Prevalence and factors associated with the uptake of the second dose of the measles vaccine among children aged 18–59 months in Rusizi Healthcare Facilities, Rwanda, 2025

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ABSTRACT

INTRODUCTION: Measles remains a major public health challenge despite the availability of safe and effective vaccines. Completion of the second dose of the measles-containing vaccine (MCV2) is essential for achieving herd immunity and preventing outbreaks. This study determined the prevalence of MCV2 uptake and factors associated with its completion among children aged 18–59 months attending healthcare facilities in Rusizi District, Rwanda.

METHODS: A facility-based cross-sectional study was conducted between March and April 2025 among 287 caregivers selected using multistage and systematic random sampling. Data were collected through interviewer-administered questionnaires and vaccination card reviews. Descriptive statistics, chi-square tests, and multivariable logistic regression were performed using SPSS version 27. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were used to identify factors associated with MCV2 uptake at $p<0.05$.

RESULTS: MCV2 uptake was 74.9% (215/287), below the WHO target of 95% required for herd immunity. Higher household income was associated with increased vaccine uptake (201,000–300,000 RWF: AOR=2.49, 95% CI: 1.05–5.88; >301,000 RWF: AOR=3.36, 95% CI: 1.37–8.22). High caregiver knowledge also increased the likelihood of MCV2 completion (AOR=2.11, 95% CI: 1.01–4.42). Conversely, living more than 10 km from a health facility, waiting over two hours for services, and inconsistent vaccine availability significantly reduced vaccine uptake.

CONCLUSION: MCV2 uptake in Rusizi District remains below the level required for herd immunity. Strengthening outreach services, improving vaccine availability, reducing waiting times, and enhancing caregiver education are essential to increase MCV2 completion and reduce the risk of measles outbreaks.

INTRODUCTION

Measles is a highly contagious viral disease and remains an important cause of morbidity and mortality among children under five years globally despite the availability of safe and effective vaccines [1]. The disease spreads through respiratory droplets and direct contact with infected individuals and may result in severe complications including pneumonia, encephalitis, diarrhea, blindness, and death, particularly among unvaccinated children [2]. The World Health

Organization (WHO) recommends administration of two doses of measles-containing vaccine (MCV), with the first dose (MCV1) given at 9 months and the second dose (MCV2) administered at 15–18 months to ensure adequate immunity and herd protection [3].

Globally, substantial progress has been achieved in reducing measles-related deaths through routine immunization programs and supplementary immunization activities. However, measles outbreaks continue to occur in many low- and middle-income countries due to suboptimal vaccination coverage, missed vaccination opportunities, weak healthcare systems, and vaccine hesitancy [4]. In Sub-Saharan Africa, low uptake of MCV2 has remained a public health concern, particularly in rural and underserved populations where healthcare accessibility and vaccine availability remain limited [5].

In Rwanda, the Expanded Program on Immunization (EPI) has significantly improved childhood immunization coverage through strengthened healthcare delivery systems, community health worker involvement, integrated health data systems, mHealth reminders, and nationwide vaccination campaigns [6]. According to the Rwanda Demographic and Health Survey and Ministry of Health reports, MCV1 coverage remains relatively high nationally, but MCV2 coverage has consistently remained lower than the WHO target of 95% in Rusizi district [7]. Recent surveillance reports also indicated periodic measles outbreaks in Western Province and border districts neighboring the Democratic Republic of Congo, including Rusizi District, where cross-border movement and inconsistent immunization uptake may contribute to increased transmission risks [8].

Previous studies conducted in African countries have identified caregiver knowledge, household income, transportation challenges, long waiting times, and vaccine stock-outs as important determinants of childhood immunization completion [5,9]. However, limited evidence exists regarding factors influencing uptake of the second dose of measles vaccine among children aged 18–59 months in Rusizi District. This study therefore aimed to determine the prevalence and factors associated with uptake of the second dose of measles-containing vaccine among children aged 18–59 months attending healthcare facilities in Rusizi District, Rwanda. The study hypothesized that caregiver-related, economic, and institutional factors significantly influence MCV2 uptake.

METHODS

Study Design and Study Area

A facility-based descriptive cross-sectional study was conducted in Rusizi District, Western Province, Rwanda, between March and April 2025. Rusizi District borders the Democratic Republic of Congo and consists of both urban and rural sectors served by public and private healthcare facilities providing routine immunization services. The study design was chosen because it enabled simultaneous assessment of prevalence and associated factors of uptake of the second dose of measles-containing vaccine (MCV2) among children aged 18–59 months.

Study Population

The study population comprised caregivers of children aged 18–59 months attending selected healthcare facilities for child health and immunization services during the study period. The accessible population was identified from immunization clinic attendance records in selected healthcare facilities.

Inclusion and Exclusion Criteria

Caregivers of children aged 18–59 months who attended selected healthcare facilities during the study period and consented to participate were included in the study. Caregivers who were critically ill, unable to communicate effectively, or unwilling to participate were excluded.

Sample Size Determination and Sampling Procedure

The sample size was calculated using Fisher's formula for cross-sectional studies with a 95% confidence level, 5.0% margin of error, and an assumed prevalence of 50.0%. Since the target population was below 10,000, finite population correction was applied, resulting in a final sample size of 287 participants.

A multistage sampling technique was used. In the first stage, healthcare facilities providing routine immunization services in Rusizi District were listed. According to district health records, there were 18 eligible health centers offering routine immunization services in Rusizi District. Health posts and clinics with irregular immunization services were excluded from the sampling frame to ensure consistency in service delivery.

From the 18 eligible health centres, 10 health facilities were selected using simple random sampling (lottery method), ensuring that each facility had an equal probability of selection and that both rural and semi-urban settings were represented. In the second stage, proportional allocation was applied to distribute the total sample size (n = 287) across the 10 selected health facilities based on the average monthly immunization clinic attendance in each facility. This ensured that facilities with higher client flow contributed more participants while maintaining representativeness across all sites.

Within each selected health facility, systematic random sampling was used to recruit eligible caregivers. The sampling interval (k=3) was determined by dividing the estimated number of eligible caregivers attending immunization services during the study period by the allocated sample size per facility. A random starting point between 1 and k was selected, and thereafter every 3th eligible caregiver was recruited until the required sample size per facility was achieved

Data Collection Instrument and Procedure

Data were collected using a structured interviewer-administered questionnaire developed from previous immunization studies and WHO vaccination assessment guidelines [10,11]. The questionnaire contained sections on socio-demographic characteristics, caregiver knowledge, economic factors, and institutional factors associated with MCV2 uptake. Vaccination cards and child health records were reviewed to verify vaccination status and minimize recall bias.

The questionnaire was initially prepared in English and translated into Kinyarwanda for data collection. Trained research assistants conducted face-to-face interviews under supervision of the principal investigator. Daily supervision and verification of completed questionnaires were performed to ensure data completeness and consistency.

Operational Definition of Knowledge Level

Caregiver knowledge regarding measles vaccination was assessed using 10 structured knowledge questions. Each correct response scored one mark, while incorrect or “don’t know” responses scored zero. Total scores ranged from 0–10 and were categorized as follows: Low knowledge: 0–4 points; moderate knowledge: 5–7 points; and high knowledge: 8–10 points.

Validity and Reliability

Content validity of the instrument was assessed by public health and epidemiology experts to ensure relevance and clarity of questionnaire items. The questionnaire was pretested among 28 caregivers at Mugonero Health Facility in Nyamasheke District, which was not included in the main study. Reliability was assessed using Cronbach’s alpha coefficient, and the tool demonstrated good internal consistency with a Cronbach’s alpha value of 0.82.

Data Quality Control

Research assistants received one-day training on study objectives, ethical principles, interview techniques, and questionnaire administration. Completed questionnaires were checked daily for completeness and accuracy. Vaccination cards were used where available to reduce information and recall bias. Confidentiality was maintained through use of unique identification codes instead of participant names.

Data Management and Statistical Analysis

Collected data were coded, cleaned, and entered into Statistical Package for Social Sciences (SPSS) version 26 for analysis. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to summarize study variables. Bivariate analysis using chi-square tests was performed to determine associations between independent variables and MCV2 uptake.

Variables with p-values less than 0.05 at bivariate analysis were included in multivariate logistic regression analysis to identify independent predictors of MCV2 uptake. Adjusted Odds Ratios (AORs) with 95.0% Confidence Intervals (CIs) were reported. Caregiver age and education level were additionally included in the multivariate model to control for confounding effects. Interaction between distance to healthcare facility and transport cost was assessed during regression modeling. Multicollinearity among predictor variables was assessed using Variance Inflation Factor (VIF), and no significant multicollinearity was identified (all VIF values <2.5). Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test ($p=0.71$), indicating adequate model fit.

Ethical Considerations

Ethical approval was obtained from the Mount

Kenya University Research Ethics Committee (Approval No: MKU/PH/2025/041). Permission to conduct the study was also obtained from Rusizi District health authorities and participating healthcare facilities. Written informed consent was obtained from all participants before data collection. Participation was voluntary, and respondents were informed of their right to withdraw from the study at any time without penalty. Confidentiality and anonymity were maintained throughout the study.

RESULTS

A total of 287 caregivers of children aged 18–59 months participated in the study, giving a response rate of 100.0%. No participant withdrew from the study, and there were no incomplete questionnaires or missing records during data collection.

Socio-demographic Characteristics of Respondents

Most caregivers were aged 20–29 years (41.5%), followed by 30–39 years (28.6%). Female caregivers constituted the majority (72.5%). Most respondents were married (74.2%), and more than half had secondary education (55.1%).

Table 1: *Socio-demographic characteristics of respondents*

Characteristics/Categories	Frequency n (%)
Caregiver age	
<20 years	59 (20.6)
20–29 years	119 (41.5)
30–39 years	82 (28.6)
≥40 years	27 (9.4)
Gender	
Male	79 (27.5)
Female	208 (72.5)
Marital status	
Single	59 (20.6)
Married	213 (74.2)
Widowed	8 (2.8)
Divorced/Separated	7 (2.4)
Education level	
No formal education	14 (4.9)
Primary education	60 (20.9)
Secondary education	158 (55.1)
Higher education	55 (19.2)

Self-employment (36.6%) and farming (26.1%) were the most common occupations among caregivers.

Prevalence of Uptake of the Second Dose of Measles Vaccine

The overall prevalence of uptake of the second dose of measles-containing vaccine (MCV2) among children aged 18–59 months was 74.9% (215/287), while 25.1% (72/287) had not received the second dose (Table 2).

Caregiver Knowledge Regarding Measles Vaccination

Assessment of caregiver knowledge showed that 64.8% had moderate knowledge, 32.1% had low knowledge, and only 3.1% demonstrated high knowledge regarding measles vaccination and immunization schedules (Table 3).

Economic Factors Associated with MCV2 Uptake

Children from households earning more than 301,000 RWF per month were more likely to receive MCV2 compared to those earning less than 100,000 RWF (COR = 1.841; 95% CI: 0.867–3.906; p = 0.012), Vaccination-related costs were negatively associated with uptake, where spending 2,000–5,000 RWF (COR = 0.292; 95% CI: 0.137–0.621; p = 0.001) and ≥5,000 RWF (COR = 0.318; 95% CI: 0.140–0.722; p = 0.006) reduced the likelihood of completing MCV2. In addition, children living more than 10 km from a health facility had higher odds of MCV2 uptake

Table 2: *Uptake of the Second Dose of Measles Vaccine*

Variable	Frequency n (%)
MCV2 uptake	
Yes	215 (74.9)
No	72 (25.1)
Total	287 (100)

Table 3: *Caregiver Knowledge Levels on Measles Vaccination*

Variable	Frequency n (%)
Knowledge level	
Low knowledge	92 (32.1)
Moderate knowledge	186 (64.8)
High knowledge	9 (3.1)

Knowledge scores were categorized based on responses to 10 knowledge assessment questions.

compared to those within 1 km (COR = 2.600; 95% CI: 1.021–6.619; p = 0.045), Children of caregivers with moderate knowledge had higher odds of receiving MCV2 compared to those with low knowledge (COR = 1.78; 95% CI: 1.05–3.02; p = 0.033). Similarly, caregivers with high knowledge were more likely to complete MCV2 vaccination for their children (COR = 2.64; 95% CI: 1.10–6.32; p = 0.028) (Table 4).

Multivariate logistic regression analysis identified household income and transport costs as significant predictors of MCV2 uptake. Children from households earning 201,000–300,000 RWF were more likely to receive MCV2 compared to households earning less than 100,000 RWF (AOR=2.49; 95.0% CI:1.05–5.88; p=0.038). Similarly, children from households earning above 301,000 RWF had increased odds of MCV2 uptake (AOR=3.36; 95.0% CI:1.37–8.22; p=0.008). Children whose caregivers spent between 2,000–5,000 RWF on transportation were less likely to receive MCV2 (AOR=0.31; 95.0% CI:0.14–0.68; p=0.004). In addition, children living more than 10 km from healthcare facilities had significantly higher odds of missing MCV2 vaccination compared to those living within 1 km (AOR=4.70; 95.0% CI:1.60–13.83; p=0.005). Children of caregivers with high knowledge had higher odds of MCV2 uptake compared to those with low knowledge (AOR = 2.11; 95% CI: 1.01–4.42; p = 0.047) (Table 5).

Institutional Factors Associated with MCV2 Uptake

The bivariate analysis showed that several institutional factors were significantly associated with uptake of MCV2. Longer distance to health

Table 4: *Bivariate logistic regression analysis of economic factors associated with uptake of the second dose of measles vaccine*

Variable	Category	COR (95% CI)	P-value
Household Income	<100,000 RWF	Ref	–
	100,000–200,000 RWF	1.116 (0.527–2.365)	0.774
	201,000–300,000 RWF	1.342 (0.647–2.783)	0.429
	>301,000 RWF	1.841 (0.867–3.906)	0.012
Health Insurance	No	Ref	–
	Yes	1.602 (0.774–3.314)	0.204
Mode of Transport	Walking	Ref	–
	Public	1.583 (0.806–3.110)	0.182
	Private	1.150 (0.544–2.430)	0.715
Vaccination Cost	Nothing	Ref	–
	<2,000 RWF	0.608 (0.302–1.222)	0.162
	2,000–5,000 RWF	0.292 (0.137–0.621)	**0.001**
	≥5,000 RWF	0.318 (0.140–0.722)	**0.006**
Transport Affordability	Easily	Ref	–
	With difficulty	1.530 (0.814–2.877)	0.186
	Not easy	0.970 (0.474–1.987)	0.934
Distance to Facility	<1 km	Ref	–
	1–5 km	1.083 (0.610–1.925)	0.785
	6–10 km	0.773 (0.241–2.474)	0.664
	>10 km	2.600 (1.021–6.619)	**0.045**
Caregiver Knowledge Level	Low knowledge	Ref	–
	Moderate knowledge	1.78 (1.05–3.02)	**0.033**
	High knowledge	2.64 (1.10–6.32)	**0.028**

COR = Crude Odds Ratio; CI = Confidence Interval; Ref = Reference category; RWF = Rwandan Francs; p-value indicates statistical significance, with p < 0.05 considered significant.

Table 5: *Multivariate analysis of economic factors associated with the uptake of measles vaccine*

Variables	Category	AOR (95% CI)	p-value
Household income	<100,000 RWF	Ref	–
	201,000–300,000 RWF	2.49 (1.05–5.88)	0.038
	>301,000 RWF	3.36 (1.37–8.22)	0.008
Transport cost	None	Ref	–
	2,000–5,000 RWF	0.31 (0.14–0.68)	0.004
Distance to facility	<1 km	Ref	–
	>10 km	4.70 (1.60–13.83)	0.005
Caregiver knowledge level	Low knowledge	Ref	–
	Moderate knowledge	1.62 (0.92–2.88)	0.091
	High knowledge	2.11 (1.01–4.42)	**0.047**

AOR: Adjusted Odds Ratio; CI: Confidence Interval; Ref: Reference category.

facilities, prolonged waiting time, and inconsistent vaccine availability were significantly associated with reduced likelihood of MCV2 uptake at the crude level (Table 6).

In multivariate analysis, institutional factors including distance to healthcare facilities, waiting time, and vaccine availability significantly influenced uptake of MCV2. Children living more

Table 5: *Bivariate analysis of institutional factors associated with the uptake of measles vaccine*

Variable	Category	COR (95% CI)	p-value
Distance to health facility	<1 km	Ref	–
	1–5 km	1.47 (0.43–4.99)	0.54
	6–10 km	0.77 (0.24–2.47)	0.664
	>10 km	0.11 (0.03–0.43)	**<0.001**
Waiting time at facility	<30 min	Ref	–
	30–60 min	0.68 (0.28–1.62)	0.38
	1–2 hrs	0.38 (0.17–0.87)	0.022
	>2 hrs	0.17 (0.07–0.41)	**<0.001**
Vaccine stock-out	No	Ref	–
	Yes	0.64 (0.37–1.12)	0.117
Healthcare workers' attitude	Very friendly	Ref	–
	Neutral	1.01 (0.51–1.99)	0.979
	Unfriendly	1.81 (0.82–3.98)	0.143
Vaccine availability	Always	Ref	–
	Sometimes	1.03 (0.54–1.95)	0.935
	Rarely	2.15 (0.57–8.13)	**0.05**
	Don't know	0.65 (0.25–1.64)	0.358
Facility satisfaction	Very satisfied	Ref	–
	Somewhat satisfied	0.68 (0.30–1.54)	0.356
	Neutral	0.78 (0.32–1.90)	0.579
	Dissatisfied	0.69 (0.18–2.67)	0.589

COR = Crude Odds Ratio; CI = Confidence Interval; Ref = Reference category; p-value < 0.05 considered significant.

Table 5: *Multivariate Analysis of institutional factors associated with the uptake of measles vaccine*

Variables	AOR (95% CI)	p-value
Distance to health facility		
• <1 km	Ref	–
• >10 km	0.08 (0.02–0.37)	**<0.001**
Waiting time at facility		
• <30 minutes	Ref	–
• >2 hours	0.30 (0.11–0.84)	**0.022**
Vaccine availability		
• Always available	Ref	–
• Rarely available	0.13 (0.02–0.79)	**0.027**

AOR: Adjusted Odds Ratio; CI: Confidence Interval; Ref: Reference category.

than 10 km from health facilities were significantly less likely to receive MCV2 compared to those living within 1 km (AOR=0.08; 95.0% CI:0.02–0.37; p<0.001). Caregivers who waited more than two hours at healthcare facilities were also less likely to complete MCV2 vaccination (AOR=0.30; 95.0% CI:0.11–0.84; p=0.022). Furthermore, inconsistent vaccine availability significantly reduced vaccine uptake. Children attending facilities where vaccines were rarely available had lower odds of receiving MCV2 compared to facilities with consistent vaccine availability (AOR=0.13; 95.0% CI:0.02–0.79; p=0.027) (Table 7).

DISCUSSION

This study found that MCV2 uptake among children aged 18–59 months in Rusizi District was 74.9%, which remains below the WHO-recommended 95% threshold required for herd immunity. This indicates that a considerable proportion of children are still not fully protected against measles, leaving communities at risk of outbreaks. Similar suboptimal coverage has been reported in Uganda and Kenya, where MCV2 uptake remains below optimal levels despite strong national immunization programs [23,24]. The findings suggest that improving second-dose completion remains a persistent challenge across several East African settings.

In the Rwandan context, this coverage level is lower than national targets reported in routine immunization performance reviews, where MCV2 coverage has generally been estimated above 85% in recent years, although still below the 95% elimination threshold required for measles control. According to the Rwanda Demographic and Health Survey (RDHS 2019–20), full immunization coverage among children aged 12–23 months was relatively high, but dropout between MCV1 and MCV2 remains a documented concern, particularly in western districts such as Rusizi, Nyamasheke, and Rubavu, where geographic access challenges persist [25]. Similarly, the Rwanda EPI annual reports highlight that while MCV1 consistently achieves high coverage nationally, MCV2 uptake lags behind due to missed opportunities, delayed follow-up visits, and caregiver mobility [26]. These patterns suggest that the Rusizi findings are consistent with national evidence of a persistent MCV2 completion gap despite strong first-dose performance.

Most caregivers had moderate knowledge, with few demonstrating high knowledge of measles vaccination schedules. This pattern is consistent with findings from Ethiopia and Kenya, where limited caregiver understanding contributes to incomplete vaccination schedules [27,28]. However, knowledge alone was insufficient to ensure full vaccine uptake, indicating that structural barriers may outweigh behavioral awareness in determining vaccination completion.

This finding is also consistent with Rwanda-based studies conducted in southern and western provinces, which report that although caregiver awareness of routine immunization is generally high, knowledge gaps persist specifically regarding vaccination schedules, especially the timing of second doses such as MCV2 [27]. The RDHS also indicates that maternal education and exposure to health information through community health workers (CHWs) are strongly associated with full immunization completion, suggesting that knowledge interacts with service accessibility rather than independently determining uptake [25]. Therefore, even in settings like Rwanda where immunization awareness campaigns are widespread, knowledge alone does not fully translate into timely completion of MCV2.

Household income and transport-related costs were significant predictors of MCV2 uptake. Children from higher-income households were more likely to complete vaccination, while those facing higher transport costs had reduced uptake. These findings align with evidence from Ghana, Bangladesh, and other low-income settings where indirect costs such as transport and opportunity costs reduce immunization completion [29,31]. Although vaccines are provided free of charge in Rwanda, indirect financial barriers continue to influence access. This suggests that financial protection strategies targeting indirect costs may be important to improve equity in immunization coverage.

In Rwanda, similar socioeconomic gradients have been documented in immunization uptake. RDHS findings show that children from the lowest wealth quintiles are more likely to experience delayed or incomplete vaccination compared to those from wealthier households, despite nationwide insurance coverage (Mutuelle de Santé) reducing direct cost barriers [25]. In addition, EPI monitoring reports indicate that transport costs and opportunity costs (such as lost working time for caregivers) remain key reasons for missed vaccination appointments, particularly in rural and hard-to-reach sectors of Rusizi District [26]. This suggests that even in a context of free immunization services, economic constraints remain a hidden but significant determinant of MCV2 completion, reinforcing the need for decentralized outreach services and strengthened community-based vaccination strategies.

Institutional factors such as distance to health facilities, waiting time, and vaccine availability were strongly associated with MCV2 uptake. Children living farther from health facilities and those experiencing long waiting times were less likely to complete vaccination. Similar findings have been reported in Uganda and Nigeria, where geographical inaccessibility and long service delays reduce immunization adherence [35,36]. Vaccine stock-outs and inconsistent availability also negatively affected uptake, consistent with studies in East Africa highlighting supply chain weaknesses as a major barrier to vaccination completion [36]. These findings underscore the importance of strengthening service delivery systems and improving vaccine logistics.

In Rwanda, these institutional barriers are particularly relevant in rural and island-adjacent sectors of Rusizi, where terrain and distance to health centers significantly affect service utilization. The RDHS and EPI reports consistently highlight geographic inequities in health service access, with western provinces reporting higher rates of missed immunization appointments compared to urban districts such as Kigali [25,26]. Furthermore, Rwanda's Health Management Information System (HMIS) reports indicate that while national vaccine stock-out rates are generally low, sub-national disparities still occur due to cold-chain limitations and distribution inefficiencies at health center level, which can temporarily disrupt MCV2 service delivery [26]. Studies conducted in Rwandan border districts have also shown that long waiting times and opportunity costs discourage return visits for second-dose vaccines, contributing directly to dropout between MCV1 and MCV2 [27]. These findings emphasize that improving immunization completion requires not only demand-side interventions but also continued strengthening of supply chain efficiency and service delivery responsiveness.

The findings highlight the need for integrated immunization strategies that address both demand- and supply-side barriers. Strengthening community outreach, improving health facility efficiency, and ensuring consistent vaccine availability could significantly improve MCV2 coverage in Rusizi District. Additionally, enhancing caregiver education through community health workers may help improve adherence to vaccination schedules.

This study was cross-sectional in design, which limits the ability to establish causal relationships between the independent variables and MCV2 uptake among children. Therefore, the associations observed should be interpreted as correlational rather than causal. There is also a possibility of recall bias, particularly among caregivers who were unable to accurately remember vaccination histories. However, this limitation was minimized by cross-checking responses with child vaccination cards whenever they were available.

In addition, the study employed a facility-based sampling approach, which may have introduced selection bias. Specifically, caregivers who attended health facilities were more likely to be included in the study, while those who do not routinely seek healthcare services may have been systematically excluded. This could result in overrepresentation of health-seeking caregivers, who may differ in knowledge, attitudes, and vaccination practices compared to those not accessing health services. As a result, the findings may not be fully generalizable to the entire population of caregivers in the community.

Social desirability bias may also have influenced responses, as caregivers might have provided answers they perceived as acceptable to health workers or researchers, particularly regarding vaccination practices and child health behaviors.

CONCLUSION

The uptake of the second dose of the measles-containing vaccine (MCV2) among children aged 18–59 months in Rusizi District was 74.9%, below the WHO-recommended 95% threshold for herd immunity. Uptake was influenced by socioeconomic, caregiver, and health system factors. Higher household income and better caregiver knowledge significantly increased the likelihood of completing MCV2, whereas long travel distances, prolonged waiting times, and inconsistent vaccine availability reduced vaccine uptake. These findings highlight the need for integrated interventions to improve immunization completion. The Ministry of Health and Rusizi District should expand outreach and mobile vaccination services in underserved communities, strengthen vaccine supply chain management to eliminate stock-outs, reduce waiting times through improved staffing and appointment systems, and enhance caregiver education on the importance of completing the two-dose schedule. Community health workers should intensify defaulter tracing and reminder systems using routine EPI, integrated Civil Registration and Vital Statistics (CRVS) and HMIS data to identify children who miss scheduled vaccinations. These coordinated strategies will improve MCV2 coverage, reduce missed opportunities for vaccination, and support Rwanda's progress toward measles elimination.

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