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## ACCESS BARRIERS THAT AFFECTED INFECTIOUS DISEASE VACCINATION COVERAGE AMONG CHILDREN AGED FIVE YEARS AND YOUNGER IN ECUADOR DURING THE COVID-19 PANDEMIC IN 2020

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**Abstract:** Introduction: The response to the COVID-19 pandemic caused worldwide, interruption of routine immunizations. To understand the barriers to access to routine immunization during the COVID-19 pandemic in the population aged 5 years and younger during 2020, we captured the local experiences of district and area immunization officers in the 24 provinces of the country through a survey. Methodology: The study design has a quantitative approach, descriptive, retrospective cross-sectional and non-experimental design, the instrument to be used is a survey (see Annex 1) which is an adaptation of the National Health and Nutrition Survey of the National Institute of Statistics and Census of Ecuador. Results: Of the 93 responses received, 88 reported some barriers to access to the regular vaccination schedule in the population aged 5 years and younger. The data analysis identified the following causes for not immunizing: closure of health facilities, closure of schools and colleges, lack of population to vaccinate, lack of human talent to vaccinate, health personnel dedicated to the search for cases of COVID-19, health personnel infected with COVID-19, fear declared by the population of contracting COVID-19 by attending health facilities, population that refused the visit of health personnel who were following up on vaccination schedules at home for fear of contracting COVID-19. In addition, it was asked if there was compliance with vaccination campaigns that are executed on a regular basis in years without pandemic and the results were as follows: Vaccination day of the Americas during the year 2020 only 76% of the facilities carried it out, in the vaccination campaign against Influenza developed between the months of October November and December 2020 91% of the facilities complied with it in its entirety; and the training activities (national and international) to achieve the goals in vaccination coverage of regular scheme

during 2020 only 75% of the facilities carried it out. Likewise, a comparative analysis was performed between a year with and without pandemic and there is a significant difference between 2019 and 2020 for Pentavalent vaccine  $F(440) = 2.817$  ( $p = 0.000$ ) and DPT  $F(440) = 4.179$  ( $p < 0.05$ ). In the case of Pentavalent vaccine the average coverages decreased by 12.04% while for DPT vaccine the average coverage at the cantonal level increased in 2020 by 8.25%, i.e. the country suffered from lack of access in routine vaccination with at least one antigen. Conclusion: Respondents reported access barriers regarding routine immunization during 2020. It is concluded that work on the identified critical nodes is needed to strengthen the childhood immunization program, prioritizing health services, logistical support and targeted communication strategies to reinforce routine immunizations during the COVID-19 response.

Keywords: childhood vaccination, pandemic, COVID-19, coronavirus, health systems, access

## INTRODUCTION

Immunization is the safest way in the world to protect children from deadly diseases and is one of the most cost-effective public health interventions, providing benefits for the control and prevention of vaccine-preventable diseases by activating the immune system in preparation for the time of infection (1).

Coronaviruses (nCoVs) are highly diverse, a large family of respiratory viruses that can cause diseases ranging from the common cold to Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), and can cause disease in both humans and animals (2,3).

On December 31, 2019, in Wuhan City, China, an outbreak of a “viral pneumonia” with an epidemiological link was reported in Huanan Market which mainly sells seafood products (4) (2) (5).

On January 30, 2020, the World Health Organization declared the COVID-19 pandemic a public health emergency of international concern (PHEIC).

On March 11, 2020, the World Health Organization (WHO) declared the occurrence of the COVID-19 pandemic, urging all countries to take action and join control efforts in what appears to be the greatest global public health emergency of modern times (2).

The response to the COVID-19 pandemic has caused disruptions in health care services worldwide, including access to routine immunizations. Countries around the world were forced to develop strategies to prevent the spread of the disease, and among the most important measures adopted were the use of masks, social distancing, the application of strict or targeted quarantine measures, and vaccination against Covid-19. Subsequently, some countries decided to close educational and economic activities and health facilities(6).

The coronavirus disease pandemic (COVID-19) affected health systems in the countries of the region and also vaccination coverage in several countries around the world, making it difficult to meet the objectives of the World Health Organization's Global Vaccine Action Plan 2011-2020 (GVAP), which urges all countries to achieve national coverage of  $\geq 90\%$  with all vaccines in the country's national immunization schedule by 2020 (7).

Disruptions in immunization services were widespread in 2020, with the World Health Organization's South-East Asia and Eastern Mediterranean Regions being the hardest hit. As access to health services and vaccination coverage declined, the number of children who did not receive even their first vaccinations increased in all regions. Compared to 2019; 3.5 million children did not receive their first dose of pertussis, tetanus and diphtheria vaccine (DTP-1), while 3 million more children missed their first dose of measles vaccine

In Ecuador, on March 16, the President of the Republic of Ecuador, by means of Executive Decree 1017, declared a sanitary emergency "*state of exception due to public calamity throughout the national territory (...)*". As a result, economic, educational and health activities were affected in our country, as well as vaccination coverage.

In Ecuador in 2018 immunization coverage with BCG was 90%, followed by 3rd dose of Pentavalent with 85%, SRP1 83% and DPT5 64% and in 2019 it was 86%, 85%, 83% and 85% respectively.

Vaccination is an essential health service that should be prioritized for the prevention of communicable diseases, the government through its health policies despite the ongoing COVID-19 pandemic, has the obligation to protect the lives of the child population, through strategies that restore attention to vaccination services, compliance with biosecurity measures, social distancing, supplying health personnel with everything they need, and expanding interventions to reach all children in the most distant communities, ensuring that the application of vaccines against COVID-19 and the regular schedule is carried out in parallel (5).

The consequences of lack of access to routine immunization programs have the potential to be widespread and catastrophic. It is estimated that the lack of routine immunization puts at least 80 million children under one year of age at risk of contracting vaccine-preventable diseases, of which measles is a particular concern.

Previous outbreaks of infectious diseases (including Ebola) were also associated with an increase in cases of vaccine-preventable diseases, such as measles(8).

Worldwide, strategies have been proposed to determine the achievement of vaccination coverage, such as rapid vaccination monitors in the post-pandemic phase, electronic re-

cords, training for caregivers and guaranteeing the supply of biologicals by government agencies in order to verify that coverage is over 95% and thus identify critical areas, supervise and monitor the population that has not received the vaccines and establish the reasons for not being vaccinated(9).

The present research focuses on analyzing how access to regular vaccination schedules to combat infectious diseases has been affected in the population aged five years or less in Ecuador during the COVID-19 pandemic in the year 2020, which may reintroduce preventable diseases that were eradicated and eliminated and affect the morbidity and mortality rate of the child population(10).

## **OVERALL OBJECTIVE**

To determine the barriers to access that affected vaccination coverage against infectious diseases in Ecuador's population of children five years of age and younger during the COVID-19 pandemic in the year 2020.

## **SPECIFIC OBJECTIVES**

1. To identify the vaccination coverage of the regular vaccination schedule and its relationship with the goals planned for the year 2020 in Ecuador.
2. Identify significant differences between coverage for 2019 as a non-pandemic year and 2020 as a COVID-19 pandemic year.
3. To identify issues and activities that interfered with the fulfillment of vaccination goals of the regular schedule based on the analysis of the results of the survey applied to those responsible for vaccination of the MOH at the zonal and district levels, during 2020.
4. Propose mitigation actions based on the critical points that arose during 2020 to achieve optimal coverage and reduce the risk of epidemics in the country.

## **HYPOTHESIS**

The vaccination coverage of the regular vaccination schedule for the population 5 years of age and younger did not reach the planned goals due to problems arising from the COVID-19 pandemic.

## **METHODOLOGY**

### **RESEARCH DESIGN**

This research has a quantitative, descriptive and retrospective cross-sectional approach, which allowed us to determine the access barriers that affected vaccination coverage against infectious diseases in the population of children five years of age or younger in Ecuador during the COVID-19 pandemic in the year 2020.

It is considered descriptive because it will identify and characterize the variables and cross-sectional because it will be carried out in a specific time (year 2020).

### **ETHICAL CONSIDERATIONS**

Due to the absence of confidential information in the databases analyzed, since the databases are anonymized, and because at no time was there any contact with human beings for the development of the present study, approval for its execution by a Human Research Ethics Committee (CEISH) was not required.

A detailed written request was submitted to the Ministry of Public Health, where the objectives of the research and the procedure to be followed were explained. It was emphasized that participation was voluntary and they were informed that the results of the research would be confidential (see Annex 2).

This research work did not violate any of the three universal principles: beneficence, justice and respect for people. The principles of autonomy and reliability were also taken into account with the information provided by those responsible for immunizations.

The data obtained in this study will be submitted to the authorities of the Ministry of Public Health of Ecuador, in order to rethink tactics and strategies that will contribute to improve vaccination coverage in the population pending vaccination.

## POPULATION AND SAMPLE

The vaccinated population and the population that should have been vaccinated were used to calculate the vaccination coverage of the regular vaccination schedule during 2020. A sample was applied to identify the problems encountered during 2020 to reach the vaccination goals of the regular schedule, based on the application of a survey to officials of the Ministry of Health in charge of executing the vaccination plans, these are the zonal and district immunization managers, whose population is 140 and the zonal immunization chiefs, whose population is 9. The population corresponds to the total number of officials responsible for immunizations, who are 149 health professionals. The calculated sample size is 93 officials based on the formula (formula 1) of proportions with known population, at 95% confidence, 5% error and 80% proportion of problems encountered. The sociodemographic characteristics are important in this study because they characterize the members of this study.

$$\text{Formula 1: } n = \frac{NZ^2PQ}{d^2(N-1)+Z^2PQ}$$

Where:

N = population size

Z<sup>2</sup> = confidence level

P = proportion of farms with vaccination problems.

Q = 1 - P

d = error

## VARIABLES

- Variables for calculating coverage: population vaccinated for each vaccine in the regular schedule. Population under 1 year of age, population under 1 year of age, population under 5 years of age.

- Variables for the identification of problems: The following variables were collected from the questionnaire applied: Lack of vaccine distribution, Closure of health facilities, Closure of schools and colleges, Restricted opening hours in health facilities, Lack of equipment for vaccine storage (cold chain equipment), Lack of population to vaccinate, Lack of human talent to vaccinate (not hired), Health personnel dedicated to search for COVID-19 cases, Health personnel infected with COVID-19 and in isolation, Fear declared by the population of catching COVID-19 by attending health facilities to comply with the vaccination, Population refusing the visit of health personnel who were following up on vaccination schedules at home and shortage of biologicals at the national level due to the closure of borders, airports and customs, Provinces and Cantons, Was the vaccination day of the Americas carried out as it is done every year?, Did the Influenza vaccination campaign take place between the months of October, November and December 2020, Did any campaign to recover regular vaccination coverage during 2020, Did any training activities (national and international) take place to achieve the goals in regular vaccination coverage during 2020, Did regular vaccination promotion activities take place in your district/area during 2020, Did any regular vaccination promotion activities take place in your district/area during 2020, Did any regular vaccination coverage campaign take place during 2020, Did any training activities (national and international) take place to achieve the goals in regular vaccination coverage during 2020, Did any regular vaccination promotion acti-



vities take place in your district/area during 2020, Did any regular vaccination promotion activities take place in your district/area during 2020, Did any regular vaccination promotion activities take place in your district/area during 2020.

## **MEASURING INSTRUMENTS AND TECHNIQUES**

The instrument used was a survey (see Annex 1) that was adapted from the National Health and Nutrition Survey (ENSANUT) of the National Institute of Statistics and Census of Ecuador and is a statistical study tool that is aimed at those responsible for zonal and district immunizations, the format of the questions posed to collect are the frequencies of problems encountered and the frequency of the event during the year. A database will be created using the excel tool with population data as denominator and data of doses applied as numerator, disaggregated by province and cantons, significant differences will be identified between the coverage of the years 2019 as a year without pandemic and 2020 as year with pandemic COVID-19 and also the vaccination coverage of the regular scheme and its relation with the planned goals in 2020 in Ecuador will be identified.

## **PROCEDURES**

The survey was applied by e-mail and served to meet the specific objective of identifying issues and activities that interfered with the fulfillment of vaccination goals of the regular vaccination schedule based on the analysis of the results of the survey applied to those responsible for vaccination of the MOH at the zonal and district levels during 2020. The most frequent problems that occurred in 2020 and in the territory will be identified, in addition to knowing if the annual vaccination was carried out on a daily basis.

## **STATISTICAL ANALYSIS**

This is a quantitative data analysis based on vaccination coverage data in the regular schedule for each of the vaccines that Ecuador has and applies to the population aged 5 years or younger. The first stage of the analysis consists of a description, based on measures of central tendency and dispersion, of both vaccination coverage and the results of the survey applied to those responsible for vaccination in the country at the national level. The bivariate analysis of the data will allow identifying if there are significant differences in vaccination coverage when comparing years with and without pandemic (if the data come from normal distributions, ANOVA will be applied). The calculations and analysis will be developed and processed in excel and SPSS version 22 and google forms for the application and consolidation of the survey.

## **RESULTS**

In this section, the results of the respondents and the statistical analysis of vaccination coverage data are presented:

### **DEMOGRAPHIC CHARACTERISTICS OF THE SAMPLE**

The following table describes the demographic characteristics of the survey sample.

The people who provided information through the survey are mostly women (81% of the sample), the same who work (90%) in Districts as vaccination managers and 71% consider themselves to be of mixed race. Of the 93 surveyed, 40% have provisional appointments, 45% have occasional contracts and only 15% have permanent appointments.

The average age is 38.5, with a mode of 38.0 and a standard deviation of 9.3.

CHARACTERISTICS	CATEGORIES	n	%
Sex	Female	75	81%
	Male	18	19%
Level where you work	District	84	90%
	Zone	9	10%
Area	Urbana	40	43%
	Rural	53	57%
Type of contract	Occasional Contract	42	45%
	Definitive Appointment	14	15%
	Provisional Appointment	37	40%
Ethnic Self-Identification	Afro-Ecuadorian	5	5,4%
	Indigenous	15	16,1%
	Mongrel	66	71,0%
	Montubio	7	7,5%
	AVERAGE	FASHION	DESV. STD
Age	38,5	38,0	9,3

Tabla 1. Demographic characteristics of the sample.

Source: Survey on barriers to access to vaccination in the population aged 5 years and younger during 2020. (Annex 1)

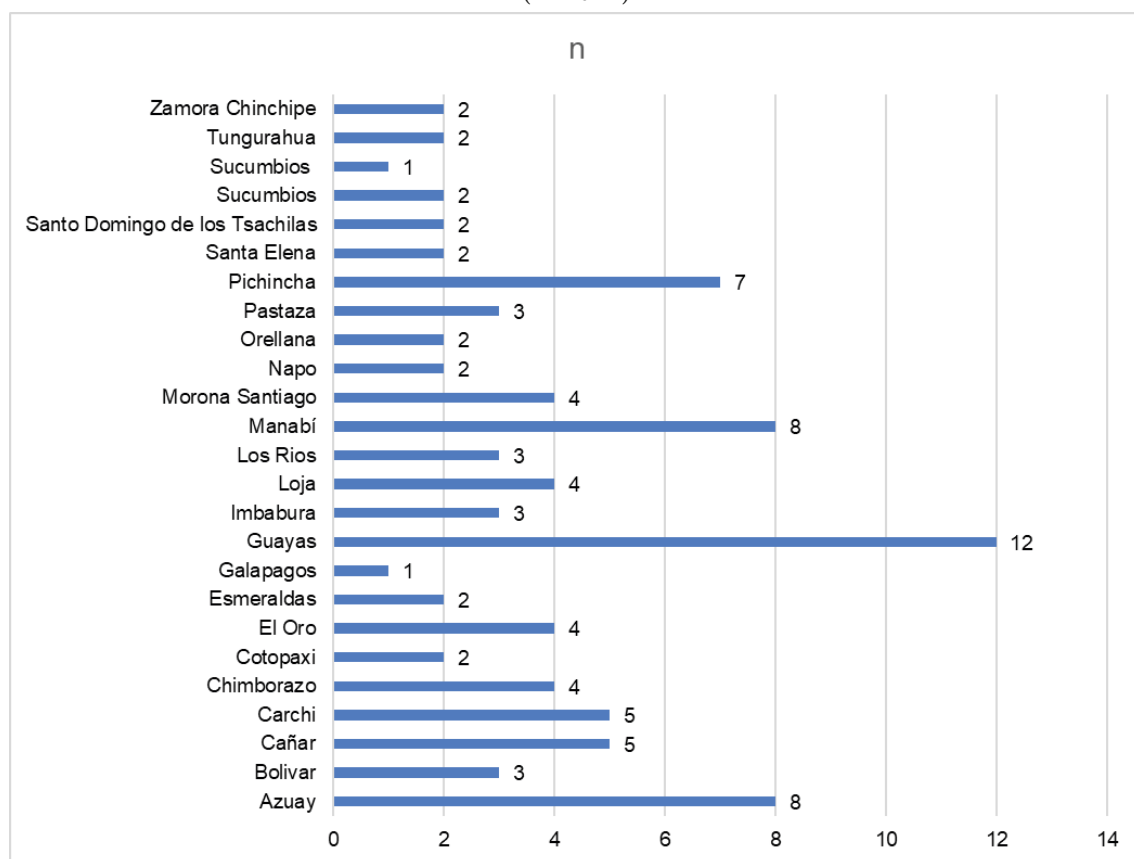


Figura 1. Respondents by province

Source: Survey on barriers to access to vaccination in the population aged 5 years and younger during 2020. (Annex 1)

# DISTRIBUTION OF SURVEYED PERSONS BY PROVINCE

According to the organizational scheme of the Ministry of Public Health, this institution has a deconcentrated model comprised of 9 Zones and 140 districts.

Generally the districts are located in each canton, the information for this research comes from 93 districts located in the 24 provinces of the country and 23.9% corresponds to rural parishes and 76.1% to urban parishes. With the highest number of people surveyed in the province of Guayas, followed by the provinces of Manabí and Azuay with 8 districts that were surveyed. The 93 districts correspond to 93 different cantons of the country.

The following graph shows the distribution of respondents by province:

# IMMUNIZATION COVERAGE OF THE REGULAR VACCINATION SCHEDULE AND ITS RELATION WITH THE PLANNED GOALS FOR THE YEAR 2020

Below is a comparison of the vaccination coverage planned by those responsible for immunizations versus those achieved during the year 2020.

Age range	Vaccine	2020	
		Planned	Reached
Less than 1 year old	BCG	100,0	80,7
	HB ZERO	100,0	61,7
	ROTAVIRUS 2D	100,0	75,6
	ANTIPOLIO 3D	100,0	73,1
	3D PEEK	100,0	75,7
12 to 23 months	SRP 1 D	100,0	81,0
	SRP 2D	100,0	70,9
	YELLOW FEVER	100,0	80,2
	VARICELA	100,0	78,6
	OPV 4D	100,0	70,0
	4D DPT	100,0	75,8
5 years	OPV 5D	100,0	67,7
	DPT 5D	100,0	96,2

Tabla 2. Comparison of planned vs. achieved vaccination coverage during 2020.

Source: Immunization 2020 databases

As can be seen, the planned vaccination coverage was not achieved during the year 2020 and this research study was conducted to identify the reasons for obtaining a goal of less than 100%.

# REASONS STATED FOR OBTAINING A GOAL OF LESS THAN 100%

The reasons stated by those responsible for immunizations according to their perspectives in their districts for obtaining goal lower than 100% were the following:

The objectives stated by the respondents to obtain goal less than 100% were as follows:

- Closure of health facilities, which corresponds to 57%.
- Closures of schools and colleges corresponding to 91%.
- Lack of population to vaccinate which corresponds to 51%.
- Lack of human talent to vaccinate (not contracted), which corresponds to 56%.
- Health personnel dedicated to the search for COVID-19 cases, which corresponds to 63%.
- Health personnel infected with COVID-19 and in isolation, which corresponds to 76%.
- Fear declared by the population of contracting COVID-19 due to attending health facilities to comply with the vaccination, which corresponds to 83%.
- Population that refused the visit of health personnel who were following up vaccination schedules at home for fear of contracting COVID-19, which corresponds to 69%.

They also stated that there were problems with: Lack of biosecurity equipment with 44%, followed by lack of support from authorities with 32% and lack of transportation with 32%.

In order to identify whether vaccination activities were carried out in accordance with annual programs established to achieve epidemiologically acceptable coverage, we inquired about the development of periodic activities carried out in years when there were no pandemics. The results were as follows:



Motive	Frequency	n	%
<b>Lack of vaccine distribution?</b>	NEVER	21	24%
	RARELY FREQUENT	43	49%
	REGULAR	19	22%
	VERY FREQUENT	5	6%
<b>Closure of health facilities?</b>	NEVER	5	6%
	RARELY FREQUENT	26	30%
	REGULAR	50	57%
	VERY FREQUENT	7	8%
<b>Closing of schools and colleges?</b>	NEVER	0	0%
	RARELY FREQUENT	2	2%
	REGULAR	6	7%
	VERY FREQUENT	80	91%
<b>Lack of vaccine storage equipment (cold chain equipment)?</b>	NEVER	8	9%
	RARELY FREQUENT	45	51%
	REGULAR	31	35%
	VERY FREQUENT	4	5%
<b>Lack of population to vaccinate?</b>	NEVER	2	2%
	RARELY FREQUENT	3	3%
	REGULAR	45	51%
	VERY FREQUENT	38	43%
<b>Lack of human talent to vaccinate (not hired)?</b>	NEVER	0	0%
	RARELY FREQUENT	1	1%
	REGULAR	38	43%
	VERY FREQUENT	49	56%
<b>Health personnel engaged in COVID-19 case-finding?</b>	NEVER	0	0%
	RARELY FREQUENT	4	5%
	REGULAR	29	33%
	VERY FREQUENT	55	63%
<b>Health personnel infected with COVID-19 and in isolation?</b>	NEVER	0	0%
	RARELY FREQUENT	1	1%
	REGULAR	20	23%
	VERY FREQUENT	67	76%
<b>Is the population afraid of catching COVID-19 because of going to health facilities for vaccination?</b>	NEVER	0	0%
	RARELY FREQUENT	0	0%
	REGULAR	15	17%
	VERY FREQUENT	73	83%
<b>Population that refused the visit of health personnel who were doing follow-up of vaccination schedules in homes for fear of contracting COVID-19?</b>	NEVER	0	0%
	RARELY FREQUENT	2	2%
	REGULAR	25	28%
	VERY FREQUENT	61	69%
<b>Shortage of biologicals at the national level due to border, airport and customs closures?</b>	NEVER	1	1%
	RARELY FREQUENT	50	57%
	REGULAR	27	31%
	VERY FREQUENT	10	11%

Tabla 3. Reasons stated for obtaining a goal of less than 100%.

Source: Survey on barriers to access to vaccination in the population aged 5 years and younger during 2020. (Annex 1)

VACCINE	YEAR	N	Media	Standard deviation	Mean standard error	Diff. Average	% of Diff
BCG	2019	221	53,8149	44,94810	3,02354	-1,8887	-3,51%
	2020	221	55,7036	42,71895	2,87359		
PENTA	2019	221	85,9842	18,26836	1,22886	10,3493	12,04%
	2020	221	75,6348	15,51614	1,04373		
SRP	2019	221	84,5425	18,53144	1,24656	-0,9810	-1,16%
	2020	221	85,5235	17,44928	1,17377		
CFW	2019	221	87,0484	34,97764	2,35285	-7,1805	-8,25%
	2020	221	94,2290	37,27646	2,50749		

Tabla 5. Average immunization coverage.

Source: Immunization Databases 2019 and 2020.

## ANNUAL PERIODIC ACTIVITIES CARRIED OUT DURING 2020

In addition, data was collected on compliance with the annual periodic activities carried out in 2020.

Activity	Category	n	%
Did the 2020 Vaccination Day of the Americas take place every year?	YES	71	76%
	NO	22	24%
Did the Influenza vaccination campaign take place between the months of October, November and December 2020?	YES	85	91%
	NO	8	9%
Was there any campaign to recover regular vaccination coverage during 2020?	YES	22	24%
	NO	69	74%
	DOES NOT KNOW	2	2%
Have training activities (national and international) been developed to achieve the goals of regular vaccination coverage during 2020?	YES	70	75%
	NO	23	25%
Were regular schedule vaccination promotion activities carried out in your district/area during 2020?	YES	38	41%
	NO	50	54%
	DOES NOT KNOW	1	1%

Tabla 4. Annual periodic activities carried out during 2020.

Source: Survey on barriers to access to vaccination in the population aged 5 years and younger during 2020. (Annex 1)

Despite the COVID-19 pandemic, the most frequently performed annual recurring activities during 2020 are as follows:

- Vaccination journey of the Americas during the year 2020 which corresponds to 76%.
- Influenza vaccination campaign during the months of October, November and December 2020, which corresponds to 91%.
- Training activities (national and international) to achieve the goals in vaccination coverage of the regular vaccination schedule during 2020, which corresponds to 75%.

## STATISTICAL ANALYSIS OF VACCINATION COVERAGE

Multivariate analysis of the data allowed us to identify whether there are significant differences in the average vaccine coverage for each of the age groups.

The difference in coverage averages in the year at the cantonal level reveals that there is a significant difference between 2019 and 2020 for Pentavalent F(440) = 2,817 (p = 0.000) and DPT F(440) = 4,179 (p < 0.05). In the case of Pentavalent vaccine the average coverages decreased by 12.04% while for DPT vaccine the average coverage at the cantonal level increased in 2020 by 8.25%.

Vaccination coverage for BCG and MMR vaccines did not show significant differences at the cantonal level. This is shown in the following statistical analysis:

IAN-DEC										
No.	COMPONENT	PROJECT	ACTIVITY	PRODUCT	START DATE	FINAL DATE	RESPONSIBLE AREA AND CO-RESPONSIBLE	GOAL FOR PERIOD IAN-DEC (GAP PLUS PRIOR YEAR)		
								EXECUTED	COMPLIANCE	
1	Vaccination	Unit of analysis of slopes to be vaccinated by age group and type of vaccine.	Intensify vaccination in hospitals, health facilities and house-to-house strategy.	Epidemiologically acceptable coverage	January 1	Dec 31	Directors of health units, responsible for immunization, epidemiology and statistics.	-	-	-100%
									-	-100%
									-	-100%
2	Organization, planning and coordination	Logistics	Articulation Ministry of Inclusion	District Child Development Centers and Creciendo con Nuestros Hijos (Growing Up with Our Children)	January 1	Dec 31	immunization team of zonal, district and health facilities of the ministry of public health, ministry of education and ministry of social inclusion	-	-	-100%
									-	-100%
									-	-100%
		Programming	Articulation with the Ministry of Education	Educational units	January 1	Dec 31	Zonal, district and health facility immunization team of the Ministry of Public Health	-	-	-100%
									-	-100%
									-	-100%
		Tactical vaccination selection	Trained personnel for the intervention of the emergency plan.	January 1	Dec 31	District and health facility immunization manager	-	-	-100%	
								-	-100%	
								-	-100%	
		Schedules with daily goals and assigned brigades on a monthly and weekly basis	Number of doses applied in relation to assigned target, daily monitoring	January 1	Dec 31	District and health facility immunization manager	-	-	-100%	
								-	-100%	
								-	-100%	

3	Cold chain	Coordination with administrative personnel responsible for the custody of zonal-district vaccine banks. Coordination with those responsible for cold chain management in health facilities.	Weekly contingency plan in the context of COVID 19	On-site vaccination with priority search for children close to missing immunizations	January 1	Dec 31	District and health facility immunization manager	-	-	-100%
		Daily monitoring of cold chain equipment in good working order	Correct operation of cold chain	January 1	Dec 31	District and facility managers and vaccine bank managers	-	-	-100%	
		Monitoring of surveillance of cold chain breakage notification reports	Compliance with standards	January 1	Dec 31	Immunization officers of zones, districts, health facilities and vaccine banks.	-	-	-100%	
4	Supply	monitoring of vaccine balances	Quantity of biologicals per district, expiration date, scenarios, regular and late schedule, pending vaccinations	Good use of biologics, intensive vaccination	January 1	Dec 31	Vaccine bank manager	-	-	-100%
5	Information system	Analysis of current situation	100% of daily reports filled out correctly	Health personnel with correct use of the daily report	January 1	Dec 31	Responsible for statistics - directors of health units - responsible for local immunizations	-	-	-100%
		progress report on goals achieved	excellent data quality	January 1	Dec 31	Area and district statistics manager	-	-	-100%	
6	Monitoring and supervision	Supervisions performed	check list application	assessment of implementation and compliance of immunization components	January 1	Dec 31	Zonal and district immunization manager	-	-	-100%
7	Communication	Socializations	75% of users informed about the vaccination schedule attending the health facility	population informed about the importance of vaccination	January 1	Dec 31	District - zone - district - health facilities promotion manager	-	-	-100%

Tabla 7. Action plan for achieving acceptable vaccination coverage  
 Source: own elaboration

VACCINES	F	gl	Sig. (bilateral)
BCG	1,023	440	,651
PENTAVALENT	2,817	440	,000
SRP	,049	440	,567
CFW	4,179	440	,037

Tabla 6. Test of differences in means of cantonal coverages between 2019 and 2020.

Source: Immunization Databases 2019 and 2020.

### ACTION PLAN FOR ACHIEVING ACCEPTABLE VACCINATION COVERAGE

In order to achieve acceptable vaccination coverage and reduce the risk of epidemics in Ecuador, the following action plan has been developed, which can be adapted according to the social context, epidemiological profile and type of population to be vaccinated:

### DISCUSSION

In Ecuador, since the introduction of compulsory vaccination in 1997, immunization coverage has progressively increased, with good results(11).

However, during the 2020 COVID-19 pandemic, there were problems in accessing regular schedule vaccination that led to delays in vaccine delivery. Reduced routine immunization coverage can be a serious, life-threatening problem for the unvaccinated and under-vaccinated. The pandemic is a stark reminder of how quickly an outbreak can spread without a vaccine to protect us. Disseminating accurate information and stopping the spread of misinformation is important to ensure that all children are protected with life-saving vaccines, as well as seeking to immunize children in the event of missed appointments. At any time and on any occasion, it is important to reinforce the value of vaccination to prevent vaccine-preventable diseases.

A retrospective study using data from a network of family medicine clinics in Ontario Canada found that routine childhood immu-

nization coverage rates in children under 2 years of age declined significantly in the early months of the COVID-19 pandemic, especially in children 15 and 18 months of age. Coverage rates recovered in the second half of 2020, but remained lower overall compared with pre-pandemic rates; this is comparable with the results of this study as 94% of respondents responsible for immunization in districts and zones reported difficulty in achieving acceptable immunization coverage in the childhood population during the COVID-19 pandemic during 2020 (95).

In a systematic review in twelve countries investigating thirteen vaccines, which investigated factors affecting vaccine uptake in children aged 5 years and younger, the results indicated that, to improve uptake, communications to parents should address concerns about vaccines causing adverse effects and focus on children’s susceptibility to disease, in addition to promoting the belief that the vaccine is effective in times of pandemic and non-pandemic. Increasing parental awareness of the vaccination schedule and ensuring that all health care providers recommend vaccination may also increase uptake. More research on the influence of different sources of information is needed to determine how best to disseminate information to parents(96). One possible explanation is that parents’ distrust of information causes them to seek information from multiple sources, including the Internet and social networks. Unfortunately, many websites perpetuate the “myths” of vaccines, misinforming parents, causing fear and influencing barriers to access vaccination, this is comparable to one of the reasons for problems of access to vaccination in which 83% of those responsible for immunizations in the zones and districts stated that the population was afraid of catching COVID-19 for attending Health facilities to comply with vaccination.



In this study 94% of respondents responsible for immunization in districts and zones during the 2020 COVID-19 pandemic reported barriers to accessing regular schedule vaccination in the population aged 5 years and younger. This is comparable to a WHO Pulse survey addressing the continuity of essential health services during the COVID-19 pandemic as of July 2020 where respondents from 91 countries in five WHO regions were to report interruptions in immunization services as none, partial, or severe. Disruptions in outreach immunization services were reported in 70% of countries (severe disruption in 18%) and in facility-based services in 61% (severe disruption in 10%) (8).

In our study, the reasons stated for obtaining a goal lower than 100% were the closure of health facilities, school and college closures, lack of population to vaccinate, lack of human talent to vaccinate, health personnel dedicated to the search for cases of COVID-19, health personnel infected with COVID-19 and in isolation, fear declared by the population of contracting COVID-19 for attending health facilities to comply with the vaccination, population refusing visits by health personnel who were following up vaccination schedules at home for fear of contracting COVID-19, this is comparable to the results of the Rebecca Harris study published in April 2021 in which the access barriers that affected vaccination were fear of infection, movement/travel restrictions and limited access to medical care. These were also the most frequently cited reasons, reported by 100%, 88% and 76% of countries, respectively. Supply chain disruption and affordability problems were the two lowest ranked causes(97). And it is also comparable to a study conducted by the Italian Society of Pediatrics through which conducted a survey among Italian families on the vaccination of children during the period of confinement, whereby families were asked

whether they have decided to vaccinate their children during confinement. More than one third (34%) of them, skipped the vaccination appointment. The reasons for barriers to vaccination access varied. Families reported that they had their children unimmunized because vaccination services postponed the appointment (42.5%) or were closed to the public (13.5%). Some parents (44%) were reluctant to leave home because of movement restrictions, lack of information, such as availability to book the child's immunization appointment and knowledge of preventive measures taken, or because they feared COVID-19 virus infection. The reasons for missed vaccination appointments were investigated. In 46% of cases, families reported not having received sufficient information about national and local preventive measures, including physical distancing, hand washing, and proper coughing/sneezing hygiene. As a result, they felt overwhelmed by concerns about immunization in the close period.

In this study there is significant difference between 2019 and 2020 for Pentavalent vaccine  $F(440) = 2.817$  ( $p = 0.000$ ) and DPT  $F(440) = 4.179$  ( $p < 0.05$ ). In the case of Pentavalent vaccine the average coverages decreased by 12.04% while for DPT vaccine the average coverage at the cantonal level increased in 2020 by 8.25%, this is comparable to a study conducted in Asia where the results showed that eighteen (95%) of the 19 participating countries reported interruptions in routine vaccination with at least one antigen(97). Furthermore, it is important to compare with a study conducted in Ecuador in 2020, where maintaining massive vaccination coverage with at least one selected antigen achieves innate immunity trained for resistance against infectious diseases(98).

Of the respondents responsible for immunization in the districts and areas that reported barriers to access to regular schedule vaccina-

tion, 57% were from rural parishes, comparable to a study in Pakistan that showed a higher incidence in rural populations followed by urban slums. These results highlight the risks of overlooking important variations in summarizing disruptions at the regional level and demonstrate the need for appropriate tailored data and solutions at the national or even sub-national level. The variations in COVID-19 impact by age, national income category and within countries revealed by our study provide indicators for specific actions(99).

The limitations of this study include reliance on surveys, a limitation shared by other surveys on this topic. And one of the strengths is that the vaccination coverage databases correspond to official data from the Health Authority. The geographic scope is broad, reaching all 24 provinces of the country.

## CONCLUSIONS

In the comparative analysis of planned vaccination coverage versus vaccination coverage achieved in Ecuador during 2020, it can be seen that the planned vaccination coverage was not achieved for any biological product.

In the survey conducted among those responsible for immunizations in the zones and districts, it was found that the most frequent causes for reaching the goal of less than 100% during 2020 were: closure of health facilities, closure of schools and colleges, lack of population to vaccinate, lack of human talent to vaccinate, health personnel dedicated to search for cases of COVID-19, health personnel infected with COVID-19, fear declared by the population of contracting COVID-19 by attending health facilities, population refusing the visit of health personnel who were following up vaccination schedules at homes for fear of contracting COVID-19.

The survey identified that the goals proposed in the following vaccination activities were not met: vaccination campaign of the

Americas during 2020 with 76%, vaccination campaign against Influenza between the months of October, November and December 2020 with 91%, training activities (national and international) to achieve the goals in vaccination coverage of regular vaccination schedule during 2020 with 75%.

In the years 2019 (year without pandemic) and 2020 (year with pandemic) a significant difference was found for Pentavalent vaccine  $F(440) = 2.817$  ( $p = 0.000$ ) and DPT  $F(440) = 4.179$  ( $p < 0.05$ ). In the case of Pentavalent vaccine, the average coverage decreased by 12.04% while for DPT vaccine the average coverage at cantonal level increased in 2020 by 8.25%, i.e. the country suffered from lack of access to routine vaccination with at least one antigen.

Based on the findings described above, an action plan was drawn up to achieve acceptable vaccination coverage during epidemics and prevent the population from becoming vulnerable to immunopreventable diseases.

It is important for the Ministry of Public Health to focus on developing alternative and innovative strategies to overcome or circumvent the lack of access in the provision of immunization services in a way that is flexible enough to adapt quickly to the evolving situation, thus avoiding the suspension of key immunization programs or services.

There is a need to assess the risk of the likelihood of vaccine-preventable disease outbreaks along with current COVID-19 transmission and communicate overall efforts that explain the safety measures in place, combined with the message that vaccination is important and saves lives, pandemic or no pandemic.

It is essential to monitor barriers to access to routine vaccination and better understand the reasons for interruptions to inform local programs in order to implement strategies to recover vaccination coverage in a timely manner.

Strategies in these settings may also need to focus on greater community engagement to improve uptake and access to immunization. Accurate and up-to-date advice can be provided using more user-friendly approaches, for example, through social media, given the

importance of accurate online messaging during the pandemic. Effective communication strategies would serve to address misinformation, which, unfortunately, has been a global concern during the pandemic.

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## ANEXO 1

### ANNEX 1. SURVEY FORM

Encuesta sobre problemas de acceso a la vacunación en la población de ... <https://docs.google.com/forms/d/1sdrHEznHsLwlt9Dkz6bWWb4ztmd...>

#### Encuesta sobre problemas de acceso a la vacunación en la población de 5 años y menos durante el año 2020

*\*Obligatorio*

1. Provincia donde trabaja

\_\_\_\_\_

2. Cantón donde trabaja

\_\_\_\_\_

3. Nivel donde trabaja

*Marca solo un óvalo.*

- ☐ Zona  
☐ Distrito

4. Tipo de contrato

*Marca solo un óvalo.*

- ☐ Contrato ocasional  
☐ Nombramiento provisional  
☐ Nombramiento definitivo

## 5. Sexo

*Marca solo un óvalo.*

☐ Femenino

☐ Masculino

## 6. Edad

---

## 7. Nivel de instrucción

*Marca solo un óvalo.*

☐ Inicial

☐ Básica

☐ Bachillerato

☐ Superior

## 8. Autoidentificación

*Marca solo un óvalo.*

☐ Afroecuatoriano

☐ Mestizo

☐ Indígena

☐ Montubio

☐ Negro

☐ Blanco

☐ Mulato

9. ¿Ud alcanza la meta planificada de vacunación de esquema regular para su distrito u zona durante el año 2020? \*

*Marca solo un óvalo.*

- ☐ Si      *Salta a la pregunta 22*  
☐ No      *Salta a la pregunta 10*

¿Cuál de los siguientes temas, se suscitaron en el distrito o zona que usted coordina o dirige, respecto a las actividades de vacunación con el esquema regular durante el año 2020 que no permitieron alcanzar las coberturas de vacunación esperada? (marque todos los que considere):

10. ¿Falta de distribución de vacunas? \*

*Marca solo un óvalo.*

- ☐ NUNCA  
☐ POCO FRECUENTE  
☐ REGULAR  
☐ MUY FRECUENTE

11. ¿Cierre de establecimientos de salud ? \*

*Marca solo un óvalo.*

- ☐ NUNCA  
☐ POCO FRECUENTE  
☐ REGULAR  
☐ MUY FRECUENTE



## 12. ¿Cierre de escuelas y colegios? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

## 13. ¿Falta de equipos para almacenamiento de vacunas (equipos de cadena de frío)? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

## 14. ¿Falta de población para vacunar? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

15. ¿Falta de talento humano para vacunar (no contratado)? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

16. ¿Personal de salud dedicado a la búsqueda de casos de COVID-19? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

17. ¿Personal de salud contagiado con COVID-19 y en aislamiento? \*

*Marca solo un óvalo.*

- ☐ NUNCA
- ☐ POCO FRECUENTE
- ☐ REGULAR
- ☐ MUY FRECUENTE

18. ¿Miedo declarado por la población de contagiarse de COVID-19 por asistir a los establecimientos de Salud para cumplir con la vacunación? \*

*Marca solo un óvalo.*

- ☐ NUNCA  
☐ POCO FRECUENTE  
☐ REGULAR  
☐ MUY FRECUENTE

19. ¿Población que rechazaba la visita del personal de salud que estaba haciendo seguimiento de esquemas de vacunación en domicilios por miedo de contagiarse de COVID-19? \*

*Marca solo un óvalo.*

- ☐ NUNCA  
☐ POCO FRECUENTE  
☐ REGULAR  
☐ MUY FRECUENTE

20. ¿Escasez de biológicos a nivel nacional por el cierre de fronteras, aeropuertos y aduanas? \*

*Marca solo un óvalo.*

- ☐ NUNCA  
☐ POCO FRECUENTE  
☐ REGULAR  
☐ MUY FRECUENTE

21. Otra, ¿cuál?

---

Durante el año 2020 se llevaron a cabo actividades de vacunación extraordinarias como

22. ¿Se desarrolló la jornada de vacunación de las Américas que se realiza cada año durante el año 2020? \*

*Marca solo un óvalo.*

- ☐ SI
- ☐ NO
- ☐ NO SABE

23. ¿Se desarrolló la campaña de vacunación contra la Influenza entre los meses de octubre noviembre y diciembre de 2020? \*

*Marca solo un óvalo.*

- ☐ SI
- ☐ NO
- ☐ NO SABE

24. ¿Se desarrolló alguna campaña de recuperación de coberturas de vacunación de esquema regular durante el 2020? \*

*Marca solo un óvalo.*

- ☐ SI
- ☐ NO
- ☐ NO SABE

25. ¿Se desarrollaron actividades de capacitación (nacional e internacional) para alcanzar las metas en coberturas de vacunación de esquema regular durante el 2020? \*

*Marca solo un óvalo.*

- ☐ SI  
☐ NO  
☐ NO SABE

26. ¿Se desarrollaron actividades de promoción de vacunación de esquema regular en su distrito/zona durante el año 2020? \*

*Marca solo un óvalo.*

- ☐ SI  
☐ NO  
☐ NO SABE

---

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Google Formularios



## ANNEX 2. LETTER OF AUTHORIZATION FOR USE OF DATA AND PERMISSION TO CONDUCT THE SURVEY

MINISTERIO DE SALUD PÚBLICA

Subsecretaría Nacional de Vigilancia de la Salud Pública  
Dirección Nacional de Estrategias de Prevención y Control

Oficio Nro. MSP-DNEPC-2022-0003-O

Quito, D.M., 30 de junio de 2022

**Asunto:** SOLICITUD DE DATOS DE COBERTURAS DE VACUNACIÓN 2019 Y 2020 Y AUTORIZACIÓN PARA APLICAR ENCUESTA AL PERSONAL RESPONSABLE DE INMUNIZACIONES DE LOS DISTRITOS Y ZONAS EN LOS PROGRAMAS DE INMUNIZACIONES RUTINARIAS EN EL ECUADOR.

Dr. Inocente Franklin Bajaña Loor  
En su Despacho

Reciba un cordial saludo, en virtud de que me encuentro realizando mi trabajo de grado con el tema "Problemas de acceso que afectaron la vacunación contra enfermedades infecciosas en la población infantil de cinco o menos años en Ecuador durante la pandemia COVID-19 en el año 2020" con la finalidad de obtener mi Título de Master en Salud Pública en la Universidad Internacional Iberoamericana y en la Universidad Europea del Atlántico.

Con este antecedente solicito comedidamente los datos anonimizados de coberturas de vacunación del país correspondiente a los años 2019 y 2020 con la finalidad de desarrollar los datos para la investigación, adicionalmente solicito la autorización para levantar una encuesta al personal responsable de inmunizaciones de los distritos y coordinaciones zonales.

Por la atención al presente anticipo mis agradecimientos.

Atentamente,



Md. Jackson Robert Rivas Condo  
CI. 0926474164  
CIUDADANO

jr

Dirección: Av. Quitumbe Ñan y Amaru Ñan. Código Postal: 170146 / Quito Ecuador  
Teléfono: 593-2-3814-400 - [www.salud.gob.ec](http://www.salud.gob.ec)



Futuro

Lenin

1/1

# ANNEX 3. RESPONSE TO LETTER OF AUTHORIZATION FOR USE OF DATA AND PERMISSION TO CONDUCT A SURVEY

MINISTERIO DE SALUD PÚBLICA

Subsecretaría Nacional de Vigilancia de la Salud Pública  
Dirección Nacional de Estrategias de Prevención y Control

Oficio Nro. MSP-DNEPC-2022-0045-O

Quito, D.M., 26 de julio de 2022

**Asunto:** RESPUESTA A SOLICITUD CIUDADANA SOBRE REQUERIMIENTO DATOS DE COBERTURAS DE VACUNACIÓN 2019 Y 2020 Y AUTORIZACIÓN PARA APLICAR ENCUESTA AL PERSONAL RESPONSABLE DE INMUNIZACIONES DE LOS DISTRITOS Y ZONAS EN EL ECUADOR.

Md. Jackson Robert Rivas Condo  
En su Despacho

En atención al Oficio Nro. MSP-DNEPC-2022-0003-O con fecha 30 de junio de 2022, mediante el cual solicitan "(...) los datos anonimizados de coberturas de vacunación del país correspondiente a los años 2019 y 2020 con la finalidad de desarrollar los datos para la investigación, adicionalmente solicito la autorización para levantar una encuesta al personal responsable de inmunizaciones de los distritos y coordinaciones zonales (...)"

Con este antecedente se autoriza a quien corresponda la autorización del levantamiento de la encuesta al personal responsable de inmunizaciones de los distritos y zonas y se remite los datos anonimizados de coberturas de vacunación correspondiente a los años 2019 y 2020 en el documento anexo en formato en excel.

Por la atención al presente anticipo mis agradecimientos.

Atentamente,

Dr. Innocente Franklin Bajiña Loo  
**DIRECTOR NACIONAL DE ESTRATEGIAS DE PREVENCIÓN Y CONTROL**

Anexo:  
- Base\_datos\_2019\_2020.xls

Copia:  
Señora  
Andrea Maria Herdoiza Camacho  
Asistente administrativo

ah

Dirección: Av. Quitumbe Ríen y Ameru Ríen. Código Postal: 170148 / Quito Ecuador  
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1/1