International Journal of Medical and Health Research
ISSN: 2454-9142
Impact Factor: RJIF 5.54
www.medicalsciencejournal.com
Volume 3; Issue 9; September 2017; Page No. 44-48

Health districts of Côte d'Ivoire performance during the national poliomyelitis immunization days in march 2017 according to the cluster lots quality assurance sampling method

[*1] Soualihou Noufé, [2] Kouadio Daniel Ekra, [3] Lepri Nicaise Bernadin Aka, [4] Harvey Attoh-Touré, [5] Konan N'Guessan, [6] Ali Yéo, [7] Joseph Soya, [8] Alfred Douba, [9] Vroh Joseph Bénié Bi

[1, 5, 6] National Institute of Public Hygiene, Abidjan, Côte d'Ivoire

[2, 3, 4, 8, 9] Felix Houphouët-Boigny University, Abidjan, Côte d'Ivoire

[7] General Direction of Health, Abidjan, Côte d'Ivoire

Abstract

To address the risk of importing wild polioviruses, Côte d'Ivoire organized poliomyelitis national immunization days in March 2017. A post-campaign survey was conducted with the objective of assessing health districts' performance.

Material and Methods: We conducted a descriptive cross-sectional study in the 83 health districts of the country. We used the cluster lots quality assurance sampling method. The sample size was 60 target children in each health district and the decision value was 3 unvaccinated children.

Results: Findings showed that 17 (20%) health districts had low-performance. The estimated national immunization coverage was 93.4%. The main non-immunization reasons were the absence during the campaign (47%), the non-revisited houses (22%) and the non-visited houses (20%).

Conclusion: The eradication of the poliomyelitis has not been achieved yet. There is an urgent need to strengthen the quality of immunization campaigns in order to accelerate efforts towards this objective.

Keywords: CLQAS, poliomyelitis, immunization, Côte d'Ivoire

Introduction

The poliomyelitis is a viral infection that mainly affects children under five years of age and results in an irreversible paralysis, usually, of legs [1]. In 1988, 350,000 global cases of paralytic poliomyelitis have been reported by 125 endemic countries. It is in this context that the Global Initiative for Poliomyelitis Eradication (GIPE) has been launched. In spite of the significant progress having allowed to reduce the global incidence of this disease by more than 99%, the eradication of the poliomyelitis comes up against of numerous obstacles [2].

In May 2012, the completion of the poliomyelitis eradication was declared a "programmatic emergency for global public health" by the Sixty-fifth World Health Assembly (WHA). A strategic plan 2013-2018 has been developed to accelerate the fight against this disease. The improvement of the quality of National Immunization Days (NIDs) against poliomyelitis is one of the key points of this strategic plan, particularly in endemic countries and in countries at risk of reintroduction [2].

In November 2015, Côte d'Ivoire was certified free of poliomyelitis. In spite of this major progress, Côte d'Ivoire remains a country at risk of reintroduction, due to the low routine vaccine coverage (below 80%) [3], the persistence of countries that are still endemic (Nigeria), and the occurrence of circulating polioviruses derived from the vaccine in the sub region (Nigeria and Democratic Republic of Congo) [4].

To address this risk, NIDs against poliomyelitis were organized from 24 to 27 March 2017 and were able to vaccinate 95.4% of children aged 0-59 months on the basis of administrative data. The use of this data to judge the performance of health districts is called into question by several authors, who believe that they are unreliable and erroneous [5, 6]. This is one of the reasons why independent monitoring of activities has been instituted by the World Health Organization (WHO) to assess the quality of vaccination campaigns and take corrective measures. Although this monitoring contributes to improving the quality of NIDs against poliomyelitis, the results cannot be extrapolated to the health district as this is a non-probabilistic survey [5, 7].

To address this situation, a post-campaign evaluation using the Lots Quality Assurance Sampling (LQAS) survey methodology was conducted in accordance with the guidelines of the Strategic Plan for the poliomyelitis Eradication [2, 8]. The LQAS is a probabilistic survey method that allows from a small-sized sample to provide information to determine whether immunization coverage is adequate in an area. Well designed, LQAS data at the peripheral level may be aggregated under certain conditions to estimate vaccine coverage at a higher level [9]. This choice also meets the relatively low cost and ease of execution of the LQAS compared to the traditional cluster vaccine coverage surveys [6, 7].

The main objective of this study was to evaluate the performance of the health districts during the NIDs against poliomyelitis in March 2017 in Côte d'Ivoire. Specifically, the focus was on identifying low-performing health districts,

estimating national immunization coverage, and identifying the reasons for non-immunization of target children.

Material and methods

Type and period of survey

This was a descriptive cross-sectional study that took place March 28th and 29th, 2017 in the 83 health districts of Côte d'Ivoire.

Population of study

The target population consists of all children aged from 0 to 59 months in the campaign period (children born between March 25th, 2012 and March 27th, 2017).

Survey technique

We used the cluster lots quality sampling assurance (CLQAS) method. Each health district was considered as a lot. The aim was to randomly draw a sample of target children in each health district and assess their vaccination status, based on the marking of the left little finger. Beyond a predetermined number of unvaccinated target children in the sample, the performance of the health district was rejected.

Sample size and decision value

The sample size (n) and decision value (d) in each health district were determined using the following formulas [9 - 11].

$$n \geq \left(\frac{z_{1-\alpha}\sqrt{P_0(1-P_0)} + z_{1-\beta}\sqrt{P_1(1-P_1)}}{P_0 - P_1} \right)^2 \quad (1)$$

$$d = n * (1 - P_0) \quad (2)$$

P_0: coverage objective = 95%;
P_1: minimum threshold for immunization coverage = 85%;
α : risk of classifying in tors a district as efficient = 5%;
β : risk of classifying in tors a district as non-performing = 20%;
$z_{1-\alpha}$: quantile of order "1-α" of the normal centered reduced law.

The sample size was 60 children per health district and the decision value was 3 unvaccinated children.

Selection of surveyed children

The survey concerned all the 83 health districts in the country. To facilitate the data collection, the 60 target children to be surveyed by health district were recruited in 6 localities, with a cluster of 10 target children per locality. The selection of the 6 localities to be surveyed was carried out by random sampling, in proportion to the demographic weight of the localities making up the health district.
In each selected locality, 10 eligible households (households with at least one child aged from 0 to 59 months) were selected randomly. In each eligible household, only one target child was randomly selected and surveyed.

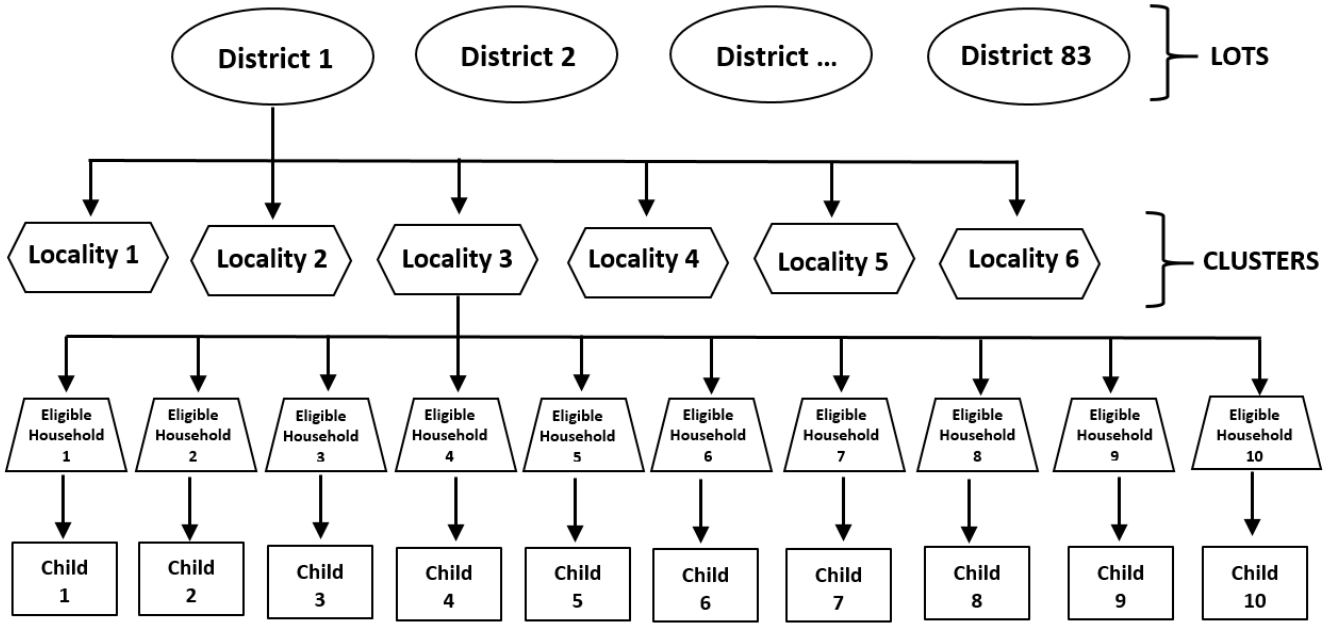

Fig 1: Method of selection of surveyed children for the LQAS

Technique and tools of collection

The data collection was supervised by the national campaign consultants and supervisors. It was preceded by the training of the investigators and a pilot survey which allowed them to appropriate the LQAS approach and the collection tools.
The data were collected by direct interview with the mothers of children, the child minders or any other member of the household present during the vaccination of the eligible child, using a structured questionnaire.

Data processing and analysis

The data were processed and analyzed on Microsoft Excel

2013 and SPSS 20.0. They were summarized in tabular and graphical form. The Chi 2 test was used for proportional comparisons, with an α risk of 5%. For the estimation of vaccination coverage, the data were weighted, taking into account the demographic weight of each health district, and aggregated.

Ethical Considerations

The verbal consent of the respondents was obtained and we used an anonymous questionnaire to ensure the confidentiality of the information collected.

Results

The survey included a total sample of 4,980 children aged from 0 to 59 months. This sample consisted of as many boys (50.3%) as girls (49.7%). The children under 24 months accounted for 50% of the target children surveyed (Table 1). The mean age of the children was 24.2 ± 0.2 months.

Table 1: Characteristics of the target children surveyed during the LQAS of March 2017 in Côte d'Ivoire

Characteristics Studied	Children Targeted	
	Frequency (n=5181) *	Percentage (%)
Age groups		
0-11 months	1 313	25.3
12-23 months	1 274	24.6
24-35 months	1 035	20.0
36-47 months	832	16.1
48-59 months	727	14.0
Sex		
Boys	2 605	50.3
Girls	2 576	49.7

* Weighted data

The survey allowed to identify 17 low-performing health districts, about 20% of the country's health districts. The cross-analysis of the CLQAS results and the administrative results shows that 51 health districts, or 61% of the districts evaluated, had confirmed their administrative performance. The results were discordant for 32 health districts, or about 2 out of 5 health districts. On the 17 health districts with poor performance, 12 reported administrative coverage above 95%. Among the 66 health districts whose performance was accepted, 20 reported administrative immunization coverage of less than 95% (Table 2).

Table 2: Comparative analysis of the administrative results and the results of the LQAS after the NIDs against the poliomyelitis of March 2017 in Côte d'Ivoire

Results of CLQAS	Administrative results				Total	
	Vaccination coverage ≥ 95%		Vaccination coverage < 95%			
	n	%	n	%	n	%
Performance accepted	46	55.5	20	24.1	66	79.6
Performance rejected	12	14.4	05	6.0	17	20.4
Total	58	69.9	25	30.1	83	100.0

The post-campaign estimated coverage at the national level was 93.4% ± 0.2%. In the different geographical areas, it varied from 82.6% in the south-west to 99.6% in the central-east. On the 11 geographical areas of the country, 6 were unable to reach the 95% coverage objective. These are the south-west, the north, the city of Abidjan, the center-north, the west and the south. The proportion of target children vaccinated was 93.1% for the boys compared to 93.7% for the girls (Table 3).

Table 3: Immunization status of target children following the NIDs against polio in March 2017 in Côte d'Ivoire by geographical area and by gender

Characteristics Studied	Target Children Vaccinated *	Vaccination coverage (%)	CI 95%	P
Geographical areas				
Center	237	95.2	[95.5 - 95.4]	0.97
East Center	127	99.6	[99.5 - 99.7]	
North Center	265	94.6	[94.4 - 94.8]	
Midwest	632	96.7	[96.5 - 96.9]	
North	260	84.0	[83.6 - 84.4]	
North East	166	98.4	[98.3 - 98.5]	
North West	231	98.9	[98.8 - 99.0]	
West	447	94.7	[94.5 - 94.9]	
South	609	94.9	[94.7 - 95.1]	
South West	480	82.6	[82.2 - 83.0]	

City of Abidjan	1 384	94.5	*[94.3 - 94.7]*	
Sex				
Boys	2 425	93.1	*[92.9 - 93.4]*	*0.40*
Girls	2 413	93.7	*[93.5 - 93.9]*	
Côte d'Ivoire	4 836	93.4	*[93.1 - 93.6]*	-

* Weighted data

The reasons for non-vaccination were dominated by the absence of children during the campaign (47%), the non-revisit of houses (22%) and the non-visited houses (20%) (Table 4).

Table 4: Distribution of reasons for non-vaccination of the target children after the NIDs against poliomyelitis in March 2017 in Côte d'Ivoire

Reasons for non-vaccination	Frequency (n=343) *	Percentage (%)
Child absent during campaign	161	47,7
House not revisited	75	21,8
House not visited	70	20,4
Omission of vaccinators	11	3,3
Refusal	5	1,4
Child passing through	4	1,2
Sick child	2	0,5
Child born after the volunteers	2	0,5
Other	13	3,9

* Weighted data

Discussion

It emerges from our survey that for 1 out of 5 health districts the declared administrative performance was rejected. Yet, among the poor performing health districts, 12 had reported more than 95% administrative coverage. In contrast, among the health districts whose performance was accepted, 20 reported administrative coverage of less than 95%.

Our results were better than those reported in Cameroon in an LQAS survey conducted after a combined vaccination campaign against yellow fever and poliomyelitis. This survey identified 14 low-performing health districts in the 17 high-risk health districts with low immunization coverage [12]. A survey conducted in Nigeria in 2009 according to the same method reported that 4 out of 5 health districts had their performance rejected because their coverage was less than 90% [13]. This is because the survey was conducted in high-risk, low-coverage health districts in the northern regions of the country. In Pakistan, an LQAS survey conducted in 20 health areas in a Punjab health district identified 15 health areas with less than 90% coverage [14]. The poor performance in endemic countries could be explained by difficulties in reaching certain areas for safety reasons.

The discrepancies between the administrative results and those of the LQAS in our survey could be explained by the inadequacies in the quality of the data produced by the dedicated health workers [5, 9]. The problem of data quality raised here would concern as well the numerator as the denominator of the administrative coverage. It has already been highlighted by some surveys on the quality of vaccination data conducted in the country in 2013 and 2015 [15, 16].

The inaccuracy of the numerator (number of vaccinated target children) could be due to errors in the compilation of daily results from health centers and health districts. Indeed, for this passage the score cards of the target children vaccinated have been modified and certainly not well understood by the vaccinating agents. The age groups taken into account increased from two (0 to 11 months and 12 to 59 months) to three (less than 1 month, 1 to 11 months and 12 to 59 months) and for each age group, the Information should be collected separately for the boys and the girls. Moreover, the messages broadcast during this activity "vaccination of children from 0 to 5 years old" lead parents to present the 5-year-olds to the vaccinating agents, whereas the campaign truly targets the children of 4 years over.

The denominator problems would be related to the method used to estimate the target populations of the campaign. For a passage, the target populations are estimated on the basis of the maximum number of target children vaccinated in previous campaigns. The populations used do not reflect the reality on the ground, due to the natural or forced movements of the populations. Also, the number of vaccinated target children reported may itself be inaccurate for the reasons given.

The objective of the immunization coverage set at the beginning of the campaign was not able to be reached at national level and in 6 of the 11 geographical areas of the country. There was no significant difference in immunization coverage among the boys and the girls (P = 0.40). The failure to achieve immunization coverage could create pockets of unprotected children in a context of low routine national in OPV-3 vaccine coverage at the national level [3].

The reasons for non-vaccination of the target children found in our survey are similar to those reported during the independent monitoring of the NIDs against poliomyelitis in 2016 in Côte d'Ivoire [17, 18]. The non-vaccination of the target children could be explained by the inadequate implementation of the strategies adopted for the campaign.

The main vaccination strategy used to reach target children was door-to-door. However, due to the absence of some children from their homes, the strategies for vaccination at the regrouping and transit sites were chosen (markets, bus stations, corridors, beaches, etc.). These new strategies could have been insufficiently implemented. The non-revisiting of

houses during mass campaigns would be linked to the excessive workload assigned to volunteers by district teams, without taking into account the resources available for the campaign. The non-revisiting of the houses could also be explained by the insufficiency or even the absence of supervision of proximity. Finally, some houses are not visited during the NIDs against poliomyelitis because they have not been listed on maps at the time of microplanning. Also, the recognition visits of the zones assigned to the supervisors and their teams prior to the start of the campaign are not always conducted. The local recruitment of volunteers could help minimize the non-visiting of homes by vaccination teams.

Conclusion

The post-campaign survey according to the CLQAS allow to identify 17 low-performing health districts, to estimate the post-campaign immunization coverage (93.4% at the national level), and the reasons for the non-vaccination of children Targets; Which were dominated by the absence during the campaign, the non-revisiting of houses and the houses not visited.

The eradication of poliomyelitis has not yet been achieved. There is an urgent need to strengthen the quality of immunization campaigns in order to accelerate efforts towards this objective.

Conflict of interest

There are no conflicts of interest.

Acknowledgments

We would like to thank the Department of Health and Public Hygiene of Côte d'Ivoire and the WHO country office in Côte d'Ivoire for their contribution to this work.

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