

# Missed vaccination opportunities: primary care performance aspects in Recife, Pernambuco, Brazil, 2012

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## Abstract

**Objective:** to describe aspects related to missed vaccination opportunities at Primary Health Care Units at Health District II, in Recife, Pernambuco, Brazil. **Methods:** this was a descriptive study aimed at children under 1 year of age with delayed vaccination in 2012; data were collected by applying structured forms and an interview with parents or guardians. **Results:** 18 Primary Health Care Units and 33 vaccinators were evaluated. 300 vaccination record cards were analyzed, 120 (40%) of which were found to have overdue vaccinations. More than half the professionals did not vaccinate children in situations considered appropriate for vaccination and 50% parents or guardians reported 'lack of time' and 'forgetfulness' as reasons for overdue vaccination. **Conclusion:** delayed vaccination was found; vaccinators have conducts which may be characterized as missing vaccination opportunities.

**Key words:** Vaccines; Immunization Programs; Health Centers; Infant; Epidemiology, Descriptive.

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## Introduction

The Brazilian National Immunization Program (NIP) regulates, implements and supervises the policies and immunization measures in the country, since its foundation on September 18th, 1973. The NIP aims to fulfill the purposes of the World Health Organization (WHO) of offering immunobiologicals to all children.<sup>1-3</sup> The Ministry of Health, through NIP and its planned and systematic actions have achieved the program goals, by defining and putting into practice the national immunization schedule for children, adolescents, adults, the elderly, pregnant women and indigenous people. Furthermore, turning it into an important State program of social scope, broad vaccine coverage, extending to all national territory.<sup>3</sup>

*In order to ensure an excellent vaccination coverage by the health service, it is necessary to accomplish a series of conducts and action scheming that range from the management and structure to the administration of immunobiologicals.*

A study carried out in 2000, in a suburb neighborhood in the municipality of Bauru, São Paulo State, when investigating the main causes for missed vaccination opportunity (MVO) related to the mobility of the population, found that out of 79 children under the age of 6 with delayed immunization, only 47 were located by the health services. Other motives for MVO were associated with (i) low education level of the child's parents or guardians (ii) forgetfulness (iii) children's illnesses (iv) opening hours of the primary health care units (UBS) and (v) distance of the UBS from the child's residence.<sup>4</sup> Errors in the continuing education of vaccinators may induce to false contraindications, e.g., local reaction to a previous dose of the vaccine, allergy not related to any component of the immunobiological, prematurity or low birth weight, infection of the upper respiratory tract, skin illness – jeopardizing the quality of vaccination.<sup>5</sup>

Other situations that can contribute to the MVO are the precarious facilities of primary health care units, difficulties concerning the management of the service rendered and establishment of fixed days for vaccination, besides the neglect of professionals by not previously observing the vaccination card and vaccination status during visits of beneficiaries to UBS in order to properly schedule medical appointments.<sup>6,7</sup>

In order to ensure an excellent vaccination coverage by the health service, it is necessary to accomplish a series of conducts and action scheming that range from the management and structure to the administration of immunobiologicals. Evidences of missed vaccination opportunity and its contribution to the non-achievement of goals of vaccine coverage targeted by the Ministry of Health<sup>8</sup>, associated with the scarcity of information regarding MVO<sup>9</sup> in the municipality of Recife, capital of Pernambuco State, justify the conduction of researches on the topic.

The present study aimed to describe aspects related to the missed vaccination opportunity in primary health care units in the Health District II of Recife, Brazil.

## Method

This is a descriptive study carried out from August 2011 to June 2012, in vaccination rooms of UBS in Recife, Pernambuco State. In order to achieve such goal, UBS of the Family Health Strategy (ESF) of the Health District II were considered in this study.

In 2010, Recife had a population of 1,422,905 inhabitants from which 19,142 were aged between zero and 1 year old and the infant mortality rate was 13.20 per 1,000 born alive babies.<sup>10</sup> The city occupies an area of 218,498 square kilometers and is divided into 94 neighborhoods, grouped in 18 micro-regions, which are grouped in 6 political-administrative regions – inside the structure of the Health Department – corresponding to Health Districts (HD) of the municipality.<sup>11</sup>

Vaccinators (technicians and nursing assistants) who work at the UBSs of the Health District II joined the study. The HD II had 18 UBSs, accounting for nearly 11% of all primary health care units of the municipality. For the analysis of vaccination cards with overdue vaccination, a sample calculation was carried out according to the following standards: (i) a sample of 1,639 children under 1 year of age registered in the Family Health Units of the HD II, (ii) a 50% estimated prevalence (unknown) of MVO in the population studied (iii) a 95% confidence interval (95%CI).

The software Epi Info, version 3.5.1 was used to carry out the sample calculations, with the tool StatCalc, which resulted in a sample of 300 children. This process was conducted through stratification with proportional shares according to the UBS and convenience sample. In case of refusal to join the study, there was replacement of the sample.

The data collection of vaccination cards occurred from July to December 2012, in the moment of the children's vaccine screening: parents or the guardian of the children under 1 year of age who took them to the vaccination room and had vaccination cards with overdue immunization were asked to join the study and answer the survey before the immunization procedures were conducted.

The criteria used in the inclusion of participants were: (i) vaccinator (technician or nursing assistant) currently working in the *UBS*, (ii) children under 1 year of age with overdue vaccination or register of overdue vaccination and (iii) parent or guardian of a child who has overdue vaccination or child with vaccination card that has an overdue immunization record.

The exclusion criteria for the study were the following: technician or nursing assistant inactive in the vaccine room and children above or under 1 year of age with updated vaccination card.

Data collection was performed based on a three-part structured form:

The first part of the data collection was related to the knowledge of vaccinators and answered by technicians or nursing assistants and had 15 objective questions, based on the Manual of rules for vaccination,<sup>12</sup> listed below

a) administration of bacterial or live viruses vaccines in people:

- with congenital or acquired immunodeficiency;
  - with any malignant neoplasm;
  - undergoing a treatment with corticosteroids in immunosuppressive regimens (2 mg/kg/day during 2 weeks); and
  - undergoing other immunosuppressive therapies (antineoplastic chemotherapy, radiotherapy, etc.).
- b) administration of vaccines in people:

- with malnutrition;
- with ongoing application of rabies vaccine;
- with stable neurological disease (e.g., cyclic convulsive syndrome) or a previous one, with actual sequelae;
- with a family record of convulsion;
- undergoing systemic treatment with corticosteroid during a short period (less than 2 weeks) or extended daily treatment or in alternate days with either low or moderate doses;
- in prematurity or low birth weight – except for Bacillus Calmette–Guérin (BCG) that must be administered solely in children weighing more than 2 kilograms;

- with infectious or recurrent mild allergic diseases in the upper respiratory tract;
- with cough or rhinitis;
- currently hospitalized; and
- with allergies, except for systemic and severe allergic reactions, related to components of some vaccines.

The second part of the form was filled out by the researcher through on-site observation, based on the assessment tool for the vaccine room.<sup>13</sup> It evaluated the following technical procedures:

- observing temporary postponement of vaccination and/or counter-indications;
- giving proper instructions on the vaccine to be administered;
- checking the vaccine expiration date;
- recording the day and hour in which the vaccine flask was opened;
- observing the expiration date after opening the flask;
- stowing sharp materials according to biosecurity standards;
- treating vaccines with live microorganisms before the disposal;
- active search for susceptible ones among the patients that often go to the *UBS*;
- observing the amount of vaccines – if it is enough to meet the demand;
- observing the vaccine stock at the *UBS* – if it is excessive;
- observing the amount of syringes and needles – if it is enough to meet the demand;
- observing the expiration date of syringes and needles; and
- separate packing of the various types of waste.

The third part of the form was related to the data collected in the interview with the children's parents or guardians, conducted during the screening, consisting of open questions on the motive(s) for the delay in the immunization schedule.

The following aspects concerning the vaccinators were also taken into account: professional category (assistant; nursing technician); sex (male or female); age (in years), education level (Elementary school; High School; Complete or Incomplete higher education); work experience in vaccination room (in years); specific training in vaccination room (did not receive any training; received 1 or 2, 2 or 3; or more than 3 trainings).

A descriptive analysis was conducted based on the distribution of absolute and relative frequency of variables. Data were analyzed by Epi Info, version 3.5.1 and Microsoft Excel, version 2007.

The study project, in accordance with the Resolution of National Health Council (CNS) No. 466 dated December, 12 2012 was approved by the Ethics Research Committee of the University of Pernambuco (UFPE) under Protocol No. 257/11 and the Certificate of Presentation for Ethics Assessment (CPEA) No. 0261.0.097.000-11. The confidentiality and anonymity of the information were guaranteed to parents and guardians who agreed to join the study All of whom have signed the Term of Consent.

## Results

18 UBSs were evaluated, 33 health workers were interviewed and 300 vaccination cards of children under 1 year of age were analyzed. The workers were, on average, 36.6 years old (standard deviation [SD] of 7.6). All of them had complete high school and 13 were still attending or had completed higher education. The most frequent professional category was Nursing Technician. 27 out of 33 workers claimed to have more than 4 years of experience. Only 2 workers affirmed not having received any training in vaccination room. The average of trainings was 3.5 (SD=2.6); the majority had been trained less than a year ago.

Nine (9) professionals thought incorrectly – in other words, interpreted as an indication – situations characterized as vaccine contraindication (Table 1).

Situations of false contraindication were also observed, in which the vaccinators decided not to carry out the vaccination though there was actually no contraindication for the procedure (Table 2).

When they were asked about adverse events following immunization (AEFI), 27 vaccinators answered the questions based on the literature, 6 vaccinators were either not aware of the AEFI or did not describe the events completely. 22 professionals proved knowledge on the immunobiologicals available at the Reference Center for Special Immunobiologicals (RCSI), though 19 of them were not aware of the procedures flow for requesting these immunobiologicals. Furthermore, 24 vaccinators did not investigate the occurrence of AEFI concerning the previous dose.

Most of the professionals (31/33) offered orientation on the interval between the doses supplied and 22 performed active search for absent patients.

With regards to the behavior of the vaccinators with the parent or guardian going to the health unit without the vaccination card of the child, 23 asked them to return later with the report card as a condition to carry out the procedure, 8 researched the records in the electronic memory card (a conduct that contributes to the reduction of MVO) and 4 consulted the health community agent.

From all the unities monitored, 17 had an electronic memory card for children under 1 year of age and 11 organized the patients according to the date of return. The researchers noticed that all the vaccinators verified the age and the interval between recommended doses before the administration of immunobiologicals. In the technical procedure assessment carried out in vaccination rooms (Table 3), all vaccinators verified the age and the interval between doses before the application of

**Table 1– Distribution of the answers given by the vaccinators of UBS<sup>a</sup> of HD II<sup>b</sup> (n=33) about the administration of bacterial or live viruses vaccines in the municipality of Recife, Pernambuco State, 2012**

	Yes (n)	No (n)
People with congenital or acquired immunodeficiency	9	24
People with malignant neoplasm	9	24
People undergoing a treatment with corticosteroids in immunosuppressive regimens (2 mg/kg/day during 2 weeks)	7	26
People undergoing other immunosuppressive therapies (antineoplastic chemotherapy, radiotherapy)	9	24

a) UBS: Primary health care unit  
b) HD II: Health District II

**Table 2 – Distribution of the answers given by the vaccinators at UBS<sup>a</sup> of the HD II<sup>b</sup> (n=33) on the administration of vaccines of the national vaccination calendar in the municipality of Recife, Pernambuco State, 2012**

	Yes (n)	No (n)
People with malnutrition	13	18
People in ongoing application of rabies vaccine	9	21
People with stable neurological disease (i.e. cyclic convulsive syndrome) or a previous one, with present sequelae	9	23
People with family record of convulsion	9	24
People undergoing systemic treatment with corticosteroid during a short period (for less than 2 weeks) or extended treatment or alternate days with either low or moderate doses	11	19
in prematurity or low birth weight – except for (BCG) <sup>c</sup> that must be administered solely in children weighing more than 2 kilograms	15	18
People with infectious or recurrent mild allergic diseases in the upper respiratory tract	10	22
People with cough or rhinitis	7	25
People with mild or severe diarrhea	3	30
People currently hospitalized	7	23
People with allergy except for systemic and severe allergic reactions, related to components of some vaccines	13	18

a) UBS: Primary health care unit  
b) HD II: Health District II  
c) Bacillus Calmette–Guérin

immunobiologicals. Of the 18 UBSs visited, 14 vaccination rooms were open for 8 hours or more and, according to the population, just one room was difficult to be accessed; 7 rooms were not exclusively destined for the activity of vaccination and 6 were not properly identified. Concerning the facilities, 6 rooms were smaller than 6 square meters, not meeting the standards established by the National Immunization Programme; the majority of rooms had light-colored, easy-to-clean and rain-tight walls, resistant and non-slip floors.

The ventilation, illumination and the distribution of the furniture in the room failed to meet the requirement in half of the rooms. 9 rooms did not have appropriate protection against direct light. The temperature in 12 rooms surpassed the interval of 18°C-20°C. 11 rooms were in ideal conservation conditions and 13 rooms were in ideal cleaning conditions.

Taking into account the 300 vaccination cards analyzed, 120 (40.0%) had reports on overdue vaccination. The motives for such delay, reported by parents or guardians are presented in Table 4, the top motives were lack of time, forgetfulness and lack of immunobiologicals in the UBS.

## Discussion

Most of the vaccinators from the visited UBSs claimed to have experience and to have received training to work in vaccination room. However, these professionals presented conducts that may lead to MVO.<sup>9</sup> The vaccination rooms call for improvements, especially in terms of physical structure and functional organization. More than a third of the children presented vaccination cards with overdue vaccination records,

**Table 3 – Technical procedures conducted in the vaccination rooms at UBS<sup>a</sup> of the HD II<sup>b</sup> (n=18) in the municipality of Recife, Pernambuco State, 2012**

Assessment of the technical procedures carried out in vaccination rooms	Yes (n)	No (n)
Observing temporary postponement of vaccination and/or contraindications	10	8
Giving proper instructions on the vaccine to be administered	17	1
Checking the vaccine expiration date	10	8
Recording the day and hour in which the vaccine flask was opened	9	9
Observing the expiration date after opening the flask	10	8
Stowing sharp materials according to biosecurity standards	18	-
Treating vaccines with live microorganisms before the disposal	18	-
Active search for susceptible ones among the patients that often go to the UBS	3	15
Observing the amount of vaccines – if it is enough to meet the demand	15	5
Observing the vaccine stock at the UBS – if it is excessive	5	13
Observing the amount of syringes and needles – if it is enough to meet the demand	15	3
Observing the expiration date of syringes and needles	8	10
Separate packing of the various types of waste	14	4

a) UBS: Primary health care unit  
b) HD II: Health District II

**Table 4 – Motives reported by parents or guardians to justify the delay (n=120) in the national vaccination schedule in UBSs<sup>a</sup> of the HD II<sup>b</sup> in the municipality of Recife, Pernambuco State, 2012**

Motives	n	%
Sick child	15	12.5
Water shortage	9	7.5
Lack of immunobiologicals	16	13.3
Accessibility	2	1.7
Vaccinators mistake	8	6.7
Loss of the vaccination card (no electronic memory card in the UBS)	3	2.5
Parents who took pity on their child	3	2.5
Lack of time	24	20.0
Forgetfulness	36	30.0
Others <sup>c</sup>	4	3.3
<b>Total</b>	<b>120</b>	<b>100</b>

a) UBS: Primary health care unit  
b) HD II: Health District II  
c) Lack of syringe in the unit, closed vaccination room and energy shortage, as a result, the vaccination room did not open.

the main excuses given by the parents were the lack of time, forgetfulness and lack of immunobiologicals in the unit. Those aforementioned facts call for an intervention of the professionals of the primary health care units observed.<sup>14,15</sup>

The nursing staff is in charge of the vaccination in the UBSs and, according to the legislation, it is composed of workers who can carry out such activity.<sup>15</sup> In the present study, the vast majority of vaccinators had incomplete higher education, and some professionals mentioned that they had not received any training for vaccination rooms. Thus, light should be shed upon this positive aspect: the workers' experience and their education level.

The education in health is an important tool for primary care. The improvement in the quality of the process of communication between health service and families,<sup>14,16-18</sup> enhanced by the continuous training of professionals, is of utmost importance to diminish cases of missed vaccination opportunity. Attention should be drawn to the fact that continuous education enables the professional to keep up to the latest scientific or immunobiological technology progresses,<sup>16</sup> contributing to a higher level of confidence among professionals when it comes to vaccine indication.

Vaccines were not administered in situations considered appropriate, e.g., malnutrition, mild diarrhea, cough or rhinitis, family record of convulsion, among others, also referred as false contraindications<sup>18</sup> – what compromises the quality of vaccine coverage.<sup>5</sup> Nevertheless, cases of contraindicated vaccines were verified, what may favor risks of adverse events and further complications.<sup>19</sup>

Most of the professionals correctly conceptualize adverse events following immunization (AEFI) – though some were not aware or described those events incompletely. This fact draws attention to a worrisome situation. The information on the possible post vaccination reactions, the accurate identification of cases and the appropriate conduct prevent from the community alienation and non-adherence to the vaccination.<sup>5,20</sup>

The NIP proposes an 100% vaccine coverage. In the attempt to reach this goal, it is necessary identify the individuals with special medical conditions and head them to a Reference Center for Special Immunobiologicals (RCSI) – located in all Brazilian states.<sup>3</sup> Whilst all vaccinators interviewed were aware of the existence of these centers, a considerable amount of them were not aware of how the RCSIs work as well as the types

of immunobiologicals available. Attention should be drawn to this special finding, given that this was a study carried out in the capital of a state, with an RCSI properly installed.<sup>1</sup>

The vast majority of the interviewed nursing staff registered and oriented the beneficiaries on the intervals between doses and types of vaccines administered, a positive conduct in contrast to a study carried out in the countryside of São Paulo State, where the overdue vaccination was ascribed to the lack of information given in the vaccination room.<sup>17</sup>

More than half of vaccinators performed active search among UBS patients and most patients had the electronic memory vaccination cards, and a great number of cards was not organized according to the return date. And when asked about their attitude toward attendance of a patient who arrived in the primary health care unit facility without the vaccination card, most of these professionals responded that they did not carry out the vaccine procedure in children without the presentation of the report card, making clear to the parent/guardian that returning to the primary health care unit with the booklet was a required condition for the procedure. The vaccine cards should be organized,<sup>16</sup> personal and have easy access for the professionals, so that, in case of missing vaccination cards or their absence during immunization screening, the child can be vaccinated, avoiding the MVO and facilitating the search of absent children.<sup>21</sup>

Most of the vaccine rooms visited were open for at least 8 hours, a period regarded as ideal by the NIP. A significant number of rooms were not exclusively reserved for vaccination; therefore, they were not appropriately identified. Logistic problems such as the aforementioned ones were also found in the public health system in the city of Marília, São Paulo State<sup>1</sup>, what can jeopardize the activity of the vaccination room, leading to missed vaccination opportunities.

Some immunization rooms visited in this study did not have appropriate protection against direct light, and the majority had a room temperature above the ideal range. When exposed to discrepant temperature and/or not stored properly, vaccines can lose their quality and effectiveness due to deriving physical or chemical alterations.<sup>1,15,16</sup>

The main causes for delay in immunization schedule observed in children under 1 year of age were related to forgetfulness and failure to attend on the schedule

date due to a parent or guardian's lack of time. The reasons for this lack of time were divided between urgent trips and motives related to work, with the latter being the main reason. Lack of immunobiologicals in the primary health care unit and child illnesses – e.g., otitis, flu, spots on the skin and diarrhea – were also reported for justifying the delay. Health education, by allowing proper guidance on false contraindications, problems caused by vaccination postponement and possible needs for referrals to an RSCE, besides letting parents/guardians know about the vaccine-preventable diseases and their relation to the importance of properly attending the vaccine schedule, is an important strategy to increase adherence to vaccination.<sup>18,20-23</sup>

In the attempt to increase the immunization opportunities, the Ministry of Health guides some relevant actions to be taken with the population and communities, aiming to raise awareness on false contraindication of vaccination, identifying concerns in relation to adverse reaction to the vaccine, systematically update vaccinators and encourage them to instruct parents or guardians on the importance of the children's vaccination card and the attendance in medical appointments.<sup>5</sup>

Logistical problems, which lead to the lack of immunobiologicals in immunization rooms, represent a major flaw in the management of the primary health care unit where the product is the main object of the service. This fact was observed and analyzed in a study conducted in the northern region of São Paulo city.<sup>24</sup> Difficulties in human resources management, such as the absence of vaccinators on vaccine rooms or failure to properly attend the recommended interval between doses<sup>22,23</sup> due to the limit imposed by injectable vaccines also compromise the quality of vaccination coverage.<sup>6,7</sup>

The present study has limitations with regards to its population and sample. The sampling was not random in the UBS of a Health District, which allows considering the results only for the studied sample. In addition, the children selected were the ones who attended the service, which may underestimate the occurrence of overdue vaccination.

Despite the aforementioned limitations, the results were relevant as to the reasons that contribute to missed vaccination opportunities. There is a need for health education of this population about the dynamic process of the immunization program offered by the Brazilian National Health System (SUS) and its immunobiologicals available, in addition to the importance of compliance with the schedule of vaccines.

Furthermore, priority should be given to training strategies that support the technical and theoretical aspects of daily practice of vaccinators, enabling the qualification and the update of their knowledge and the improvement of the service rendered by primary care to achieve the objectives and goals set by the National Immunization Program – NIP – and break the chain of myths that lead to missed vaccination opportunity in the municipality of Recife.

### Authors' contributions

Barros MGM, Santos MCS, Bertolini RPT and Andrade MS contributed to the conception of the study, analysis, interpretation of data, writing, proofreading and final submission of the paper.

Pontes-Netto VB contributed to the conception, proofreading and final submission of the paper.

They are all responsible for every aspect of the manuscript, including its accuracy and integrity.

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