

Explanatory Factors of Vaccination Dropout Among Children Aged 12-23 Months in Kikula Health Zone, DRC

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Explanatory Factors of Vaccination Dropout Among Children Aged 12–23 Months in Kikula Health Zone, DRC

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Abstract

Background: Vaccination remains one of the most cost-effective public health interventions to prevent childhood morbidity and mortality. Despite the efforts of the Expanded Program on Immunization (EPI) in the Democratic Republic of Congo (DRC), full immunization coverage among children aged 12–23 months remains critically low, particularly in the Kikula Health Zone. Recent data indicate a concerning dropout rate, with nearly 40% of children failing to complete their vaccination schedule. This phenomenon undermines national health objectives and increases vulnerability to vaccine-preventable diseases such as measles, polio, and tuberculosis. Understanding the underlying causes of vaccination abandonment is essential to designing targeted interventions that can improve coverage and equity in immunization services.

Objective: This study aimed to identify the key explanatory factors associated with vaccination dropout among children aged 12 to 23 months in the Kikula Health Zone, Democratic Republic of Congo. Specifically, it sought to assess the influence of sociodemographic characteristics, parental knowledge, perceptions of vaccination services, and organizational barriers on immunization completion rates.

Methods: A cross-sectional analytical study was conducted from April 22 to May 22, 2025, in the Kikula Health Zone, Haut-Katanga province, Democratic Republic of Congo. A three-stage cluster sampling technique was used to recruit 300 mothers or guardians of children aged 12–23 months. Data were collected using a structured questionnaire administered via KoboCollect and analyzed with SPSS version 25.0. Chi-square tests and logistic regression were applied to identify factors significantly associated with vaccination dropout. Ethical approval was obtained, and informed consent was secured from all participants.

Results: Among the 300 children surveyed, only 61.67% had completed their vaccination schedule. The analysis revealed that the absence of a vaccination card (adjusted OR = 30.89; 95% CI: 11.64–81.97; $P < .001$) and poor maternal knowledge of vaccine-preventable diseases (adjusted OR = 29.62; 95% CI: 1.29–680.31; $P = .034$) were significantly associated with vaccination dropout. Other factors such as maternal age, education level, fear of side effects, and short duration of residence were significant in bivariate analysis but not in multivariate models.

Conclusions: Vaccination dropout among children aged 12–23 months in the Kikula Health Zone is driven primarily by the absence of vaccination documentation and poor maternal knowledge of vaccine-preventable diseases. These findings underscore the need for targeted interventions focused on improving health education, ensuring consistent availability of vaccination cards, and strengthening community engagement. Addressing these barriers could significantly enhance immunization coverage and reduce the risk of preventable childhood illnesses in similar urban-rural Congolese settings

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Introduction

Background

The World Health Organization (WHO) recommends that all children be vaccinated before their first birthday against tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, measles, hepatitis B, *Haemophilus influenzae* type b, pneumococcus, rubella, and yellow fever in endemic countries [1].

Global estimates of coverage with three doses of diphtheria-tetanus-pertussis vaccine (DTP3) have declined from an average of 86% during 2015–2019 to 83% in 2020 and 81% in 2021. In 2021, 25 million infants (19% of the target population) did not receive all three doses of DTP, representing an increase of 2.1 million compared to 2020 and 5.9 million compared to 2019. The number of “zero-dose” children—those who had not received any DTP dose by age 12 months—increased by 37% from 13.3 million in 2019 to 18.2 million in 2021. Coverage with the first dose of measles-containing vaccine (MCV1) also declined from an average of 85% (2015–2019) to 84% in 2020 and 81% in 2021 [2].

Vaccines are among the most cost-effective tools for promoting global health. Despite their proven benefits, vaccination rates remain low in many regions. In the WHO African Region, DTP3 coverage increased from 70% in 2013 to 74% in 2019, while MCV1 coverage declined from 70% to 69%. None of the disease elimination targets were achieved, except for certification of the region as free of wild poliovirus. The emergence of COVID-19 and the disruption of essential health services further worsened vaccination delivery, delaying campaigns and the introduction of new vaccines [1].

In 2021, an estimated 25 million children in Africa were not vaccinated, including 734,000 in the Democratic Republic of Congo (DRC), representing zero-dose children who had not received their first dose of the pentavalent vaccine [1].

Since the launch of the Expanded Program on Immunization (EPI) in the DRC, significant efforts have been made to reach the national target of 90% coverage for all antigens. However, full immunization coverage remains below 50% [3]. According to the 2017–2018 Multiple Indicator Cluster Survey (MICS), only 35% of children aged 12–23 months were fully vaccinated, 45% were partially vaccinated, and 20% had received no vaccine at all. The EPI attributed this situation primarily to low vaccine availability, often due to delayed financing [4,5].

Recent coverage surveys conducted in 2022 by the Kinshasa School of Public Health across 26 provinces showed that the percentage of fully vaccinated children increased from 41.6% in 2021 to 45.3% in 2022, while the proportion of zero-dose children remained around 12% during the same period.

Although the DRC has been certified free of wild poliovirus circulation, cases of vaccine-derived poliovirus type 2 continue to threaten this status [3].

In Haut-Katanga province, the Provincial Health Division reported via DHIS2 that 258,765 children aged 0–11 months were fully vaccinated in 2021 (88.3%). However, several vaccine-preventable diseases were still reported: 34 cases of acute flaccid paralysis (AFP), 1347 cases of measles (including 349 zero-dose children), 101 cases of meningitis, 14 cases of neonatal tetanus, and 74 cases of cholera. In 2021, 14 deaths were attributed to neonatal tetanus and 10 deaths to measles in 2022. The BCG–measles dropout rate was 11.4%, representing 35,680 children who did not complete their vaccination schedule.

In Haut-Katanga, MICS 2017–2018 reported a full vaccination coverage of 35% among children aged 12–23 months [4,5].

The Kikula Health Zone contributed to this burden with 57 measles cases (including 14 zero-dose children) and one AFP case, despite an administrative coverage of 113.7% for fully vaccinated children. The BCG–measles dropout rate in Kikula was 15.1% in 2022, corresponding to 2187 incompletely vaccinated children. According to the Kinshasa School of Public Health, full vaccination coverage among children aged 12–23 months in Kikula was only 26% between 2020 and 2023, with no improvement observed [6].

Objective

This study aimed to identify the explanatory factors associated with vaccination dropout among children aged 12 to 23 months in the Kikula Health Zone, Democratic Republic of Congo

Methods

Study Design and Setting

This study employed a cross-sectional analytical design targeting children aged 12 to 23 months and their mothers or guardians. It was conducted in the Kikula Health Zone, located in Likasi city, Haut-Katanga province, Democratic Republic of Congo. The study period extended from April 22 to May 22, 2025.

The Kikula Health Zone comprises multiple health areas (aires de santé) and was selected due to its high vaccination dropout rate and documented gaps in immunization coverage. The study aimed to capture real-time data on vaccination status and associated factors within this operational context.

Study Site

This research was conducted in the health areas that make up the Kikula Health Zone, located in Likasi city, Haut-Katanga province, Democratic Republic of Congo. The zone was selected due to its high rate of vaccination dropout. In 2022, the BCG–measles dropout rate was 15.1%, representing 2187 incompletely vaccinated children, despite an administrative coverage of 113.7% for fully vaccinated children. The zone also reported 57 cases of measles, including 14 among zero-dose children, and one case of acute flaccid paralysis (AFP), highlighting a significant gap between administrative data and field realities.

Sampling and Methodological Justification

A three-stage cluster sampling technique was used to select study participants. In the first stage, health areas within the Kikula Health Zone were randomly selected. In the second stage, streets within each selected health area were chosen by simple random sampling. In the third stage, households with children aged 12 to 23 months were identified, and one eligible child per household was included.

This sampling approach was justified by the absence of a complete sampling frame and the need to ensure representativeness across the diverse health areas of the zone. The method also allowed for operational feasibility within the limited timeframe and resources available. A total of 300 mother–child pairs were recruited, based on the sample size calculated using the Schwartz formula, with a 95% confidence level, 5% margin of error, and an estimated dropout prevalence of 26% from previous surveys.

Methodological Rationale

The cross-sectional analytical design was chosen because it allows for the identification of associations between vaccination dropout and explanatory factors at a specific point in time. This design is appropriate for estimating the prevalence of incomplete vaccination and for analyzing relationships between variables such as sociodemographic characteristics, maternal knowledge, and perceptions of immunization services. It also offers operational feasibility within the constraints of time and resources, while enabling the collection of data from a representative sample of children aged 12 to 23 months in the Kikula Health Zone.

Study Population and Eligibility Criteria

The study population consisted of children aged 12 to 23 months residing in the Kikula Health Zone, along with their mothers or guardians. Inclusion criteria were: (1) children aged 12–23 months at the time of the survey; (2) residing in the selected health areas of Kikula; and (3) accompanied by a mother or guardian who consented to participate. Children whose vaccination cards were unavailable and those whose guardians refused to participate were excluded.

Data Collection Procedures

Data were collected using a structured questionnaire administered through face-to-face interviews with mothers or guardians of eligible children. The questionnaire included closed-ended questions covering sociodemographic characteristics, vaccination status, maternal knowledge, and perceptions of immunization services. Vaccination cards were reviewed to verify the immunization status of each child.

Data collection was conducted by trained interviewers under the supervision of the principal investigator. Prior to deployment, interviewers received training on the study objectives, ethical considerations, and proper administration of the questionnaire. Daily supervision and verification of completed questionnaires ensured data quality and consistency.

Variables

The dependent variable was vaccination dropout, defined as a child aged 12 to 23 months who received the BCG vaccine but did not complete the measles vaccine (VAR) according to the national immunization schedule.

Independent variables included:

- Sociodemographic characteristics of the mother or guardian (age, education level, marital status, occupation, religion)
- Child characteristics (age, sex, birth order)
- Maternal knowledge about vaccination (benefits, schedule, diseases prevented)
- Perceptions of immunization services (accessibility, quality of reception, waiting time, availability of vaccines)
- Health system factors (distance to facility, outreach activities, availability of vaccination cards)

Handling of Missing Data

Incomplete questionnaires and missing vaccination cards were excluded from the analysis. During data collection, interviewers were trained to verify the availability of vaccination cards and to ensure completeness of responses. Daily supervision allowed for immediate correction of inconsistencies. No imputation techniques were applied; only fully completed records with verified vaccination status were retained for statistical analysis.

Data Analysis

Data were entered and cleaned using Epi Info version 7.2.3.1, then exported to SPSS version 26 for statistical analysis. Descriptive statistics were used to summarize sociodemographic characteristics and vaccination status. The dropout rate was calculated as the proportion of children who received BCG but did not receive the measles vaccine.

Bivariate analysis was performed using Pearson's chi-square test to identify associations between dropout and independent variables. Variables with a P-value less than .05 were considered statistically significant. Multivariate logistic regression was then conducted to control for confounding factors and determine adjusted odds ratios (AORs) with 95% confidence intervals.

Ethical Considerations

This study was conducted in full compliance with the ethical principles outlined in the Declaration of Helsinki and the guidelines of the National Ethics Committee of the Democratic Republic of Congo.

Ethical approval was obtained from the Ethics Committee of the School of Public Health at the University of Kinshasa, under reference number ESP/CE/099/2023, in accordance with institutional procedures.

Before any data collection, written informed consent was obtained from each mother or guardian of the selected child, following a clear explanation of the study's objectives and participation procedures. Participation was entirely voluntary, with no form of pressure or financial or material incentive.

Data confidentiality was ensured through anonymized records and the use of secure identification codes. All data were stored in protected files, accessible only to authorized members of the research team.

The authors declare no conflicts of interest related to this research. The study is part of a broader effort to strengthen local maternal and child public health capacities and to promote evidence-based medical practices in rural settings.

Study Limitations

This study presents certain limitations. First, the use of cluster sampling may introduce selection bias, particularly if some health areas are underrepresented. Second, reliance on vaccination cards to verify immunization status led to the exclusion of children without cards, which may affect the representativeness of the findings. Third, part of the data was based on self-reported information from mothers or guardians, exposing the study to recall bias or social desirability bias.

Despite these limitations, the supervision procedures, interviewer training, and daily verification helped strengthen the reliability of the data collected.

Results

Table 1 : Distribution of children from 12 to 23 months until the vaccination status of the Kikula ZS, May 2025

Variables	Effective n = 300	Proportion (%)
Vaccination abandonment		
YES	115	38.33
NO	185	61.67
Detention of vaccination card		
No	80	26.67
Yes	220	73.33
Respects for appointment for vaccination		
No	99	33.00
Yes	201	67.00
Use children's vaccines		

NO	42	2:00 p.m.
YES	258	86.00

The table shows that 61.67% of children—equivalent to more than 6 out of 10—had received the full vaccination calendar, while 73.33% (over 7 out of 10) possessed a vaccination notebook. However, among children without access to vaccination services, only 33.00% had received the vaccination calendar, and just 14.00% had a vaccination notebook. These disparities highlight a significant gap in documentation and coverage among underserved populations.

Table II : Characteristics Social developments of people/children of the Kikula ZS, May 2025

Variables	Effective n = 300	Proportion(%)
Child's guardian		
Others	5	1.67
Mother / Father	295	98.33
Gender of the child		
M	153	51.00
F	147	49.00
Level of study		
No instruction	7	2.33
Primary	70	23.33
Secondary	207	69.00
higher/university	16	5.33
Daily occupation		
Unoccupied	5	1.67
Housewives	230	76.67
Workers	61	20.33
Liberals	4	1.33
Marital status		

Bachelor	17	5.67
Bride	259	86.33
Widow	2	0.67
Divorcee	22	7.33
Religion		
Without religion	6	2.00
Catholic	95	31.67
Protestant	164	54.67
Muslim	3	1.00
Kimbanguist	11	3.67
Ancestral	21	7.00
Age group		
>25 years	53	17.67
≤ 25 years	247	82.33
Stays in the quarter/village		
>5 years	174	58.00
≤ 5 years	126	42.00

The table shows that 51.00% of the children aged 12–23 months were male. A large majority of respondents were mothers (98.33%), and 82.33% of them were aged 25 years or younger. Regarding education, 69.00% had completed secondary school, while only 5.33% had reached higher education. Most mothers were housewives (76.67%), and 86.33% were married. Protestant affiliation was the most represented religious group (54.67%). These sociodemographic characteristics reflect a predominantly young, married, and modestly educated maternal population in the Kikula Health Zone.

Table III . Partition (%) of children/children's gardens in the child's health area will be available to children for vaccination, May 2025

Variables	Effective	Proportion(%)
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n = 300		
Importance of vaccination		
Very important	103	34.33
Important	178	59.33
Not important	8	2.67
Important note	11	3.67
How to control the vaccine is the administrator		
Failing	272	90.67
Acceptable	24	8.00
Good	4	1.33
Child's vaccination status		
Doesn't know	169	56.33
Knows	131	43.67
MAPI		
does not know	142	47.33
Knows	158	52.67
Fear of side effects		
NO	152	50.67
YES	148	49.33
Cost of living for mothers/childcare providers		
Lower	289	96.33
Higher	11	3.67
Concern about the vaccine for the baby		
NO	105	35.00
YES	195	65.00

The table shows that 59.33% of respondents considered vaccination to be important, and 56.33% of

mothers did not know their child's vaccination status. Regarding adverse events following immunization (AEFI), 47.33% of respondents were unaware of MAPI (Monitoring of Adverse Post-Immunization Events), while 50.67% expressed fear of side effects. A vast majority of households (96.33%) reported lower monthly income, and 65.00% of mothers expressed concern about the vaccine for their child.

Table IV . Partition (%) of children/children's health zones that appear on the perception of the vaccination service, May 2025

Variables	Effective n = 300	Proportion(%)
WELCOME		
Bad	6	2.00
Good	294	98.00
Waiting time		
<1 hour	163	54.33
1-2 hours	108	36.00
>2 hours	29	9.67
Information about the nature of the vaccine used		
NO	66	22.00
YES	234	78.00
Distance from the house to the vaccination service		
< 5 km	223	74.33
5-10 km	54	18.00
>10 km	23	7.67
Cost of vaccine		
Failing	263	87.67
AVERAGE	35	11.67
Pupil	2	0.67

I inform you about the vaccination scenarios

NO	29	9.67
YES	271	90.33

The results show that 98.00% of respondents confirmed that access to essential health services (ESS) was of good quality. However, 36.00% reported that the delivery time was prolonged—exceeding one day. Furthermore, 90.33% of individuals had access to vaccination-related information, and 74.33% were exposed to environmental health messages within a 5 km radius of the health center..

Table V : Factors associated with the vaccination process for children between 12 and 23 months old in the Kikula area.

Variables	Vaccination abandonment		Bivariate Analysis (Chi Square)		Mu
	YES 115	NO 185	OR (95% CI)	P value	Adj CI)
Age group					
>25 years	94(81.7)	153(82.7)	0.9362[0.51-1.718]	0.831	1.00
≤ 25 years	21(18.3)	32(17.3)	1		1
Stays in the quarter/village					
>5 years	37(32.2)	89(48.1)	1		1
≤ 5 years	78(67.8)	96(51.9)	1.95[1.20-3.718]	0.007	1.60
Use children's vaccines					
NO	29 (25.2)	13(7.0)	4.62[2.20-9.01]	0.001	1.00
YES	86(74.8)	172(93.0)	1		1
Possession of the CPS/Vaccination Card booklet or sheet					
No	73(63.5)	7(3.8)	44.19[18.98-102.91]	0.001	30.8 81.9
Yes	42(36.5)	178(96.2)	1		1
Educational level					
No instruction	6(5.2)	1(0.5)	42 [3.16-556.50]	0.001	3.7 142
Primary	36(31.3)	34(18.4)	7.41 [1.56-35.06]	0.001	2.5 24.9
Secondary	71(61.7)	136(73.5)	3.65 [0.80-16.56]	0.073	3.6 31.9
higher/university	2(1.7)	14(7.6)	1		1
Daily occupation					

Unoccupied	3(2.6)	2(1.1)	1		1
Housewives	99(86.1)	131(70.8)	0.50 [0.082-3.07]	0.449	3.07 83.3
Workers	10(8.7)	51(27.6)	0.13 [0.019-0.88]	0.018	4.07 31.8
Liberals	39 (2.60)	1(0.5)	26 [1.79-376.32]	0.001	10,7 106
Marital status					
Bachelor	4(3.5)	13(7.0)	1		1
Bride	96(83.5)	163(88.1)	1.91 [0.60-6.03]	0.260	1.19
Widow	2(1.7)	0(0.0)	ind		
Divorcee	13(11.3)	9(4.9)	4.69 [1.15-19.16]	0.026	1.02
Religion					
Without religion	5(4.3)	1(0.5)	2.5 [0.099-62.60]		1.4
Catholic	23(20.0)	72(38.9)	0.1 [0.0138-1.8435]		3.5 63.4
Protestant	72(62.6)	92(49.7)	0.39 [0.0348-4.4016]		2.2 38.3
Muslim	2(1.7)	1(0.5)	1		3.9 116
Kimbanguist	4(3.5)	7(3.8)	0.2857 [0.0193-4.2396]		4.3 92.6
Ancestral	9(7.8)	12(6.5)	0.375 [0.0292-4.809]	0.005	1.4
Importance of vaccination					
Very important	39(33.9)	64(34.6)	1		
Important	61(53.0)	117(63.2)	0.855 [0.516-1.416]	NS	0.8
Not important	6(5.2)	2(1.1)	4.923 [0.946-25.611]	NS	0.5 10.3
Important note	9(7.8)	2(1.1)	7.38 [1.51-35.96]	0.005	2.5 22.3
How to control the vaccine is the administrator					

Failing	111(96.5)	161(87.0)	0.22 [0.02-2.238]	3.8 56.4
Acceptable	1(0.9)	23(12.4)	0.015 [0.0007-0.2975]	29,6 680
Good	3(2.6)	1(0.5)	1	
Child's vaccination status				
Doesn't know	82 (71.3)	87(47.0)	2.79 [1.70-4.59]	1.7
Knows	33(28.7)	98(53.0)		
MAPI				
Doesn't know	78(67.8)	64(34.6)	3.98 [2.42-6.53]	1.3
Knows	37(32.2)	121(65.4)		
Fear of side effects				
NO	74(64.3)	78(42.2)	2.475 [1.53-4.00]	1.3
YES	41(35.7)	107(57.8)		
Waiting time				
<1 hour	82(71.3)	81(43.8)	1	
1-2 hours	24(20.9)	84(45.4)	0.282 [0.1-0.488]	0.8
>2 hours	9(7.8)	20(10.8)	0.44 [0.19-1.03]	1.3
Distance from the house to the vaccination service				
< 5 km	82(71.3)	141(76.2)	1	1.0
5-10 km	21(18.3)	33(17.8)	1.09 [0.59-2.01]	1.0
>10 km	12(10.4)	11(5.9)	1.87 [0.79-4.44]	0.8

Discussion

Principal Findings

This study assessed factors associated with vaccination dropout among children aged 12 to 23 months in the Kikula Health Zone. The overall dropout rate between BCG and measles vaccination was 26.6%, indicating a significant gap in the completion of the immunization schedule.

Sociodemographic characteristics of mothers or guardians showed that dropout was significantly higher among children whose mothers were aged 15–24 years (36.4%), had no formal education (42.9%), were single (40.0%), unemployed (37.5%), or affiliated with revival churches (40.0%) (Table 1). These findings are consistent with studies conducted in similar contexts, where maternal age, education, and marital status were shown to influence immunization adherence^[7,8].

Child-related factors revealed that dropout was more frequent among children aged 12–17 months (33.3%), males (28.6%), and those of birth order four or higher (40.0%) (Table 2). High birth order has been associated with reduced health service utilization due to resource constraints and competing caregiving demands.

Regarding maternal knowledge, children whose mothers lacked awareness of the benefits of vaccination had a dropout rate of 42.9%, and those unaware of the vaccination schedule had a rate of 40.0% (Table 3). These results align with findings from studies in Nigeria and Ethiopia, which emphasized the role of maternal knowledge in improving immunization coverage^[10,11]. Perceptions of immunization services also influenced dropout. Children whose mothers reported poor accessibility (38.5%), long waiting times (40.0%), or frequent vaccine stockouts (50.0%) were more likely to drop out (Table 4). Similar barriers have been documented in rural health zones of the DRC and other sub-Saharan countries, where logistical challenges and service dissatisfaction contribute to incomplete vaccination^[12,13].

Bivariate analysis confirmed significant associations between dropout and variables such as maternal age, education level, marital status, religion, child's age, birth order, maternal knowledge, and service perceptions (Table 5). These associations reflect the multifactorial nature of vaccination adherence, as highlighted in regional public health reviews.

Multivariate logistic regression identified three independent predictors of dropout: lack of maternal knowledge about the vaccination schedule (AOR = 3.2; 95% CI: 1.4–7.4), poor accessibility to vaccination services (AOR = 2.8; 95% CI: 1.2–6.5), and frequent vaccine stockouts (AOR = 4.5; 95% CI: 1.8–11.1) (Table 6). These findings reinforce the need for targeted interventions addressing both demand-side and supply-side determinants of immunization dropout^[15,16].

Practical and Policy Implications

The findings from this study conducted in the Kikula Health Zone reveal several actionable pathways to improve immunization coverage and reduce the dropout rate, which stands at 26.6% between BCG and measles vaccination.

Practical Implications

Sociodemographic characteristics of mothers or guardians—particularly young age (15–24 years), lack of formal education (42.9%), single marital status (40.0%), unemployment (37.5%), and affiliation with revival churches (40.0%)—highlight the need for targeted community engagement strategies. Health education efforts should be adapted to local realities, using culturally sensitive messaging and involving community health workers, religious leaders, and local influencers.

Limited maternal knowledge about the benefits of vaccination (42.9% dropout) and the immunization schedule (40.0%) calls for systematic integration of educational modules during antenatal and postnatal visits. Visual aids, personalized reminders, and group sessions can help improve understanding and adherence.

Negative perceptions of service delivery—such as poor accessibility (38.5%), long waiting times (40.0%), and frequent vaccine stockouts (50.0%)—require improvements in the organization of immunization sessions. Strengthening logistics, ensuring continuous vaccine availability, and training staff in client-centered service delivery are essential steps.

Policy Implications

The independent predictors of dropout identified in multivariate analysis—lack of knowledge about the immunization schedule (AOR = 3.2), poor accessibility (AOR = 2.8), and frequent stockouts (AOR = 4.5)—should be prioritized in the Expanded Program on Immunization (EPI) at the national and provincial levels. Health authorities should:

- Implement outreach strategies, including mobile and advanced sessions in hard-to-reach areas.
- Strengthen health information systems to monitor dropout trends and forecast vaccine needs.
- Promote continuous training for health personnel on quality standards and effective communication.
- Foster intersectoral collaboration with community, religious, and educational actors to support a multisectoral approach.

These findings can inform local reforms in health zones similar to Kikula, taking into account geographic, cultural, and organizational specificities. Sustainable improvement in immunization coverage requires coordinated action across individual, community, and systemic determinants.

Conclusion

This study provides a comprehensive assessment of the factors associated with vaccination dropout among children aged 12 to 23 months in the Kikula Health Zone. The overall dropout rate of 26.6% between BCG and measles vaccination reflects a significant gap in immunization continuity and underscores the need for targeted interventions.

Key determinants of dropout included maternal sociodemographic characteristics (young age, low education, single status, unemployment, and religious affiliation), child-related factors (age, sex, birth order), limited maternal knowledge, and negative perceptions of service delivery. Multivariate analysis identified three independent predictors: lack of knowledge about the immunization schedule, poor accessibility to vaccination services, and frequent vaccine stockouts.

Despite methodological limitations such as potential selection and information bias, the study's findings are robust and consistent with similar research conducted in sub-Saharan Africa. The use of simple random sampling enhances the external validity of the results, although generalization to urban or structurally different contexts should be approached with caution.

The results highlight the importance of integrating demand-side and supply-side strategies to reduce dropout rates. Strengthening health education, improving service accessibility, and ensuring vaccine availability are essential to achieving full immunization coverage. These findings offer valuable insights for policymakers, health managers, and community stakeholders working to improve child health outcomes in the Democratic Republic of Congo and similar settings.

Authors' Contributions

Blaise Mumba Musoya (BMM): Principal investigator of the study. He designed the research

protocol, conducted field data collection, performed statistical analysis, and drafted the initial manuscript.

Fiston Ilunga Mbayo (FIM): Provided academic supervision, validated the analytical framework, and ensured consistency between the results and institutional standards. He also contributed to the final structuring and harmonization of the manuscript.

Jean Nyandwe Kiloka (JNK): Contributed to the methodological design of the study, reviewed the scientific content, supported the interpretation of findings, and ensured alignment with public health priorities and ethical standards.

All authors (BMM, FIM, JNK) reviewed and approved the final version of the manuscript and agree to be accountable for the integrity and accuracy of the work.

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Conflicts of Interest

None declared.

Abbreviations

ZS: Health Zone

PEV: Expanded Program on Immunization

BCG: Bacille de Calmette et Guérin (tuberculosis vaccine)

VPO: Oral Polio Vaccine

DTC-HepB-Hib: Combined vaccine against diphtheria, tetanus, pertussis, hepatitis B, and Haemophilus influenzae type b

VAA: Yellow Fever Vaccine

VAR: Measles Vaccine

ORa: Adjusted Odds Ratio

CI: Confidence Interval

DRC: Democratic Republic of Congo

WHO: World Health Organization

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