIC), the highest alarm level. Since then, among the initial measures to prevent the spread of the disease, which is considered a pandemic, it has been recommended that only essential activities remain in operation, indicating the need for the population to ensure social isolation, especially in localities with an increase in the number of cases[20].

As SARS-CoV-2 spread rapidly around the world beginning in 2020 and governments sought to contain the transmission, many health services, mainly routine immunization, faced severe disruptions. These effects were due to numerous factors, including travel restrictions and public policies aimed at reducing opportunities for social contact between people, directing health professionals to work on the front line to deal with COVID-19, and canceling or postponing medical visits, for fear of exposure to the virus.

Consequently, the supply and demand for vaccination posts decreased in the countries, and vaccination coverage, which was already lower than expected, became even inferior, increasing the risk of new outbreaks of immunopreventable diseases prevented by vaccines of the NVCs. The need for physical distancing cannot be a reason to stop vaccinating, especially children, adolescents, and pregnant women, in addition to patients with comorbidities and at-risk groups. WHO and PAHO have published guidelines indicating that it is imperative to maintain the continuity of immunization services, as long as they can be carried out under safe conditions, understanding that the benefits of maintaining up-to-date vaccination regimens outweigh any risk of exposure [(21(21, 22),22)].

As important as the concern for preventing COVID-19 transmission is that vaccination for diseases has stopped circulating or countries of the region have controlled them thanks to vaccination actions. With the drastic increase of susceptible people, these diseases can re-affect the population, bringing deaths and sequelae that are irreversible, not to mention the increased demand for health services, which are already working at their limit, due to the excessive registration of the number of COVID-19 cases in all regions of the country.

The Florida International University Global Health Consortium conducted a collaborative study with Latin American experts on the impact of the pandemic on vaccination coverage. Only a few countries managed to maintain their coverage, while the majority dropped coverage for all or several vaccines[23]. These drops in a range increase the risk of outbreaks and reintroducing diseases that had been eliminated until now, such as polio, in six high-risk countries and two very high-risk countries[24, 25].

In this sense, analyzing the effects of the pandemic on vaccination coverage, and proposing actions that can improve the support of the population and the organization of vaccination areas, is extremely important to avoid an even more drastic decrease in ICV. The return of the people to a more active demand for primary care services will increase vaccination coverage if vaccines are available. However, it will not be sufficient if the lags caused by the pandemic and the cohorts of unvaccinated children or incompletely vaccinated cohorts are not considered.

In the same sense, it is also essential to monitor the coverage of the vaccination schedule throughout the life cycle, to increase vaccination coverage and thus expand the protection of the general population.

2 DISCUSSIONS

2. 1 CHILDHOOD VACCINATION

With the strengthening of EPI actions, it was possible to reduce regional and social inequalities by enabling access to vaccination for children in the Americas region.

Despite the progress made, in 2019, WHO estimated that nearly 14 million children had missed vital vaccines, such as measles and DTP3, and 2/3 of these children were concentrated in 10 countries, including Brazil, Angola, Democratic Republic of Congo, Ethiopia, India, Indonesia, Mexico, Nigeria, Pakistan, the Philippines, and the Democratic Republic of Congo[26].

It is worth mentioning that the reduction in CVs in recent years cannot be attributed to a single cause. Several factors were identified as the cause of this decline, such as lack of awareness of the importance of vaccination, hesitation to vaccinate, reported fake news and misinformation, especially on social networks, about the harm that vaccines can cause to health, the partial shortage of some products, operational problems for the correct execution of vaccination actions, including inadequate data recording, lack of professionals, operating hours of health services, up to the difficulty of access to the health unit[26, 27].

In recent years, there have been irregularities in the supply of immunobiological in several regional countries due to production problems. The shortage of a vaccine, even for a short period, may mean that the person responsible for the child does not have time to return to the facility at another appropriate time for vaccination. This child may be vaccinated later, with delay, but depending on their age, this dose will not count for ICV calculations, which may compromise monitoring. In addition, if the child attends the vaccination center outside the recommended period and the health professional does not know how to guide which vaccinations should be performed simultaneously at the time of vaccination, there may be a delay in keeping all vaccinations up to date.

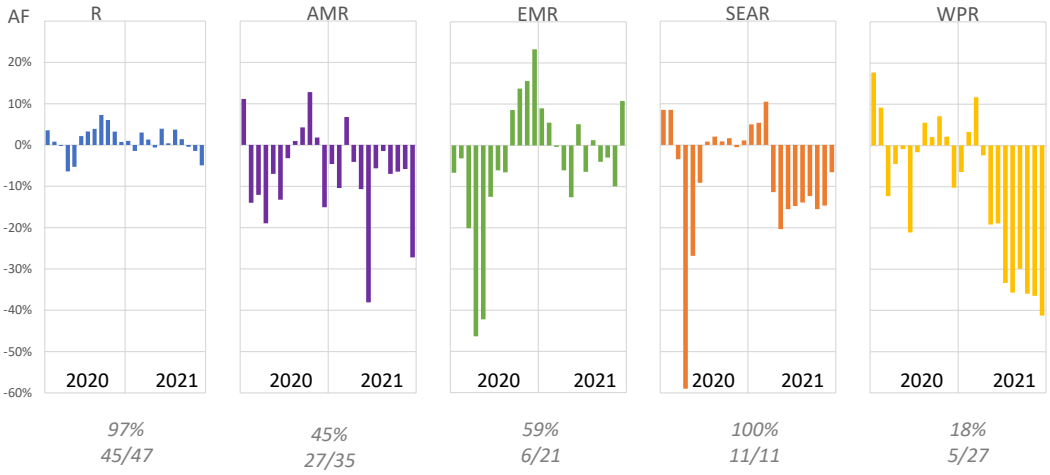
Simultaneous schedules allow, at the same time, to vaccinate the child with a more significant number of vaccines and, consequently, to protect against a more substantial number of diseases.

Therefore, health sector managers must address these problems to identify the factors contributing to the decrease in ICV. This assessment is even more urgent in the pandemic scenario to avoid increasing the population susceptible to immunopreventable diseases, especially children.

Social distancing or lockdown measures (confinement, which restricts the movement of people in public places) began to be adopted mainly from March 2020, when the first deaths from COVID-19 were confirmed, further accentuating the decrease in the ICV of children. As mentioned above, there is evidence of declining coverage in many countries globally and our region due to the interruption in vaccine supply and the interruption of vaccination actions caused by the COVID-19 pandemic[28].

A UNICEF and the World Health Organization assessment of vaccine coverages in the pandemic period identified that 25 million children were not vaccinated in 2021 with DTP3, 2 million more than in 2020, and 6 million more than in 2019. First-dose measles coverage dropped to 81% in 2021, leaving 5 million more children unvaccinated compared with 2019[29]. Therefore, Recovery from the 2020 AND 2021 setbacks is necessary to achieve the goals of the 2030 immunization agenda (Figure 3).

Figure 3. Disruptions caused by the COVID -19 pandemic in vaccination efforts.



Source: Progress and Challenges with Achieving Universal Immunization Coverage. 2021 WHO/UNICEF Estimates of National Immunization Coverage. Estimates as of July 8th, 2022

Even when services continued to offer vaccinations, many people could not access them due to public transportation disruptions, economic hardship, movement restriction measures adopted by several cities, or fear that people would be exposed to COVID-19 when attending health services. Likewise, existed a lack of availability of health professionals in vaccination services due to travel restrictions or displacement from their duties to deal with the COVID-19 response, in addition to a lack of protective equipment. Given this situation, global agencies have recommended immediately adopting strategies for the return of vaccination and increasing ICVs[30].

In this sense, considering the search for strategies to return vaccination in the population and ensure high vaccination coverage should be an essential activity. Therefore, services should strive to reestablish vaccination activities.

Those services interrupting their activities should resume them, adopting the safety measures recommended by health professionals, ensuring social distancing in the vaccination lines, and adopting hygiene recommendations in the vaccination rooms.

Health services should follow up on the families of children with delayed immunization schedules and actively search for this population. Success will depend on the quality of the vaccination records in the health units, the mapping of the child population, and the possibility of doing fieldwork. The primary health care program should be active in this action and ensure that the people in its coverage area are vaccinated correctly. Priority should be given to the vaccination of diseases with high morbidity and mortality burdens, such as pneumonia and meningitis, as well as those with outbreak potentials, such as measles, diphtheria, pertussis, and poliomyelitis; however, the aim should be to apply the most significant number of vaccines in the same visit, respecting the recommendation for each immunization. It is important to note that the CDC has established that vaccines against COVID-19 can be administered independently of the administration of other vaccines. It includes the simultaneous administration of the COVID-19 vaccine and other vaccines on the same day to recover vaccination coverage[31].

It is essential to articulate with civil society, involving community leaders who can support the mobilization of society, alerting about the importance of vaccination, emphasizing clear information and communication actions and education for better family decision making regarding their health.

The media should be involved, and each municipality should disclose the respective ICV for CNV vaccines, pointing out the areas with the lowest rates.

Due to the closure of schools and daycare centers, the participation of these professionals is also highly relevant. When children and adolescents return to school, the vaccination booklet must be up to date because schools can be a propitious place for the spread of diseases in the community if there is a high number of people susceptible to immunopreventable diseases returning to classes. Therefore, integrating the health sector with other sectors, such as education, is highly relevant to vaccinating this vulnerable population correctly.

Municipalities with populations located in regions that are difficult to access should organize extra-mural activities, maintaining security and distancing measures.

Finally, it is recommended to review vaccination regimens for people who have not started or are below the vaccination schedule. Vaccination schedules should be updated without repeating previous doses, respecting the minimum interval of 28 days between doses. The adoption of programs with shorter intervals than those recommended by the CNV makes it possible to guarantee that children with delayed schedules can benefit from completing the vaccination regimens in a short period and, in this way, can update their vaccination booklet with all the doses recommended for their age and be adequately protected, and not miss the opportunity to receive all the amounts of the regimen for each vaccine[32].

In this sense, managers must ensure the recovery of vaccination regimens in the shortest possible time, adopting the minimum intervals established for each vaccine.

Table 1 shows how these schedules can be accelerated at this time and thus ensure that children receive the maximum doses foreseen in the CNV. All sectors must work articulated to transmit the same guidelines to avoid confusion among health professionals and the population in adopting this strategy.

Table 1. Recommendations for interrupted or delayed schemes for the secondary calendar: simplified table.

Vaccine		Vaccination schedule	Dosage for those who start the delayed scheme		
			< 12 months	> 12 months	Vaccine booster
BCG		One dose at birth	One dose	One dose administer one dose of the vaccine for up to four years, 11 months, and 29 days	Not recommended
Hepatitis B at birth		One dose until 30 days after birth	Schedule the Penta vaccine for two months for unvaccinated children older than one month.	Complete the basic penta scheme.	Not recommended
Poliomyelitis	VIP	1st dose at two months 2nd dose at four months 3rd dose at six months	Three doses After four months of age, consider the minimum interval of 28 days between doses.	Three doses Consider a minimum interval of 28 days between doses. Administer up to four years, 11 months, and 29 days,	Not recommended
	BOPV	Reinforcement at 15 months and four years	Not recommended	One dose of BOPV	One dose of BOPV booster at a minimum interval of

				Administer for up to four years, 11 months, and 29 days.	28 days after the last dose. Up to four years, 11 months, and 29 days.
Penta DTP		Penta 1st dose at two months 2nd dose at four months 3rd dose at six months DTP Booster at 15 months and four years	Three doses After four months of age, consider the minimum interval of 28 days between doses.	Three doses Consider a minimum interval of 28 days between doses. Administer for up to six years, 11 months, and 29 days.	Child from 15 months and under four years of age, without booster: Administer 1st booster with DTP, and schedule 2nd booster for four years. For children up to four years of age without a booster: administer the 1st booster with DTP. In this case, these children are released from the 2nd booster. Schedule DTP for ten years after the first booster.
10- valent Pneumococcus Conjugate		1st dose at two months 2nd dose at four months Booster at 12 months	Two doses After four months of age, consider the minimum interval of 28 days between doses.	one dose Administer for up to four years, 11 months, and 29 days.	One dose booster at a minimum interval of 60 days after the last dose, up to four years, 11 months, and 29 days.
Rotavirus		1st dose at two months 2nd dose at four months	Two doses 1st dose: child from one month and 15 days up to three months and 15 days. 2nd dose: child from three months and 15 days to seven months and 29 days.	Not recommended	Not recommended

Meningitis C	1st dose at three months 2nd dose at five months Booster at 12 months	Two doses After five months of age, consider the minimum interval of 28 days between doses.	One dose Administer for up to four years, 11 months, and 29 days.	One dose administered at least 60 days after the last dose up to four years, 11 months, and 29 days.
Yellow fever	1st dose at nine months Booster at four years of age	One dose	One dose Consider the minimum interval of 28 days between doses.	One dose Individuals who received a vaccine before the age of 5 administer a booster dose, regardless of the age at which the individual seeks vaccination service. Consider the minimum interval of 28 days between doses.
Triple viral (SRC) Tetra viral	1st at 12 months 2nd dose at 15 months	Children 6 months and older should receive an additional dose due to the measles outbreak. This dose should be considered a zero dose (D), and two subsequent doses (D1) and D2) should be applied according to the national schedule.	The child aged 15 months to four years, 11 months, and 29 days should receive: 1st dose of MMR. 2nd dose of MMR or MMR plus varicella (attenuated) vaccine, depending on vaccine availability. Consider the air as the minimum interval of 28 days between doses.	Not recommended
Hepatitis A	One dose at 15 months	Not recommended	Children from 15 months to four years, 11 months, and 29 days should receive one dose.	Not recommended

Source: Own elaboration based on Table 3 - WHO vaccination schedules: https://www.who.int/immunization/policy/Immunization_routine_table3.pdf

2.2 IMPORTANCE OF VACCINATION FOR PREGNANT WOMEN

Vaccination of pregnant women is a strategy that has been gaining importance in recent decades, driven primarily by the successful results of the efficacy and safety of maternal immunization programs that have contributed to dramatic reductions in the incidence of neonatal tetanus and, more recently, influenza and rubella. Vaccination of pregnant women induces a vaccine-specific immune response in mothers, also providing the transfer of specific post-vaccine antibodies through the placenta and breast milk to protect the infant during the first months of life against the pathogens targeted by the immunization.

During the last decade, many Latin American countries have included vaccines for pregnant women in their national immunization programs. Tetanus vaccination during pregnancy has been recommended for years in most countries in the region, and pertussis and influenza vaccination programs for pregnant women have recently been implemented in several countries, including Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Mexico, Uruguay, among others. In September 2017, the Pan American Health Organization (PAHO) declared maternal and neonatal tetanus eliminated from the Americas region. Notably, several vaccines are under development for potential use during pregnancy, such as vaccines that prevent group B streptococcal (GBS) infection, a significant cause of disease in newborns and transmitted by mothers usually during delivery, as well as respiratory syncytial virus (RSV) infection, associated with a dramatic burden of morbidity and mortality in infants[33].

The recognition of pregnancy as a risk factor for COVID-19 morbidity and mortality, as well as preterm delivery, motivated the implementation of recommendations for the use of COVID-19 vaccines in pregnant women, especially mRNA vaccines, which have been the most widely used in this group of women. Data to date have shown this strategy to be safe, with no detection of serious adverse events associated with vaccination of pregnant women, with documented effectiveness for preventing COVID-19 and its varied severity outcomes[34].

To optimize the protection offered to mothers and infants by maternal immunization, factors that may affect and influence this strategy deserve careful attention.

Completing the immunization schedule during pregnancy is essential to protect a woman's and her infant's health. Mothers and their infants are susceptible to potentially vaccine-preventable severe diseases such as tetanus, pertussis, hepatitis B, influenza, and diphtheria.

When a pregnant woman is vaccinated, in addition to taking care of her health, she transfers the antibodies obtained through vaccination, first through the placenta and then through breast milk. This protection is essential in the first

months of the child's life, as the immune system is still developing and strengthening. Premature infants are an extremely susceptible group to infections, especially respiratory infections. Vaccinating pregnant women can reduce prematurity, preventing low birth weight babies.

INFLUENZA

Influenza affects individuals of all age groups, with the highest infection rates observed in children, recognized as important vectors of virus transmission in the community. Complications, hospitalizations, and deaths are observed mainly in individuals older than 60 and patients with chronic diseases (patients with asthma and other chronic lung diseases, heart disease, metabolic diseases such as diabetes mellitus, hemoglobinopathies, immunocompromised, morbidly obese, and chronic aspirin users). However, pregnancy is also at particularly high-risk for flu-associated complications and deaths, significantly affecting women in the third trimester of pregnancy. Influenza vaccination should be given to all pregnant women, regardless of the trimester of pregnancy, because of the increased risk of hospitalization and complications, preferably one season before influenza virus circulation[35].

Epidemiologic data show that infants in the first six months of life have high rates of infection and hospitalization, precisely in a period when there is no possibility of using influenza vaccines, licensed for use only from the age of 6 months. Therefore, the protection of this age group depends on many antibody transmission streams during pregnancy after maternal immunization. A recent meta-analysis showed that maternal influenza immunization reduced the risk of laboratory-confirmed influenza infection by 48% (95% CI, 33-59) in infants. In addition, maternal influenza vaccination has been associated with a reduced risk of severe pneumonia in children[36].

HEPATITIS B

Hepatitis B is also a disease of relevant impact on pregnant women. The condition is associated with various manifestations, from asymptomatic forms, a subacute illness with nonspecific symptoms, and clinical hepatitis with jaundice, to fulminant and fatal forms. The risk of an adolescent or a woman becoming a chronic carrier of hepatitis B virus after infection is 6% to 10%. Perinatal transmission of hepatitis B virus (HBV) is highly efficient and generally occurs through exposure to blood during labor and delivery. Intrauterine transmission accounts for less than 2% of all vertically transmitted HBV infections. In the absence of postexposure prophylaxis, the risk of an infant acquiring HBV from an infected mother as a result of perinatal exposure is 70% to 90% for infants born to mothers who are HBsAg and HBeAg positive; the risk is 5% to 20% for infants born to HbsAg-positive but HbeAg-negative mothers[37].

TETANUS

According to the World Health Organization, neonatal tetanus was a significant cause of mortality in the late 1980s. Neonatal tetanus remains a common disease in several resource-poor countries where pregnant women are not adequately immunized against tetanus and where non-sterile cord care practices are followed. WHO estimated that, in 2015, 34,019 newborns died of neonatal tetanus, a 96% reduction since the late 1980s[38]. Thanks to vaccination policies, with the DT vaccine during pregnancy, the Region of the Americas achieved the goal of eliminating the disease by September 2017.

PERTUSSIS

Pertussis has a cyclical behavior, with the periodic occurrence of outbreaks associated with significant morbidity and mortality in infants. The disease is quite severe when it affects infants in the first year of life, with the risk of hospitalization and even death. In adolescents and adults, on the other hand, it is characterized

by causing persistent cough and can often go unnoticed, undiagnosed, causing the infected individual to transmit Bordetella pertussis to contacts for prolonged periods. In some countries in the region as Brazil, case fatality rates of up to 6% were reported in cases reported infants. In more than half of the patients in, infants, parents, and other family members were the sources of transmission of infection, confirming the need to encourage vaccination of adolescents and adults.

In the last decade, several countries in the region have begun to recommend the use of the triple acellular vaccine (DTPA) in pregnant women instead of the double vaccine (DT). The DTPA vaccine should be administered to pregnant women during the third or late second trimester (after 20 weeks of gestation). Maternal pertussis vaccination for pertussis prevention in infants during the first 2 to 3 months old has been well-documented, both in Europe and in the United States and Canada, with estimates of 85-90% in the prevention of the disease[39, 40]. In Brazil, the vaccine's effectiveness was 82.6% for preventing pertussis in infants < 2 months of age, confirming the success of the maternal pertussis immunization strategy in our region as well[41].

If not administered during pregnancy, DTPA vaccination should be performed immediately after delivery.

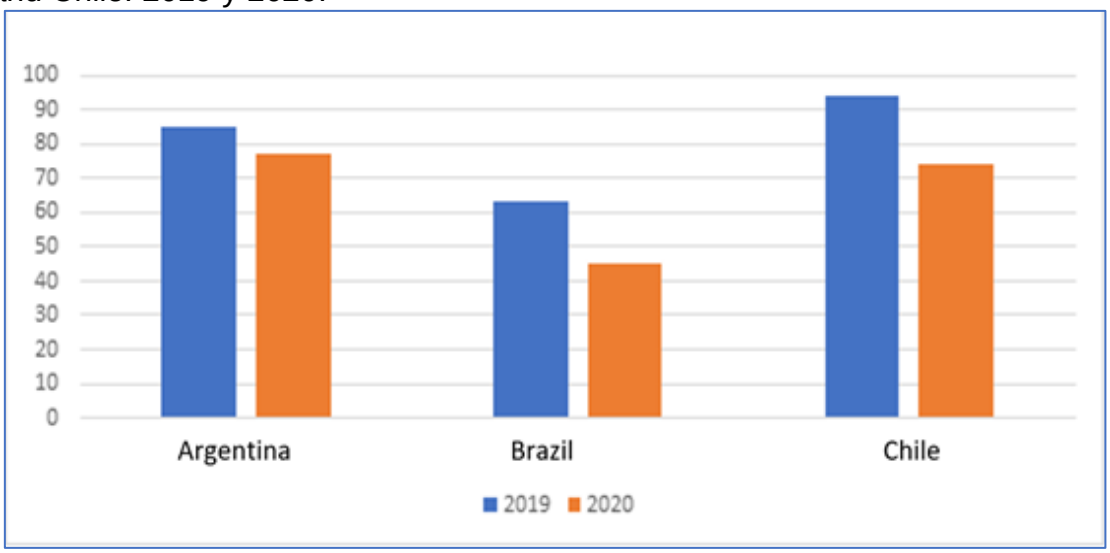
Vaccination in pregnant women is considered a priority by the World Health Organization (WHO) because it benefits the mother and child binomial, especially children under six months. Maternal antibodies are essential for the baby, as they will protect it until it can be adequately vaccinated and develop its defenses.

Most countries in the Americas offer influenza, hepatitis B, and DTPA vaccines in the schedule for pregnant women. These vaccines have proven safe for use at any gestational period; however, the DTPA vaccination is recommended from week 20 onwards to transfer the most astonishing number of antibodies to their baby.

Immunization coverage

As seen in Figure 3, vaccination in pregnant women against DTPA in 2020 was lower than in 2019; the pandemic also impacted the demand for health services for this population.

Figure 3. DTPA immunization coverage in pregnant women, Argentina, Brazil, and Chile. 2019 y 2020.



Source: Directorate for the Control of Immunopreventable Diseases, Ministry of Health of Argentina; National Immunization Program, Ministry of Health of Brazil; National Immunization Registry, Ministry of Health of Chile.

2.3 STRATEGIES FOR IMPROVING IMMUNIZATION COVERAGE

The physician who provides pregnancy control should be aware of the need to update the vaccines and their respective boosters in the care of their patients, a necessary action to maintain control of serious diseases such as tetanus, neonatal tetanus, diphtheria, and pertussis in newborns.

It is up to these professionals to assume an active role in the education and prescription for the administration of vaccines in women, pregnant women, and postpartum women to maintain the population's well-being.

Maternal vaccination should be a priority of prenatal and immunization services. From this approach, two generations can benefit directly at once in a lasting and efficient manner.

Women who are planning to become pregnant or who are already pregnant become more receptive to receiving vaccinations to make the gestational period as safe and healthy as possible, so health professionals must guide the importance of vaccination during this period of life. The topic of immunizations, both preconception and during pregnancy and postpartum, should be addressed in women's routine consultations. These crucial moments should be valued by all health professionals, especially gynecologists and obstetricians, who, together with pediatricians, have an essential role in guidance and counseling during pregnancy and postpartum.

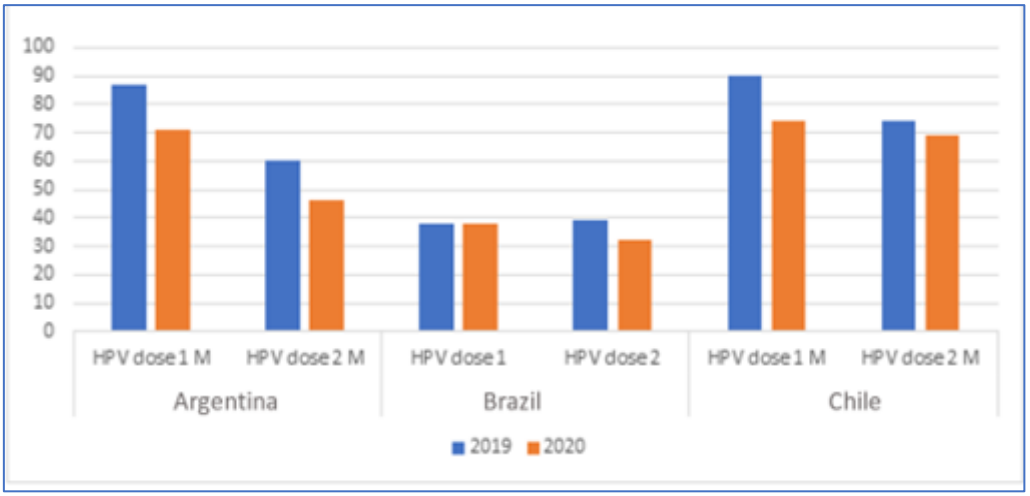
2.3.1 ADOLESCENT VACCINATION

HVP

The HPV vaccine, although already part of most vaccination schedules in the countries of the Americas, has not been able to achieve high coverage. Vaccination of the adolescent population should be prioritized in the school setting to ensure the participation of the entire target group and develop awareness campaigns on the benefits of HPV immunization for males and females.

During the COVID-19 pandemic, there was also a decrease in vaccination coverage, as shown in Figure 4.

Figure 4: HPV vaccination coverage in women, by type of dose. Argentina, Brazil, and Chile. 2019 y 2020.



Source: Directorate for the Control of Immunopreventable Diseases, Ministry of Health of Argentina; National Immunization Program, Ministry of Health of Brazil; National Immunization Registry, Ministry of Health of Chile.

The HPV vaccine is most associated with fake news circulating on social networks. Monitoring these publications is essential to develop positive messages with clear and accessible language[42].

The involvement of medical societies, especially gynecologists and infectologists, as well as the improvement of the curriculum of health professionals in addressing the issue, is paramount for improving vaccination coverage.

MENINGOCOCCAL DISEASE

Neisseria meningitidis (meningococcus), aerobic, non-motile, gram-negative diplococci belonging to the family Neisseriaceae causes Meningococcal disease (MD)(meningococcus). Based on the immunohistochemistry of capsular polysaccharides, meningococcus is classified into 12 distinct serogroups, six of which (A, B, C, W, X, and Y) are responsible for virtually all cases of the meningococcal disease worldwide.

Despite not being considered a common disease, MD remains a significant public health problem in several Latin American countries. Few diseases have as much power to cause panic among the population as DM due to its potential epidemic character, the rapid onset of the disease, its high lethality (10% - 30%), and substantial morbidity (up to 25% of DM survivors develop long-term sequelae, including neurodevelopmental delay, cognitive impairment, hearing impairment, motor deficits, seizures, visual hyperacuity, focal neurological signs, hydrocephalus, behavioral problems, learning difficulties, hypotonia, spasticity, and diplopia, or limb amputation).

The highest incidence rates of MD are generally seen among infants, 3 to 12 months. However, unlike invasive pneumococcal and Haemophilus influenzae B disease, the highest rates of nasopharyngeal colonization are evident in adolescents and young adults.

After introducing the meningococcal C conjugate vaccine for infants in 2010, there was a significant reduction in the incidence ratios (IC) of serogroup C MID in Brazil's age groups targeted for vaccination. ON THE OTHER HAND, Serogroups W, Y and B have a trend of stability in the period, with no significant changes in their incidence rates.

In 2017 to enhance the reduction of the disease burden in the country, it was necessary for the MCC vaccine began to be made available by the PNI/MS also to adolescents, initially from 12 to 13 years, and later, in 2018, for those aged 11 to 14 years, administering a booster or single dose, according to the

vaccination status found. Since the end of 2019, the ACWY conjugate vaccine has replaced the MCC vaccine in the adolescent dose. This measure was intended to increase the protection of the other serogroups covered by the vaccine[43].

With the implementation of non-drug measures to control the COVID-19 pandemic, such as the use of facemasks, school closures, and physical distancing guidelines, in 2020 and 2021, there has been evidence of a substantial decrease in MD incidence rates worldwide. Vaccination coverage in adolescents, who were already at deficient levels of desirability, suffered even steeper declines, raising concerns that there will be outbreaks as the habits of living together resume with future pandemic control[45].

Maintain training in vaccines and vaccination for health care workers, people in particular conditions, and adolescent care practices, in addition to offering operation of vaccination rooms at alternative times for the population.

Another critical strategy during the COVID-19 pandemic is the concomitant administration of this vaccine with other vaccines defined in the vaccination schedule. To date, there are no data from clinical studies on the simultaneous administration of SARS-CoV-2 vaccines and other vaccines in the routine regimen, except for inactivated influenza vaccine, which has been studied in concomitant administration with RNAm and non-replicating viral vector vaccines, and no interference in the immune response to SARS-CoV-2 influenza has been observed. No serious adverse events have been detected.

On the other hand, CDC recommendations for FDA-approved vaccines (from Pfizer BioNTech, Moderna, and Janssen laboratories) state that there is no monitoring period for co-administration of the vaccines.

Extensive experience with vaccines has shown that immunogenicity and adverse event profiles are generally similar when administering vaccines simultaneously or separately.

This background recommends the simultaneous administration of COVID-19 vaccines approved for use in schoolchildren and adolescents, both mRNA vaccines and inactivated whole virus vaccines, with other vaccines in the routine

vaccination schedule, as well as the administration of other indicated vaccines at any interval, should be considered.

Finally, it is necessary for managers to organize services with the required time, consistency, and creativity for this age group to increase vaccination not only against HPV and meningococcus but also with other vaccines in the schedule for this age group to reduce the barriers to access to health services inherent to the adolescent population.

3. FINAL CONSIDERATIONS

The ICV assessment points out that, in recent years, the opportunity to ensure the integrity of the children's schedule promptly is increasingly lost.

Even children presenting at health centers are not being vaccinated simultaneously, according to the vaccination schedules established by the EPIs, as vaccines given in the same period have different rates, including lower rates than for those vaccines where there was a shortage. This situation may worsen during the COVID-19 pandemic.

For the time being, there is a need for solid population mobilization, clarifying the risk countries are taking due to the decrease in vaccination, especially for children.

The measles outbreak has shown that this resurgence is a reality. It is necessary to immediately stop this chain of transmission installed in many countries and prevent other diseases from re-circulating in our region.

Likewise, although the last confirmed case of wild poliovirus poliomyelitis in the Region of the Americas occurred in 1991, the threat persists. Despite eradication efforts, there are still children with polio in some countries in Asia and Africa. At this particular time, low vaccination coverage is the leading risk factor for children under five years of age acquiring this disease.

The EPI should again be on the priority agenda of all regional governments, considering the participation of various sectors of society, as was done in the past, and ensuring the structuring and strengthening of vaccination

actions. Therefore, a broad debate is needed in all Americas countries to provide a high ICV and thus prevent the return and spread of immunopreventable diseases, avoiding the increase in morbidity and mortality of vaccine-preventable diseases of the CNV.

Innovative strategies should ensure the catch-up of unvaccinated persons during the pandemic while maintaining high vaccination coverage. It is essential to ensure that past achievements are not lost and become an unacceptable setback for public health in the Americas.

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