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Obstacles to vaccination coverage for children aged 12 to 59 months in the Mangobo health zone from 2016 to 2019 in Kisangani (DR Congo)

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Abstract

Introduction: Vaccination saves lives and is one of the greatest medical successes in the history of humanity. It saves around three million lives every year worldwide. Specifically, the study aims to determine the obstacles to immunization coverage of children aged 12 to 59 months in the Mangobo Health Zone and to identify the gaps between the administrative immunization coverage of the Health Zone and the coverage of household surveys.

Methods: Using a retrospective descriptive approach based on documentary analysis and interviews, we selected a sample of 150 children aged 12 to 59 months living in the Mangobo Health Zone between 2016 and 2019.

Results: Adverse events (45.3%) and vaccine stock-outs in the health areas (30.7%) were found to be the main obstacles to child immunization in the Mangobo Health Zone. The differences between administrative vaccination coverage and household survey vaccination coverage are very significant: for the VAA 64.07% and the VAR 62.07%.

Conclusion: In order to optimize immunization coverage, it is essential to implement an effective policy for the management of health facilities by the Central Office of the Health Zone and to set up an effective monitoring mechanism with the aim of producing reliable epidemiological data.

Keywords: Obstacles; Vaccination coverage; Children

1. Introduction

Vaccination coverage is the proportion of people vaccinated in a population at a given time. It is the ratio between the number of people correctly vaccinated, i.e. having received the required number of doses at a given age, and the total number of people who should have been vaccinated in the same population. The World Health Organization (WHO) estimates that disability and two to three million child deaths a year are prevented worldwide by vaccination [1, 2].

Vaccination is a proven tool for controlling and eliminating potentially fatal infectious diseases, which cause 3 million deaths every year. It is one of the most cost-effective health investments, with proven strategies that make it accessible to even the most hard-to-reach and vulnerable populations [3]. Through the National Expanded Program on Immunization, the World Health Organization recommends that all children should be immunized against all vaccine-preventable diseases before their first birthday [4].

In 2019, 14 million infants worldwide had not received initial DTP, and 5.7 million infants were only partially vaccinated. This situation concerned 10 countries, including the Democratic Republic of Congo. Vaccination is declared

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by the WHO to be the most effective public health intervention for preventing morbidity, complications and mortality from infections in children. However, complete vaccination coverage varies depending on the context [5].

Globally, the immunization rate for children aged between 12 and 23 months rose from 69% in 1992 to 85% in 2017. However, 169 million children worldwide did not receive the first dose of measles vaccine between 2010 and 2017, an average of 21.1 million children per year [6]. According to UNICEF, some 110,000 people, mostly children, died from measles in 2017. In Pakistan, it was reported that in 2019, one in ten children had never been vaccinated against measles, diphtheria and tetanus, despite these vaccines being considered vital [7].

In 2018, nearly 350,000 cases of measles were reported worldwide, more than twice as many as in 2017, and these outbreaks are occurring in poor and unstable countries as well as in countries with generally high levels of vaccination [8]. In Ukraine, 90% of infants are vaccinated against measles; this ranking also shows that in many other countries the incidence of coverage is high, but there are large population groups that have not benefited from vaccination in the past, demonstrating that low coverage over a prolonged period where particular groups of unvaccinated people can be the spark that triggers deadly outbreaks [9].

In Africa, it is estimated that 74% of children received OPV3 vaccine in 2018 and Pneumo3 vaccine coverage was 73% as well as 48% for ROTA3. In Congo Brazzaville, vaccination coverage over the past five years has stagnated at 72% for Pentavalent, OPV and VAR, which exposes populations to vaccine-preventable diseases and epidemics, and nearly 31 million children under the age of five suffer from vaccine-preventable diseases every year, with more than a million dying for lack of access to the vaccinations they need [10].

In the Central African Republic, systematic vaccination coverage is still low, while 25% of measles cases affect children under five, who are the most vulnerable [11]. Since 2019, around 310,000 cases of measles have been reported. The epidemic has been exacerbated by low coverage of vulnerable communities, malnutrition, weak public health, outbreaks of other diseases with epidemic potential, difficult access to healthcare for the vulnerable population and insecurity that has hampered the response in some areas [12].

In the Democratic Republic of Congo, 212 of the country's 516 health zones (41%) achieved 80% vaccination coverage for all antigens in 2017. Vaccination coverage fell between 2010 and 2018, with DTP3 dropping from 61% to 47.6%, OPV3 from 58% to 32.7%, VAR 67% in 2010 to 57.2% in 2018, and VAA remaining the same between 2010 and 2018 at 65% [13]. Only 35% of children received all their vaccines in 2018. The drop in vaccination coverage has naturally had an impact on the proportion of children who have not received any vaccine, which is now 20%, corresponding to 5,000,000 children [14].

There are differences in vaccination coverage according to province, place of residence (urban and rural), household income and mother's level of education. For DTP3, vaccination coverage is 58.4% in urban areas compared with 40.3% in rural areas [15]. Among unvaccinated children, only 7.7% are from wealthy families compared with 27.9% from poor families, and half of these children have not received any vaccine at all. It should be noted, however, that according to the same report, vaccination coverage for girls is 46.2% compared with 49.1% for boys. The widespread drop in vaccination coverage is a major concern, and can be explained by multiple outbreaks of epidemics such as measles, which has claimed around 6,000 lives in the last 2 years [16].

The city of Kisangani, capital of Tshopo Province hosted an EPI ceremony in 2019 through the National Ministry of Public Health on measles vaccination, the administrative vaccination coverage of Tshopo Province for VAR was 92% in the city of Kisangani in 2018 and in the first five months of 2019.According to Sugas and Sossi [17], more than 1,500 deaths linked to the measles epidemic have been recorded in the city, the majority of deaths coming from the Lubunga health zone where parents remain reluctant to vaccinate and the beliefs of the population.

Currently in Kisangani, many children aged between 0 and 15 months are exposed to vaccine-preventable diseases for the simple reason that they have not had access to routine vaccination services. As a result, there are occasional reports of an upsurge in diseases such as measles, tetanus, meningitis and poliomyelitis.

One of the best ways of protecting children is to follow the vaccination schedule. Every time parents put off a vaccination, they increase their child's vulnerability to disease. Routine vaccinations help children grow up healthy. Vaccines help protect children from serious, often fatal, diseases. They save two to three million lives every year throughout the world. Routine vaccination is free and compulsory for all children.

The general objective of the study is to contribute to the reduction of morbidity and mortality due to vaccine-preventable diseases in children aged 12 to 59 months in the Mangobo Health Zone in particular and throughout the Tshopo Province in general.

The specific aim of this study is therefore to determine the obstacles to immunization coverage of children aged 12 to 59 months in the Mangobo Health Zone and to identify the gaps between the administrative immunization coverage of the Health Zone and the coverage of household surveys.

2. Material and method

2.1. Materials

2.1.1. Description of the study area

The study took place in the Mangobo Health Zone, located in the commune of the same name, in the city of Kisangani in Tshopo Province. This Health Zone oversees 18 Health Areas and a General Reference Hospital.

The Mangobo Health Zone is one of five in the city of Kisangani. These include the Health Zones of Makiso, Tshopo 1, Kabondo and Lubunga. It is bordered by the Kabondo Health Zone to the East, the Yakusu Health Zone to the West, the Banalia Health Zone to the North and the Makiso Health Zone to the South.

2.1.2. Study population and sample

Our study population consisted of parents of children aged between 12 and 59 months living in the Mangobo Health Zone, as demographic data were not made available to us at the time of our survey by the administrative and health services.

Selected from an infinite population, we thought it would be useful to work with a non-probabilistic random sample of 150 parents chosen from a number of households in the Mangobo Health Zone. As a result, we highlighted a number of inclusion criteria for selecting our study sample: any parent of a child under 5 years of age, any parent using health services, whether or not they had a vaccination card for their children, and any parent who freely agreed to take part in the survey.

2.2. Method and techniques

2.2.1. Type of study

This is a retrospective descriptive study conducted in the Mangobo Health Zone and covering the period from 2016 to 2019.

2.2.2. Data collection technique and instrument

Data collection was made possible by the documentary analysis technique and direct interviews. The documentary analysis enabled us to consult the documentaries available in the Mangobo Health Zone in order to gather information relating to the administrative aspect of immunization coverage; while the interview enabled us to make contact with the communities in order to obtain information on the determinants of immunization coverage from households.

To achieve this, we drew up two data collection forms, one for the documentary analysis carried out at the Central Office of the Mangobo Health Zone and the other for the household interview.

2.2.3. Data processing technique

We grouped the data collected in the various frequency distribution tables for analysis; the calculation of percentages and the arithmetic mean enabled us to interpret the data statistically.

3. Results

3.1 Socio-demographic data

Table 1 Distribution of study subjects by socio-demographic data

Socio-demographic data		Effectives (n=150)	Percentage
Age	25 - 35 years	25	16.7
	36 - 46 years	19	12.7
	47 -57 years	45	30.0
	58 - 68 years	61	40.6
Sex	Female	86	57.3
	Male	64	42.7
Education level	No level	19	12.7
	Primary	10	6.6
	Secondary	69	46.0
	Higher	52	34.7
Main occupancy	Housekeeper	42	28.0
	Civil servant	29	19.3
	Farmer	22	14.7
	Saleswoman	22	14.7
	Liberal professions	18	12.0
	Student	17	11.3

The data in this table show that most of the subjects in the study were aged between 58 and 68, i.e. 40.6%, compared with 12.7% aged between 36 and 46, who were less represented, with an estimated average age of 46.5. Women also predominated over men, at 50.7% and 49.3% respectively. Secondary education predominated, with 46.0% of respondents having completed secondary education, compared with 6.6% at primary level. Finally, in terms of main occupation, housewives were predominant, with 28.0%, compared with 11.3% of students.

3.1. Knowledge of vaccination schedule

Table 2 Distribution of study subjects according to knowledge of the vaccination calendar

Knowledge of the vaccination schedule	At birth		After 6 weeks		After 10 weeks		After 14 weeks		At 9 months	
	n	%	n	%	n	%	n	%	n	%
Yes	99	66.0	42	28.0	39	26.0	38	25.3	36	24.0
No	51	34.0	108	72.0	111	74.0	112	74.7	114	76.0
Total	150	100	150	100	150	100	150	100	150	100

This table shows that 66.0% of the subjects in the study were aware of the vaccination schedule when their child was born; 28.0% said that their children were vaccinated at 6 weeks of age; 26.0% at 10 weeks; 25.3% at 14 weeks and 24.0% at 9 months. It should also be noted that the rate of children not vaccinated in accordance with the immunization schedule is much higher at all routine immunization appointments.

3.2. Presence of the vaccination card at the time of the household survey

Table 3 Distribution of study subjects according to presence of vaccination card at household survey

Presence of the vaccination card	(n=150)	%	Completed card filled		Card not fully completed	
			n(150)	%	n(150)	%
Yes	88	58.7	33	37.5	55	62.5
No	62	41.3	0	0.0	0	0.0
Total	150	33	37.5	55	62.5	

Analysis of table 3 shows that out of a total of 150 parents of children aged 12 to 59 months targeted by our survey in households in the Mangobo Health Zone, 88 parents, or 58.7%, presented vaccination cards, of which 62.5% were incompletely filled out and 37.5% completely filled out.

3.3. Obstacles to vaccination

Table 4 Distribution of study subjects according to obstacles to vaccination

Obstacles to vaccination	(n =150)	%
Vaccine adverse events	68	45.3
Vaccine shortages in health areas	46	30.7
Lack of material time	24	16.0
Long distances to cover	8	5.3
Long-distance journeys	4	2.7
Total	150	100

This table shows that, according to the subjects surveyed, adverse events (45.3%) and vaccine stock-outs in the health areas (30.7%) are the main obstacles to vaccinating children in the Mangobo Health Zone, compared with 2.7% for long-distance travel.

3.4. Administrative vaccination coverage and household survey vaccination coverage

Table 5 Presentation of administrative vaccination coverage and survey vaccination coverage in the Mangobo Health Zone

Antigens	2016 (%)	2017 (%)	2018 (%)	2019 (%)	Average administrative vaccination coverage (%)	Survey coverage (%)
BCG	100.0	98.0	97.0	98.2	98.3	87.33
$PENTA_1$	101.1	99.2	98.8	101.6	100.17	76.67
$PENTA_3$	98.8	99.1	100.0	98.6	99.12	66.67
VPO_3	98.8	99.1	100.0	98.6	99.12	66.67
$PCV_{13\,3}$	98.8	99.1	100.0	98.6	99.12	66.67
VAA	105.0	108.0	101.0	103.4	104.4	39.33
VAR	105.0	108.0	101.0	103.	103.4	41.33
VPI	99.1	99.1	100.0	98.6	98.6	60.67

By analyzing this table, we noted that the average BCG coverage for the Mangobo Health Zone was 98.3% compared with 87.33% for the household survey, for PENTA1, the Health Zone recorded coverage of 100.17% compared with

76.67% for the household survey. However, we observed that the highest administrative vaccination coverage recorded in the Health Zone was 104.4% for the VAA and 103.4% for the VAR, and the lowest coverage in households was 39.33% for the VAA and 41.33% for the VAR.

3.5. Differences between household survey vaccination coverage and administrative vaccination coverage in the Health Zone

Table 6 Distribution of differences between household survey vaccination coverage and administrative vaccination coverage in the Health Zone

Vaccination	Vaccination coverage in household surveys (%)	Administrative vaccination coverage in the Health Zone (%)	Spreads (%)
BCG	87.33	98.30	10.97
$PENTA_1$	76.67	100.17	23.50
$PENTA_3$	66.67	99.12	32.45
VPO_3	66.67	99.12	32.45
$PCV13_3$	66.67	99.12	32.45
VAA	39.33	103.4	64.07
VAR	41.33	103.4	62.07
VPI	60.67	98.60	37.93

The findings in this table indicate that the difference between administrative vaccination coverage and survey vaccination coverage in households was very high for the VAA (64.07%) and the VAR (62.07%) and lower for the BCG and PENTA1 (10.97% and 23.50% respectively).

4. Discussion

4.1. Profile of respondents

We noted in this series that approximately 57.3% of the study subjects were female. Our result is much lower than that found by Sugas and Sossi [17]. Study of early drop-out factors: non-compliance with the immunization schedule of the extended immunization program in the town of Bandundu/RD. Congo, according to which 62.5% of measles cases were male. It should be noted, however, that gender is not a risk factor for the occurrence of a vaccine-preventable disease in children, as both sexes can be affected without a predilection factor.

Secondary level comes first with 46.0%. Our result is in line with the report of the Multiple Indicator Demographic and Health Surveys carried out in the Democratic Republic of Congo [3], which shows that 54% of children with effective immunization coverage come from mothers with a high level of education, especially in urban areas.

Bulupiy and Fufulafu [18] in their study on Evaluation of compliance with the vaccination schedule among Pygmy children aged 0-59 months: Study conducted in the Isiro urban-rural health zone from 1 February to 31 May 2018. The difference is that our study only involved subjects' surveyed living in the Mangobo Health Zone in the city of Kisangani where the level of education is high. This would be justified by the fact that the level of education influences an individual's behavior in the face of a given phenomenon.

In terms of parental occupation, 28% of the subjects were housewives. This result is similar to that of Mariko [19], in his epidemioclinical study of measles in the general pediatric department in Mali, who found a high rate of housewives (84%) and uneducated women (58.8%). The high rate of housewives can be explained by the fact that in our series, women predominate over men. The parents' level of education and occupation can have a favourable or unfavourable impact on the demand for health services, particularly vaccination.

4.2. Knowledge of the right time to vaccinate a child

It was noted that 66.0% of the subjects in the study indicated that the useful period for having children vaccinated was at birth. This result is in line with the findings of the World Health Organization report [2], which found that 64.35% of parents were unaware of the vaccination schedule and its importance, in order to determine the gaps between administrative vaccination coverage in rural areas and the field survey. According to a similar study by Ibrahima Seck et al [20] on the social determinants of routine immunization coverage of children aged 12 to 23 months in the Kaolack region of Senegal, the level of knowledge of mothers or childminders about the immunization schedule remains low (20.1%). Preventable diseases are responsible for over two million deaths a year worldwide. In sub-Saharan Africa, one child in two receives an incomplete series of vaccinations every year. The lowest vaccination coverage (CV) is recorded in Africa, where health systems do not take account of geographical disparities [21].

According to the WHO, in Africa, coverage for the first dose of VAR rose from 57% in 2001 to 73% in 2008 [22]. In the Democratic Republic of Congo, child immunization has been a key EPI activity since the 1980s, with the main objective of achieving 90% immunization coverage for all children by 2015 (MDG4). Despite the efforts made by the EPI over the last ten years, all the immunization coverage indicators show a rollercoaster ride. The result will only be good if coverage of all antigens reaches 90%, as envisaged by the EPI. Unfortunately, vaccination coverage is still low, with only 42% of children aged between 12 and 23 months having received all the vaccines by the age of 12 months (MICS-2010). Coverage for children in this age group rose from 23% in 2001 (MICS2) and 31% in 2007 (EDS-RDC).

4.3. Presence of vaccination cards during household surveys

In this series we found that out of 150 children found in the households surveyed, 88 children, i.e. 58.67%, had presented their cards, 62.5% of which were incomplete. A similar study by Baonga et al [15] on vaccination coverage and factors associated with non-completion of vaccination in children aged 12 to 23 months in the Djoungolo Health District in Cameroon showed that 54.3% of 66.7% of children had a vaccination card. It should be emphasized that the presence of a vaccination card is an important factor in ensuring that the vaccine is administered to the child. Parents' negligence and low level of education mean that their children miss out on the vaccination card. The lack of vaccination cards is proof enough that the vaccine has not been properly administered in a Health Zone and that vaccination coverage is inadequate.

4.4. Obstacles to vaccination

There are several obstacles to vaccination. In this series, we found that adverse events (45.3%) and vaccine stock-outs in the health areas (30.7%) were the main obstacles to immunizing children in the Mangobo Health Zone. In contrast, Batumbo Doudou and al [16] in their study of the knowledge, attitudes and practices of mothers of children aged 0-23 months in the Ngaba health zone with regard to vaccination in Kinshasa found that the proportion of mothers who had sufficient knowledge about vaccination was 11%.

The problem of adverse reactions to vaccines was revealed in the study by Faye, Seck and Dia [14], which found 58.2% of people resistant to vaccination, and by Lazarevic Alexandra [23], who found in France a higher rate of parents (64.7%) who obstructed their child's completion of the vaccination schedule. This position does not only concern African parents; in France, Flavia Bustreo [24] recorded the comments of some parents: 'I'm not going to take risks for diseases that no longer exist, or are infrequent'. "When you weigh up the benefits against the risks, you can see that the benefits fall to zero and that the risk tends towards the intolerable... I'm afraid of side effects, encephalitis, sudden infant death syndrome, deaths, cases of autism, asthma, etc.".

In the USA, another testimonial from a parent confirms the doubt about vaccination: 'Adaline was a happy baby when she was born on May 7, 2013. At two months old, she had her routine vaccinations like everyone else and we didn't ask ourselves a single question. The following night, Adaline's health took a turn for the worse and only got worse in the aftermath. Her first side effects were swelling, redness, irritability, drowsiness, dizziness, nausea and vomiting. Five days later, she was lethargic and vomiting blood clots. We took her to A&E, where they found she was suffering from severe reflux and dehydration. She stayed there for a few days, then we took her home. From that moment on, our little angel was never the same' [25]. However, according to the World Health Organization, serious post-vaccination symptoms are extremely rare [1].

The results of another study also showed that unvaccinated children very rarely suffered from the following health problems: dyslexia, speech delay, enuresis, coeliac disease, gluten sensitivity and gastro-esophageal reflux [26]. Furthermore, Zylberman [27] found that out of 1004 unvaccinated children, none suffered from asthma, compared with 8 to 12% of those vaccinated; 1.2% of the unvaccinated suffered from dermatitis, compared with 10 to 20% of those

vaccinated; 3% of the unvaccinated had allergies, compared with 25% of those vaccinated; and less than 1% of the unvaccinated were diagnosed with attention deficit disorder (ADHD), compared with 5 to 10% of those vaccinated. Another study of the children of 15,000 mothers, carried out between 2010 and 2016 in Guinea-Bissau, West Africa, showed that the mortality rate was twice as high among children vaccinated against diphtheria, tetanus and whooping cough [14].

The question of adverse reactions to vaccines raises many questions and divides opinion. Like any other drug (a foreign body in the body), we believe that vaccines can cause undesirable effects that are not fatal, as many parents claim. It should be noted, however, that these obstacles are sometimes linked to parents' ignorance.

4.5. Administrative vaccination coverage and household survey vaccination coverage in the Mangobo Health Zone

The highest administrative vaccination coverage recorded in the health zone was 104.4% for the yellow fever vaccine and 103.4% for the yellow fever vaccine, while the lowest household coverage was 39.33% for the yellow fever vaccine and 41.33% for the yellow fever vaccine. In Africa, although statistics on vaccination coverage for children were moderately lacking, there were 350,000 cases of poliomyelitis in 1998 and only 400 today. Countries such as Nigeria, where vaccination was suspended for several years, have relaunched vaccine distribution program. Vaccination coverage has also increased significantly since 2001 in most countries, thanks to the efforts of governments and national and international partners [28]. According to WHO and UNICEF estimates, coverage for the first dose of measles vaccine rose from 57% in 2001 to 73% in 2008. Despite this achievement, in 2008 nearly 7.5 million children in the WHO Africa region did not receive their first dose of measles vaccine [1,2].

Nguefack and al [10] indicate that in sub-Saharan Africa, one child in two receives an incomplete vaccination. Nigeria is the country with the highest number of children who missed the first dose of VAR in 2008, with 2.04 million children. The drop-out rate between BCG and VAR in rural Senegal was 18.2% in 2007. In Benin, it was over 25% in 2008. The current measles outbreak is affecting EPI targets in some countries, but also so-called 'out-of-band' children, most of whom are the results of the accumulation of unvaccinated children over the years [14]. In Burkina-Faso, administrative BCG and VAR vaccination coverage rose from 86.0% in 2005 to 99.4% in 2009. As a result, there is still a resurgence of vaccine-preventable diseases in the country: an outbreak of measles in 2009, with a total of 53,886 cases, including 353 deaths (which affected the large towns most of all). One of the reasons for this epidemiological situation is the completion of children's vaccination contacts.

In the Democratic Republic of Congo, the mission of the Expanded Program on Immunization (EPI), created in 1978, is to contribute to better child health by reducing mortality and morbidity attributable to vaccine-preventable diseases. Since 1981, EPI activities have been progressively integrated into health centers, to the point where today all health zones have integrated EPI into their routine activities. In the Ngaba health zone in Kinshasa, immunization coverage for all antigens has fallen below the threshold required to protect children against vaccine-preventable diseases. The proportion of mothers who had sufficient knowledge about vaccination was 11%, the attitudes of mothers were good for 65% and the proportion of mothers who had good practices was 33% [29, 30].

In our opinion, the low vaccination coverage could be explained by several factors, such as input stock-outs, false results presented by health areas, and fear of adverse post-vaccination effects. The competent authorities, in particular the EPI and the Ministry of Health, have their work cut out to curb this phenomenon of refusal to vaccinate, which has a negative impact on vaccination coverage in our communities.

4.6. Gaps between household survey and administrative vaccination coverage in the Mangobo Health Zone

Through this study, the differences between the administrative vaccination coverage and the survey vaccination coverage in the Mangobo Health Zone are very significant: for the VAA 64.07% and the VAR 62.07%. According to the final report of the National Vaccine Coverage Survey in the Congo, published in 2023, there is a considerable gap between gross coverage and valid coverage. For BCG gross coverage is 92.4% and valid coverage is 36.7%, difference 55.6%; for PENTA1 gross coverage is 66.9%, valid coverage is 29.2%, difference 37.8%; for PENTA3 gross coverage is 46.4%, valid coverage is 22.9%, difference 18.4%, for VAA gross coverage is 64.1%, and valid coverage is 14.9%, difference 49.2%. Our results corroborate those of the WHO [1, 2] in a survey carried out on the consistency of vaccination data from the Health Zone and household surveys: for BCG the difference is 12.9%, Penta1 the difference is 19.1%, Penta3, VPO3 and Pneumo3 the difference is 13.6%, VAA the difference is 14.1%, VAR the difference is 12.9% and VPI the difference is 17.3%.

This difference between administrative vaccination coverage and household survey vaccination coverage can be explained by the fact that health facilities often produce the data to achieve the targets set, whereas this is not the case in the field. In addition, these discrepancies can be explained by the fact that all children who do not have an immunization card were considered unvaccinated by our survey, and by the fact that immunization facilities add data to improve their immunization coverage.

5. Conclusion

Vaccination is a global priority for protecting children against disease, especially vaccine-preventable diseases. Today, it plays a vital role in achieving the Millennium Development Goals (MDGs), in particular by reducing infant and child mortality by 2025.

In the Mangobo Health Zone, the level of education and occupation are the factors influencing immunization coverage of children aged 12 to 59 months. In addition, the factors that explain the discrepancies in administrative immunization coverage in the health zone and survey coverage are the production of data by the health facilities to achieve the targets set, the fact that all children who do not have an immunization card were considered unvaccinated by our survey, and the fact that the immunization facilities add data to improve their immunization coverage.

In order to improve immunization coverage in the Mangobo Health Zone in particular, and in the city of Kisangani in general, it is essential to introduce a good policy for the management of health facilities by the Health Zone Central Office, and to introduce an effective monitoring mechanism for the production of reliable epidemiological data with the aim of reducing the morbidity and mortality rate due to vaccine-preventable diseases.

Compliance with ethical standards

Disclosure of conflict of interest

The authors believe that there are no conflicts of interest in the conduct of this study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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