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Original research

Systematic documentation of the introduction of COVID-19 vaccines in Latin America and the Caribbean

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ABSTRACT

Objective. To document the process of introducing COVID-19 vaccines in a selection of Latin American and Caribbean countries, including the lessons learned and the strengths and weaknesses, and similarities and differences among programs.

Methods. This descriptive study is based on a systematic evaluation of the process of introducing COVID-19 vaccines in Argentina, Belize, Brazil, Costa Rica, Panama and Peru. Data were collected through a questionnaire distributed to key stakeholders. Six informants from each of the included countries participated in this study. The period of the study was from December 2021 through September 2022.

Results. The main strengths reported by countries were health workers' commitment to delivering vaccinations, evidence-based decision-making, the development of plans for vaccine introduction, the participation of national immunization technical advisory groups, the availability of economic resources and positive actions from the respective Ministry of Health. The main challenges were the actions of antivaccination groups, problems with electronic immunization registries, a lack of vaccines, delays in the delivery of vaccines and the scarcity of health personnel at the local level.

Conclusions. Commitment, the participation of multiple sectors, the availability of resources and preparedness planning were some of the many strengths shown by countries introducing COVID-19 vaccines. Weaknesses included third parties' interests, the lack of information systems and difficulty in accessing vaccines and vaccine services. There is a window of opportunity for countries to maintain the good practices that allowed for the processes' strengths and to assess the identified weaknesses to invigorate immunization programs and prepare for future health crises.

Keywords COVID-19 vaccines; immunization; information systems; decision making; Latin America.

The development of safe and effective vaccines to reduce the mortality and morbidity caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been a global and scientific priority since the beginning of the COVID-19 pandemic (1–3). The development of COVID-19 vaccines included the use of established vaccine platforms and technologies considered innovations at the time of the pandemic (4, 5). The vaccine platforms include viral vectors, in which viral material is placed in a modified version of a virus, as well as messenger RNA vaccines that triggered the synthesis of the viral spike protein, along with classic inactivated vaccines (6).

The global introduction of new vaccines has posed a formidable challenge. Recent years have witnessed a surge in health care development, promising substantial reductions in the burden of various diseases through these new vaccines. This has ignited a keen interest in unraveling the complex decision-making

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processes surrounding the integration of these vaccines into national immunization programs (7). Several frameworks have been developed to analyze decision-making about vaccine adoption, with widely used criteria encompassing factors such as the importance of a particular health problem; the characteristics of a vaccine; considerations related to immunization programs, including the acceptability and accessibility of vaccines, equity and ethics; financial and economic considerations; impact assessments; alternative interventions; and the decision-making process itself (8, 9). These broad categories of criteria significantly influence decisions about vaccine adoption.

The challenges to global vaccine introduction are echoed in Latin America and the Caribbean, where despite regional successes, vaccination policies have significant shortcomings. Regional data about effective coverage and epidemiological risks lack detail and consistency in their criteria and collection methods, emphasizing the need for standardization. Inequalities in vaccine coverage exist both between and within countries, suggesting the importance of a regional reference scheme. As diseases are eliminated, the political motivation to expand coverage decreases (10); training for vaccine providers becomes deficient, contributing to variations in quality and coverage; and immunization inequality is compounded by weak international coordination between countries at the global level. Furthermore, some countries in Latin America and the Caribbean lack an independent advisory committee for vaccines, hindering evidence-based decision-making. Additionally, a lack of appropriate financing mechanisms can delay the introduction of new vaccines. Regulatory procedures are often lengthy and inefficient, requiring coordination to streamline processes (11). Local capacity for vaccine research, development and production is limited, necessitating investments and partnerships between the private and public sectors (12).

The introduction of COVID-19 vaccines has been challenging globally. In countries in Latin America and the Caribbean, once COVID-19 vaccines were available, new challenges had to be addressed. Those challenges included determining priority groups; ensuring access to vaccination and equity in vaccine distribution; ensuring appropriate financing, supply chain management and electronic systems for registry; providing vaccinators; and working to increase acceptance of the vaccines, among others (13–15).

Describing the experiences of and lessons learned about the introduction of COVID-19 vaccines in Latin American and Caribbean countries can support decision-making during a pandemic and potentially decision-making during future health emergencies. This study systematically documents the introduction of COVID-19 vaccines in a selection of Latin American and Caribbean countries, including assessing lessons learned and identifying the strengths and weaknesses, and similarities and differences, in the processes of vaccine introduction for the purpose of informing future decision-making about introducing vaccines and immunizations during a health crisis.

METHODS

Study location and population

Six Latin American and Caribbean countries that introduced COVID-19 vaccines during the pandemic and officially accepted the invitation to participate in the study were included: Argentina, Belize, Brazil, Costa Rica, Panama and Peru. The only inclusion criterion for countries was an acceptance by health authorities of the invitation to participate. The six stakeholders from each country who completed questionnaires corresponded to the groups targeted for vaccination by a particular country.

Study design

We conducted an observational cross-sectional study based on systematically documenting the process of introducing COVID-19 vaccines in the six countries between December 2021 and September 2022.

Data collection

Data were collected for the study period. A questionnaire was distributed to key stakeholders after obtaining informed consent. These stakeholders included health authorities, those responsible for immunization programs, individuals responsible for epidemiological surveillance, representatives from the Pan American Health Organization (PAHO), members of national immunization technical advisory groups (NITAGs) and personnel involved in vaccination services (Table 1). Six surveys were completed for each country. Information was collected about the legal structure, planning for vaccine introduction, the process of vaccine introduction, financing, vaccine procurement and challenges and strengths revealed during vaccine introduction (Table 1). Demographic data were retrieved from official secondary sources, including *the Human development report 2021/2022*, data from the World Bank and official reports from PAHO about immunization coverage (16–18).

Data analysis

Two investigators reviewed and abstracted all data manually (RJS and XS). Findings were compiled for each country and aggregated for regional analysis. To evaluate the strengths and weaknesses of the COVID-19 vaccine introduction process, a Likert scale (0–5) was established, with 0 constituting a parameter of little influence and 5 of high influence. An average final score for perceptions of strengths and challenges was estimated when there was more than one respondent to the questionnaire per country. The protocol was submitted to and approved by PAHO's Ethics Review Committee.

RESULTS

The demographic and socioeconomic data obtained from secondary sources about participating countries are presented in Table 2.

The vaccine platforms used by participating countries to introduce COVID-19 vaccines were viral vector (AstraZeneca, CanSinoBio, Gamaleya, Janssen, Serum Institute of India), messenger RNA (Moderna and Pfizer-BioNTech) or inactivated (Sinovac and China National Biotec Group). All countries introduced at least two of the three types of COVID-19 vaccines (Table 3).

Vaccine coverage (i.e. uptake) goals were determined by each country. The World Health Organization (WHO) recommended that coverage of 70% be reached before June 30, 2022 (19). By mid-2022, all countries had reached the coverage goal

TABLE 1. Key stakeholders and topics addressed during the introduction of COVID-19 vaccines in six countries in Latin America and the Caribbean, December 2021 to September 2022

Key stakeholder	Topics addressed
Chief of EPI or key professionals in the Ministry of Health	Decision-making, data used to generate evidence, support for institutions planning for and introducing vaccines, critical evaluation of the introduction process
Health authorities in the Ministry of Health	Decision-making, funding allocation, financing, sustainability, plans for introduction, regulatory process, quality control, communication
Chief of epidemiological surveillance or key professionals in the Ministry of Health	Surveillance, computer systems, vaccine introduction process, vaccination coverage
Adviser on immunization at PAHO country office	Political and technical environment, role of PAHO, decision-making process and support for institutions
Chair or member of national immunization technical advisory group	Role of the national immunization technical advisory group in determining immunization practices, technical discussions, sources of information considered, main recommendations to the health authority
Chief of EPI at the municipal level	Service provision, supply chain, operational challenges

EPI: Expanded Programme on Immunization; PAHO: Pan American Health Organization.
Source: Table prepared by the authors based on the results of their study.

recommended by WHO except for Belize, which reached 54.2% coverage. Primary COVID-19 vaccination coverage reported to PAHO by epidemiological week 35 (August 29 to September 4 2022) (18) showed that Costa Rica, Panama and Peru exceeded their own coverage goals (Table 3).

All countries reported the existence of legal bases for vaccine introduction, a guaranteed budget for COVID-19 vaccination and that they had pandemic management plans. Additionally, between October 2020 and February 2021, all six countries created a COVID-19 national vaccination plan for guidance and implementation during the pandemic (Table 4).

All countries considered that it was a technical and political decision to introduce COVID-19 vaccination. They considered the best scientific evidence during the decision-making process. Consultation sources were the country's NITAG, PAHO's technical advisory group, the WHO Strategic Advisory Group of Experts on Immunization (SAGE), scientific societies, and other countries' recommendations about vaccine introduction. The Expanded Programme on Immunization (EPI) participated in the vaccine introduction process in five of the six participating countries and coordinated vaccination delivery in four of them (Table 4).

All countries reported that the main source of financing for and acquisition of COVID-19 vaccines was their national government. Argentina, Belize and Panama reported carrying out costings prior to acquiring vaccines. For the procurement of vaccines, all countries conducted direct negotiations, used the COVAX (COVID-19 Vaccines Global Access) Facility and received donations, with exception of Brazil, which reported that it did not receive donations (Table 4).

Health care centers at all levels were the main sites where COVID-19 vaccines were administered. Although all countries required support from external personnel for vaccination delivery, Costa Rica and Peru indicated that the number of personnel assigned to the vaccination process was insufficient. Most countries reported difficulties with the cold chain, storage, multidose vials, vaccine wastage and distribution because the vaccination campaign required new procedures and a different supply chain due to the introduction of a new vaccine platform (Table 4).

Prior to the pandemic, all countries except Peru had an electronic immunization registry (EIR). Peru implemented an EIR during the pandemic. All countries provided a paper card with a record of vaccination, and five of them also provided an electronic card as a COVID-19 vaccination certificate. Four countries published daily reports on an official website of the number of doses administered (Table 4).

All countries developed a communication plan during the pandemic. National authorities were the main spokespersons.

TABLE 2. Demographic and socioeconomic indicators of six countries in Latin America and the Caribbean introducing COVID-19 vaccines, December 2021 to September 2022

Characteristic	Country					
	Argentina	Belize	Brazil	Costa Rica	Panama	Peru
Area (km^2)[a]	2 780 400	22 970	8 515 770	51 100	75 320	1 285 220
Total population[a]	45 808 747	404 915	213 993 441	5 139 053	4 381 583	33 359 416
% population by age group (years)[a]						
0–14	24	29	20	21	26	25
15–64	64	66	70	69	65	66
≥ 65	12	5	10	11	9	9
% annual population growth[a]	0.9	1.8	0.7	0.9	1.5	1.2
Life expectancy at birth (years)[a]	77	75	76	80	79	77
Mortality/1 000 people[b]	8	5	7	5	5	6
Births/1 000 people[b]	17	20	13	13	18	18
Infant mortality/1 000 live births[b]	8	10	13	7	12	10
Per capita GDP[a] (US$)	10 729.20	4 420.50	7 518.80	12 508.60	14 516.50	6 692.20
Human Development Index[b,c]	0.842	0.716	0.754	0.809	0.805	0.762

GDP: gross domestic product.
[a] Data from 2022.
[b] Data from 2021.
[c] On the Human Development Index, scores 0.8–1.0 are considered very high, 0.7–0.79 are high, 0.55–0.70 are medium, and <0.55 is considered low.
Source: Table prepared by the authors based on the results of their study.

TABLE 3. COVID-19 vaccine introduction, platform used, prioritized groups, coverage, vaccination scheme and booster doses, by country, December 2021 to September 2022

Country	Date vaccine introduced	Manufacturer (vaccine or vaccines)	Vaccination priority groups	Coverage goal (%)	Coverage (%) of primary schedule vaccination by epidemiological week 35, 2022	Booster dose	Heterologous vaccination
Argentina	December 2020	AstraZeneca (Vaxzevria) China National Biotec Group (BIBP-CorV) CanSinoBio (Ad5-nCoV) Gamaleya (Sputnik V) Janssen (Ad26.COV2.S) Moderna (mRNA-1273) Pfizer–BioNTech (Comirnaty) Serum Institute of India (Covishield)	Health workers Older adults	95	82.8	Yes	Yes
Belize	March 2021	AstraZeneca (Vaxzevria) China National Biotec Group (BIBP-CorV) Janssen (Ad26.COV2.S) Pfizer–BioNTech (Comirnaty) Serum Institute of India (Covishield)	Health workers Older adults Patients with comorbidities Essential workers not in health care	70	54.2	Yes	No
Brazil	January 2021	AstraZeneca (Vaxzevria) Janssen (Ad26.COV2.S) Pfizer–BioNTech (Comirnaty) Sinovac (CoronaVac)	Health workers Older adults	90	76.9	Yes	Yes
Costa Rica	December 2020	AstraZeneca (Vaxzevria) Moderna (mRNA-1273) Pfizer–BioNTech (Comirnaty)	Health workers Older adults Patients with comorbidities Essential workers not in health care	70	81.6	Yes	Yes
Panama	January 2021	AstraZeneca (Vaxzevria) Pfizer–BioNTech (Comirnaty)	Health workers Older adults Patients with comorbidities	70	71.7	Yes	Yes
Peru	February 2021	AstraZeneca (Vaxzevria) China National Biotec Group (BIBP-CorV) Moderna (mRNA-1273) Pfizer–BioNTech (Comirnaty)	Health workers Older adults Patients with comorbidities	80	84.3	Yes	Yes

Source: Table prepared by the authors based on the results of their study.

Information was disseminated through many channels: health care centers, radio stations, print media, television and social media (Table 4).

Vaccination safety was monitored by surveillance for adverse events following immunization (AEFI). AEFI monitoring was done by all countries, yet three countries could not report on the final classification of AEFIs (Table 4). All countries reported that they participated in research projects to generate evidence about vaccination against COVID-19, together with developing observational studies. Clinical trials were carried out in Argentina, Panama and Peru to evaluate the effectiveness of COVID-19 vaccines (Table 4).

During the introduction of COVID-19 vaccines, the recommendations of the country's NITAG were considered very important or important by five of six countries. Four countries had a functional NITAG before the COVID-19 pandemic, and one was created during the pandemic. All NITAGs issued recommendations that were partially or fully accepted by national authorities.

PAHO's collaboration with countries was considered optimal in three countries and excellent in three. The role of PAHO in supporting NITAGs and health authorities by providing evidence was considered crucial by all countries (Table 5).

Weaknesses and strengths were rated using the Likert scale. Weaknesses identified by countries during the introduction of COVID-19 vaccines included actions by antivaccination groups, identified by four countries as having had a moderately negative impact on vaccine introduction and one country as having had a high negative impact. The greatest strengths identified by all the countries were health workers' commitment to delivering vaccines, that decisions were based on evidence, there were plans to introduce the COVID-19 vaccines, the participation of NITAGs in vaccine introduction, the availability of economic resources and actions taken by the Ministry of Health (Table 6).

DISCUSSION

This pioneering study systematically documented the process of COVID-19 vaccine introduction in six Latin American and Caribbean countries. Previous vaccine introduction processes in Latin America have been described as not following a systematic approach but instead being initiated as a political decision that was later supported by scientific evidence (18). The decision-making processes for introducing COVID-19 vaccines in six countries in Latin America and the Caribbean were considered to be technical and political. In the context of a global health crisis, participating countries acknowledged the importance of using scientific evidence and data to inform their policy decisions. It is essential to highlight the need to institutionalize

TABLE 4. Characteristics of the introduction of COVID-19 vaccines, by country, December 2021 to September 2022

Characteristic	Country					
	Argentina	Belize	Brazil	Costa Rica	Panama	Peru
Structure						
EPI creation (year)	1983	1977	1973	1970	1979	1972
Vaccination law introduced (year)	1983	1963	1977	2001	2007	2003
EPI belongs to Ministry of Health	Yes	Yes	Yes	Yes	Yes	Yes
Assured budget for vaccination	Yes	Yes	Yes	Yes	Yes	Yes
Assured budget for health emergencies	NR	NR	Yes	Yes	Yes	Yes
Pandemic management plan	Yes	Yes	Yes	Yes	Yes	Yes
COVID-19 national vaccination plan	Yes	Yes	Yes	Yes	Yes	Yes
COVID-19 national vaccination plan introduced	December 2020	February 2021	December 2020	December 2020	January 2021	October 2020
Decision-making process						
Decision-making type	Technical, political	Technical, political	Technical, political	Technical, political	Technical, political	Technical, political
EPI participates in vaccine introduction	Yes	Yes	Yes	Yes	Yes	No
EPI coordinates vaccinations	Yes	Yes	No	Yes	No	Yes
Decision-making based on scientific evidence	Yes	Yes	Yes	Yes	Yes	Yes
Financing and acquisition of COVID-19 vaccines						
Main financing sources	Government	Government	Government	Government	Government	Government
Economic evaluation of vaccine introduction	Yes	Yes	No	NR	Yes	NR
Vaccine acquisition mechanisms	Direct trading, COVAX Facility, donations	Direct trading, COVAX Facility, donations	Direct trading, COVAX Facility	Direct trading, COVAX Facility, donations	Direct trading, COVAX Facility, donations	Direct trading, COVAX Facility, donations
Local perception of the implementation of COVID-19 vaccination						
Main place vaccinations offered	Health care centers	Health care centers	Health care centers	Health care centers	Health care centers	Health care centers
External staff	Yes	Yes	Yes	Yes	Yes	Yes
Adequate no. of vaccination staff	Yes	Yes	Yes	No	Yes	No
Staff training	Yes	Yes	Yes	Yes	Yes	Yes
Expansion of cold chain	Yes	Yes	Yes	Yes	Yes	Yes
Acquisition of refrigerators	Yes	Yes	Yes	Yes	Yes	Yes
Vaccine wastage	Yes	Yes	Yes	Yes	No	Yes
Problems with multidose vials	Yes	Yes	Yes	Yes	No	Yes
Problems with distribution	Yes	Yes	Yes	Yes	No	No
COVID-19 vaccination information systems						
Prepandemic information system	Yes	Yes	Yes	Yes	Yes	No
Type of information system	Electronic	Electronic	Electronic	Electronic	Electronic	Mixed
System implementation level	National	National	National	National	National	National
Data quality assessment	Yes	Yes	Yes	Yes	Yes	NR
Computer system training	Yes	Yes	Yes	Yes	Yes	Yes
Training frequency	Weekly	Weekly	Weekly	Monthly	NR	NR
Physical and electronic vaccination card	Yes	Yes	No	Yes	Yes	Yes
No. of doses delivered updated on official website	Daily	Daily	Daily	NR	Daily	Daily
Disease burden report	Yes	No	Yes	No	Yes	Yes
Communication about COVID-19 vaccination program						
Communication plan	Yes	Yes	Yes	Yes	Yes	Yes
Main actors in communication plan	National and health authorities, EPI, other experts, NITAG	National and health authorities, EPI, other experts, community leaders	Health authorities, other experts	National and health authorities, EPI, other experts, NITAG, community leaders	National and health authorities, EPI, other experts, NITAG	National and health authorities, EPI, other experts, NITAG, PAHO, WHO, community leaders
Main communication channels	Health care centers, webpage, radio, TV, social media	Health care centers, webpage, radio, TV, social media, home visits	Webpage, radio, social media	Health care centers, social media	Health care centers, webpage, radio, TV, social media	Health care centers, webpage, radio, TV, social media

(Continue)

TABLE 4. (Cont.)

Characteristic	Country					
	Argentina	Belize	Brazil	Costa Rica	Panama	Peru
Communication results	Clear but insufficient	Clear but insufficient	Clear but insufficient	Clear but insufficient	Clear but insufficient	Clear but insufficient
Vaccination information on official website	Yes	Yes	Yes	Yes	Yes	Yes
Vaccine efficacy and safety communication	Yes	Yes	No	Yes	Yes	Yes
Communication strategy evaluation	Yes	Yes	No	Yes	NR	Yes
Management of AEFI						
VAERS	Yes	Yes	Yes	Yes	Yes	Yes
AEFI research team	Yes	Yes	Yes	Yes	Yes	Yes
AEFI causality assessment committee	Yes	Yes	Yes	Yes	Yes	Yes
Final AEFI classification	Yes	NA	Yes	Yes	NA	NA
Notification of severe AEFI	Yes	No	Yes	Yes	No	Yes
AEFI communication plan	Yes	Yes	Yes	Yes	Yes	Yes
Staff training for managing AEFI	Yes	Yes	Yes	Yes	Yes	Yes
Research						
Research participation	Yes	Yes	Yes	Yes	Yes	Yes
Types of studies	Clinical trial, effectiveness, burden of disease	Knowledge, attitudes, practices	Effectiveness	Effectiveness	Clinical trial, burden of disease, and knowledge, attitudes, practices	Clinical trial, burden of disease, and knowledge, attitudes, practices
Support institutions	PAHO, CDC	PAHO	Fiocruz Foundation	PAHO	SENACYT	Government

AEFI: adverse events following immunization; CDC: US Centers for Disease Control and Prevention; COVAX: COVID-19 Vaccines Global Access; EPI: Expanded Programme on Immunization, NA: not applicable; NITAG: national immunization technical advisory group; NR: no response; PAHO: Pan American Health Organization; SENACYT: Secretaría Nacional de Ciencia, Tecnología e Innovación; VAERS: vaccine adverse event reporting system.
Source: Table prepared by the authors based on the results of their study.

TABLE 5. Stakeholders' assessments of collaboration with the national immunization technical advisory group and assessment of contributions by the Pan American Health Organization during the introduction of COVID-19 vaccines, by country, December 2021 to September 2022

Group or organization	Country					
	Argentina	Belize	Brazil	Costa Rica	Panama	Peru
NITAG						
Presence	Yes	No	Yes	Yes	NR	Yes
Year created	2000	2020	1991	2001	NR	2006
Restructured due to pandemic	Yes	Yes	Yes	No	NR	No
No. of participants	1–5	5–10	> 10	5–10	NR	5–10
Meeting registry	Yes	Yes	Yes	Yes	NR	Yes
Provided decision support	Always	Always	Always	Always	NR	Always
Government asked for recommendations	Always	Always	Always	Always	NR	Always
No. of recommendations made during COVID pandemic	> 10	> 10	> 10	> 10	NR	3–5
Recommendations accepted	Totally	Partially	Partially	Totally	NR	Partially
Provide evidence-based recommendations	Yes	Yes	Yes	Yes	NR	Yes
Consensus on decisions	Always	Always	Sometimes	Always	NR	Always
Contributions during the pandemic	Very important	Very important	Very important	Very important	NR	Important
Pan American Health Organization						
Political environment of the country	Stable government	Stable government	Stable government	Stable government	Recent change	Recent change
Role of the office in the country	Optimum	Excellent	Optimum	Optimum	Excellent	Excellent
Support by providing evidence to authorities	Always	Always	Always	Always	Always	Always
Support by providing evidence to NITAG	Always	Always	Always	Always	Always	Always
Type of country decisions	Technical, political	Technical, political	Technical, political	Technical	Technical, political	Technical, political
Use of recommendations from NITAG or WHO SAGE	Always	Always	Always	Always	Always	Always

NITAG: national immunization technical advisory group; NR: no response; SAGE: WHO Strategic Advisory Group of Experts on Immunization.
Source: Table prepared by the authors based on the results of their study.

TABLE 6. Reported weaknesses and strengths of programs to introduce vaccination against COVID-19, by country, December 2021 to September 2022[a]

High impact
Medium impact
Low impact

Weaknesses and strengths	Country					
Weaknesses	Argentina	Belize	Brazil	Costa Rica	Panama	Peru
Antivaccine groups' actions	1.20	3.17	4.00	3.40	3.20	3.29
Access to vaccination services	1.00	1.33	1.89	0.33	0.80	2.86
Political decisions	1.00	0.83	3.30	0.60	0.75	2.86
Vaccine storage	1.00	1.33	1.22	0.67	0.60	3.00
Vaccine cold chain	1.00	1.33	1.50	0.33	0.40	2.86
Information system	1.17	2.17	3.10	1.40	1.40	2.57
Vaccine transportation	0.75	0.83	1.10	0.17	0.40	2.71
Limited scientific evidence	3.00	0.67	2.10	0.67	1.40	3.14
Lack of insulated containers	0.25	0.17	0.75	0.00	0.50	1.50
Lack of syringes	0.75	0.00	1.60	0.33	0.40	0.67
Lack of personnel	0.80	2.67	2.30	0.83	1.20	3.86
Lack of planning for COVID-19 vaccine introduction	0.50	0.50	2.00	0.33	0.40	1.57
Lack of crisis management planning for COVID-19 vaccination	1.00	0.50	2.33	0.50	1.40	2.43
Lack of a vaccine adverse event reporting system	0.17	1.67	1.40	0.20	0.80	1.14
Lack of vaccines	3.17	0.50	2.90	0.83	0.20	2.86
Insufficient funding	0.75	1.33	1.56	0.33	0.33	3.14
Occurrence of adverse events following immunization	1.17	1.50	2.10	0.33	1.50	1.43
Population refusal	1.00	2.83	2.70	1.00	1.40	2.71
Delay in delivery of vaccines procured through COVAX Facility	3.33	1.33	3.17	2.60	2.00	2.67
Delay in delivery of vaccines procured from laboratories	3.67	0.00	2.67	1.60	0.33	2.40
Problems with processes of and coordination with COVAX Facility	2.33	1.33	2.50	3.25	2.00	2.67
Poor dissemination of information to or communication with the population	1.17	2.17	2.90	0.60	1.40	2.86

Low impact
Medium impact
High impact

Strengths						
Acceptance of COVID-19 vaccine by the population	4.67	3.00	3.90	4.00	4.00	4.00
Performance of the country's Ministry of Health	4.33	4.50	2.20	4.83	4.80	4.14
Streamlined vaccine procurement processes	3.67	4.00	2.56	4.33	4.67	3.17
Streamlined process for purchasing inputs	4.25	4.00	3.56	4.00	4.67	3.40
Streamlined process for purchasing services	3.67	4.00	3.88	3.80	4.00	3.67
Adequate leadership and political support	4.50	4.50	3.20	4.67	4.40	3.71
Support from international organizations	3.80	4.50	2.90	4.00	3.75	3.86
Outreach campaigns	3.67	4.00	3.20	4.33	4.20	3.43
Health workers' commitment	4.83	4.50	4.60	5.00	4.80	4.29
Evidence-based technical decisions	4.33	4.00	4.40	4.83	4.80	4.29
Availability of timely data for decision-making	4.50	4.17	3.70	4.67	4.20	3.57
Involvement and participation of other ministries	3.80	4.00	4.11	4.67	3.80	3.00
Mobilization of economic resources	3.67	4.00	4.10	4.17	4.67	4.17
Participation of academia	2.80	2.60	3.00	3.67	4.00	2.43
Involvement of national immunization technical advisory group	4.50	4.00	4.20	5.00	3.80	4.43
Participation of armed forces, police or firefighters	3.50	2.80	4.10	3.67	4.80	3.83
Public participation	3.83	3.17	3.60	3.83	4.20	3.00
Private sector participation	3.00	3.17	3.30	3.67	4.00	3.43
Participation of scientific societies	3.33	2.20	4.10	3.60	3.75	3.00
Participation of civil society (associations, unions, federations, nongovernmental organizations)	2.80	3.33	3.10	3.20	2.50	2.57
Plan for introducing the COVID-19 vaccine	4.33	4.17	4.00	4.50	5.00	4.29
COVID-19 vaccination crisis management plan	3.80	3.50	4.14	4.17	3.50	3.80

COVAX: COVID-19 Vaccines Global Access.
[a] The values in the table reflect scores on a Likert scale. Weaknesses scored 4–5 are categorized as high impact, 2–3 as medium impact and 0–2 as low impact. Strengths scored 4–5 are categorized as low impact, 2–3 as medium impact and 0–2 as high impact.
Source: Table prepared by the authors based on the results of their study.

the use of evidence in decision-making. Scientific evidence facilitates a rapid and efficient response during health crises (20, 21).

The six participating countries mentioned that prior to the introduction of COVID-19 vaccines they had developed national vaccination plans that included guidelines for administering vaccines. This is in line with regional and global recommendations for introducing vaccines (22).

Although each part of the world had different ways of fighting the COVID-19 pandemic, the primary goal of reducing disease burden was common to all countries, and there are similarities and differences in vaccination policies between regions. A common factor for most regions was the formulation of risk-based vaccination plans; however, broad differences were evident in terms of access, delivery and the use of information systems, in which North America, Europe and Asia performed better than Latin America and Africa (14, 23, 24). A study that assessed challenges to introducing COVID-19 vaccines in the Democratic Republic of the Congo reported that successful vaccine introduction depended to a large extent on adequate operational planning (25).

There was variability in the results reported by the six different countries in this study in terms of strengths and weaknesses. Belize, Costa Rica and Panama reported greater strengths and fewer weaknesses, while Brazil and Peru had fewer strengths and more weaknesses. This phenomenon could be explained by the use of a self-assessment questionnaire in this study. Furthermore, there are many different points of view among participants, and there are also many disparities in the structure and characteristics of health systems among countries in the study.

One of the challenges identified by our study was the need to rely on robust EIRs that allow for continual monitoring and evaluation of vaccine performance (26, 27), similar to findings reported by Ariyarajah et al. regarding vaccination delivery in low- and middle-income countries (28).

A plan for health communication is a key element in health crisis management. During the COVID-19 pandemic, countries needed to communicate with all age groups about prevention and control measures and with most age groups for vaccination-related purposes. As described by Zola Matuvanga et al. (25), community leaders and health workers should be considered as key spokespersons in vaccination campaigns, and this was the case in the countries included in this study, where health authorities were the main spokespersons delivering vaccination-related messages to the community through a variety of channels including TV, radio and social media. Previous studies have shown that health authorities' positive attitudes towards vaccines contribute to their acceptance by the population (29, 30).

Strengths reported by countries during the introduction of COVID-19 vaccines include health workers' commitment to delivering vaccines, the implementation of evidence-based decisions, the development of plans to introduce COVID-19 vaccines, as well as the participation of NITAGs, the availability of economic resources and positive actions taken by the Ministry of Health. The main challenges identified included antivaccination groups' actions, problems with the EIR, a lack of vaccines, delays in the delivery of vaccines and a scarcity of health personnel at the local level. These strengths and challenges are similar to those identified in other studies looking at vaccine introduction (18, 31, 32).

Brazil reported the strongest influence of antivaccine groups in our study. Even though the influence of these groups has been known for many years, the impact during the COVID-19 pandemic was greater because of all the erroneous information that was available on social media. This negative stimulus has been common in many countries, and it had a negative impact on vaccine coverage, jeopardizing the well-being of individuals and the collective well-being of the community (28, 29, 33, 34).

To overcome the impact of the actions of antivaccine groups and regardless of social and economic circumstances and the health emergency, efforts and resources must be allocated and dedicated to preserve historic achievements in vaccinating populations, for example the eradication of smallpox in 1980 and the elimination of polio in the Americas in 1994 (35, 36). One of the most powerful strategies to overcome the challenges of antivaccination campaigns is to ensure that communities have confidence in the use of vaccines. This can be achieved by ensuring communities are ready to respond with an appropriate spokesperson to address the misinformation put forward by antivaccine groups (34).

EIRs constitute a means to strengthen national immunization programs and, at the same time, these programs can guarantee the availability of high-quality immunization data to inform decision-making (37, 38). The implementation and use of information systems was a weakness reported by the countries included in this study. It is recommended that these information systems be strengthened to better monitor vaccinations and that strategies are devised to improve vaccination programs (39).

While our study contributes valuable insights into the initial phases of COVID-19 vaccine introduction in six select countries in Latin America and the Caribbean, several limitations must be considered. First, the study's limited regional representation raises concerns about the generalizability of findings to the entire region. Focusing on six countries may not fully capture the diverse array of health care systems, cultural contexts and vaccination infrastructure across the broader region. Additionally, the criteria for country inclusion, based on vaccine introduction and a willingness to participate, introduces potential bias, as omitted countries might have had distinct experiences and challenges that are crucial to come to a comprehensive understanding of regional dynamics.

Temporal limitations also impact the study's scope, as the data collection period from December 2021 to September 2022 covers the initial stages of vaccine introduction. Rapid developments in the landscape of the global pandemic and evolving vaccination strategies beyond this time frame are not accounted for. A longitudinal approach would be necessary to provide a more nuanced understanding of the sustained challenges and adaptations encountered in the dynamic situation of COVID-19 vaccine introduction. Moreover, the nature of our study, relying on questionnaires and stakeholders' perceptions, may not fully capture the multifaceted aspects of vaccine introduction. The inherent subjectivity in stakeholders' assessments and potential biases, such as social desirability or recall, could influence the completeness and accuracy of the reported data. Additionally, stakeholders may emphasize certain aspects of a process or downplay challenges.

Another significant limitation pertains to the incompleteness of the factors explored. While the study primarily focused on legal structures, planning, procurement and challenges related

to vaccine introduction, it did not comprehensively address factors such as public perceptions, community engagement or broader sociopolitical dynamics. A more holistic exploration of these elements is essential to gain a comprehensive understanding of the complexities influencing vaccine introduction in diverse sociocultural contexts. Finally, external factors, such as geopolitical influences, international collaborations and the emergence of new virus variants, which could significantly impact vaccine introduction, were not comprehensively addressed in this study.

Acknowledging these limitations is crucial for interpreting the study's findings, and they underscore the need for future research to delve deeper into the multifaceted challenges and successes of COVID-19 vaccine introduction in the Latin American and Caribbean region.

Conclusions

This study systematically documented the early phases of COVID-19 vaccine introduction in six countries in Latin America and the Caribbean, highlighting that most decisions were based on technical and political approaches. The findings underscore the pivotal role of evidence-based planning and active participation from NITAGs in shaping effective vaccination strategies during a global health crisis. Key challenges included actions by antivaccination groups, deficiencies in EIRs and logistical hurdles at the local level, highlighting areas requiring targeted interventions. The results emphasize the importance of developing robust health communication plans that emphasize community engagement and the transparent dissemination of information, and their contribution to the successful introduction of vaccines. As countries in Latin America and the Caribbean continue navigating the complexities of vaccine introduction, these findings offer timely insights. The challenges identified underscore the need for ongoing research to monitor and adapt vaccination strategies to ensure the resilience of immunization programs in the region during health emergencies.

Based on the comprehensive findings of this study, several key recommendations can be made to inform and enhance the ongoing efforts related to introducing COVID-19 vaccines in the region. First and foremost, there is a critical need to strengthen EIRs by addressing identified deficiencies to ensure robust monitoring, evaluation and data management capabilities. Additionally, targeted interventions should be developed and implemented to counteract the influence of antivaccination groups, and these should focus on community engagement, educational initiatives and transparent communication strategies to build and maintain public trust. Local-level logistical challenges, particularly in areas such as cold chain management, storage and distribution, should be systematically addressed to enhance the overall efficiency of vaccination campaigns. Vital steps to guide policy decisions related to vaccine introduction include emphasizing evidence-based decision-making and institutionalizing the use of scientific data from NITAGs. Furthermore, establishing mechanisms for continual monitoring and adaptation of vaccination strategies, particularly during health emergencies, is essential to ensure the resilience and responsiveness of immunization programs in the dynamic landscape of public health. Incorporating these recommendations into public health practices will contribute to refining and optimizing COVID-19 vaccine introduction processes in the Latin American and Caribbean region.

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Documentación sistemática de la introducción de vacunas contra la COVID-19 en América Latina y el Caribe

RESUMEN

Objetivo. Documentar el proceso de introducción de las vacunas contra la COVID-19 en un algunos países de América Latina y el Caribe, incluidas las enseñanzas extraídas y sus puntos fuertes y débiles, así como las similitudes y diferencias entre los distintos programas.

Métodos. Este estudio descriptivo se basa en una evaluación sistemática del proceso de introducción de las vacunas contra la COVID-19 en Argentina, Belice, Brasil, Costa Rica, Panamá y Perú. Los datos se recopilaron mediante un cuestionario distribuido a las principales partes interesadas. El estudio contó con la participación de un informante de cada uno de los seis países incluidos. El período de estudio fue de diciembre del 2021 a septiembre del 2022.

Resultados. Los países indicaron como puntos fuertes principales el compromiso del personal de atención de salud con la vacunación, la toma de decisiones basada en la evidencia, la formulación de planes para la introducción de las vacunas, la participación de grupos técnicos asesores nacionales sobre inmunización, la disponibilidad de recursos económicos y las medidas favorables adoptadas por respectivos los Ministerios de Salud. Los retos más importantes fueron las acciones de los grupos contrarios a las vacunas, los problemas con los registros electrónicos de vacunación, la falta de vacunas, los retrasos en la entrega de vacunas y la escasez de personal de atención de salud a nivel local.

Conclusiones. Se observó que el compromiso, la participación de múltiples sectores, la disponibilidad de recursos y la planificación de la preparación eran algunos de los puntos fuertes de los países que introdujeron las vacunas contra la COVID-19. Los puntos débiles fueron los intereses de terceros, la falta de sistemas de información y las dificultades para acceder a las vacunas y a los servicios de vacunación. Los países disponen ahora de una oportunidad para mantener las buenas prácticas que propiciaron los puntos fuertes de los procesos y evaluar los puntos débiles identificados a fin de fortalecer los programas de inmunización y prepararse para futuras crisis de salud.

Palabras clave Vacunas contra la COVID-19; inmunización; sistemas de información; toma de decisiones; América Latina.

Documentação sistemática da introdução das vacinas contra a COVID-19 na América Latina e no Caribe

RESUMO

Objetivo. Documentar o processo de introdução da vacina contra a COVID-19 em alguns países da América Latina e do Caribe, incluindo as lições aprendidas e os pontos fortes e fracos, bem como semelhanças e diferenças entre os programas.

Métodos. Este estudo descritivo baseia-se em uma avaliação sistemática do processo de introdução das vacinas contra a COVID-19 na Argentina, em Belize, no Brasil, na Costa Rica, no Panamá e no Peru. Os dados foram coletados por meio de um questionário distribuído às principais partes interessadas. Seis informantes de cada um dos países incluídos participaram do estudo, que foi realizado entre dezembro de 2021 e setembro de 2022.

Resultados. Os principais pontos fortes relatados pelos países foram o comprometimento dos profissionais de saúde com a vacinação, a tomada de decisões baseadas em evidências, o desenvolvimento de planos para a introdução de vacinas, a participação de grupos técnicos assessores nacionais sobre imunização, a disponibilidade de recursos econômicos e ações positivas dos respectivos ministérios da Saúde. Os principais desafios foram as ações de grupos antivacina, problemas com os registros eletrônicos de imunização, a falta de vacinas, atrasos na entrega das vacinas e a escassez de pessoal de saúde em nível local.

Conclusões. O comprometimento, a participação de vários setores, a disponibilidade de recursos e o planejamento de preparação foram alguns dos muitos pontos fortes demonstrados pelos países ao introduzirem as vacinas contra a COVID-19. Entre os pontos fracos estavam os interesses de terceiros, a falta de sistemas de informação e a dificuldade de acesso às vacinas e aos serviços de vacinação. Há uma janela de oportunidade para que os países mantenham as boas práticas que viabilizaram os pontos fortes dos processos e avaliem os pontos fracos identificados a fim de revigorar os programas de imunização e preparar-se para futuras crises sanitárias.

Palavras-chave Vacinas contra COVID-19; imunização; sistemas de informação; tomada de decisões; América Latina.