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Strategies for expanding childhood vaccination in the Americas following the COVID-19 pandemic

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ABSTRACT

Objective. To provide an overview of the status of the childhood vaccination schedule in the Americas, outline program structures, and identify updated implementation strategies to improve vaccination coverage following the COVID-19 pandemic.

Methods. A group of experts in pediatrics, epidemiology, vaccines, and global and public health discussed the current status of the childhood vaccination schedule in the Americas, describing the program structure and identifying new implementation strategies that have the potential to improve vaccination coverage in the post-pandemic context, after the challenges COVID-19 presented for more than two years.

Results. The Americas currently face a high risk of resurgence of diseases that were previously controlled or eliminated. Therefore, it is important to find new strategies to educate citizens on the risks associated with lower vaccination rates, especially in children.

Conclusions. New strategies along with strong mobilization of the population and advocacy by citizens are necessary to prevent antivaccination groups from gaining a stronger presence in the region and jeopardizing the credibility of the Expanded Program on Immunization.

Keywords Immunization programs; immunization schedule; vaccination coverage; vaccine-preventable diseases; COVID-19; Latin America.

Vaccination is considered one of the main public health milestones with a major global impact. Vaccination, together with safe drinking water and improved access to the health system, has contributed to the reduction of infant mortality and increased life expectancy across many countries. According to World Health Organization (WHO) data, vaccination campaigns prevent 2–3 million deaths annually (1). Practically anywhere in the world, a newborn now has a higher five-year survival rate compared to those born in 1990. The mortality rate in children younger than 5 years old has decreased by 59%, from 93 deaths for every 1 000 live births in 1990 to 38 deaths for every 1 000 live births in 2019. On average, the daily under-five mortality was 14 000 in 2019, a significant drop from 34 000 in 1990 (2).

The mortality and morbidity rates for vaccine-preventable diseases (VPDs) in the early 1970s were high worldwide. The lack of consolidated immunization programs led WHO, in 1974, to recommend the creation of the Expanded Program on Immunization (EPI) to support worldwide vaccination efforts. The EPI has been a successful program in the Americas for over 40 years, being the world leader in controlling and eliminating VPDs, including smallpox, polio, rubella, measles, and neonatal tetanus. Since the creation of the EPI, countries have updated their national vaccine schedules from including six to an average of 16 vaccines, thus expanding protection of the population (3).

Infant vaccination not only directly reduces the incidence of disease cases but also has a broader impact on public health by

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curbing transmission of infectious agents within communities. This ripple effect due to indirect protection (collective immunity) extends to the well-being of adults, the elderly, and individuals at high risk of developing complications. This article aims to provide an overview of the status of the childhood vaccination schedule in the Americas, outline program structures, and identify updated implementation strategies that can improve vaccination coverage following the COVID-19 pandemic.

METHODS

A group of experts in pediatrics, epidemiology, vaccines, and global and public health discussed the current status of the childhood vaccination schedule in the Americas, describing the program structure and identifying new strategies for implementation that have the potential to improve vaccination coverage in the post-pandemic context, after the challenges COVID-19 presented for more than two years.

RESULTS AND DISCUSSION

Vaccine-preventable diseases

VPDs are one of the main causes of illness, long-term incapacity, and deaths among children, in both developed and developing countries (4). Initially, six VPDs were covered in the EPI more than four decades ago, and at least ten more vaccines have since expanded the degree of protection provided (5, 6). To provide indirect protection against VPDs in the population through collective immunity, a high vaccination coverage for a sustained time is required, with the percentage coverage varying depending on the disease (7). Vaccines are currently available for preventing measles, mumps, rubella, chickenpox, diphtheria, tetanus, pertussis, polio, hepatitis B, hepatitis A, influenza, human papillomavirus, meningococcal disease, pneumococcal disease, rotavirus, yellow fever, and Japanese encephalitis (8).

Vaccines have eradicated smallpox, almost eliminated polio, and reduced measles, pertussis, and other disease outbreaks to historically low numbers (9). In 2019, WHO estimated that almost 14 million children did not receive essential vaccinations, such as diphtheria, tetanus toxoid, and pertussis (DTP) and measles, and two-thirds of these children were in countries including Angola, Brazil, Democratic Republic of Congo, Ethiopia, India, Indonesia, Mexico, Nigeria, Pakistan, and Philippines (10). In 2016, the elimination of measles in the Americas was certified by the Pan American Health Organization (PAHO). However, due to the low rates of infant vaccination with the measles, mumps, and rubella (MMR) vaccine, susceptibility to these diseases developed and outbreaks reappeared, resulting in higher transmission (11).

In 2020, nine countries in the Americas reported measles cases and deaths. The reemergence of measles in Brazil was associated with high disease incidence (110.7 cases per 100 000 population) in children under 1 year of age, being the most-affected age group (12, 13). This indicates that the passive immunity received from the mother is insufficient to protect the newborn during the first year of life and underscores the importance of maintaining a high vaccine coverage index in the target vaccination groups to create collective immunity, subsequently protecting individuals who cannot be vaccinated or who are not included in the vaccination strategy, such as children younger than 1 year old.

Pneumococcal disease, with diverse clinical manifestations, represents an important cause of morbidity and mortality. WHO estimates that invasive pneumococcal disease (IPD) accounts for more than 1 million under-five deaths annually (14, 15). Since the conjugated pneumococcal vaccine was introduced in the national vaccination calendars (NVC) of the region in 2010, a significant reduction of all disease results was observed. In a study (16) conducted in eight countries of the Americas (Argentina, Brazil, Chile, Colombia, Dominican Republic, Mexico, Paraguay, and Uruguay), the distribution of isolated serotypes of IPD was evaluated in children under 5 years of age, before and after the introduction of the pneumococcal conjugate vaccines (PCV)10 and PCV13 in their NVCs. The results of this study indicated that the annual incidence rates of IPD isolates associated with vaccine serotypes were reduced from –82.5% to –94.7% in the countries that used the PCV10 vaccine, and from –58.8% to –82.9% in countries using PCV13. Conversely, in the same period, there was an increase in the number of isolated non-vaccine serotypes in all eight countries after the introduction of the conjugate vaccines.

Impact of the COVID-19 pandemic on vaccination coverage

As SARS-CoV-2 spread rapidly worldwide since 2020 and governments attempted to contain its transmission, many health services, especially those in charge of routine immunization, faced serious disruptions. These disruptions resulted from numerous factors, including travel restrictions and public policies aimed at reducing social contact, redeployment of health professionals to work on the front lines of COVID-19, and the canceling or postponing of medical visits due to fear of exposure to the virus. Consequently, the supply of and demand for vaccination clinics decreased in several countries, and the vaccination coverage, which was already below expectations, was further reduced, increasing the risk of new outbreaks of VPDs included in the NVC.

A UNICEF and WHO vaccination coverage report (17) during the COVID-19 pandemic revealed that 25 million children were unvaccinated against diphtheria, tetanus, and pertussis (DTP3) in 2021, which corresponded to 2 million and 6 million higher than the number of children unvaccinated in 2020 and 2019, respectively. The first-dose measles coverage dropped to 81% in 2021, resulting in 5 million more children unvaccinated compared to 2019 (17). The search for strategies to restore vaccination in the population and guarantee high vaccination coverage should be considered an essential activity in countries' health systems.

The vaccination regimens of people who have not yet started or have not completed the vaccination calendar should be revised in every country and updated accordingly without repeating prior doses and allowing a minimum of 28 days between doses. Adopting vaccination regimens with shorter intervals between doses than those currently recommended by NVCs allows children who are behind vaccination schedules to complete these in a shorter time, thus obtaining a complete vaccination card with all the doses recommended for their age and being duly protected, without losing the opportunity of receiving all the doses for every vaccine (18).

Table 1 shows how these schedules can currently be expedited, guaranteeing that children receive the maximum doses recommended by the NVC. It is essential to establish a collaborative and aligned approach across sectors, operating under the same directions, with the goal of preventing confusion among health professionals and the population while adopting this strategy.

Expert opinion

The importance of vaccination goes beyond individual protection, as it also prevents the massive spread of diseases that could lead to serious sequelae or death, compromising the quality of life and population health in general. After more than two decades of reaching the highest rates of vaccination

TABLE 1. Recommendations for interrupted or delayed childhood immunization schedule: simplified table

Vaccine		Doses in primary series (minimum interval between doses)	Dosage for those who start the delayed scheme		
			If ≤12 months	If >12 months	Vaccine booster
BCG[1]		1 dose as soon as possible after birth	1 dose	1 dose Administer one dose of the vaccine for up to age 4 years, 11 months, and 29 days	Not recommended
Hepatitis B[2]		Birth dose <24 hours plus 2–3 doses with DTPCV (4 weeks)	3 doses	3 doses	Not recommended
Polio[3]	bOPV + IPV	5 doses (3 bOPV and 2 IPV)	5 doses (IPV to be given with 1st dose & 3rd dose of bOPV)	5 doses (IPV to be given with 1st dose & 3rd dose of bOPV)	Not recommended
	IPV/bOPV sequential	1–2 doses IPV and 2 doses bOPV (4 weeks)	1–2 doses IPV and 2 doses bOPV	1–2 doses IPV and 2 doses bOPV	Not recommended
	IPV	3 doses (4 weeks)	3 doses	3 doses	If the primary series begins <2 months of age, booster to be given at least 6 months after the last dose
DTP-containing vaccine (DTPCV)[4]		3 doses (4 weeks)	3 doses	3 doses with interval of at least 4 weeks between 1st & 2nd dose, and at least 6 months between 2nd & 3rd dose (if >7 years use only aP-containing vaccine; if >4 years, Td-containing vaccine is preferred and should only be used for >7 years)	3 boosters: 1–23 months (DTP-containing vaccine); 4–7 years (Td/DT-containing vaccine), see footnotes; 9–15 years (Td-containing vaccine; if >7 years use only aP-containing vaccine) If tetanus vaccination started during adolescence or adulthood, only 5 doses are required for lifelong protection
Haemophilus influenzae type b[5]	Option 1	3 doses (4 weeks)	3 doses	1 dose >5 years not recommended if healthy	Not recommended
	Option 2	2–3 doses (8 weeks if 2 doses; 4 weeks if 3 doses)	2–3 doses (8 weeks if 2 doses; 4 weeks if 3 doses)		At least 6 months after last dose
Pneumococcal conjugate[6]		3 doses (3p+0) with DTPCV (4 weeks) or 2 doses (2p+1) (8 weeks)	2–3 doses	1–5 years at high risk: 2 doses	Booster at 9–18 months if following 2-dose schedule Another booster if HIV+ or preterm neonate Vaccination in older adults
Rotavirus[7]		2 or 3 depending on product given with DTPCV	2 or 3 depending on product	>24 months limited benefit	Not recommended
Meningococcal[8]	MenA conjugate	1 dose if ≥9 months 2 doses if <9 months with 8-week interval	2 doses if <9 months with 8-week interval	1 dose of 5µg up to 24 months	Not recommended
	MenC conjugate	2 (8 weeks)	2 doses	1 dose	1 dose after 1 year of age for those who received the 2-dose infant primary immunization
	MenACWY conjugate	2 (8–12 weeks)	2 doses	1 dose	1 dose after 1 year of age for those who received the 2-dose infant primary immunization
Yellow fever[9]		1 dose In Brazil: 1st dose at 9 months Booster at 4 years of age	1 dose	1 dose	Not recommended
Measles mumps rubella[10]		2 doses (4 weeks)	2 doses	2 doses	Not recommended

(Continue)

TABLE 1. (Cont.)

Vaccine	Doses in primary series (minimum interval between doses)	Dosage for those who start the delayed scheme		
		If ≤12 months	If >12 months	Vaccine booster
Varicela[11]	1–2 doses (4 weeks to 3 months, depending on manufacturer)	Not recommended	1–2 doses	Not recommended
Hepatitis A[12]	At least 1 dose (minimum 1 year of age)	Not recommended	At least 1 dose	Not recommended

BCG, bacillus Calmette–Guérin; bOPV, bivalent oral polio vaccine; DTP, diphtheria tetanus pertussis; DTPCV, diphtheria tetanus pertussis-containing vaccine; HIV, human immunodeficiency virus; IPV, inactivated polio vaccine.

Notes:

[1] BCG vaccination is recommended for unvaccinated tuberculin skin test (TST)-negative or interferon-gamma release assay (IGRA)-negative older children, adolescents, and adults from settings with high incidence of tuberculosis (TB) and/or high leprosy burden and those moving from low to high TB incidence/leprosy burden settings.

[2] If delayed or interrupted scheduling of vaccination for children, adolescents, and adults, 3 doses are recommended, with the second dose administered at least 1 month after the first, and the third dose 6 months after the first dose. If the vaccination schedule is interrupted it is not necessary to restart the vaccine series.

[3] All countries that currently administer three bOPV and one IPV dose should add a second IPV dose in their routine immunization schedule (Oct 2020 SAGE Meeting Report). Regardless of the 2-dose IPV schedule used, introduction of the second IPV dose does not reduce the number of bOPV doses (three) used in the routine immunization schedule (Oct 2020 SAGE Meeting Report).

[4] If either the start or the completion of the primary series has been delayed, the missing doses should be given at the earliest opportunity with an interval of at least 4 weeks between doses.
Three booster doses of diphtheria toxoid-containing vaccine should be provided during childhood and adolescence. The diphtheria booster doses should be given in combination with tetanus toxoid using the same schedule; i.e., at 12–23 months of age, 4–7 years of age, and 9–15 years of age, using age-appropriate vaccine formulations. Ideally, there should be at least 4 years between booster doses.
Tetanus: To ensure lifelong protection against tetanus all people should receive 6 doses (3 primary plus 3 booster doses) of tetanus toxoid-containing vaccine (TTCV) through routine childhood immunization schedules.
If tetanus vaccination is started during adolescence or adulthood, a total of only 5 appropriately spaced doses are required to obtain lifelong protection.
To provide and sustain both tetanus and diphtheria immunity throughout the life course and for both sexes, age-appropriate combinations of tetanus and diphtheria toxoids should be used. For children <7 years of age DTwP or DTaP combinations may be used. For children aged 4 years and older Td-containing vaccine may be used and is preferred.
From 7 years of age only Td combinations should be used. Age-appropriate combinations containing pertussis vaccine with low-dose diphtheria antigen are also available.
Pregnant women and their newborn infants are protected from birth-associated tetanus if the mother received either 6 TTCV doses during childhood or 5 doses if first vaccinated during adolescence/adulthood (documented by card, immunization registry, and/or history) before the time of reproductive age. Vaccination history should be verified in order to determine whether a dose of TTCV is needed in the current pregnancy.
Pertussis vaccine: Only aP-containing vaccines should be used for vaccination of persons aged ≥7 years.
Pertussis containing booster: A booster dose is recommended for children aged 1–6 years, preferably during the second year of life (≥6 months after last primary dose), unless otherwise indicated by local epidemiology; the contact could also be used to catch up on any missed doses of other vaccines. This schedule should provide protection for at least 6 years for countries using wP vaccine. For countries using aP vaccine, protection may decline appreciably before 6 years of age.
Delayed or interrupted DTP-containing series: For children whose vaccination series has been interrupted, the series should be resumed without repeating previous doses. Children aged 1 to <7 years who have not previously been vaccinated should receive 3 doses of vaccine following a 0, 1, 6 month schedule. Two subsequent booster doses using Td or Tdap combination vaccines are needed with an interval of at least 1 year between doses.

[5] The number of primary doses should be set after consideration of the local epidemiology, vaccine presentation (Hib conjugate monovalent vaccine versus Hib conjugate vaccine in combination with other antigens), and how this fits into the overall routine immunization schedule.
If the vaccination course has been interrupted, the schedule should be resumed without repeating the previous dose. Children who start vaccination late, but are aged under 12 months, should complete the vaccination schedule (e.g., have 3 primary doses or 2 primary doses plus a booster).
When a first dose is given to a child older than 12 months of age, only 1 dose is recommended.
Hib vaccine is not required for healthy children after 5 years of age.

[6] For administration of pneumococcal conjugate vaccine (PCV) to infants, WHO recommends a 3-dose schedule administered either as 2p+1 or as 3p+0, starting as early as 6 weeks of age.
If the 2p+1 schedule is selected, an interval of ≥8 weeks is recommended between the 2 primary doses, and the booster dose should be given at 9–18 months of age, according to programmatic considerations; there is no defined minimum or maximum interval between the primary series and the booster dose.
If the 3p+0 schedule is used, a minimum interval of 4 weeks should be maintained between doses.
Interrupted schedules should be resumed without repeating the previous dose.
If a series cannot be completed with the same type of vaccine, the available PCV product should be used. Restarting a series is not recommended, even for the primary series.
Wherever possible, catch-up vaccination at the time of introduction of PCV should be used to accelerate its impact on disease in children aged 1–5 years, particularly in settings with a high disease burden and mortality. If there is limited availability of vaccine or of financial resources for catch-up vaccination, the youngest children (e.g., <2 years of age) should be prioritized to receive catch-up doses of PCV because of their higher risk for pneumococcal disease.
Catch-up vaccination can be done with a single dose of vaccine for children ≥24 months.
Unvaccinated children aged 1–5 years who are at high risk for pneumococcal infection because of underlying medical conditions, such as HIV infection or sickle-cell disease, should receive at least 2 doses separated by at least 8 weeks.
WHO does not currently have recommendations on the use of PCV in individuals over 5 years of age.

[7] Early immunization is favored with the first dose of rotavirus vaccine to be administered from 6 weeks of age; however, in order to benefit those who may come late, infants can receive doses without age restriction. Because of the typical age distribution of rotavirus gastroenteritis (RVGE), rotavirus vaccination of children >24 months of age is not recommended.
Regardless of the duration of delay, interrupted schedules should be resumed as soon as possible without repeating previous doses.
Rotavirus vaccinations can be administered simultaneously with other vaccines in the infant immunization program.

[8] For MenA conjugate vaccine (5µg) a 1-dose schedule is recommended in African countries at 9–18 months of age based on local programmatic and epidemiologic considerations.
There is no reason to expect interference when co-administered with other vaccines. The need for a booster dose has not been established.
If in a specific context there is a compelling reason to vaccinate infants younger than 9 months, a 2-dose schedule should be used starting at 2–3 months of age, with an interval of at least 8 weeks between doses.
For monovalent MenC conjugate vaccine one single intramuscular dose is recommended for children aged ≥12 months, teenagers, and adults. Children 2–11 months require 2 doses administered at an interval of a least 2 months and a booster about 1 year after.
If the primary series is interrupted, vaccination should be resumed without repeating the previous dose.

[9] A single dose of yellow fever (YF) vaccine is sufficient to confer sustained life-long protective immunity against YF disease; a booster dose is not necessary.
The vaccine is contraindicated in children aged <6 months and is not recommended for those aged 6–8 months, except during epidemics when the risk of infection with the YF virus is very high. Other contraindications for YF vaccination are severe hypersensitivity to egg antigens and severe immunodeficiency.

[10] Reaching all children with 2 doses of measles vaccine should be the standard for all national immunization programs. In addition to the first routine dose of MCV1, all countries should add a second routine dose of MCV2 to their national immunization schedules regardless of the level of MCV1 coverage.
Regardless of the duration of delay, interrupted schedules should be resumed as soon as possible without repeating previous doses.
Because many cases of measles occur in children aged >12 months who have not been vaccinated, routine delivery of MCV1 should not be limited to infants aged 9–12 months and routine delivery of MCV2 should not be limited to infants 15–18 months of age. Every opportunity (e.g., when children come into contact with health services) should be taken to vaccinate all children that missed one or both MCV routine doses, particularly those under 15 years of age. Policies that prohibit use of vaccine in children >1 year of age, older children, and teenagers should be changed to allow these individuals to be vaccinated. The minimum interval between MCV1 and MCV2 is 4 weeks.

[11] Varicella vaccine can be administered concomitantly with other vaccines. Unless given together with other live viral vaccines (measles, MR, MMR), it should be administered at a minimum interval of 28 days.
Regardless of the duration of delay, interrupted schedules should be resumed as soon as possible without repeating previous doses.

[12] Inactivated hepatitis A (HAV) vaccine is licensed for intramuscular administration in a 2-dose schedule with the first dose given at the age of 1 year or older. The interval between the first and second dose is flexible (from 6 months up to 4–5 years) but is usually 6–18 months. Countries may consider a 1-dose schedule as this option seems comparable in terms of effectiveness and is less expensive and easier to implement. However, in individuals at substantial risk of contracting hepatitis A and in immunocompromised individuals, a 2-dose schedule is preferred. Inactivated HAV vaccines produced by different manufacturers, including combined hepatitis A vaccines, are interchangeable. Apart from severe allergic reaction to the previous dose, there is no contraindication to their use. These vaccines can be co-administered simultaneously with other routine childhood vaccines and should be considered for use in pregnant women at definite risk of HAV infection.

Source: Adapted by the authors, from: World Health Organization. Recommendations for Interrupted or Delayed Routine Immunization - Summary of WHO Position Papers [Table 3]. Geneva: WHO; 2023 [cited 31 January 2023]. Available from: https://www.who.int/teams/immunization-vaccines-and-biologicals/policies/who-recommendations-for-routine-immunization---summary-tables.

coverage in all countries in the Americas, the EPI has noted a significant reduction in infant vaccination rates. Diseases that have been controlled or even eliminated are now becoming unfamiliar to the new generations of health personnel and the general population. Consequently, this poses a potential threat, as the seriousness of these diseases is underestimated and the necessity of maintaining the infant vaccination schedule is questioned, which could result in the resurgence or reemergence of already controlled or eliminated diseases in those countries.

The measles outbreaks have shown that this reemergence is a reality and that it is necessary to immediately break this chain of transmission already prevalent in many countries, in addition to preventing other diseases from again spreading in the region. Similarly, although the last case of polio caused by a wild poliovirus strain in the Americas was confirmed in 1991, the threat remains clear. Despite the eradication efforts, cases of polio among children still exist in a few countries in Asia and Africa. Thus, the low vaccination coverage is the main risk factor for children younger than 5 years old to contract the disease.

With the diminished vaccination coverage for VPDs since 2020 and the drastic increase in the number of susceptible individuals, the resurgence of these diseases can increase the demand on health services, which due to COVID-19-related issues are already at the capacity threshold, as reflected in the waiting lists for scheduled visits or ambulatory procedures in the entire region.

In these last years, more opportunities to guarantee the integrity of infant vaccination coverage are being lost, according to the evaluation of the vaccine coverage index across the countries of the region. More children who are visiting the health centers are not receiving simultaneous vaccines according to the established EPI vaccination schedules. These issues result from administering vaccines of different indexes in the same period. Additionally, some vaccines were understocked, leading to lower indexes when compared to other vaccines that were administered in the same period – a situation worsened by the COVID-19 pandemic.

Other key factors to consider are the lack of access to vaccines and the vaccine distribution issues that are observed in some countries in the region. Clinic hours and vaccine shortages, even for a short time, can interfere with parents' schedules and activities, and consequently, parents are not returning to the clinic with their children according to the proper infant vaccination schedule. The child can be vaccinated later, with a delay; however, depending on the child's weight, the dose may not count for the calculation of the vaccine coverage index, which could compromise its monitoring. Furthermore, if the child visits the vaccination center outside the recommended age and the health professional is unable to determine which vaccines can be simultaneously administered at that moment, the whole vaccination schedule can be altered.

The concurrent implementation of the schemes allows administration of a greater number of vaccines simultaneously, thereby providing protection against a broader spectrum of diseases. Therefore, it becomes imperative for the health sector to address these problems, particularly in the post-pandemic context. Identifying the factors contributing to a reduced vaccine coverage index is of heightened urgency to prevent the increase in the number of individuals susceptible to VPDs, especially children. Health services can locate children with delayed schedules and engage with their families proactively. The accuracy of this endeavor hinges on the quality of the vaccination records, comprehensive mapping of the child population, and the possibility of conducting fieldwork. Accordingly, EPI managers should analyze and propose innovative ways to reach those unvaccinated children, thinking on how to facilitate parents in having their children vaccinated. Each country should implement those actions fit for its specific settings.

To prevent a more drastic decrease in the vaccine coverage index, it is extremely important to analyze the effects of the pandemic on vaccination coverage and to propose actions that can improve the support of the population and the organization of the vaccination services. The return to a more active demand for primary care services on the part of the population will increase vaccination coverage in terms of the availability of vaccines; however, it will not be enough if the delays caused by the pandemic and the cohorts of unvaccinated or incompletely vaccinated children are not considered. Monitoring of the coverage of the vaccination schedule throughout the life course is crucial, with the aim of increasing vaccination coverage and thus broadening the protection of the population in general.

The primary care program must be active in this action and guarantee adequate vaccination coverage in the local population. Vaccination should be prioritized against diseases with high rates of morbidity and mortality, such as pneumonia and meningitis, as well as those with outbreak potential, including measles, diphtheria, pertussis, and polio. Establishing good communication with civil society, involving community leaders who can support the mobilization of society, is vital for advocating the importance of vaccination, ensuring clear information dissemination, and fostering informed decision-making for the health of the entire family.

Currently, strong mobilization of the population is necessary, clarifying the risks that countries are facing regarding the reduction in vaccination rates, especially in children. The media need to be involved, and the coverage index for each vaccine in the NVC needs to be disclosed in each population, highlighting the areas with the lowest rates. Innovative strategies must be identified to ensure that people unvaccinated during the pandemic are brought up to date with their vaccination schedules, thus averting the unacceptable risk of forfeiting previous progress and potential setbacks to public health in the Americas.

The EPI must be on the priority agenda of all the governments in the region, with the participation of various sectors of society, as done in the past, to ensure the structuring and strengthening of vaccination actions. Therefore, a broad debate involving all the countries of the Americas is necessary to ensure a high vaccine coverage index and thus prevent the reemergence and spread of VPDs, avoiding the increase in morbidity and mortality of the diseases that are part of the NVC.

Conclusion

The COVID-19 pandemic has affected regional immunization access and operations, as well as vaccination coverage achieved prior to the pandemic, allowing the resurgence of VPDs that were previously under control globally. The Americas face high risk of reemergence of diseases that were previously eliminated. Due to the reduced vaccination coverage during the pandemic and the increasing refusal of vaccination in the region, efforts to recover adequate levels of vaccination coverage are required. Articulated work with governments and the reinforcement of vaccination activities and campaigns in every program are recommended. The population needs education on the risks associated with lower vaccination rates, especially in children. Subsequently, strong mobilization of the population and advocacy by citizens are required. New strategies are needed to prevent antivaccination groups from gaining a stronger presence in countries and jeopardizing the credibility of the EPI.

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REFERENCES

1. World Health Organization. Vaccines and immunization. Geneva: WHO; 2022 [cited 15 April 2023]. Available from: https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1.
2. IGME UN Inter-agency Group for Child Mortality Estimation. Under-five mortality rate. [New York]: IGME; 2023 [cited 15 April 2023]. Available from: https://childmortality.org/analysis.
3. Pan American Health Organization. Immunization. Washington, DC: PAHO; 2021 [cited 15 April 2023]. Available from: https://www.paho.org/en/topics/immunization.
4. World Health Organization. State of the world's vaccines and immunization. 3rd edition. Geneva: WHO; 2009. Available from: https://iris.who.int/handle/10665/44169.
5. Lindstrand A, Cherian T, Chang-Blanc D, Feikin DL, O'Brien KL. The World of Immunization: Achievements, Challenges, and Strategic Vision for the Next Decade. J Infect Dis. 2021;224(4):S452–S467. https://doi.org/10.1093/infdis/jiab284.
6. Cohen M, Rodriguez R, Ramirez J, Guerreros A, Ospina-Henao S. Pneumococcal Vaccines: A Public Health Perspective. Int J Pulm Respir Sci. 2022;5(5):555671. https://doi.org/10.19080/IJOPRS.2022.05.555671.
7. Violette R, Pullagura GR. Vaccine hesitancy: Moving practice beyond binary vaccination outcomes in community pharmacy. Can Pharm J (Ott). 2019;152(6):391–394. https://doi.org/10.1177/1715163519878745.
8. United States Centers for Disease Control and Prevention. Diseases & the Vaccines that Prevent Them. Atlanta: CDC; 2019 [cited 15 April 2023]. Available from: https://www.cdc.gov/vaccines/parents/diseases/index.html.
9. Reda SM, Cant AJ. The importance of vaccination and immunoglobulin treatment for patients with primary immunodeficiency diseases (PIDs)-World PI Week April 22-29, 2015. Eur J Immunol. 2015;45(5):1285–1286. https://doi.org/10.1002/eji.201570054.
10. Muhoza P, Danovaro-Holliday MC, Diallo MS, Murphy P, Sodha SV, Requejo JH, et al. Routine Vaccination Coverage — Worldwide, 2020. MMWR Morb Mortal Wkly Rep. 2021;70(43):1495–1500. https://doi.org/10.15585/mmwr.mm7043a1. Erratum in: MMWR Morb Mortal Wkly Rep. 2021;70(46):1620.
11. Pan American Health Organization. Measles/Rubella bi-Weekly Bulletin. Vol. 19, No. 19-20. 2 June 2023. Washington, DC: PAHO; 2023. Available from: https://www.paho.org/en/measles-rubella-weekly-bulletin.
12. Ministry of Health of Brazil, Secretariat of Health Surveillance. Guia de Vigilância em Saúde [Guide to Health Surveillance]. 3rd edition. Brasília: Ministry of Health; 2019 [cited 9 September 2020]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/guia_vigilancia_saude_3ed.pdf.
13. World Health Organization; United Nations Children's Fund. Global Action Plan for Prevention and Control of Pneumonia (GAPP). Geneva: WHO; 2009. Available from: https://iris.who.int/handle/10665/70101.
14. World Health Organization. Pneumococcal disease. Geneva: WHO; 2015 [cited 8 September 2021]. Available from: https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/vaccine-standardization/pneumococcal-disease.
15. Vieira IL, Kupek E. The impact of pneumococcal vaccine in reducing pneumonia hospitalizations in children under 5 years old, in Santa Catarina, Brazil, 2006 a 2014. Epidemiol Serv Saude. 2018;27(4):1–9. https://doi.org/10.5123/s1679-49742018000400012.
16. Agudelo CI, Castañeda-Orjuela C, Brandileone MCC, Echániz-Aviles G, Almeida SCG, Carnalla-Barajas MN, et al. The direct effect of pneumococcal conjugate vaccines on invasive pneumococcal disease in children in the Latin American and Caribbean region (SIREVA 2006-17): a multicentre, retrospective observational study. Lancet Infect Dis. 2021;21(3):405–417. https://doi.org/10.1016/S1473-3099(20)30489-8.
17. World Health Organization; United Nations Children's Fund. Progress and Challenges with Achieving Universal Immunization Coverage. 2021 WHO/UNICEF Estimates of National Immunization Coverage. Estimates as of 8 July 2022. Geneva: WHO; 2022. Available from: https://www.who.int/teams/immunization-vaccines-and-biologicals/immunization-analysis-and-insights/global-monitoring/immunization-coverage/who-unicef-estimates-of-national-immunization-coverage.
18. World Health Organization. WHO recommendations for routine immunization - summary tables. Geneva: WHO; 2020 [cited 20 September 2020]. Available from: https://www.who.int/teams/immunization-vaccines-and-biologicals/policies/who-recommendations-for-routine-immunization---summary-tables.

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Estrategias para ampliar la vacunación infantil en la Región de las Américas después de la pandemia de COVID-19

RESUMEN

Objetivo. Presentar un panorama general de la situación del calendario de vacunación infantil en la Región de las Américas, describir la estructura de los programas y encontrar estrategias actualizadas para su ejecución a fin de mejorar la cobertura de vacunación después de la pandemia de COVID-19.
Métodos. Un grupo de expertos en pediatría, epidemiología, vacunas y salud pública y mundial analizó la situación actual del calendario de vacunación infantil en la Región de las Américas, mediante la descripción de la estructura de los programas y la búsqueda de nuevas estrategias de ejecución capaces de mejorar la cobertura de vacunación en el contexto posterior a la pandemia de COVID-19, una vez superados los desafíos planteados por esta durante más de dos años.
Resultados. En este momento, en la Región de las Américas hay un riesgo alto de reaparición de enfermedades previamente controladas o eliminadas. En consecuencia, es importante contar con nuevas estrategias para la educación de salud de la ciudadanía sobre los riesgos asociados a las tasas bajas de vacunación, especialmente en la población infantil.
Conclusiones. Es necesario contar con nuevas estrategias, acompañadas de una fuerte movilización de la población y una promoción por parte de la ciudadanía, para evitar que los grupos que generan mensajes antivacunas aumenten su presencia en la Región y pongan en peligro la credibilidad del Programa Ampliado de Inmunización.

Palabras clave Programas de inmunización; esquemas de inmunización; cobertura de vacunación; enfermedades prevenibles por vacunación; COVID-19; América Latina.

Estratégias para ampliar a vacinação infantil nas Américas depois da pandemia de COVID-19

RESUMO

Objetivo. Apresentar um panorama da situação do calendário de vacinação infantil nas Américas, definir a estrutura do programa e identificar estratégias de implementação atualizadas para melhorar a cobertura vacinal depois da pandemia de COVID-19.
Métodos. Um grupo de especialistas em pediatria, epidemiologia, vacinas e saúde pública e global discutiu a situação atual do calendário de vacinação infantil nas Américas, descrevendo a estrutura dos programas e identificando novas estratégias de implementação que poderiam melhorar a cobertura vacinal no contexto pós-pandemia, na sequência dos desafios impostos pela COVID-19 durante mais de dois anos.
Resultados. Atualmente, as Américas enfrentam um grande risco de ressurgimento de doenças já controladas ou eliminadas. Desse modo, é importante identificar novas estratégias para conscientizar os cidadãos sobre os riscos decorrentes da queda das taxas de vacinação, sobretudo em crianças.
Conclusões. É necessário adotar novas estratégias, aliadas a uma forte mobilização da população e promoção da causa pelos cidadãos, a fim de impedir que os grupos antivacinas fortaleçam sua presença na região e coloquem em risco a credibilidade do Programa Ampliado de Imunização.

Palavras-chave Programas de imunização; esquemas de imunização; cobertura vacinal; doenças preveníveis por vacina; COVID-19; América Latina.