Methodology for the Evaluation of Missed Opportunities for Vaccination

PAN AMERICAN HEALTH ORGANIZATION

World Health Organization

REGIONAL OFFICE FOR THE Americas

METHODOLOGY FOR THE EVALUATION OF MISSED OPPORTUNITIES FOR VACCINATION

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
BCG	*bacille Calmette-Guérin* vaccine for severe forms of tuberculosis
DPT	diphtheria-pertussis-tetanus vaccine (whole-cell pertussis – wP – vaccine)
DPT-3	third dose of diphtheria-pertussis-tetanus vaccine
EPI	Expanded Program on Immunization
ESAVI	event supposedly attributable to vaccination or immunization
HepB	hepatitis B vaccine
Hib	*Haemophilus influenzae* type b
HPV	human papillomavirus
LAC	Latin America and the Caribbean
MMR	measles-mumps-rubella vaccine
MR	measles-rubella vaccine
MOV	missed opportunity for vaccination
OPV	oral polio vaccine
PAHO	Pan American Health Organization
PCV	pneumococcal conjugate vaccine
Penta	pentavalent vaccine against diptheria, pertussis, tetanus, Hepatitis B, and Haemophilus influenzae type B
Penta-3	third dose of pentavalent vaccine against diphtheria, pertussis, tetanus, Hepatitis B, and *Haemophilus influenzae* type B
Td	vaccine against tetanus and diphtheria
VPD	vaccine-preventable disease
WHO	World Health Organization

GLOSSARY

Attitudes (vaccination): Favorable or unfavorable personal positions regarding vaccination on the part of health workers or users of health services.

Booster: Additional vaccine dose given to increase immunity to a disease.

Contraindication: Situation in which a vaccine should not be administered under any circumstances due to the high risk of a severe or fatal adverse reaction.

False contraindications: Conditions falsely perceived as contraindications for vaccination by health personnel.

Knowledge (vaccination): The ability to identify, define, and use concepts and procedures related to the vaccines that are administered in the Expanded Program on Immunization (EPI).

Practices: Activities related to promotion, identification of candidates for vaccination, provision of counseling and vaccination services to the population by health personnel, as well as other activities implemented in the community to generate demand for vaccines.

Sample unit: The unit of selection in the sampling process (e.g., a child in a house, a house in a neighborhood, or a district in a country). The sampling unit is not necessarily the unit of observation or study.

Sampling frame: Set of units from which a sample will be selected (e.g., a list of names or places).

Target population: Groups of individuals who are included in routine immunization services, taking into account age, sex, and area of residence.

Vaccination coverage: Percentage of the population that has been vaccinated.

I. INTRODUCTION

Since the inception of the Expanded Program on Immunization (EPI) in 1977, the majority of the Member States of the Pan American Health Organization/World Health Organization (PAHO/WHO) have considered immunization a public good as well as an essential preventive component of primary health care.

The Regional Immunization Program has made major advances in recent years but continues to face many challenges. Vaccination coverage rates at the regional level are among the highest in the world. According to data from the PAHO/WHO-UNICEF Joint Reporting Form (JRF) for 2012, coverage levels in the Americas were 96% for *bacille Calmette-Guérin* (BCG), 93% for third-dose coverage of polio vaccine (Polio-3), 93% for diphtheria-pertussis-tetanus vaccine (DPT-3) in children aged <1 year, and 94% for measles-containing vaccine (MCV-1) in children aged 1 year (*1*). Nevertheless, in 2012, 50% of the 14,716 municipalities in Latin America and the Caribbean (LAC) reported DPT-3 coverage <95% and 23% reported coverage <80%. Municipalities with <95% DPT-3 coverage contain approximately 61% of children in LAC aged <1 year, and municipalities with <80% DPT-3 contain 20% of the children living in LAC (*1*). These pockets of low coverage create a risk for the reintroduction of vaccine-preventable diseases (VPDs) that have been eradicated, eliminated, or are under epidemiological control.

Strategic Objective 3 of the Global Vaccine Action Plan (GVAP) calls for the benefits of immunization to be distributed equitably to all people. In this light, PAHO wishes to make a standardized methodology available to LAC countries for evaluating missed opportunities for vaccination (MOVs), so that specific corrective interventions can be implemented to improve vaccination services and to increase demand for vaccines.

The methodology will also contribute to the description of the epidemiology of vulnerable populations that countries have started in hopes of developing strategies specifically adapted to reach populations in low-coverage areas, as well as in areas where epidemiological surveillance is insufficient. All of these actions are part of efforts to address the unfinished agenda, one of the strategic areas of PAHO's Regional Immunization Vision and Strategy (RIVS).

This methodology is a "living" document that must remain flexible and capable of being adapted to the diverse situations of countries in LAC. An extensive review of existing methodologies went into its creation. The methodology was validated in the state of Morelos, Mexico in September 2012, and subsequently implemented on a national scale in the Dominican Republic in October 2012.

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Background

As early as 1983, the Global Advisory Group of the EPI recommended using every opportunity to immunize all eligible people as a direct strategy to increase vaccination coverage levels. To this end, countries developed protocols to estimate MOVs, and various evaluations were conducted in the 1980s and 1990s (*2-17*). These studies pointed to rates of missed opportunities ranging between 34-66%, the lowest proportion being Ecuador at 34%, followed by Colombia, Mexico, and Venezuela at 40%, Honduras at 45%, and Nicaragua at 66% (*5,12*).

Problems in logistics and in the management of vaccination programs were identified and determined to be related to lack of resources and organizational problems, such as rigid hours of operation. Problems associated with health workers were also found, including false contraindications, outdated knowledge of vaccines, and improper practices such as the failure to vaccinate children in order to prevent the loss of doses. Lastly, causes underlying the population's rejection of vaccines were identified. These related to beliefs and cultural factors.

Thanks to these studies, valuable data were collected and used to identify immunization barriers, and countries implemented corrective measures. In El Salvador, for example, follow-up evaluations conducted after implementing interventions showed a reduction in MOVs from 45% to 14% among children aged <5 years (*14*). Similarly, Peru reduced MOVs in women of childbearing age and children aged <2 years from 52% in 1990 to 13% in 1995 following the implementation of strategies designed to reduce MOVs (*15*).

At the request of the WHO Strategic Advisory Group of Experts (SAGE) in November 2008, the WHO conducted a detailed analysis of the epidemiology of unvaccinated and undervaccinated (partially vaccinated) children. The analysis took a three-pronged approach: (1) an analysis of demographic and health surveys and multiple indicator cluster surveys (MICS) in 241 countries; (2) a review of data in the gray literature; and (3) a review of the data published in scientific journals.

The literature review underlined the key role that immunization systems play in non-vaccination and undervaccination through factors such as distance to vaccination sites, the motivation of health workers, lack of resources, and false contraindications. Factors related to demand were also evident, including family characteristics and parental attitudes and knowledge (e.g., educational level and religious beliefs) (*18*).

Recent studies (2010-2011) in Colombia, El Salvador, and Guatemala on the causes of non-vaccination pointed to a strong pro-vaccination culture in these countries, but identified barriers in both the supply and demand of immunization services that hinder the ability of all citizens to be vaccinated (*19-21*).

Scope

Vaccination is an everyday activity in public health, and is understood as a dynamic system in which supply and demand are interrelated and in which the satisfaction of a population with identified needs depends on the behavior of both users and providers of vaccination services. Interactions between users and providers require that users recognize a need for vaccines and seek service and that providers offer vaccines under the technical, logistical, and operational conditions that ensure efficient, high-quality service.

Fostering user awareness of the importance of vaccination requires promoting the routine program and carrying out health education activities for the population. Likewise, eliminating

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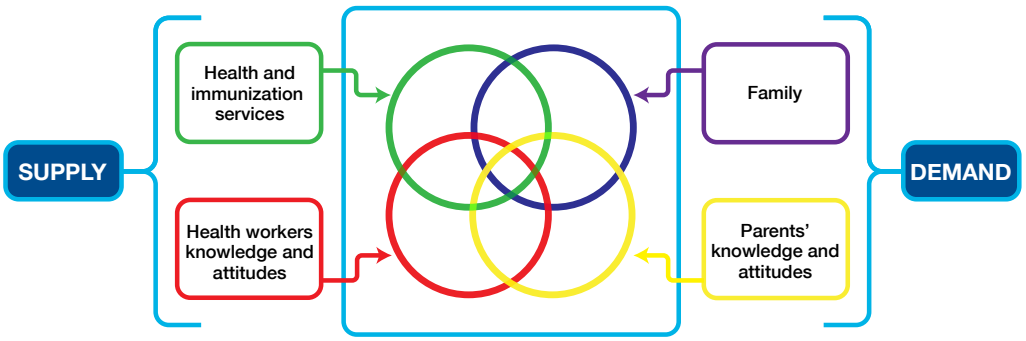
health workers' cognitive and attitude barriers to vaccination requires training on the latest advances in immunization. The provision of human, material, and financial resources is an indispensable strategy for health programs generally – and EPI programs in particular – to operate adequately and provide high-quality service (*22-27*).

The determinants of immunization coverage are complex and mutually interactive. They can be classified in at least two major categories, which can be further disaggregated (**Figure 1**):

- Attributable to users and demand:
  - Family characteristics
  - Knowledge and attitudes of parents or others responsible for vaccination of children
- Attributable to the provision of services:
  - Health services and immunization programs
  - Knowledge, attitudes, and practices of health workers

FIGURE 1: DETERMINANTS OF LOW VACCINATION COVERAGE



To understand the factors associated with non-vaccination and undervaccination (*27-31*), countries in the Region have conducted evaluations from the social perspective, from the perspective of health systems and providers, and from the perspective of the users of vaccination services (*2-17,32-62*). These studies have employed different methodologies and been implemented in communities and health centers.

1. Studies in the community (homes) are an important resource for estimating vaccination coverage and providing information on **the causes of non-vaccination**, undervaccination, and adherence to the program. These studies can introduce some biases, such as the idea that a child did not receive vaccines in the past due to real contraindications.

2. Studies in health services make it possible to more accurately assess why a child who goes to a health facility with a parental guardian is not given the necessary vaccines, despite having no contraindications for vaccination. These situations are known as **missed opportunities for vaccination.** Studies on MOVs, conducted at the exits of health facilities, provide a real-time evaluation of missed opportunities and are not affected by memory biases. These practical guidelines are oriented toward evaluating MOVs in health facilities.

The purpose of this methodology is to evaluate MOVs in health centers and obtain real-time information on the determinants of low coverage rates previously mentioned in order to understand:

1. Immunization services: shortage of resources, proportion of caregivers bringing vaccination cards to health facilities, and records of doses administered, among others.
2. Attitudes and knowledge of health workers: advice provided on events supposedly attributable to vaccination or immunization (ESAVIs), courteous interactions with patients, inquiries about vaccination status of patients, review of children's vaccination cards, and satisfaction of health workers, among others.
3. User attitudes and knowledge regarding the vaccination program.
4. Family characteristics that may increase MOVs.

The evaluation of MOVs is considered to be operational research and an instrument for managing the immunization program and providing practical data for decision-making. The end goal of the project is to implement strategies to reduce MOVs and include these in the EPI's national plan of action. If necessary, specific reasons for missed opportunities can be explored in greater depth using qualitative tools (e.g., focus groups). Additionally, complementary studies may be administered (e.g., in homes or communities) that allow barriers related to access of immunization and health services to be identified.

PAHO will soon prepare modules that make it possible to determine and explore in greater depth the causes of non-vaccination and undervaccination in the cases of new or underutilized vaccines, or in the case of particular population groups—for example, the administration of the human papillomavirus (HPV) vaccine in adolescents, or influenza and pneumococcal vaccines in older adults or health workers.

Features of the updated methodology

The updated methodology provides specific guidelines for implementing studies in health centers by:

- Systematizing the processes of planning, implementation, analysis, and presenting findings in a sequential manner.
- Explaining the sampling procedure in detail.
- Presenting the ethical issues that should be considered in health studies.
- Providing syntaxes to facilitate the analysis and interpretation of conceptual findings.
- Generating evidence on the challenges posed by the knowledge and attitudes of health workers concerning vaccination.
- Including a list of real and false contraindications for vaccination based on the variety of biological products used in the Region.

Purpose of the manual

The purpose of the manual is to provide a standardized tool for planning, implementing, and evaluating missed opportunities of vaccination, so that corrective interventions can be designed to achieve and maintain uniform vaccination coverages across different localities.

The manual covers the following phases of the process:

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II. PLANNING

1. Study objectives

To estimate the cause and proportion of MOVs that occur in children aged <5 years who are eligible for vaccination during visits to health facilities.

The specific objectives are:

1. To estimate the number and proportion of children aged <5 years who are eligible for beginning, continuing, or completing their vaccination schedules during a visit to a health facility for any reason.
2. To estimate the proportion of vaccinated, unvaccinated, and undervaccinated children during the study.
3. To obtain information on the knowledge, attitudes, and practices of caregivers of children <5 years and health care workers that can affect both the supply and demand of services.
4. To obtain information for the development and implementation of specific strategies to reduce MOVs and increase demand for vaccination.

2. Operational definitions

Child aged <5 years: A child of any age between newborn and 4 years, 11 months, and 29 days accompanied by at least one adult exiting a selected health facility on the day that the survey is conducted.

Eligible child: Child aged <5 years who has not begun or completed the vaccination schedule for his or her age; who has no real contraindications for receiving one or more vaccine doses; and who, given the date of administration of a previous dose or doses, is eligible to be vaccinated by the health personnel during the visit to the health facility on the day of the study.

Missed opportunity for vaccination (MOV): Any situation in which an eligible child has contact with a health facility and is not administered an indicated vaccine, despite not having contraindications (*63*).

Unvaccinated child: Child aged <5 years who has received none of the vaccines in the vaccination schedule.

Undervaccinated child (or child with an incomplete vaccination schedule): Child aged <5 years lacking one or more of the vaccines in the national schedule, including boosters.

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Vaccinated child: Child who has received all required doses of the following antigens: BCG, polio, pentavalent (diphtheria, tetanus, pertussis, *Haemophilus influenzae* type b [Hib], and hepatitis B), and measles, rubella, and mumps. Doses of yellow fever vaccine are also required for children living in countries endemic for this disease. Additionally, new vaccines, such as rotavirus and pneumococcal vaccines, must be evaluated in countries where these antigens are included in the routine vaccination schedule.

Window of opportunity: Accepted period for the application of a vaccine dose according to the national schedule.

Table 1: Definition of window of opportunity for vaccination[1]

	Recommended age	Too early[2] (invalid dose)[3]	Timely[4]	Not timely[5]	Late (not included in coverage for age)[6]
Hep B	Birth		0-1 days	2-28 days of age	29-60 days of age (after which it becomes HepB1)
BCG	Birth		0-30 days of age	31-364 days of age	>365 days (not recommended)
Polio1/ Penta1/ PCV1	2 months	<42 days of age	42-90 days of age	91-364 days of age	>1 year of age (365 days)
Polio2/ Penta2/ PCV2	4 months	<28 days from previous dose	70-150 days of age or 28-58 days from previous dose	>151 days of age or >59 days from previous dose	>1 year of age (365 days)
Polio3/ Penta3/ PCV3	6 months	<28 days from previous dose	98-210 days of age or 28-58 days from previous dose	>211 days of age or >59 days from previous dose	>1 year of age (365 days)
Rotavirus 1	2 months	<42 days of age	42-90 days of age	91-104 days of age	>105 days of age (not recommended)
Rotavirus 2	4 months	<28 days from previous dose	70-150 days of age or 28-58 days from previous dose	151-240 days of age	>241 days of age (not recommended)
MMR	12 months	<270 days of age	270-395 days of age (or 30 days after recommended age if after 12 months)	<730 days of age	>2 years of age (730 days)
Yellow Fever	12 months	<182 days of age	182-395 days of age	<730 days of age	>2 years of age (730 days)

(*continued*)

(*continued*)

	Recommended age	Too early[2] (invalid dose)[3]	Timely[4]	Not timely[5]	Late (not included in coverage for age)[6]
PCV booster	12 months	<365 days of age	365-395 days of age	<730 days of age	>2 years of age (730 days)
DTP booster	18 months	<181 days from previous dose	<577 days of age	<730 days of age	>2 years of age (730 days)
Polio booster	18 months	<28 days from previous dose	<577 days of age	<730 days of age	>2 years of age (730 days)
Polio booster 2	Refer to national schedule.	<181 days from previous dose	Up to 30 days after the recommended age on the national schedule	More than 30 days after the recommended age on the national schedule	Refer to national schedule
DTP booster 2	Refer to national schedule	<181 days from previous dose	Up to 30 days after the recommended age on the national schedule	More than 30 days after the recommended age on the national schedule	Refer to national schedule

[1] The information in this table should be adapted to the country's current vaccination schedule. This table does not include information about boosters or vaccines against HPV or influenza.

[2] Too early dose: dose that is administered before the recommended period and is invalid.

[3] Invalid dose: dose that was not administered on time and thus cannot generate an immune response.

[4] Timely dose: dose administered when the child has turned an appropriate age, considering the minimum interval between doses in the vaccination schedule.

[5] Not timely dose: dose that was not applied in a timely manner but that is included in the national coverage (children aged ≤1 year).

[6] Dose that was not applied in a timely manner and that is not included in the national schedule but that should be administered to the child to generate an immune response.

Source: Adapted from tables 2 and 3: Summary of WHO Position Papers – Recommended Routine Immunizations for Children

3. Study type

This study is a cross-sectional evaluation of MOVs in primary and secondary health care facilities that offer vaccination services to the population. The study is completed at a different health facility each day, such that an individual health center is only visited once.

4. Target population

1. Children aged <5 years and their caregivers.
2. Health workers at the selected facilities, with an emphasis on general medicine and certain specialties, such as pediatrics, gynecology, family health, vaccination, etc.

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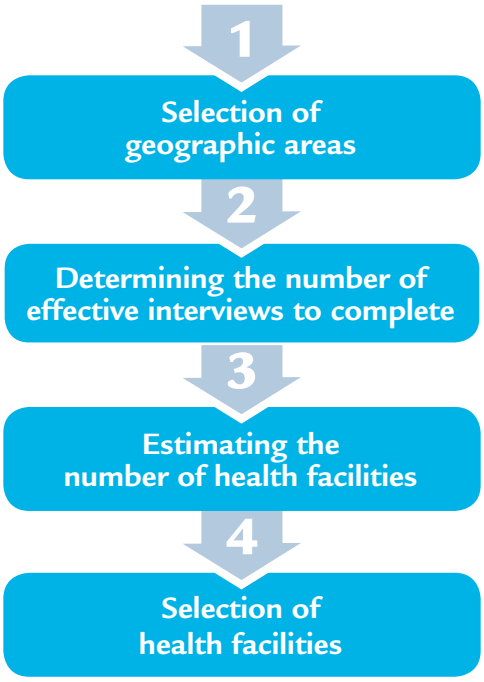
5. Sample design

Because this type of study serves as an operational tool for the identification of missed opportunities in municipalities that do not meet target coverage levels, simple sampling rather than probability sampling is recommended. Accordingly, the sample is only representative of children aged <5 years visiting health services in the geographic area surveyed on the day of the study. It is important to consider potential biases associated with the selection of the sample (e.g., the exclusion of some health facilities and the balance between the number of establishments chosen and the number of children in each facility).

The steps to be followed for the design of the sample are presented below:



5.1 Selection of geographical areas

The following are the proposed criteria for choosing geographical areas (municipalities or their equivalent):

- Coverage of third dose of pentavalent vaccine or the equivalent in the previous year (or in the most recent year with available information). Assign 1 point if the area's coverage is below the median coverage of all municipalities in the country; otherwise, assign value of 0.
- Proportion of the population aged <1 year. Assign 1 point if the population aged <1 year in the municipality is above the median population of all municipalities in the country; otherwise, 0.
- Index of basic unsatisfied needs. Assign 1 point if the area's index is above the median index of all municipalities in the country; otherwise, 0.

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- Reporting rate for suspected measles and rubella cases. Assign 1 point if the rate does not meet the reporting rate for suspected cases; otherwise, 0.
- Presence of tourist or border areas. Assign 1 point if one or both these characteristics is met; otherwise, 0.

Municipalities with the highest scores will be selected, taking into account logistics and available resources (**Table 2**).

Table 2: Selection of municipalities according to score obtained from indicators

Municipalities	DPT-3 coverage Median for the region = 79%		Children aged <1 year as a proportion of total population to be evaluated Median for the region = 10%			Index of unmet needs Median for the region = 70		Measles-rubella SCRR* Not met = 1	Tourist or border area score Met = 1	Total score
	%	Score	No.	Proportional weight	Score	Index	Score			
San Marcos	85	0	2,600	9	0	68	0	1	0	1
Tenango del Valle	62	1	3,190	11	1	75	1	1	1	5
San Lucas	57	1	3,340	11.5	1	79	1	1	0	4
Puerto Libre	45	1	2,030	7	0	76	1	1	1	4

* SCRR: Suspected case reporting rate.

In the example from **Table 2**, the municipalities selected to complete the survey would be Tenango de Valle, San Lucas, and Puerto Libre.

5.2 Number of effective interviews to complete

For purposes of this study, "effective interviews" are those that include the transcription of the vaccination card of a child aged <5 years, which requires that the child's caregiver has brought the card to the health center.

No standard method exists for determining the number of interviews to be conducted. Due to logistical reasons and budgetary constraints, countries are recommended to use 1% of the population aged <1 year in the municipality selected as a proxy variable to calculate the number of effective interviews to complete.

Based on previous experiences, **a minimum of 500-700 effective interviews** should be conducted in order to complete the analyses recommended in this methodology. However, the number should be adjusted according to the size of the population in the selected municipalities.

Continuing with the previous example, **Table 3** shows the number of effective interviews to conduct in the selected municipalities. In this example, only four municipalities are selected; as a result, the number of effective interviews is fewer than the 500-700

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previously recommended. To estimate the number of interviews that should be conducted in order to obtain the correct **number of effective interviews**, the following assumption has been made: "in the selected municipalities, one of every three interviewed parents or guardians will have taken their child's vaccination card with them to the health center." Based on these estimates, the total number of interviews to complete in these three municipalities would be 255.

The percentage of caregivers who have brought their children's vaccination cards to the health centers is an estimate that is not always available. During the pilot project, countries should identify the proportion of the population bringing vaccination cards to the health center, so that the number of interviews required to obtain 500-700 effective interviews can be determined.

Table 3: Estimated number of effective interviews by municipality*

Municipality	Population aged <1 year	Number of effective interviews (Population aged <1 year *0.01)	Number of interviews required to reach target number of effective interviews (= effective interviews*3)
Tenango	3,190	32	96
San Lucas	3,340	33	99
Puerto Libre	2,030	20	60
Total		**85**	**255**

5.3 Estimating the number of health centers

To estimate the number of facilities to select, the following indicators are suggested:

1. Percentage of population living in rural and urban areas.
2. Percentage of population that uses:
   a. Primary care facilities
   b. Secondary care facilities

These indicators can be obtained from official reports, national health surveys, catalogs of health resources, or previous studies. In the section below, a sample selection of individual facilities is presented. (The percentages and numbers in the example are based on empirical data and are not necessarily realistic. If possible, these should be replaced with official data from the country where the study will be conducted.)

A. Geographical area:
   - 20% of the population lives in rural areas.
   - 80% of the population lives in urban areas.

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B. Level of care:

- 40% of the population uses hospitals.
- 60% of the population uses primary care facilities.

Continuing with the previous example, the calculations needed to obtain the number of primary and secondary health facilities and the number of rural and urban health facilities in Puerto Libre are provided in **Table 4**. These calculations assume an estimated total of 60 interviews to conduct.

Table 4: Estimated number of health facilities by care level and geographic area (urban vs. rural), municipality of Puerto Libre

Type of facility	Number in urban areas (80%)	Number in rural areas (20%)[1]	Total
Primary care (60%)	29 (=36 interviews [int.] *0.80 urban)	7 (=36 int.*0.20 rural)	36 (=60 int.*0.60 1st level)
Secondary care (40%)	19 (=24 int.*0.80 urban)	5 (=24 int.*0.20 rural)	24 (=60 int.*0.40 2nd level)
Total	**48** (=60 int.*0.80 urban)	**12** (=60 int.*0.20 rural)	**60**

[1] If the number of secondary health facilities in rural areas is insufficient, these should be replaced with interviews conducted at primary facilities, since health care in rural areas will generally be provided at the primary care level.

According to the calculations, 48 interviews should be conducted in Puerto Libre in urban areas and 12 should be conducted in rural areas. Of the interviews to be conducted in urban areas, 29 should be completed at primary health facilities and 19 at secondary facilities. For rural areas, since no secondary health facilities exist in Puerto Libre, all 12 interviews would be conducted at the primary care level.

5.4 Selection of individual health facilities

If the designated number of health care facilities is greater than exists in the geographical area, or not all facilities can be evaluated for logistical or budgetary reasons, it is advisable to select those attended by the greatest number of children aged <5 years.

Based on a list of health units in the geographical areas where the study will be conducted, hospitals, health centers, and vaccination facilities will be randomly selected. Facilities that do not offer vaccination services, or do not do so routinely, may be included if the country wishes to assess the number of eligible children who use those facilities, and accordingly provide a rationale for equipping and including them in the network of facilities that provide routine vaccination services (*30*).

If a selected facility is closed, or the number of children aged <5 years there is insufficient, the interviewing team should proceed to the next facility of the same care level in the same geographical area. Similarly, if the selected health center is difficult to access and for logistical reasons it is not feasible to proceed to the next facility, the study team may remain at the original site for a maximum of two days. However, it is generally recommended that the evaluation of missed opportunities in each health facility be completed in one working day.

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It is important to remember that all choices in the field regarding the selection of health facilities may skew the results. For example, excluding health facilities that lack a doctor can affect the number of MOVs related to health personnel. **Box 1** contains some suggestions for substituting data that may not be available.

BOX 1: USE OF PROXY VARIABLES TO SELECT AREAS AND FACILITIES

Since access to population indicators and indicators relating to the use of health services may vary or be unavailable in some countries, proxy variables may be used in the place of some of the proposed indicators. For example, the index of basic unsatisfied needs might be replaced by the morbidity rate of acute respiratory infections or the morbidity rate of acute diarrheal diseases. Likewise, the average daily number of patients aged <5 years who visit a health center by facility type could be replaced by the percentage of consultations for children aged <5 years by facility type.

6. The research team

The research team includes a general coordinator, supervisors, interviewers, and data entry personnel. Their duties are as follows:

General coordinator:

- Adapt the standardized regional protocol to national or local realities.
- Estimate the budget needed and identify funding sources.
- Submit the MOV study to the country's ethics committee for approval in accordance with the committee's requirements.
- Plan and implement fieldwork.
- Provide general supervision of the study team and data collection.
- Analyze findings, prepare partial reports, and prepare the final report.
- Make technical recommendations to prepare specific intervention strategies in order to reduce MOVs and improve vaccination coverage rates.

Field or on-site supervisor:

- Provide guidance to interviewers and feedback on their work.
- Ensure that interviewers have all materials needed to administer the survey.
- Explain the content of the survey to interviewers, answering any questions.
- Validate the completion of the surveys before leaving the health facility.

Interviewer:

- Request the voluntary participation of potential participants who leave health care facilities with a child aged <5 years.
- Conduct interviews and respond to feedback from supervisors.

Data entry clerk:

Help create databases as well as data capture and analysis formats in Excel, EPI-INFO, or other programs and carry out other tasks as assigned by the general coordinator. If mobile devices are available to capture data, the data entry clerk should ensure that these are all properly linked to the database.

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Other personnel:

Drivers and local personnel, who are familiar with the area where the study will be conducted, should be available.

7. Study budget

The coordinator should prepare a budget for the survey that reflects the number of supervisors and field interviewers needed (**Box 2**). Other issues that should be considered include the cost of the pilot project and costs of materials or supplies required to implement the study. Annex 1 lists the principal items to include in the budget.

BOX 2: ESTIMATING THE NUMBER OF SUPERVISORS AND INTERVIEWERS

- One supervisor and at least two interviewers are required for each facility where a health exit survey will be conducted. Supervisors are responsible for collecting the questionnaires from the interviewers and reviewing their quality.
- Interview teams should include both men and women.
- Each supervisor should be responsible for no more than two or three teams of interviewers.

8. Considerations prior to implementing the study

Countries may wish to hire a company with experience in surveys to implement the study. If this option is chosen, the company is responsible for hiring personnel, reproducing the surveying tools, transportation, data entry, data analysis under the instruction of the general coordinator, and presentation of reports at the request of the coordinator. The coordinator should actively participate in training interviewers, analyzing study results, and preparing the final report.

If the country does not hire a private company, the study can be implemented by health professionals external to the services that are being evaluated.

9. Ethics committee approval

The general coordinator should investigate the country's procedures for approval of the protocol and ensure that required information is in place to prevent delays. Ethical review of research projects is a universal ethical requirement mandated by the Declaration of Helsinki and promulgated by the World Medical Association (*64*).

The research protocol should be submitted to a research ethics committee prior to implementation. The committee should be independent of the investigator, sponsoring agency, or any other type of improper influence. Independent committees, rather than the researchers involved, must make decisions on research that involves human beings.

Since this study does not include laboratory or experimental procedures, potential ethical issues center on the recruitment of informed and voluntary participants. Participants must be guaranteed the option to withdraw from the study without prejudice to their rights, including the right to health services. Ethical issues important to studies, even in the case of surveys, go beyond informed consent.

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Information on the content of the study, and the rights of participants, should be prepared in writing and may be included at the beginning of the questionnaire. However, ethics committees in some countries may request that information be written in an individual letter of consent or a collective letter that the interviewer reads aloud to each potential participant. Some countries also possess letters of informed consent, which must be obtained in a timely manner in order to make the necessary adjustments and meet all requirements (*Annexes 2 and 3*).

Obtaining informed consent is one of the most important elements in planning a research project. Human subjects must be able to exercise their free will in deciding to participate. It is also important that correct information be provided to participants, that they understand what they are told or read, and that they be given time to decide for themselves whether they want to participate. The informed consent text should be understandable to the participant (or the participant's adult caregiver). In most cases, a document written at a level understandable to a person with a fifth-grade education is adequate (*65*).

Finally, the PAHO Ethics Review Committee (PAHOERC) must review all research proposals, including surveys, that require PAHO's financial and/or technical support (**Box 3**).

BOX 3: DOCUMENTS REQUIRED BY THE PAHO ETHICS REVIEW COMMITTEE

1. Proof of approval by a local ethics council, or if necessary, by national authorities.
2. A structured summary (<300 words).
3. Statement of funding sources, sponsors, institutional affiliations, and any other source that may cause conflicts of interest.
4. A complete research proposal including:
   - **a.** Brief background and rationale
   - **b.** Objective or purpose of the study and a brief explanation of the study's importance
   - **c.** Methodology, procedures, and plan for data analysis
   - **d.** Sampling methodology and sample size calculations
   - **e.** Constraints or limitations
   - **f.** Risk assessment and foreseeable costs for the individuals and communities involved weighed against foreseeable benefits
   - **g.** Budget and timetable
   - **h.** References
5. CV (two-page summary) of the principal investigator and other investigators.
6. Prior reviews by other ethics or scientific councils or committees.
7. Documentation to be used for informed consent.

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III. IMPLEMENTATION

1. Data collection instruments

1.1 Health facility exit survey

A structured, precoded questionnaire (*Annex 4*) is available for obtaining information on the demographics of each interviewee (age, sex, schooling, marital status) and child (age, sex), on whether the person possesses and is carrying a vaccination card for the child, on the reason for the visit to the care facility, on the status of the child's vaccination schedule upon entry to the care facility **(information which will be validated by the vaccination card)**, on the presence of any real contraindications for vaccination where vaccines are missing, and on reasons for non-vaccination, among others. The instrument also assesses whether health personnel offered the patient an opportunity for vaccination and what vaccines, if any, were administered. Answers to the survey can be recorded on paper or on mobile devices such as a smartphone or tablet. It is also recommended that data entry, transfer to a database, and consolidation be constantly monitored.

The questionnaire should include a form to measure the number of people invited for inclusion in the study who declined to participate. This information will later be used to calculate the refusal rate.

Surveys in health facilities should be completed in one working day, such that the presence of the interviewer does not alter the behavior and practices of the health workers. If the health center is difficult to access, it is permissible to remain there for a maximum of two days.

1.2 Health workers survey

A structured, precoded questionnaire (*Annex 5*) is available for obtaining information on each interviewee's sex and age (but not name), on the type of health unit in which he or she works, on the worker's professional seniority, on vaccination trainings that the worker may have received, and on the date of the most recent training, among other variables.

The format also allows for evaluating the interviewee's general knowledge of vaccines included in the EPI, dosages, ages at which vaccines are administered, the most frequent ESAVIs, and real and false contraindications for vaccination. The instrument contains two specific sections that make it possible to identify attitudes that facilitate or inhibit vaccination and appropriate decision-making. It is also important to remember that the health worker survey should be implemented on the same day and at the same health facility as the health exit survey.

1.3 Data collection procedures

The coordinator should send a note informing the directors of the selected health centers that an investigation will be carried out at their institutions without saying that the study concerns vaccination. The note should be sent relatively close to the time of the survey in order to prevent any modification of daily vaccination practices. Upon arriving at the

facility, the supervisor should introduce the team to the head of the facility, deliver a copy of the aforementioned note, and explain the methodology of the work that will be conducted. **Box 4** shows options for distributing the questionnaire to health workers.

BOX 4: OPTIONS FOR DISTRIBUTING THE QUESTIONNAIRE TO HEALTH WORKERS

1. Ask the director of the facility to designate a physical space (auditorium or classroom) where health workers can be convened at an established time to complete the form. Consent should be obtained from individual workers before beginning the survey (see *Annex 2* for a sample oral consent letter).
2. Taking into account the working hours of the personnel, the supervisor can visit the office of health workers in order to explain and distribute the survey. If a worker chooses to participate, he or she will be asked to complete the form individually. Before the end of the day, the supervisor should return to collect the questionnaires.
3. If the facility has a daily meeting or change of shift in which all staff members are present, this time can be used to deliver the questionnaire to health workers.

The supervisor should ensure that each individual fills out the questionnaire independently.

2. Adaptation of surveying instruments

The surveying instruments should be adapted to the country implementing the study. The current vaccination schedule, types of biologicals, number of doses, ages at which doses are administered, and official standards on real contraindications for vaccination should all be adjusted as necessary (*Annex 6*). Additionally, instruments should be adjusted to standard national operational procedures on infant health, such as the need to review the child's vaccination status during a pediatric wellness visit.

In adapting the instruments, a country can incorporate specific questions related to the supply and demand of vaccines. However, it is not advisable to ask caregivers to assess the health workers' knowledge of vaccination. As part of the process of adapting the instruments, it is recommended that countries conduct a pilot test before implementing the questionnaire in the field.

2.1 Pilot test

The pilot test should preferably include health facilities at both levels of care. If possible, one rural facility should be included. An informative note for the facilities chosen for the pilot should be written. It should be remembered that the findings of the pilot study are not representative of the facilities evaluated, nor do they constitute research on vaccination services at these establishments. Rather, results serve to make final adjustments to the surveying instruments.

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3. Training

Properly training the interviewing teams is essential to successfully implementing the study.

All team members should receive a two-day training course of 8 to 10 hours. The following topics should be covered:

- Vaccination schedule in children aged <5 years and indications and contraindications for vaccination. Special consideration should be given to vaccines that have been recently introduced.
- Missed opportunities for vaccination.
- Content and methodology of the research project.
- Responsibilities of team members.
- Health facility exit survey:
  - Interview procedures
  - Obtaining informed, voluntary consent
  - Detailed contents of each section of the survey
  - Validation of questionnaires by supervisors
  - Questions, answers, and comments
- Simulation of exit interviews (role-playing)
- Importance of accurately transcribing the vaccination card.
  - Review of common errors in transcription with trainees
  - Transcription of example vaccination cards
  - Possible use of technologies to guarantee accuracy (e.g., taking image of card with smart phone or tablet while taking care to not include the child's personal information)
- Health workers survey:
  - Procedures for administering the survey
  - Obtaining informed, voluntary consent
  - Detailed contents of each section of the survey
  - Validation of questionnaires by supervisors
  - Questions, answers, and comments
- Simulation of self-filled-out survey (role-playing).
- Preparation of routes and materials for work to be completed in the coming days.

4. Logistics

The general coordinator must ensure that activities required to organize the study are completed. A checklist, such as the one in **Table 5**, is recommended:

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Table 5: Checklist for organizing the study

Activity	Person responsible	Date
Adaptation of standardized protocol and surveying instruments.		
Pilot test of modified surveying instruments.		
Submission of protocol and instruments for approval by local ethics committee, and follow-up.		
Plan for fieldwork, including timetable of activities.		
Hiring a polling company and/or recruiting interviewing teams for data collection.		
Training sessions for interviewers.		
Notification of health facilities of the study.		
Implementation of the study.		

5. Data quality control system

Interviewers should carry out the first level of quality control for the data. Good training fosters good performance at this first level of quality control, paving the way for the accurate recording of information.

The supervisor should provide the second level of quality control by ensuring that the collected data are accurate and complete. The validation of the questionnaires by the supervisors should include a review to ensure that the data fields (age, sex, etc.) are filled out correctly. Any inconsistencies in the material delivered by an interviewer should be clarified with the interviewer on the same day that the interviews take place. The validated instruments will be delivered to the data entry professional to be recorded in an electronic database.

Health exit surveys: In analyzing missed opportunities, only answers on administered or missing doses that are confirmed by the vaccination card will be accepted.

Health workers survey: A supervisor will validate each questionnaire at the end of the day. The supervisor will review the questionnaires, setting aside those that are incomplete for further evaluation.

Data collection mechanism: If the appropriate technology is available, data can be collected on mobile devices, facilitating entry into the database. Otherwise, data should be collected on paper forms and entered into a database in Excel or another program that facilitates subsequent coding and analysis.

Data processing tools: Accuracy of the information will ideally be assessed through a double capture process to identify inconsistencies and errors, which will then be validated and corrected if necessary.

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IV. ANALYSIS AND INTERPRETATION OF RESULTS

As mentioned previously, countries should adapt the health exit survey to the national schedule and establish syntaxes for determining vaccination status and MOVs. While syntaxes and software in Excel are provided to facilitate these analyses (*Annexes 7 and 8*), countries must adapt the tools to the national vaccination schedule, taking into account replacement vaccines, false contraindications, and the aforementioned definitions of windows of opportunity and valid doses.

In adapting these instruments and in analyzing data, the project coordinator should seek support from statisticians, epidemiologists, and other professionals as necessary. The analysis must also take into account the study's statistical design.

1. Univariate analysis

Using univariate analysis, the study population should be described, including the rate of non-participation. At minimum, the analysis should provide information on the following variables and questions.

1.1 Technical details of the study

- Number of institutions surveyed by care level.
- Number of people contacted to participate.
- Number of interviewers and supervisors.
- Total number of health exit interviews by care level.
- Total number of interviews of health workers by care level.
- Refusal rate (no response).

1.2 Demographics of caregiver

- Sex.
- Reason for bringing the child to the health center.
- Relationship to child.
- Level of education and literacy.
- Distance from the health facility.

1.3 Eligibility

- How many children who visited the institution had vaccination cards?
- What were the reasons for which children did not have cards?
- How many of these children had real contraindications for vaccination on the day of the survey?

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- How many of these children were eligible for vaccination on the day of the survey?
- How many of the eligible children were vaccinated on the day of the survey?
  - How many of the children who were vaccinated on the day of the survey completed the vaccination schedule for their age?
  - How many of the children who were vaccinated on the day of the survey did NOT complete the vaccination schedule for their age?
- How many of those eligible were NOT vaccinated on the day of the survey?

1.4 Vaccination status

- How many children had complete schedules for their age?
- How many children had incomplete schedules for their age?
- How many children were not vaccinated (i.e. had received no dose of vaccine)?

1.5 Missed opportunities

A child may have more than one missed opportunity for vaccination, since he or she may have required more than vaccine (e.g., polio and pentavalent vaccine at 4 months of age).

- How many vaccination opportunities were found?
- How many of these were taken advantage of?
- How many opportunities were missed (by vaccine and number of vaccine doses)?

1.6 Reasons for non-vaccination

The causes of missed opportunities identified in the health exit surveys should be classified in the categories below. Each category can be further separated into sub-categories, which are not exhaustive.

1.6.1 Causes attributable to health and immunization services

- Vaccination days or hours of service incompatible with user needs.
- Vaccinator not present.
- Shortage of vaccines and/or other supplies needed for vaccination.
- Prolonged wait times.

1.6.2 Causes attributable to knowledge, attitudes, and practices of health workers

- Deficient knowledge of:
  - Routine and/or supplementary vaccination schedules.
  - Vaccination doses and ages at which they are administered.
- False contraindications.
- Forgetting to request or review the vaccination card.
- Mistaken perceptions on vaccine effectiveness.

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- Safety concerns/perceptions: fear of multiple and simultaneous application of vaccines.
- Perception that only nurses and those working in immunization are responsible for promoting and offering vaccination services.
- Perception that low vaccination coverage rates are due to the lack of demand for services by parents and adult users of the vaccination program.

1.6.3 Causes attributable to knowledge, attitudes, and practices in the family or on the part of caregivers

- Lack of confidence in health workers.
- Prior negative experiences with health services (mistreatment/humiliation, refusal to provide vaccination, ESAVIs, etc.).
- Caregiver's decision-making autonomy with respect to vaccination.
- Pressure against vaccination by social groups.
- Social and family networks.
- Perception of the severity of the disease and the risk of getting sick.
- Perception regarding the safety of vaccines: fear of multiple and simultaneous vaccinations, fear of potentially contaminated syringes, etc.
- Perception of vaccine effectiveness.
- Perception of the importance of vaccination or preference for natural infection; belief that if the child is usually healthy there is no need for vaccination, etc..
- Feeling of not belonging to the majority social group by virtue of physical appearance and the resulting fear that vaccines will not be provided for this reason.
- Mother's fear of being pressured to participate in family planning activities

Using the aforementioned categories, the following questions at minimum should be answered:

- What percentage of MOVs was due to health workers? What were their principal causes?
- What percentage of MOVs was due to parents and caregivers? What were their principal causes?
- What percentage of MOVs was due to logistics and health services? What were their principal causes?

1.7 Other important data

1.7.1 Information on vaccines

- Percentage of places where caregivers have obtained information on vaccination.
- Percentage of caregivers who indicated that the information is useful.

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1.7.2 Quality of service

- Percentage of caregivers who report having been informed which vaccines their children received.
- Percentage of caregivers who report having been informed of the date of the child's next vaccination appointment.
- Percentage of caregivers who report having been informed about reactions to vaccines.
- Percentage of caregivers satisfied with the care received.

1.7.3 Reasons for accepting/seeking vaccination

- Percentage of caregivers who can identify VPDs.
- Percentage of caregivers who know the benefits of vaccines.

1.7.4 Health workers

- Basic information
  - Demographics.
  - Number/proportion of workers by type of care provided: medical consultations, healthy child checkups, vaccination, etc.
  - Number/proportion of workers by type of professional training: ollege, graduate level, or other.
  - Number/proportion of workers with vaccination history (MR, Td, influenza, pneumococcal conjugate vaccine, HepB, etc.).
  - Number/proportion of workers who report having received one or more courses on vaccination.
- Findings
  - Number/proportion of workers with <80% of attitudes favorable to vaccination (attitude barriers).
  - Number/proportion of workers with <80% correct knowledge of vaccines, diseases prevented, and vaccination schedules (knowledge barriers).
  - Number/proportion of workers making inappropriate vaccination decisions.

2. Stratified analysis

After finishing the univariate analysis, a stratified analysis should be conducted. Since this is a cross-sectional study, in which an event (MOV) and its explanatory variables are being simultaneously measured, prevalence ratios should be calculated as an estimate of relative risk. The prevalence among those "exposed" (those with some criteria/behavior that may explain the MOV) should be compared to the prevalence of those "unexposed" (those who lack the criteria/behavior).

2.1 Health facilities exit survey

The following elements may be explanatory variables for non-vaccination, undervaccination, and MOVs:

- Age of caregiver
- Literacy and education of caregiver.
- Occupation of caregiver.
- Sex of head of household.

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- Child's age: <1 year, 12-23 months, or 2-4 years
- Sex of child
- Ethnic group
- Residence: urban or rural
- Care level: primary or secondary
- Access to information and means of communication

2.2 Health workers survey

The following characteristics of health workers may be explanatory variables related to appropriate vaccination practices:

- Educational level.
- Professional seniority.
- Courses on vaccination.
- Courses on VPDs.
- Time since last course on vaccination.
- Attitude barriers.
- Knowledge barriers.

Charts and graphs are useful for presenting results, particularly for assessing changes or trends occurring over time. Since it can be difficult to distinguish trends if the information is presented in tables, it is suggested that study results be presented in graphs and figures. In **Boxes 5 and 6**, suggested graphs are provided to display the results of each survey.

BOX 5: TABLES AND GRAPHS FOR HEALTH EXIT SURVEY (CHILDREN AGED <5 YEARS)

Tables and graphs should distinguish between levels of care and include the following information:

1. Table: Characteristics of caregivers: age, sex, educational level, and occupation.
2. Table: Characteristics of children aged <5 years: age (<1 year, 12-24 months, 2-4 years), sex, number, and percentage with vaccination card, place of residence (same municipality or locality, or another municipality or locality).
3. Table: Relative risks or odd ratios for explanatory categories of MOVs.
4. Pie graph: Proportion of vaccinated, unvaccinated, and undervaccinated children.
5. Bar chart: Number/proportion of eligible children by care level and age subgroup.
6. Bar chart: Number/proportion of MOVs by care level and age subgroup.
7. Bar chart: Number/proportion of MOVs by vaccine type, care level, and age subgroup.

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BOX 6: TABLES AND GRAPHS FOR HEALTH WORKERS SURVEY

Tables and graphs should distinguish between levels of care and include the following information:

1. Table: Characteristics of participants: age (<20, 20-34, 35-45, 46-55, 55+), range and average years of professional experience.
2. Table: Number/proportion of workers who had taken training courses on vaccination or vaccine-preventable diseases: none, 1-2, 3, or more than 3.
3. Table: Number/proportion of workers with knowledge barriers (<80% knowledge of vaccination), attitude barriers (attitudes unfavorable to vaccination), and inadequate decision-making (simulated cases).

3. Limitations and possible biases

In general, cross-sectional studies are useful in measuring the magnitude of public health problems (e.g., missed opportunities) and in designing interventions in the short, medium, and long terms. However, cross-sectional studies do not allow investigators to establish causal association due to temporal ambiguity (the event and its explanatory factors are being measured simultaneously) and the presence of certain cofounders.

It is important to recognize biases that may affect the study's validity. These include, among others, selection bias (i.e., selecting people who seek health services and have a vaccination card for their child means that a higher proportion of those who are invested in the health of their child may be selected, as compared to those who do not seek health services) and memory bias (interviewee's memory fails or interviewee provides "politically correct" responses to avoid being labeled by her responses). Potential biases can be reduced during the training of interviewers by emphasizing the importance of obtaining honest responses from participants.

Regarding external validity, the sample is only representative of unvaccinated or undervaccinated children aged <5 years who had contact with the health facilities included in the study, assuming random selection of these facilities. In this regard, please refer again to the potential biases related to decisions made in the field regarding the sample design. Potential benefits in logistics must be weighed against potential biases of such decisions.

Although this type of study can only establish statistical associations, study results are useful in generating new hypotheses on the causes of non-vaccination and undervaccination and in preparing health centers to address the causes associated with incomplete vaccination or non-vaccination.

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V. PRESENTATION OF FINDINGS

1. Preparation of reports for specific readerships

A final report on the findings of the MOV study should be written such that specific strategies can be developed to address the challenges identified. A presentation should also be prepared to communicate the study's most significant findings to the nation's health authorities (**Box 7**).

BOX 7: PROPOSED CONTENT OF FINAL REPORT

- Introduction.
  - Executive summary
  - Context of the EPI prior to implementing the study (administrative coverage, problems of access, refusal to vaccinate, operational procedures, etc.)
  - Objectives of the study
- Methodology.
- Results (as previously described).
  - Demographics
  - Communication and information on vaccination
  - Factors favoring vaccination
  - Factors inhibiting vaccination
  - Missed opportunities for vaccination and causes of MOVs
  - Knowledge, attitudes, and practices of health workers and immunization professionals
- Discussion of results in the context of the operation and procedures of the EPI.
  - Strengths of immunization services (e.g., high user satisfaction)
  - Weaknesses of immunization services (e.g., shortage of pentavalent vaccine leading to the separate applications of DPT and HepB vaccines)
  - Opportunities for improvement (Section VI)
  - Identification of areas where new policies are needed to take advantage of all opportunities to vaccinate children who have contact with health centers
  - Lack of knowledge of or compliance with operational procedures on vaccination
  - Comparison with results from past studies (if available)
  - Limitations
- Conclusions and recommendations.

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The results of the study should be communicated to health authorities, workers at the facilities studied, and other stakeholders involved in providing vaccination services. Feedback should be given within a month of the study's implementation in the form of meetings and/or institutional bulletins. The feedback helps to remind health authorities and workers that they play a fundamental role in providing vaccination services, thereby increasing their motivation and commitment to the work.

VI. INTERVENTIONS

In order to improve immunization services in health facilities, technical recommendations must be issued and specific interventions must be proposed. These interventions should be included in the EPI's annual plan of action, with funds reserved for implementation. A broad range of strategies, activities, and practices has been implemented to raise immunization coverage levels in the developing world, many of which have been undertaken with considerable success. Thus, countries should possess mechanisms to evaluate the impact and cost-effectiveness of these interventions (*66-67*).

Implementation of the strategies will occur at the national and local levels and address the determinants of low coverage identified in the study. Below are examples that were developed as corrective measures to overcome causes of non-vaccination and under vaccination of children in low- and middle-income countries (*66, 68-69*):

Health care workers

- Intensify training activities on the guidelines and requirements of the national immunization program, emphasizing compliance with existing regulations.
- Hold meetings with health facility staff to discuss missed opportunities and discuss strategies for taking advantage of vaccination opportunities.
- Motivate health workers to provide vaccines to the community in every possible opportunity as part of a comprehensive care plan for children and women of childbearing age.
- Motivate staff to provide warm and friendly service to those seeking vaccination services.

Health services

- Develop operational procedures to ensure that all opportunities to vaccinate a child who has contact with a health center are used.
- Conduct workshops to develop appropriate scheduling of biologicals and supplies at the level required.

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- Ensure the availability of vaccines, supplies, and health professionals to administer vaccines in the health facility.
- Provide extended hours of vaccination.
- Use promotional materials to remind users about the availability of vaccines in the institution. Materials should be placed in visible locations, such as in waiting rooms, emergency rooms, and in areas where users make appointments.
- Promote the use of graphics on vaccination coverage to monitor compliance with coverage goals.

Parents and caregivers

- Develop assertive and ongoing communication strategies on vaccines, their benefits, and the ages at which vaccination is needed.
- Remind parents to always bring their child's vaccination card to the health center.
- Develop a training program for community leaders encouraging them to promote vaccination in the community.
- If problems are found related to family characteristics (caregivers' educational levels, ages, etc.), priority can be given to offering vaccination services in rural areas and to making service hours more flexible for communities with large minority populations.

Once implemented, the recommended interventions should be evaluated to ensure that they are successful in reducing the missed opportunities identified in the study.

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ANNEX 1: BUDGET

A	B	C	D	E
Items	Amount	Days of work	Unit price	Subtotal E= B X C X D
HUMAN RESOURCES				
General coordinator				
Interviewers				
Supervisors				
Data entry professional(s)				
Subtotal 1				
TRANSPORTATION IN THE FIELD				
Drivers				
Rent of vehicles				
Gasoline				
Tolls				
Subtotal 2				
OTHER SUPPLIES				
A	B	C	D	E
	Amount	Specific costs	Unit price	Subtotal E=B X D
Materials				
Office supplies				
Copes of questionnaire for health workers				
Copies of health exit survey				
Training course for interviewers and supervisors		Renting location and audovisual equipment, coffee, etc.		
Meeting to present results		Renting location and audovisual equipment, coffee, etc.		
Subtotal 3				
GRAND TOTAL				

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ANNEX 2: SAMPLE INFORMED CONSENT LETTER FOR HEALTH CARE PROFESSIONALS

Dear health care professional:

Introduction/purpose:
In collaboration with the Pan American Health Organization (PAHO), the Ministry of Health is administering a survey on vaccination to health care professionals. To this end, we kindly ask that you complete the attached questionnaire. This study aims to identify the knowledge, attitudes, and practices of health workers as it concerns the timely vaccination of users of our nation's health care system.

Study procedure:
If you decide to participate, please answer the questions in the survey, which concern indications and contraindications of vaccines in the national vaccination schedule, opinions about services delivered to users, and vaccination practices in your work place. Completing the survey will take approximately 15 minutes. Please use a blue or black pen to mark the answer that you believe most accurately answers the question. Please do not leave any questions blank.

Compensation:
You will receive no compensation for participating in this study. However, your participation allows training programs to be designed to increase the knowledge and ability of health care professionals to provide high-quality immunization services.

Confidentiality:
The information you provide in this questionnaire is strictly confidential. The survey is anonymous and will not serve as the basis for any professional evaluation of your abilities. As such, we do not ask for your name. Instead, we assign a registration number to your questionnaire, and only the person responsible for the administration of this study will have access to your responses.

Potential risks:
Questions in this questionnaire present no foreseeable risk of any kind (psychological, emotional, or work-related).

Voluntary participation/withdrawal from study
Completing this questionnaire is entirely voluntary. You are free to decline participation or to stop answering questions at any time. Refusal to participate in this study will in no way affect your rights as a health care professional in this establishment that are guaranteed to you by law.

Person to contact:
Should you have any questions or concerns regarding the interview, we are leaving you a card with the contact information of the individual responsible for these interviews. If you have general questions regarding your rights as a participant in this study, we are also providing the contact information of the president of the local ethics committee.

Thank you for your participation!

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ANNEX 3: SAMPLE INFORMED CONSENT LETTER FOR PARENTS AND GUARDIANS OF CHILDREN AGED <5 YEARS

Dear Sir or Madam:

Introduction/purpose:
In collaboration with the Pan American Health Organization (PAHO), the Ministry of Health is administering a survey on vaccination to adults accompanied by children aged <5 years who leave health centers. The survey aims to identify the causes of missed opportunities for vaccination (MOVs). To this end, we kindly ask for your participation in completing a questionnaire on immunization.

Study procedure:
If you decide to participate, we will ask you questions regarding your purpose in visiting this health center. Specifically, you will be asked if your child received a vaccine during your visit to the health center and if you are satisfied with the service received. The interview will last approximately 15 minutes.

Compensation:
You will receive no compensation for participating in this study. However, your participation allows for the design and implementation of interventions to improve the supply and demand of immunization services.

Confidentiality:
The information you provide is anonymous and strictly confidential. We will assign a registration number to your questionnaire, and only the person responsible for this study will have access to your personal information.

Potential risks:
Questions included in this survey do not present any foreseeable risk. Nevertheless, you may choose to not answer any question that makes you uncomfortable.

Voluntary participation/withdrawal from study:
Your participation is entirely voluntary, and you are free to discontinue the interview at any time. Refusing to participate will not affect your ability to continue using this health care facility.

Person to contact:
If you have any questions or concerns regarding the interview, we are leaving you a card with the contact information of the coordinator of this study. If you have general questions regarding your rights as a participant in this study, we are also leaving you the contact information of the president of the local ethics committee.

Thank you for your participation!

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY

Questionnaire no. _____

Good morning/afternoon. My name is _____ and I am working in a study about vaccination among children. I would like to respectfully ask for your help in answering the questions in this survey. Your participation is voluntary and anonymous. Would you be willing to answer these questions? Thank you very much.*

A. Type of service:
1. Network of public services provided by the State ☐
2. Private ☐
3. NGO ☐
4. Other ☐ Specify:_____

B. Health facility:
1. Hospital ☐
2. Clinic or health center ** ☐

Filter:
A. The child with the adult looks to be aged <5 years.
1) Yes ▶ **CONTINUE** 2) No ▶ **THANK THE PERSON AND RECORD THE ENCOUNTER**

1	Accepts interview ☐		
2	Refuses interview ☐	Reason	
		1. In a hurry or not available	☐
		2. Doesn't like interviews	☐
		3. Other reason	☐
3	Is excluded from the survey because:	Cause	
		1. Age criterion not met	☐
		2. Interviewee does not speak English	☐
		3. Interviewee cannot talk (mute)	☐
4	Interviews suspended ☐		

GEOGRAPHICAL LOCATION		CODES		
State/Province				
Municipality				
Section/District				
Region/Jurisdiction				
Name of facility				
Date (dd/mm/yy)				
Starting time (hour/minutes)		AM	PM	

WORKING GROUP	NUMBER	CODES			
Interviewer					
Supervisor					

* If the country's ethics committee requires a letter of consent, this introduction can be omitted from the form.

** This includes other types of primary care facilities such as doctors' offices, dispensaries, limited-service clinics, and vaccination

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

posts.

DATA ON THE CHILD (IF THE ADULT IS ACCOMPANIED BY MORE THAN ONE CHILD, ONLY THE YOUNGEST CHILD SHOULD BE INCLUDED IN THE STUDY. IN THE CASE OF TWINS, CHOOSE THE ONE BORN LAST).

1. Date of birth
Day | __ | __ | Month | __ | __ | Year | __ | __ |

1.1 Age
99 DK (Doesn't know) / NR (No response)
1. Years _____
2. Months _____
3. Days _____

2. Sex
1. Male ☐ 2. Female ☐

3. What country was the child born in?
_____
99 DK/NR ☐

4. Why did you bring the child to this health care facility? (Do not read the choices).
1. For a medical consultation (child is sick)
2. Vaccination
3. Healthy child visit, or growth/development check-up
4. Company
5. Hospitalization
6. Other [ ] Specify:_____

DEMOGRAPHICS ON CHILD'S PARENT/GUARDIAN

5. Age (years): _____

6. Sex
1. Male ☐ 2. Female ☐

7. What is your relationship with the child?
1. Mother/father ☐
2. Grandparent ☐
3. Uncle/aunt ☐
4. Brother/sister ☐
5. Other ☐ Specify: _____

8. Marital status:
1. Single ☐
2. Married ☐
3. Informal marriage ☐
4. Separated/divorced ☐
5. Widowed

9. Country where mother was born
_____ 99 DK/NR ☐

10. Nationality
_____ 99 DK/NR ☐

11. Schooling
1. None, but knows how to read and write ☐
2. None, does not know how to read and write ☐
3. Primary or less ☐
4. Incomplete secondary ☐
5. Complete secondary ☐
6. More than secondary ☐

12. Occupation
1. Housewife (work is housekeeping) ☐
2. Employee or laborer ☐
3. Self-employed ☐
4. Boss or employer ☐
5. Other [ ] Specify:_____

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

DEMOGRAPHICS ON CHILD'S PARENT/GUARDIAN (*Continued*)

13. How many people live in the home (eat the same food), including the child?

1. 2-5 ☐
2. 6 or more ☐

14. Municipality of residence:

_____ 99 DK/NR ☐

15. Is this health center in the municipality where you live?

1. Yes ☐ ▶ **Skip to question 17**
2. No ☐
3. DK ☐ ▶ **Skip to question 17**

16. Why do you come to this facility?

1. No health services in the municipality of residence ☐
2. There are health services in the municipality where I live, but their treatment of patients is not good ☐
3. The facility is on the way to my workplace ☐
4. The facility is in the same municipality as the child's daycare or school ☐
5. Because this facility offers various health services ☐
6. Have always brought the child here ☐
7. Other ☐ Specify: _____

17. How long have you been living in this municipality?

1. Always ☐
2. _____ years
3. _____ months
4. _____ weeks
5. _____ days

18. What means of transportation do you usually use to come to this facility?

1. Walk ☐
2. Bicycle ☐
3. Motorcycle ☐
4. Car ☐
5. Bus ☐
6. Other ☐ Specify: _____

19. How long does it take you to get here?

Hours _____ Minutes_____

INFORMATION ON VACCINATION

20. Have you heard or seen messages on vaccination in the last month?

1. Yes ☐
2. No ☐ — Skip to question 24

21. Where?

1. Radio ☐
2. Television ☐
3. Newspaper ☐
4. Health facility ☐
5. Telephone message ☐
6. Facebook or Internet ☐
7. Children's school ☐
8. Church ☐
9. Home visit by health workers
10. Other ☐ Specify: _____

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

INFORMATION ON VACCINATION (*Continued*)

22. What did the message say? _____

23. How did you use the information?

1. Knowing where to vaccinate the child ☐
2. Having more information ☐
3. Decided to vaccinate the child ☐
4. No use ☐
5. Other ☐ Specify: _____

24. Where do you usually look for information on what vaccines your child needs? Multiple response (MR).

1. Does not seek information ☐ ▶ **Skip to question 26**
2. Radio ☐
3. Television ☐
4. Newspaper ☐
5. Internet ☐
6. Vaccination booklet or card ☐
7. Other parents /family members ☐
8. Children's school ☐
9. Church ☐
10. Health facilities ☐
11. Other ☐ Specify: _____

25. For what did you use the information?

1. Knowing where to vaccinate the child ☐
2. Having more information than provided by the health services ☐
3. Decided to vaccinate the child ☐
4. No use ☐
5. Other ☐ Specify: _____

26. Do you think you lack information on vaccination or on the need for vaccination?

1. Yes ☐
2. No ☐
3. DK/NR ☐

27. Have you ever vaccinated your child?

1. Yes ☐
2. No ▶ **Skip to question 49** ☐

27.1 Have you ever requested vaccination service for this child and been refused?

1. Yes ☐
2. No ▶ **Skip to question 28** ☐

27.2 If so, why didn't they vaccinate the child?

1. The doctor or nurse said it couldn't be done because the child was sick ☐
2. There were no vaccines, or there were no syringes or some other supply needed for vaccination ☐
3. It was not a vaccination day ☐
4. The vaccination area was closed ☐
5. The person in charge of vaccination was not there ☐
6. There would have been a long wait ☐
7. The staff treated us badly ☐
8. We didn't have the vaccination card with us ☐
9. The hours for vaccination are limited ☐
10. Other ☐ Specify: _____

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

INFORMATION ON VACCINATION (*Continued*)

28. In your home, who makes the decision to vaccinate the children? (MR)

1. Father ☐
2. Mother ☐
3. Other relatives ☐
4. Consensus of father and mother ☐
5. Other ☐ Specify: _____

USE OF VACCINATION CARD AND INFORMATION ON VACCINES ADMINISTERED

29. Does your child have a vaccination card?

1. Yes, and I have it with me ☐
2. Yes, but I do not have it with me ☐
   ▶ **Skip to question 31**
3. No ▶ **Skip to question 31** ☐

30. Request and examine the child's vaccination card or temporary vaccination document to fill out the following table.
▶ **Then skip to question 32.**

What vaccines has the child received?	A. DATES OF ALL DOSES GIVEN			B. VACCINATION SERIES	C. ADMINISTERED TODAY?	
	DAY	MONTH	YEAR	REMINDER	YES	NO
1. BCG	|__|__|	|__|__|	|__|__|	Newborn (single dose)		
2. Hep B, newborn dose	|__|__|	|__|__|	|__|__|	Newborn (single dose)		
3. Polio						
3.1 First dose	|__|__|	|__|__|	|__|__|	2 months		
3.2 Second dose	|__|__|	|__|__|	|__|__|	4 months		
3.3 Third dose	|__|__|	|__|__|	|__|__|	6 months		
4. Whole-cell pentavalent						
4.1 First dose	|__|__|	|__|__|	|__|__|	2 months		
4.2 Second dose	|__|__|	|__|__|	|__|__|	4 months		
4.3 Third dose	|__|__|	|__|__|	|__|__|	6 months		
5. Monovalent rotavirus						
5.1 First dose	|__|__|	|__|__|	|__|__|	2 months		
5.2 Second dose	|__|__|	|__|__|	|__|__|	4 months		
6. Pneumococcal vaccine						
6.1 First dose	|__|__|	|__|__|	|__|__|	2 months		
6.2 Second dose	|__|__|	|__|__|	|__|__|	4 months		
6.3 Third dose	|__|__|	|__|__|	|__|__|	12 months		

(*Continued*)

ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

USE OF VACCINATION CARD AND INFORMATION ON VACCINES ADMINISTERED (*Continued*)

(*Continued*)

What vaccines has the child received?	A. DATES OF ALL DOSES GIVEN			B. VACCINATION SERIES	C. ADMINISTERED TODAY?	
	DAY	MONTH	YEAR	REMINDER	YES	NO
7. MMR						
7.1 First dose	| __ | __ |	| __ | __ |	| __ | __ |	12 months		
7.2 Second dose	| __ | __ |	| __ | __ |	| __ | __ |	1–4 years		
8. DPT, first booster	| __ | __ |	| __ | __ |	| __ | __ |	18 months or 1 year after the 3rd dose of pentavalent		
9. DPT, second booster	| __ | __ |	| __ | __ |	| __ | __ |	4 years		
10. Polio, first booster	| __ | __ |	| __ | __ |	| __ | __ |	18 months		
11. Polio, second booster	| __ | __ |	| __ | __ |	| __ | __ |	4 years		

Source: 1. Vaccination card ☐
2. Temporary vaccination document ☐

31. Reasons for not carrying or having vaccination cards

1. It's at the nursery school or daycare center ☐
2. Left it at home ☐
3. Lost it ☐
4. Have not been given it ▶ **Skip to question 34** ☐
5. Because vaccination was not the reason for the visit ☐
6. Other ☐ Specify: _____

32. Have you ever lost the vaccination cards?

1. Yes ☐
2. No ☐ ▶ **Skip to question 34**

33. Did you encounter difficulty getting it replaced?

1. Yes ☐
2. No ☐

34. Could you tell me what purpose the vaccination cards serves?

1. To know what vaccines the child has had and which are missing ☐
2. Other ☐ Specify: _____
3. DK

35. During the visit to the facility, did the personnel ask you for the child's vaccination card?

1. Yes ☐
2. No ☐
3. No, but they asked me about the child's vaccines ☐

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

VACCINATION DATA

36. Was your child vaccinated during this visit to the facility?

1. Yes ▶ **Skip to question 37** ☐
2. No _____ ☐
3. Other ☐ Specify: _____

36.1 Why didn't they vaccinate the child?

A. Reasons related to the health workers

1. The doctor/nurse said that the child is already vaccinated, or has had the complete series, or is not due for a vaccination at this time. ☐
2. The health workers did not ask me. ☐
3. The doctor or nurse said that it could not be done because the child is sick. ☐

Type of disease or treatment (check one or more of the items in the following list)

☐ 1. Cold and/or cough
☐ 2. Diarrhea
☐ 3. Intestinal parasitosis
☐ 4. Pneumonia
☐ 5. Malnutrition and/or anemia
☐ 6. Mild fever
☐ 7. Low birth weight
☐ 8. Dehydration
☐ 9. Is taking medicine (write down the name of the medicine) _____
☐ 10. Urinary tract infection
☐ 11. Other - Specify: _____

Interviewer: If the reasons cited by the interviewee refer to block A above, ▶ skip to question 47

B. Reasons related to the caregiver

☐ 1. The last time the child was vaccinated he/she got sick or had a reaction.
☐ 2. My religion doesn't permit it.
☐ 3. Negative experiences of a family member or acquaintances.
☐ 4. I don't trust the health service's vaccines.
☐ 5. I don't trust the personnel of the health facilities.
☐ 6. I forgot.
☐ 7. Vaccines can cause some disease or discomfort.
☐ 8. I don't have time.
☐ 9. Vaccines are not necessary, or I don't believe in vaccines.
☐ 10. The child has completed the series.
☐ 11. Vaccination was not the purpose of this visit.
☐ 12. Other - Specify: _____

Interviewer: If the reasons cited by the interviewee refer to block B above, ▶ skip to question 47

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

VACCINATION DATA (*Continued*)

C. Reasons related to the health service's logistics and organization

- ☐ 1. There were no vaccines.
- ☐ 2. There were no syringes, or other vaccination supplies were missing.
- ☐ 3. It is not a vaccination day.
- ☐ 4. The vaccination area was closed.
- ☐ 5. The person in charge of vaccinations was not there.
- ☐ 6. There would have been a long wait.
- ☐ 7. The staff treated us badly.
- ☐ 8. The hours for vaccination are limited.
- ☐ 9. Other - Specify: _____

Interviewer: If the reasons cited by the interviewee refer to block C above, ▶ skip to question 47

37. How long did you wait today for your child to be vaccinated? Hours _____ Minutes _____ .

QUALITY OF THE VACCINATION SERVICE

38. Did they tell you today what vaccines they gave the child?
1. Yes ☐
2. No ☐
3. NR ☐

39. Did they tell you today the date of the next vaccination appointment and write it in the vaccination cards?
1. Yes ☐
2. No ☐

40. Did they tell you today and write down the dates for the boosters of some vaccines?
1. Yes ☐
2. No ☐

41. Did you receive information today on the "reactions" that can occur following vaccination?
1. Yes ☐
2. No ☐ ▶ **skip to question 43**

42. If so, what did they tell you?

_____

_____

43. Did you receive information today on what you should do if the child has "reactions" to the vaccines?
1. Yes ☐
2. No ☐

44. Are you satisfied with the service provided today?
1. Yes ☐
2. No ☐ ▶ **skip to question 46**

45. Why?
1. Immediate attention ☐ ▶ **skip to question 47**
2. Friendly treatment by staff ☐ ▶ **skip to question 47**
3. No charge for service ☐ ▶ **skip to question 47**
4. Other - Specify: _____ ☐ ▶ **skip to question 47**

_____

46. Why were you not satisfied?
1. Had to wait a long time. ☐
2. The staff was discourteous. ☐
3. The language that the health workers use is not clear. ☐
4. They did not explain what vaccines they had given the child. ☐
5. Other ☐ Specify: _____

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

QUALITY OF THE VACCINATION SERVICE (*Continued*)

47. Have you ever been charged for vaccines given to a child?

1. Yes ☐
2. No ☐ ▶ **skip to question 49**

48. The health facility was:

1. Public ☐
2. Private ☐
3. DK ☐
4. Other ☐ Specify: _____

REASONS TO VACCINATE

49. Could you tell me the purpose of vaccines? (MR)

1. To prevent diseases. ☐
2. So children will grow up healthy. ☐
3. To cure diseases. ☐
4. They don't do any good. ☐
5. Not sure what they're for. ☐

50. What diseases do vaccines prevent?

1. Tuberculosis ☐
2. Hepatitis ☐
3. Poliomyelitis or polio ☐
4. Diphtheria ☐
5. Whooping cough or pertussis ☐
6. Tetanus ☐
7. Pneumonia ☐
8. Meningitis ☐
9. Diarrhea ☐
10. Influenza ☐
11. Measles ☐
12. Rubella ☐
13. Mumps ☐
14. Yellow fever ☐
15. Cancer ☐ Specify: _____
16. Other ☐ Specify: _____
17. None ☐
18. DK ☐

51. Do you think your child could get these diseases if you don't vaccinate him/her?

1. Yes ☐
2. No ☐
3. DK ☐

52. What suggestions do you have to improve vaccination services?

1. There should be more vaccination personnel. ☐
2. There should be less of a wait. ☐
3. Hours and days when vaccinations are available should not be limited. ☐
4. Vaccination cards should not be distributed. ☐
5. The treatment of the public, and of the children being vaccinated, should be friendlier. ☐
6. The health center should always have vaccines. ☐
7. They should provide information on the vaccines that are being given, on the diseases that they prevent, and on the reactions that they produce. ☐
8. Other ☐ Specify: _____
9. None ☐
10. DK ☐
11. NR ☐

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ANNEX 4: HEALTH FACILITIES EXIT SURVEY (*Continued*)

Interviewer: Thank the interviewee and note the time when the interview concluded. Read the following statement: "Remember that vaccination is a right of all people. Demand this right and remember to bring your child's vaccination card to the health center each time you visit the center."

Ending time: **Hour | ___ | ___ |** **Minutes | ___ | ___ |**

Interviewer's remarks:_____

_____

_____

Supervisor's remarks: _____

_____

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ANNEX 5: HEALTH WORKER SURVEY

The Ministry of Health, in collaboration with the Pan American Health Organization, wishes to strengthen the technical skills of all health workers who provide immunization services. This questionnaire has been designed to identify future training topics in immunization. Your collaboration is greatly appreciated.

The completion of this questionnaire is voluntary and anonymous. If you decide to participate, please use a pencil or pen to mark answers that in your opinion respond appropriately to the question or problem presented. Responses will not serve as the basis for any evaluation of your professional abilities. Read each section of the questionnaire carefully, and please do not leave any questions blank.[1]

I. BACKGROUND INFORMATION

Check the correct answer.

1. Sex 1. Male ☐ 2. Female ☐

2. Age |__|__| years

3. Professional training:

3.1 General practitioner ☐
3.2 Specialist[2] ☐
3.3 Nurse ☐
3.4 Health promoter or health aid ☐
3.5 Other ☐ Specify _____

4. Area in which you work:

4.1 Outpatient visits, inpatient dept., emergency room ☐
4.2 Preventative medicine, epidemiology, or immunization ☐

5. Time in post |__|__| years |__|__| months

6. Have you received training or participated in courses on vaccination?

1. Yes ☐ 2. No ☐

7. If so, when were you last trained?

1. <1 year ago ☐
2. 1-2 years ago ☐
3. 2-3 years ago ☐
4. >4 years ago ☐

8. Are clinical or academic sessions held in your hospital or health center?

1. Yes ☐ 2. No ☐

9. If so, has a topic related to vaccination or VPD been presented in the last 12 months?

1. Yes ☐ 2. No ☐

[1] If the country's ethics committee requires a letter of consent, this information may be omitted from the questionnaire.

[2] Include masters or doctorate degree.

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

II. KNOWLEDGE OF VACCINATION

FOR QUESTIONS 10-13, PLEASE MARK ALL CORRECT ANSWERS.

10. Vaccines that healthy children should receive:

1. BCG ☐
2. MMR ☐
3. Hepatitis B ☐
4. Td ☐
5. Rotavirus ☐

11. Diseases prevented by whole-cell pentavalent vaccines:

1. Hepatitis B, whooping cough, tetanus, pneumonia, and meningitis caused by *Haemophilus influenzae* type b ☐
2. Diphtheria, whooping cough, tetanus, Hepatitis B, and influenza ☐
3. Poliomyelitis, diphtheria, whooping cough, tetanus, pneumonia, and meningitis caused by pneumococcus ☐
4. Diphtheria, whooping cough, tetanus, poliomyelitis, pneumonia, and meningitis caused by *Haemophilus influenzae* type b ☐
5. None of the above ☐

12. Contraindication for being vaccinated against poliovirus:

1. Breastfeeding ☐
2. Axillary or rectal temperature of 37.5 °C ☐
3. Mild malnutrition ☐
4. Mild diarrhea ☐
5. None of the above ☐

13. Vaccines with boosters and age at which booster should be applied:

1. Hepatitis B at age 2 years ☐
2. BCG at any age <5 years ☐
3. Pneumococcal vaccine at age 18 years ☐
4. DPT at age 4 years ☐
5. Rotavirus at age 4 years ☐

14. Age at which the following vaccines should be administered. Write in the blank column of the first box the number that corresponds to the correct answer in the second box.

1	Rotavirus	
2	Influenza	
3	Hepatitis B vaccines	
4	2nd DPT booster	
5	1st dose MMR	

1) At birth, and 2, 4, and 6 months
2) 2 and 4 months or 2, 4, and 6 months
3) 1 year
4) 6-23 or 6-35 months
5) 4 years

FOR QUESTIONS 15-17, PLEASE MARK ONLY ONE CORRECT ANSWER.

15. Vaccines used to prevent pneumonias in children aged <2 years. Mark only one response.

1. Influenza, Hepatitis B, and pneumococcal conjugate vaccine ☐
2. BCG, pentavalent, and Hepatitis B ☐
3. Rotavirus, pentavalent, and pneumococcal conjugate vaccine ☐
4. Pentavalent, influenza, and pneumococcal conjugate vaccine ☐
5. None of the above ☐

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

II. KNOWLEDGE OF VACCINATION (*Continued*)

16. VPDs in the process of eradication or elimination:

1. Chickenpox ☐
2. Whooping cough ☐
3. Poliomyelitis ☐
4. Measles, rubella, and congenital rubella syndrome ☐
5. Only options 3 and 4 are correct ☐

17. Contraindications for any vaccine:

1. Local reaction to previous dose ☐
2. Light fever ☐
3. Seizures under medical treatment ☐
4. Pneumonia or other serious diseases ☐
5. None of the above ☐

18. Do you believe that in some situations a person vaccinated against a certain disease could contract that disease years later?

1. Yes ☐
2. No ☐ Explain your response _____

_____

19. For the following list of vaccines, place a check in the column marked AT if the vaccine is attenuated or a check in the column marked IN if the vaccine is inactivated, recombinant, or fractional.

No.	VACCINES	AT	IN
1	BCG		
2	DPT		
3	Measles		
4	Rubella		
5	Oral polio virus		
6	*Haemophilus influenzae* type b (Hib)		
7	Hepatitis B		

III. ATTITUDES

FOR QUESTIONS 20-23, PLEASE MARK ONLY ONE CORRECT ANSWER.

20. On a daily basis, who should evaluate the vaccination status of children, review vaccination cards, and ensure that children's schedules are up to date?

1. The child's parents ☐
2. The nurse responsible for immunization ☐
3. Physicians in external consultations, inpatient services, and emergency rooms ☐
4. All of the above ☐
5. Only options 1 and 2 are correct ☐

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

III. ATTITUDES (*Continued*)

21. In which of the following situations should you inquire about the doses that children should have received and those they are missing according to their age?

1. Child's wellness visit ☐
2. Consultation for any illness ☐
3. When a child is accompanying a woman during a prenatal check-up ☐
4. When a child is accompanying a woman visiting a health care facility for any reason ☐
5. All of the above ☐

22. Why do you think that some children do not have complete vaccination schedules?

1. Parents' negative beliefs related to vaccination ☐
2. Hours of vaccination incompatible with schedule of parents ☐
3. Physicians, nurses, and health workers do not ask parents about children's vaccination schedules ☐
4. Physicians, nurses, and health workers do not review children's vaccination cards ☐
5. False contraindications for vaccination by health workers ☐
6. Distance from vaccination site ☐
7. All of the above ☐

23. Do you believe that the vaccines administered in private practice vary in quality from those provided by the Ministry of Health?

1. Yes ☐ 2. No ☐ 3. Don't know ☐

24. Please state the reason _____

_____

FOR QUESTIONS 25-28, PLEASE INDICATE IF YOU AGREE OR DISAGREE WITH THE FOLLOWING STATEMENTS:

25. My knowledge of vaccination is insufficient or outdated.

1. Agree ☐ 2. Disagree ☐

26. The knowledge I have about vaccination and the Expanded Program on Immunization (EPI) is sufficient to meet the needs of the institution.

1. Agree ☐ 2. Disagree ☐

27. I fear adverse reactions from vaccines.

1. Agree ☐ 2. Disagree ☐

28. Completing nominal registries (books/notebooks) delays the timely vaccination of children.

1. Agree ☐ 2. Disagree ☐

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

IV. PRACTICES

IV.1 DECISION MAKING IN DAILY PRACTICE (QUESTIONS FOR ALL HEALTH CARE PROFESSIONALS)

FOR QUESTIONS 29-32, MARK THE CORRECT ANSWER.

29. Female infant aged 3 months with documented history of one dose of BCG and one of Hepatitis B both administered at birth. The mother seeks service to assess the child's growth and development. What vaccines would you give the child?

1. None ☐
2. Only Hepatitis B ☐
3. Polio and pentavalent ☐
4. Hepatitis B, pentavalent, and rotavirus ☐
5. Whole cell pentavalent, pneumococcal, polio, and rotavirus ☐

30. A newborn male weighing 3,200 g with a normal vaginal delivery in a hospital. The mother is HIV negative but a carrier of Hepatitis B. What vaccines should this child receive before leaving the hospital?

1. BCG vaccine ☐
2. Hepatitis B vaccine ☐
3. Heptavalent pneumococcal conjugate vaccine ☐
4. None of the above ☐
5. Only options 1 and 2 are correct ☐

31. Female infant aged 6 months with documented history of one dose of BCG, one dose of Hepatitis B, two doses of whole-cell pentavalent, two doses of pneumococcal, two doses of rotavirus, and two doses of polio vaccine. The last doses of vaccines were administered when the child was 4 months old. According to the mother, the child experienced fever and a seizure one month ago and is now receiving medical treatment. Following EPI guidelines, what vaccines would you give her?

1. I would not vaccinate her ☐
2. Only polio vaccine and I would refer her to a specialist ☐
3. Only Hepatitis B ☐
4. Polio and whole-cell pentavalent vaccine ☐
5. Only MMR ☐

32. What vaccines have you administered to an adult?

1. Td vaccine ☐
2. Measles-rubella (MR) ☐
3. Hepatitis B ☐
4. Influenza ☐
5. Pneumococcal vaccines for adults ☐
6. None

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

IV. PRACTICES (*Continued*)

IV.2 IMMUNIZATION PRACTICES AND DECISION-MAKING (QUESTIONS ONLY FOR HEALTH CARE PROFESSIONALS WHO ADMINISTER VACCINES)

33. Under what circumstances, would you tell the parent what vaccines you are administering and provide advice regarding what to do in case the child experiences an adverse reaction?

1. Only if the vaccine administered could produce a severe adverse reaction. ☐
2. Only when the parent or guardian requests this information. ☐
3. Never, since this information can be counterproductive and discourage participation in the immunization program. ☐
4. Always, regardless of the vaccine used and the type of reaction that might be expected. ☐
5. The probability that an adverse event related to vaccination is so low that I would rarely have to provide this information. ☐

34. Today, you vaccinate a female aged 2 months with the first doses of whole-cell pentavalent, polio, rotavirus, and pneumococcal vaccines. After telling her parents which vaccines she received, what other information and recommendations would you provide her caregivers?

1. The child may experience a bit of fever, diarrhea, or discomfort following vaccination. ☐
2. The symptoms above generally do not require treatment; however, in the case of fever, the child should be lightly dressed and should not stop breastfeeding under any circumstances. ☐
3. The parent should return to the health center if these symptoms persist so that the child may be evaluated by a physician. ☐
4. All of the above. ☐
5. None of the above. ☐

35. What should be done if you notice that there are children with delayed vaccination schedules in the nominal registries of a health center?

1. Make a weekly list of children with incomplete vaccination schedules. ☐
2. Contact parents or guardians by telephone, email, or another means of communication to remind them to vaccinate their children. ☐
3. Make home visits to encourage the family to complete the child's vaccination schedule and administer missing doses while there. ☐
4. All of the above ☐
5. None of the above. ☐

36. What could be done to follow up on the vaccination of children following hospitalization or outpatient treatment for a chronic condition?

1. Coordinate with clinical areas, inpatient, and emergency departments in hospitals, so that they can review the child's vaccination card. ☐
2. Send patients whose physicians consider them eligible for vaccination to the immunization department so that they can be vaccinated before leaving the hospital. ☐
3. In hospitals, a health worker in the immunization dept. could visit inpatient departments to review the medical records of children who will be discharged that day, thereby identifying children to start or complete the vaccination schedule. ☐
4. All of the above. ☐
5. None of the above. ☐

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

IV. PRACTICES (*Continued*)

IV.2 IMMUNIZATION PRACTICES AND DECISION-MAKING (QUESTIONS ONLY FOR HEALTH CARE PROFESSIONALS WHO ADMINISTER VACCINES) (*Continued*)

37. At 8:00 am, you prepare a vaccination thermos for the morning shift at the health establishment. Following proper cold chain guidelines for cold boxes, you place two vials of 10 doses of MMR vaccine in the thermos. At 3:00 pm, a mother requests that her 13 month-old child receive one dose of MMR. After reviewing the child's card, you determine that the child has not yet received MMR but that she has otherwise received all vaccines for children aged <1 year. Additionally, the child has no contraindications. Only two doses from the first vial have been administered since 8:30 am, when the first dose was administered. Which of the two vaccine vials in the thermos would you use to vaccinate the child?

1. I would use the open vial to prevent vaccine wastage. ☐
2. I would tell the mother to return the next day, since I cannot open a new vaccine vial and there are no more children to vaccinate. ☐
3. I would open the second vial of MMR vaccine to immunize the girl. ☐
4. I would recommend that the mother take the child to another health center to be vaccinated. ☐
5. I would ask that the mother wait to vaccinate her child until the second shift, which begins at 5:00 in the afternoon. ☐

38. Assume that the health center or hospital where you work is responsible for the well-being of 10,000 people, 1,000 of which are aged <5 years. Of these, assume that 200 are aged <1 year (on average 17 children are born each month), 200 are aged 1 year, and 600 are aged 2-4 years. Based on this information, how would you determine the number of children aged <1 year who should be vaccinated on a monthly basis (note: do not take into account influenza vaccine)?

1. 17 doses of BCG and 17 doses of Hepatitis B for newborns. ☐
2. 17 first doses of whole-cell pentavalent, pneumococcus, rotavirus, and polio vaccines. ☐
3. 17 second doses of whole-cell pentavalent, pneumococcus, rotavirus, and polio vaccines. ☐
4. 17 third doses of oral and whole-cell pentavalent vaccines. ☐
5. Adjust goals based on vaccination coverages. ☐
6. Estimate the doses of the children with delayed schedules (incomplete doses on the pages of the registry) and the average number of doses from children in other health establishments whose parents have vaccinated their children at these facilities for various reasons; add these to the previously estimated goals. ☐
7. All of the above. ☐

39. In the following list of resources and procedures of the cold chain, place a check mark by the statement if it is applicable to refrigerators, auxiliary thermos, or both.

No.	RESOURCES AND PROCEDURES	REFRIGERATOR	AUXILIARY THERMOS AND THERMOS FOR FIELDWORK
1	Storage at 2-8 °C		
2	Durable, washable, and sealable plastic material		
3	15 cm away from the wall		
4	Temperature logbook		

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ANNEX 5: HEALTH WORKER SURVEY (*Continued*)

IV. PRACTICES (*Continued*)

IV.2 IMMUNIZATION PRACTICES AND DECISION-MAKING (QUESTIONS ONLY FOR HEALTH CARE PROFESSIONALS WHO ADMINISTER VACCINES) (*Continued*)

IN THE FOLLOWING SECTION, INDICATE WITH A CHECK MARK WHETHER YOU AGREE WITH THE FOLLOWING STATEMENTS

40. There is sufficient staff offering immunization services at this health care facility.

1. Yes ☐ 2. No ☐

41. Today I have enough vials of all vaccines for patients who seek immunization services.

1. Yes ☐ 2. No ☐

42. Today I have all the syringes, pads or swabs, record sheets, vaccination cards, and other materials that I need to vaccinate patients who seek immunization services.

1. Yes ☐ 2. No ☐

43. When the professional in charge of vaccination is absent, a health care professional is available to replace him or her.

1. Yes ☐ 2. No ☐

ADDITIONAL COMMENTS

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR TIME!

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ANNEX 6: REAL AND FALSE CONTRAINDICATIONS FOR VACCINATION[i]

VACCINE	REAL CONTRAINDICATIONS	FALSE CONTRAINDICATIONS
All vaccines	High fever, severe or moderate diseases, transfusion of blood or gamma globulin in previous three months.	Mild reaction to previous dose, mild illness with or without fever, treatment with antibiotics, recent infection, convalescence, non-specific allergies to vaccines or their components, non-anaphylactic allergy to egg proteins or to neomycin. Any type of allergy in a family member.
Hepatitis B	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.	Child of HB-positive mother or mother who is a carrier of HB virus.
BCG	• Infants diagnosed with Human Immunodeficiency Virus (HIV), with and without symptoms of HIV infection. • Infants with an unknown status of HIV infection, but with signs and symptoms suggestive of HIV and whose mothers have HIV. • If HIV can be ruled out with virological diagnostic tests, BCG may be administered.[ii]	Child of mother who is a carrier of HB virus.
OPV (Sabin type)	OPV has not been found harmful when administered to asymptomatic HIV-positive children. However, if available, inactivated polio vaccine (IPV) is preferred, especially for symptomatic individuals. IPV is preferred for HIV-positive individuals and their household contacts due to the theoretical risk of OPV's neurovirulent effect on immunocompromised persons.	Breastfeeding, diarrhea and common cold, and other non-serious infectious diseases.
IPV (inactivated poliovirus vaccine)	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.	Diarrhea.
Diphtheria, tetanus, pertussis (DTP, DTaP) **Tetanus, diphtheria, pertussis (Tdap**	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. • Encephalopathy (e.g., coma, decreased level of consciousness, prolonged seizures) not attributable to another identifiable cause within 7 days of administration of previous dose of DTP or DTaP (for DTP/DTaP); or of previous dose of DTP, DTaP, or Tdap (for Tdap).	Neurological disease or history of seizures currently under treatment.
Rotavirus	Severe clinical event (e.g., anaphylaxis) after a previous dose or serious allergy to a vaccine component.	Breastfeeding, diarrhea and the common cold, other non-serious infectious diseases, or administration of other vaccines of viral origin.
Pneumococcal conjugate vaccine (PCV)	High fever, severe or moderate diseases, history of severe allergies to a component of the vaccine.	Non-serious infectious diseases, administration of other vaccines of viral or bacterial origin.
Pneumococcal polysaccharide vaccine (PPSV)	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.	Common cold or diarrhea.
Haemophilus influenzae type B (Hib)	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. • Age younger than 6 weeks.	Fever or diarrhea.

(*Continued*)

ANNEX 6: REAL AND FALSE CONTRAINDICATIONS FOR VACCINATION* (*Continued*)

VACCINE	REAL CONTRAINDICATIONS	FALSE CONTRAINDICATIONS
MMR[iii]	• Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. • Severe immunodeficiency (e.g., from hematologic and solid tumors, receiving chemotherapy, congenital immunodeficiency, or long-term[iv] immunosuppressive therapy or patients with HIV infection who are severely immunocompromised).[v] • Pregnancy.[vi]	HIV infection, cured or treated tuberculosis, maternal lactation, and cohabitants with immunodeficiencies.
Td	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component.	Pregnancy at any stage, puerperal condition (time following childbirth), or breastfeeding.
Yellow fever[vii]	• People with acute and severe febrile illness that comprise their general state of health. • History of hypersensitivity reactions to chicken eggs or their derivatives. • Pregnant women, except in epidemiological emergencies and following the recommendations of health authorizes. • Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component. • Immunocompromised individuals, including those with: ▫ AIDS or CD4+ cell counts <200 cells/mm^3 ▫ certain primary immunodefeciencies ▫ thymus disorders ▫ malignant neoplasms treated with chemotherapy ▫ recent recipients of stem cell transplants ▫ administration of medicines with immunosuppressive properties (e.g., high doses of corticosteroids, alkylating agents, antimetabolites, alpha-interferon inhibitors) ▫ recent or current radiotherapy ▫ children aged <6 years	
Human papillomavirus (HPV)[xiii,ix]	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	

[i] The list of contraindications may vary based on country guidelines.

[ii] Weekly Epidemiological Record, No 21, 25 May 2007.

[iii] The MMR and varicella vaccines may be administered on the same day. However, if they are not administered on the same day, they should be given 28 days apart.

[iv] Substantially immunosuppressive steroid dose is considered to be 2 weeks or more of daily receipt of 20 mg (or 2 mg/kg body weight) of prednisone or equivalent.

[v] HIV-infected children may receive varicella and measles vaccine if CD4+ T-lymphocyte count is >15%. (Source: Adapted from American Academy of Pediatrics. Passive Immunization. In: Pickering LK, ed. Red Book: 2009 Report of the Committee on Infectious Diseases. 28th ed. Elk Grove Village, IL: American Academy of Pediatrics: 2009.)

[vi] Although in most cases no fetal adverse events have been observed, live vaccines should be generally avoided during pregnancy to prevent the vaccine from being temporally associated with (or blamed for) some event in the newborn.

[vii] Weekly Epidemiological Record, No. 27, 2013, 88, 269–284.

[viii] Following vaccine administration, adolescent individuals should be observed for 15 minutes. While no evidence exists of elevated risk for fainting (syncope) specifically related to HPV vaccines, post-licensure monitoring shows an increased occurrence of post-vaccination fainting among adolescent individuals. This increased occurrence may relate to the specific psychosocial characteristics of adolescents.

[ix] HPV vaccines may be administered under immunosuppression; previous equivocal or abnormal Papanicolaou (PAP) test; known HPV infection; and history of genital warts, if none of the true contraindications is present.

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ANNEX 7: SYNTAX FOR THE INTERPRETATION OF HEALTH WORKER SURVEY DATA

IMPORTANT: For all questions below, the value of 1 indicates that an answer choice is correct, while the value of 0 indicates that an answer choice is incorrect.

1. **Knowledge of vaccination** (10 questions [10-19] are valid for evaluation):

Question 10: ***If*** the participant selected answer choices 1 and 3, ***then*** assign value of 1 (correct); for all other responses, assign value of 0 (incorrect).

Question 11: ***If*** the participant selected answer choice 1, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 12: ***If*** the participant selected answer choice 5, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 13: ***If*** the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 14: Correct answers:

1. Rotavirus = 2
2. Influenza = 4
3. Hepatitis B vaccine = 1
4. 2nd booster of DPT = 5
5. 1st dose of MMR = 3

If the participant answered 2 to item 1; 4 to item 2; 1 to item 3; 5 to item 4; and 3 to item 5, ***then*** assign value of 1 to each of these responses; all other responses should be assigned the value of 0. The total number of correct answers should be 5 or fewer.

Question 15: ***If*** the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 16: ***If*** the participant selected answer choice 5, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 17: ***If*** the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

Question 18: Correct answer: choice 1 "Yes"; explanation: the vaccine may not have worked, the person was vaccinated but not immunized, or any other response that explain why "Yes."

If the participant selected answer choice 1, ***then*** assign value of 1; for all other responses, assign value of 0.

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ANNEX 7: SYNTAX FOR THE INTERPRETATION OF HEALTH WORKER SURVEY DATA (*Continued*)

Question 19: Correct answers:

1. BCG = AT
2. DPT= IN
3. Measles = AT
4. Rubella = AT
5. OPV = AT
6. Haemophilus influenzae type b (Hib) = IN
7. Hepatitis B = IN

If the participant answered AT to item 1; IN to item 2; AT to item 3; AT to item 4; AT to item 5; IN to item 6; and IN to item 7, ***then*** assign value of 1 to each of these responses; for all other responses, assign value of 0. The total number of correct responses should be fewer than 7.

Final score for section I: Knowledge

Operational definition: Possessing less than 80% of the knowledge evaluated in the survey.

If the total number of correct answers is fewer than 16, then the participant is considered to have "knowledge barriers." ***If*** the number is 16 or greater, ***then*** the participant is not considered to have "knowledge barriers."

2. Attitudes toward vaccination:

Nine questions (20-28); questions 24-26 are not codable.

a) Questions 20: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

b) Questions 21: Codable.

If the participant selected answer choice 5, ***then*** assign value of 1; for all other responses, assign value of 0.

c) Questions 22: Codable.

If the participant selected answer choice 7, ***then*** assign value of 1; for all other responses, assign value of 0.

d) Questions 23: Codable.

If the participant selected answer choice 2, ***then*** assign value of 1; for all other responses, assign value of 0.

e) Questions 24-26: Not codable.

For question 24, written responses should be listed. For questions 25 and 26, only the number and frequency of the answer choices should be recorded.

f) Question 27: Codable.

If the participant selected answer choice 2, ***then*** assign value of 1; for all other responses, assign value of 0.

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ANNEX 7: SYNTAX FOR THE INTERPRETATION OF HEALTH WORKER SURVEY DATA (*Continued*)

g) Question 28: Codable.

If the participant selected answer choice 2, ***then*** assign value of 1; for all other responses, assign value of 0.

Final score for Section II: Attitudes

Operational definition: Marking the correct answer in at least 80% of the situations posed in the survey.

If the total number of correct responses is fewer than 4, ***then*** the participant is considered to have "attitude barriers." ***If*** the total number of correct responses is greater or equal to 4, ***then*** the participant is not considered to have "attitude barriers."

3. For all health care personnel: Decision-making on immunization in the daily practice.

Four questions (29-32), all of which are codable.

a) Question 29: Codable.

If the participant selected answer choice 5, ***then*** assign value of 1; for all other answer responses, assign value of 0.

b) Question 30: Codable.

If the participant selected answer choice 5, ***then*** assign value of 1; for all other answer responses, assign value of 0.

c) Question 31: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other answer responses, assign value of 0.

d) Question 32: Codable.

This question has multiple correct answers.
If the participant selected answer choice 5, assign value of 5. ***If*** the participant did not select this answer choice but circled other answer choices, ***then*** assign value of 1 to each of the circled options. ***If*** the participants did not select any answer choice, assign value of 0. Add number of "1s" to attain total value.

Final score for section III: Proper vaccination practices of health care personnel, part 1

Operational definition: Making the correct decision in at least 80% of the situations posed in the survey.

If the total number of responses is fewer than 6, ***then*** the participant is considered to have "improper vaccination practices." ***If*** the number of correct responses is greater than or equal to 6, ***then*** the participant is not considered to have "improper vaccination practices."

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ANNEX 7: SYNTAX FOR THE INTERPRETATION OF HEALTH WORKER SURVEY DATA (*Continued*)

4. For health care personnel working in immunization: Decision-making on immunization in the daily practice (11 questions [33-43]; questions 40-43 are not codable).

a) Question 33: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

b) Question 34: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

c) Question 35: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

d) Question 36: Codable.

If the participant selected answer choice 4, ***then*** assign value of 1; for all other responses, assign value of 0.

e) Question 37: Codable.

If the participant selected answer choice 3, ***then*** assign value of 1; for all other responses, assign value of 0.

f) Question 38: Codable.

If the participant selected answer choice 7, ***then*** assign value of 1; for all other responses, assign value of 0.

g) Question 39: Codable.

If the participant selected answer choice 1 for item 1; 2 for item 2; 1 for item 3; and 1 and 2 for item 4, ***then*** assign value of 1 for each correct answer. ***If*** not, assign value of 0. ***Then*** add the correct responses to attain a total value (maximum of 4).

h) Questions 40-43: Non-codable responses. For these questions, only the number and frequency of the answer choices should be recorded.

Final score for section IV: Improper vaccination practices of health care personnel, part 2

Operational definition: Making the correct decision in at least 80% of the situations posed in the survey.

If the total number of responses is fewer than 8, ***then*** the participant is considered to have "improper vaccination practices."

If the total number of responses is equal or greater than 8, ***then*** the participant is considered to have proper vaccination practices.

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ANNEX 8: SYNTAX FOR THE INTERPRETATION OF HEALTH EXIT SURVEY DATA

1. Basic vaccination schedule by age[1]

AGE	BASIC SCHEDULE	NO. OF VACCINES
At birth	1 BCG + 1 Hepatitis B (Hep B)	2
2-3 months	1 BCG + 1 Hep B + 1 pentavalent + 1 OPV + 1 rotavirus + 1 pneumococcal	5
4-5 months	1 BCG + 1 Hep B + 2 pentavalent + 2 OPV + 2 rotavirus + 2 pneumococcal	5
8 to 11 months and 29 days	1 BCG + 1 Hep B + 3 pentavalent + 3 OPV + 2 rotavirus + 2 pneumococcal	5
12 to 23 months and 29 days	1 BCG + 1 Hep B + 3 pentavalent + 3 OPV + 2 rotavirus + 2 pneumococcal + 1 MMR	6
18 months or 1 year to 23 months and 29 days	Series of 6 vaccines + 1st boosters of DPT and OPV	
4 years	2nd boosters of DPT and OPV	

[1] This information should be adapted to the country's vaccination schedule. This chart does not include information about influenza and human papillomavirus vaccines.

2. Errors in the vaccination card:

a) If a booster has been recorded for a child who has received no doses of that vaccine in the basic schedule, the booster is considered to fulfill one of the missing doses in the basic schedule.

Example: A child aged 2 years has only received two doses of OPV and pentavalent, but has recorded one booster of OPV and one booster of pentavalent. These boosters should be considered to be the third doses of OPV and pentavalent.

b) If a child's immunization history has a second booster of a vaccine but not a first booster, the dose should be considered the first booster.

c) Only MMR doses administered in children aged >12 months should be counted in the basic schedule. Children who only received MMR before age 12 months should be considered to lack the vaccine.

3. Definition of Timeliness by Vaccine[1]

	Recommended age	Too early[2] (invalid dose)[3]	Timely[4]	Not timely[5]	Late (not included in coverage for age)[6]
Hep B	Birth		0-1 days	2-28 days of age	29-60 days of age (after that it becomes HepB1)
BCG	Birth		0-30 days of age	31-364 days of age	>365 days (not recommended)
Polio1/ Penta1/PCV1	2 months	<42 days of age	42-90 days of age	91-364 days of age	>1 year of age (365 days)

(*Continued*)

ANNEX 8: SYNTAX FOR THE INTERPRETATION OF HEALTH EXIT SURVEY DATA (*continued*)

Definition of Timeliness by Vaccine (Continued)

	Recommended age	Too early[2] (invalid dose)[3]	Timely[4]	Not timely[5]	Late (not included in coverage for age)[6]
Polio2/ Penta2/PCV2	4 months	<28 days from previous dose	70-150 days of age or 28-58 days from previous dose	>151 days of age or >59 days from previous dose	>1 year of age (365 days)
Polio3/ Penta3/PCV3	6 months	<28 days from previous dose	98-210 days of age or 28-58 days from previous dose	>211 days of age or >59 days from previous dose	>1 year of age (365 days)
Rotavirus 1	2 months	<42 days of age	42-90 days of age	91-104 days of age	>105 days of age (not recommended)
Rotavirus 2	4 months	<28 days from previous dose	70-150 days of age or 28-58 days from previous dose	151-240 days of age	>241 days of age (not recommended)
MMR	12 months	<270 days of age	270-395 days of age (or 30 days after recommded age if after 12 months)	<730 days of age	>2 years of age (730 days)
Yellow Fever	12 months	<182 days of age	182-395 days of age	<730 days of age	>2 years of age (730 days)
PCV booster	12 months	<365 days of age	365-395 days of age	<730 days of age	>2 years of age (730 days)
DTP booster	18 months	<181 days from previous dose	<577 days of age	<730 days of age	>2 years of age (730 days)
Polio booster	18 months	<28 days from previous dose	<577 days of age	<730 days of age	>2 years of age (730 days)
Polio booster 2	Refer to national schedule.	<181 days from previous dose	Up to 30 days after the recommended age on the national schedule	More than 30 days after the recommended age on the national schedule	Refer to national schedule
DTP booster 2	Refer to national schedule	<181 days from previous dose	Up to 30 days after the recommended age on the national schedule	More than 30 days after the recommended age on the national schedule	Refer to national schedule

[1] The information in this table should be adapted to the country's current vaccination schedule. This table does not include information about boosters or vaccines against HPV or influenza.

[2] Too early dose: dose that is administered before the recommended period and is invalid.

[3] Invalid dose: dose that was not administered on time and thus cannot generate an immune response.

[4] Timely dose: dose administered when the child has turned an appropriate age, considering the minimum interval between doses in the vaccination schedule.

[5] Not timely dose: dose that was not applied in a timely manner but that is included in the national coverage (children aged ≤1 year).

[6] Dose that was not applied in a timely manner and that is not included in the national schedule but that should be administered to the child to generate an immune response.

Source: Adapted from tables 2 and 3: Summary of WHO Position Papers – Recommended Routine Immunizations for Children

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ANNEX 8: SYNTAX FOR THE INTERPRETATION OF HEALTH EXIT SURVEY DATA (*continued*)

4. Real and false contraindications (See *Annex 6*):

In order to classify diseases or conditions mentioned in the questionnaire as true or false contraindications, the data entry team should send a list of these conditions to the study's technical group for evaluation.

5. Syntax

In classifying participants as eligible or ineligible for vaccination, it is advisable to first identify those participants who are potentially eligibly.

5.1 Child potentially eligible to be vaccinated:

If, according to the age of child, ***he/she*** was missing one or doses included in the basic schedule or one or more boosters, then he/she is potentially eligible for vaccination.

5.2 Eligible child:

a) ***If*** the answer to question 30 regarding whether the child was "potentially eligible" to be vaccinated was "yes," and it was determined from section A of question 36.1 that the child had a false contraindication to be vaccinated (*Annex 5*), ***then the child*** was eligible for vaccination.

b) ***If*** the answer to question 30 regarding whether the child was "potentially eligible" to be vaccinated was "yes," and the answer from section B of question 36.1 was one of the options 1-13, ***then the child*** was eligible for vaccination.

c) ***If*** the answer to question 30 regarding whether the child was "potentially eligible" to be vaccinated was "yes," and the answer from section C of question 36.1 was one of the options 1-9, ***then the child*** was eligible for vaccination.

3. Missed opportunity for vaccination (MOV)

a) ***If*** the child was "eligible" to receive BCG on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a missed opportunity for BCG.

b) ***If*** the child was "eligible" to receive Hep B on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a MOV for Hep B.

c) ***If*** the child was "eligible" to receive OPV on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a MOV for OPV.

d) ***If*** the child was "eligible" to receive pentavalent on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had MOV for pentavalent.

e) ***If*** the child was "eligible" to receive rotavirus vaccine on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a MOV for rotavirus.

f) ***If*** the child was "eligible" to receive a dose of pneumococcal vaccine on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this

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ANNEX 8: SYNTAX FOR THE INTERPRETATION OF HEALTH EXIT SURVEY DATA (*continued*)

vaccine on the day of the survey, ***then the child*** had a MOV for pneumococcal vaccine.

g) ***If*** the child was "eligible" to receive MMR on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a MOV for MMR.

h) ***If*** the child was "eligible" to receive a dose of DPT on the day of the day of survey, and if the answers to questions 30 and 36 show that he/she did not receive this vaccine on the day of the survey, ***then the child*** had a MOV for DPT.

Multiple missed opportunities for vaccination

i) ***If*** the child was "eligible" to receive a dose of DPT on the day of the day of survey, and ***if*** the answers to questions 30 and 36 show that he/she did not receive any missing vaccine on the day of the survey, ***then the child*** had multiple MOVs equal to the sum of all vaccines that he or she did not receive.

Example: ***If*** the child was "eligible" to receive a OPV dose and a pentavalent dose on the day of the survey, and ***if*** the answers to questions 30 and 36 show that he/she did not receive any missing vaccine on the day of the survey, ***then the child*** had two MOVs, one for OPV and one for pentavalent.

Note: *Because a child can have more than one missed opportunity for vaccination, the sum of missed opportunities can be higher than the total number of children with vaccination cards. Example: A total of 500 parents of children were interviewed (no twins included). Together, they had 650 MOVs, meaning that some children had more than one missed opportunity.*

4. Vaccinated child:

If it is determined based on the responses to question 30 that the child is missing no vaccines for his/her age, ***then*** the child is classified as "vaccinated."

5. Undervaccinated or incompletely vaccinated child:

If it is determined based on the responses to question 30 that the child is missing one or more vaccines for his/her age, ***then*** the child is classified as "undervaccinated."

6. Unvaccinated child:

If it is determined based on the responses to questions 30 and 36 that the child is missing all vaccines for his/her age, ***then*** the child is classified as "unvaccinated."

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