



Prevalence and Factors Associated with Measles-Rubella Zero-Dose Status During a Measles Outbreak, Kyegegwa District, Uganda, April, 2026

Authors: Mariam Nambuya^{1*}, Godfrey Tumwizere¹, Prossy Nakito¹, Wilber Arineitwe¹, Regina Nanyunja¹, Chrispus Bakunda Musabe¹, Allan Isaac Amandu¹, Lilian Aliyinja¹, Rodgers Kalanda¹, Richard Migisha¹, Benon Kwesiga¹, Yasin Nuwamanya²

Institutional Affiliation: ¹Uganda National Institute of Public Health, Kampala, Uganda; ²Uganda National Expanded Program of Immunization Ministry of Health, Kampala, Uganda

Correspondence*: Tel: +256701847385, Email: mnambuya@uniph.go.ug

Summary

Background: The growing number of zero-dose children, those who have never received a routine vaccine, poses a major threat to global immunization efforts and increases the risk of vaccine-preventable disease outbreaks. Although the first dose of the diphtheria-tetanus-pertussis-containing vaccine (DTP1) is commonly used as the global indicator of zero-dose status, children who have not received the measles-rubella (MR) vaccine remain highly susceptible to measles outbreaks. Recurrent measles outbreaks in Kyegegwa District, Uganda, suggest persistent gaps in routine immunization and the presence of children who remain unvaccinated against measles. We assessed the prevalence of MR zero-dose status and identified factors associated with being MR zero-dose among children aged 9–59 months, Kyegegwa District, Uganda, April 2026.

Methods: We conducted a cross-sectional household survey in the two sub-counties most affected by the measles outbreak in Kyegegwa District, Uganda. Children aged 9–59 months were selected from 255 children that were recruited for the study using a multi-stage cluster sampling design. Data were collected through caregiver interviews using a structured questionnaire and by reviewing vaccination cards. Weighted prevalence estimates of MR zero-dose status were calculated. Multivariable logistic regression was used to identify factors independently associated with MR zero-dose status, with results reported as adjusted odds ratios (aORs) and 95% confidence intervals (CIs).

Results: Out of 156 children eligible for MR vaccination, 24% (38/156) were zero-dose. MR zero-dose status was slightly higher among children aged 9–17 months (30%) than among those aged 18–59 months (23%). Male children had a higher prevalence of MR zero-dose status (27%) than female children (22%). The factors associated with zero-dose MR vaccination included education (aOR = 0.14, 95% CI: 0.03–0.7; $p = 0.017$), and caregivers being unaware of the time of vaccination (aOR = 7.0, 95% CI: 1.2–41.2; $p = 0.031$). Children with caregivers who had a secondary level education or higher were less likely to miss MR vaccination.

Conclusion: Almost a quarter of children affected by the measles outbreak had never received the measles-rubella vaccine. Children whose caregivers were knowledgeable about the importance of vaccination understood why and when vaccines should be given, and those whose caregivers had more education were less likely to be zero-dose. We recommend prioritizing community-based immunization education and targeted outreach programmes to improve caregivers'



awareness of the importance of vaccination, and the vaccination schedules, especially among populations with low education levels.

Background

Measles-rubella vaccination is essential to prevent outbreaks and reduce childhood morbidity and mortality [1, 2]. However, suboptimal vaccination coverage continues to leave many children susceptible to infection, particularly in low-income countries [3, 4 &5].

In March 2026, a measles outbreak was confirmed in Kyegegwa District, Uganda, after children from Ruhangiire Parish presented with symptoms consistent with measles and five of six specimens tested positive. The outbreak subsequently spread to additional communities and disproportionately affected children under five years [6, 7]. It occurred amid suboptimal routine measles-rubella vaccination coverage, particularly for the second dose.

Because many affected children were zero-dose or under-immunized [8], we assessed the prevalence of measles-rubella zero-dose status and associated factors among children aged 9–59 months in Kyegegwa District to inform targeted interventions for improving routine immunization coverage and preventing future outbreaks.

Methods

We conducted a secondary analysis of data collected during the measles outbreak response in Kyegegwa District, Uganda, in April 2026. During the outbreak response, data were collected from 255 children identified through household and community investigations in the two sub-counties most affected by the outbreak. For this analysis, we restricted the dataset to children aged 9–59 months, the age group eligible to have received measles-rubella (MR) vaccination through routine immunization. A total of 156 children met this eligibility criterion and constituted the analytical population for assessing MR zero-dose status. No separate sample-size calculation was performed as the analysis used all eligible children available from the existing outbreak-response dataset.

MR zero-dose status was defined as having received no dose of the measles-rubella vaccine. Vaccination status was determined through review of vaccination cards and health-facility records where available; where documented evidence was unavailable, caregiver recall was used. Children were classified as MR zero-dose or not zero-dose after their vaccination status had been determined. Independent variables included child characteristics, caregiver socio-demographic characteristics, household factors, access to immunization services, caregiver knowledge of the vaccination schedule and attitudes towards vaccination, and selected health-system factors.

Using a structured questionnaire programmed in Kobo Collect we conducted face to face interviews with the caregivers. Vaccination cards were reviewed to verify immunization status whenever available. Data were cleaned and analyzed using



Stata version 19. Sampling weights were applied to account for the multistage sampling design, and weighted prevalence estimates of MR zero-dose status were calculated. Descriptive statistics were used to summarize participant characteristics. The prevalence of MR zero-dose status was calculated as the proportion of children who had received no dose of MR vaccine. Sampling weights were applied in analyses accounting for the multistage sampling design. Bivariable logistic regression was performed to examine associations between independent variables and MR zero-dose status. Variables with a p-value <0.20, together with variables considered biologically important, were entered into a multivariable logistic regression model to identify factors independently associated with MR zero-dose status. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported, and statistical significance was assessed at the 5% level ($p < 0.05$).

This study was conducted as part of the Uganda Ministry of Health response to the measles outbreak. We obtained written informed consent from all participating caregivers before data collection began.

Results

Prevalence of MR Measles- Rubella zero-dose status among children aged 9 to 59 months, Kyegegwa District, Uganda, April 2026

The prevalence of MR zero-dose status among children eligible for MR vaccination was 24.4%. Children aged 9–17 months had a higher prevalence (30.0%) than those aged 18–59 months (23.0%). Similarly, male children had a higher prevalence of MR zero-dose status (27.4%) than female children (21.7%). Children whose caregivers had no formal education had the highest prevalence of MR zero-dose status (31.2%), while those with secondary education had the lowest prevalence (3.6%).

Factors associated with Measles-Rubella Measles-Rubella zero-dose status among children aged 9-59 months Kyegegwa District, Uganda, April 2026

Caregivers with secondary school education and above were less likely to have zero-dose children than those with no education -3.6% (aOR=0.14; 95% CI: 0.03-0.70; $p=0.017$). Higher proportions of zero-dose children were also observed among caregivers who were unaware of the time of vaccination -23% (aOR=7.01; 95% CI: 1.2–41.2; $p=0.031$) (Table 1). No meaningful differences were observed by child age or sex. Overall, caregiver education was the factor most strongly associated with MR zero-dose status in the adjusted analysis.



Table 1: Factors associated with Measles-Rubella zero-dose status among children aged 9-59 months, Kyegegwa District, Uganda, April 2026

Variables	Zero-dose %		cOR(95%CI)	aOR(95%CI)
	Yes	No		
Age Category-Care giver				
<24	26	74	Ref	
25-39	23	77	1.3(0.54-3.3)	
40+	28	72	1.2(0.47-3.1)	
Sex of the Caregiver				
Female	24	76	Ref	
Male	29	71	1.3(0.44-4.1)	
Education of Caregiver				
None	31	69	Ref	
Primary	19	81	0.52(0.21-1.3)	0.61(0.25-1.5)
Secondary+	4	96	0.080(0.10-0.69)	0.14(0.027-0.70)
Religion				
Christians	13	87	Ref	
Others	23	77	1.93(0.63-5.9)	
Distance from the Nearest Health Centre				
<1km	33	67	Ref	
1-5km	26	74	0.70(0.12-4.2)	
>5km	23	77	0.59(0.10-3.5)	
Decision Maker				
Father	27	73	Ref	
Mother	26	74	0.77(0.26-2.3)	
Other	16.7	83.3	0.55(0.17-1.8)	
Health Worker Trust				
Trust	23	77	Ref	
No trust	60	40	0.20(0.32-1.3)	
Knowledge of Importance of Vaccination				
Knowledgeable	23	77	Ref	
Not Knowledgeable	57	43	0.22(0.47-1.0)	0.20(0.40-1.0)
Safety Perception				
Safe	24	76	Ref	
Not Safe	33	67	0.63(0.11-3.6)	
Satisfaction				
Yes	24	76	Ref	
No	29	71	0.80(0.15-4.3)	



Discussion

This study found that 24% of MR-eligible children in the assessed sub-counties of Kyegegwa District were zero-dose, indicating substantial immunity gaps that likely contributed to the measles outbreak [9]. Caregivers with secondary education or higher were less likely to have zero-dose children [10, 11], while caregivers who did not know when children should be vaccinated were more likely to have unvaccinated children [12]. These findings suggest that caregiver education, awareness, and understanding of vaccination schedules remain important determinants of MR vaccine uptake [13, 14].

Improving caregiver knowledge and strengthening communication on the importance and timing of routine vaccination may help reduce missed vaccination opportunities [15]. Health workers, Village Health Teams, community leaders, and other trusted community structures should be engaged to identify zero-dose children, reinforce vaccination messages, support defaulter tracing, and conduct targeted outreach in communities with persistent immunity gaps [16]. These approaches could reduce the accumulation of susceptible children and help prevent future measles outbreaks.

Study limitations: The relatively small sample of 156 children reduced the precision of some estimates, resulting in wide confidence intervals. Vaccination status was based on caregiver recall when vaccination cards were unavailable, which may have introduced recall or misclassification bias. Because the two most affected sub-counties were purposively selected, the findings may not be generalizable to the entire district. In addition, the cross-sectional design limits assessment of temporality between caregiver characteristics and vaccination status.

Conclusion: Nearly one in four MR-eligible children in the assessed communities had never received an MR vaccine dose. Zero-dose status was associated with caregiver education and knowledge of vaccination timing. Strengthening caregiver awareness, community engagement, routine immunization communication, and targeted outreach to identify missed children could improve MR vaccination uptake and reduce the risk of future measles outbreaks in Kyegegwa District.

Conflict of Interest: None declared.

Authors Contributions: NM participated in conception, design, data analysis and interpretation of the study and wrote the draft analysis. GT, PN, WA, RN, CBM, AA, LA, RK AND YN reviewed the report and the draft manuscript and made several improvements to it. BK and RM reviewed the final bulletin. All authors read and approved the final article.

Acknowledgement: We appreciate the leadership of the Kyegegwa District Local Government, Rwentuha and Kasule Sub-counties, throughout this investigation, and the local community for active participation. Our gratitude also extends to the Ministry of Health, particularly the Uganda National Expanded Program for Immunization (UNEPI), for their technical support. We are deeply thankful to the U.S. Centers for Disease Control and Prevention (CDC) for the funding, which made this investigation possible.

Copyright and Licensing: All materials in the Uganda National Institute of Public Health bulletin are in the public domain and may be used and reprinted without



permission; citations to the source, however, are appreciated. Any article can be reprinted or published. If cited as a reprint, it should be referenced in the original form.

References

1. UNICEF. Immunization. 2025; Available from: <https://data.unicef.org/topic/child-health/immunization/>.
2. World Health Organisation. Measles-Rubella Strategic Framework 2021-2030. 2020.
3. Abbas, K. and V. Mogasale, Disruptions to childhood immunisation due to the COVID-19 pandemic. *Lancet*, 2021. 398(10299): p. 469-471.
4. Hamson, E., et al., Impact of pandemics and disruptions to vaccination on infectious diseases epidemiology past and present. *Hum Vaccin Immunother*, 2023. 19(2): p. 2219577.
5. World Health Organisation. History of the Measles Vaccine. 2019; Available from: <https://www.who.int/news-room/spotlight/history-of-vaccination/history-of-measles-vaccination>.
6. World Health Organisation. Child Mortality (Under 5 years). 2026; Available from: <https://www.who.int/news-room/fact-sheets/detail/child-mortality-under-5-years>.
7. UNICEF. Facts about vaccines: Why vaccines matter for children. 2025; Available from: <https://www.unicef.org/stories/why-vaccines-matter-children>.
8. Walekhwa, A.W., et al., Measles outbreak in Western Uganda: a case-control study. *BMC Infect Dis*, 2021. 21(1): p. 596.
9. Sanyaolu, A., et al., Measles Outbreak in Unvaccinated and Partially Vaccinated Children and Adults in the United States and Canada (2018-2019): A Narrative Review of Cases. *Inquiry*, 2019. 56: p. 46958019894098.
10. Ibrahim, U.M., et al., Prevalence and Factors Associated with Zero-Dose Children amongst Nomadic and Non-Nomadic Fulani in Yobe State, North-East Nigeria. *Niger Med J*, 2024. 65(5): p. 775-791.
11. Dalton, M., et al., Caregiver and healthcare professional perspectives on drivers of routine immunisation uptake in East New Britain, Papua New Guinea: a qualitative study. *BMJ Public Health*, 2026. 4(1): p. e003553.
12. Magodi, R., et al., Factors associated with non-uptake of measles-rubella vaccine second dose among children under five years in Mtwara district council, Tanzania, 2017. *Pan Afr Med J*, 2019. 33: p. 67.
13. Adeyanju, G.C., Immunisation decision-making and barriers to vaccine uptake among children under-5 in limited-resource settings. *Sci Rep*, 2025. 15(1): p. 44146.
14. Bangura, J.B., et al., Barriers to childhood immunization in sub-Saharan Africa: A systematic review. *BMC Public Health*, 2020. 20(1): p. 1108.
15. Oyo-Ita, A., et al., Interventions for improving coverage of childhood immunisation in low- and middle-income countries. *Cochrane Database Syst Rev*, 2023. 12(12): p. Cd008145.
16. Zhang, H., et al., The effects of parent's health literacy and health beliefs on vaccine hesitancy. *Vaccine*, 2023. 41(13): p. 2120-2126.