# LEVEL OF UPTAKE OF MEASLE VACCINES AND INFLUENCING FACTORS AMONG CHILDREN AGED (9-24) MONTHS IN AGALI SUB COUNTY, A CROSS-SECTIONAL STUDY.

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## Abstract Background

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Measles remains a significant public health challenge globally despite being a vaccine-preventable disease. This study aimed at identifying the level of uptake of the measles vaccine and influencing factors among children aged (9-24) months in the Agali sub-county.

#### Methodology

A community-based cross-sectional study was conducted from January 2nd to February 7th, 2024, in the Agali subcounty, Lira district, Uganda. Mothers/caregivers of children aged 9-24 months who were interviewed were 385. Interviewer-administered pre-tested structured questionnaires were used. Data was entered into EPI data, exported, and analyzed using SPSS (Statistical Package for Social Sciences). Both binary and multivariate logistic regression analyses were performed. In multivariate analysis, a significant association was declared at a p-value of < 0.05.

#### **Results**

Response rate was 100%. The majority of caregivers were female (88.1%), aged 15-35 years (83.9%), married (95.8%), of Christian faith (99.2%), with primary education (79.0%); they correctly knew the age for measles vaccination (72.5%), were informed about its importance (82.6%), perceived the vaccine as safe (93.5%) and effective (95.3%), and mostly relied on Village Health Teams (VHTs) for information (71.4%). Immunization card records further confirmed that 72% of the children (279) had been vaccinated against measles, reflecting a relatively high level of coverage.

#### **Conclusion**

The uptake of the measles vaccine among children aged 9-24 months was low compared to the recommended national target of 95%. Factors influencing measles vaccine uptake include the marital status of the mother/caregiver, level of education attained by the head of the household, and reception of reminders for vaccination by mothers/caregivers.

#### **Recommendations**

The importance of education and social support in promoting vaccination should be emphasized, particularly among caregivers with lower education levels or those not in a marital relationship.

Keywords: Measles vaccine uptake, children aged (9-24) months, Agali sub-county.

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#### **Background**

Globally, measles vaccine coverage remains a significant challenge, with approximately 8–12 million children unvaccinated annually. In 2020, the World Health Organization (WHO) reported 149,796 measles cases worldwide, 77% of which occurred in the African region, accounting for 115,364 cases (WHO, 2024). Despite the availability of an effective vaccine, the uptake of measles vaccination is hindered by various factors, including maternal and caregiver-related barriers, socioeconomic disparities, and access to healthcare services. Maternal

education, for example, plays a crucial role globally, as higher education levels among mothers are associated with improved health-seeking behaviors and increased vaccination rates. Educated mothers demonstrate better autonomy and decision-making, positively influencing vaccination uptake (Balogun et al., 2017).

In Africa, similar trends are observed. A study in sub-Saharan Africa revealed that maternal education positively correlates with higher vaccination rates, with mothers who have secondary or higher education being more likely to vaccinate their children compared to those with primary or no education (Mamuti et al., 2022a). However, socioeconomic disparities and limited access to healthcare services, particularly in rural and disadvantaged areas, continue to impede vaccination efforts. Misconceptions, fear of vaccine side effects, and inadequate maternal knowledge further hinder vaccine uptake. Targeted educational campaigns have proven effective in dispelling myths and increasing vaccine coverage (Galadima et al., 2021).

In East Africa, maternal factors remain central to vaccine uptake. For instance, studies in Kenya have shown that children of mothers with secondary education or higher are significantly more likely to be fully vaccinated against measles. Despite these successes, challenges such as mistrust in healthcare providers, fear of side effects, and adherence to traditional beliefs persist, necessitating sustained community engagement and education efforts (Mamuti et al., 2022a).

In Uganda, measles remains a major public health concern. Between 2018 and 2020, 89 districts (66%) reported outbreaks (Nsubuga et al., 2022). While the national measles vaccination target is ≥95% to ensure adequate population immunity, coverage among children aged 9–24 months remains below optimal levels. As of September 2022, Lira District reported a vaccination rate of only 65%, with the Agali sub-county achieving 72%—both falling short of the target (Cutts & Ferrar, 2021). Maternal education, knowledge, and attitudes are significant determinants of vaccine uptake in Uganda, as observed across the continent. Mothers with higher education levels are more likely to vaccinate their children, aided by a better understanding of vaccine safety and benefits (Nsubuga et al., 2022).

Moreover, trust in healthcare providers plays a pivotal role in addressing maternal concerns and promoting vaccine acceptance. Effective communication from providers, combined with strong social support networks from family members and community leaders, enhances maternal decision-making (Abebe et al., 2019). Conversely, mothers without robust social support are less likely to seek vaccination for their children (Phoummalaysith et al., 2018). This study therefore seeks to determine the level of uptake of the measles vaccine and influencing factors among children aged (9-24) months in the Agali subcounty.

## Methodology Study design

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A community-based cross-sectional study design using quantitative data collection methods was used to identify the factors influencing the uptake of the measles vaccine among children aged (9-24) months in Agali sub-county Lira District, 2023. The study design was cross-sectional because it was the most appropriate for data collection at a single point in time which was the objective of the study.

#### Study site and setting

This study was conducted in the Agali sub-county found in Erute County, Lira District, Northern Region, Uganda. Agali sub-county is surrounded by the Adekokwok sub-county to the west, the Agweng sub-county to the north, the Amach sub-county to the southeast, the Barr subcounty to the south, Lira municipal council to the southwest, Ngetta subcounty to the northwest and Ogur subcounty to the northeast. It has an area of approximately 444 square kilometers (171 square miles) with 9 parishes and its population is approximately 29200(14300 males and 14900 females).

#### **Study populations**

The target population was children aged 9-24 months and the study population was the mothers/caregivers of the children aged 9-24 months residing in Agali sub-county, Lira district, Uganda.

## Sample size determination

The study adopted the Kish Leslie formula (1965) to calculate the sample size;

Sample size,

Where; n is the sample size

Z is the critical value corresponding to 95% confidence interval (CI) = 1.96

P = proportion of children who received the measles vaccine in Lira district = 0.65( DHIS2 2022)

Q = (1 - P) = 1 - 0.65 = 0.35

. e is the margin of error the investigator is willing to accommodate  $=0.05\,$ 

Therefore, substituting, the sample size was;

n

 $n = 349.5856 \sim 350$ 

n = 350 respondents.

Considering a non-response rate of 10% to the above sample size (35), the total sample size was 350+35=385 participants.

## Sampling techniques

Purposive sampling was used to select three parishes from nine parishes in the Agali subcounty. Adyaka parish which is in the west of the sub-county, Abwong Rwot parish in the middle of the sub-county, and Apalyolong parish in the far East of the sub-county were selected for equal representation of the Agali sub-county. All the villages in the selected parishes were listed and simple random sampling was used to select two villages from each selected parish where the first two villages with odd numbers (1 and 3) were selected from the list. VHTs listed all the households that had children aged 9-24 months within each selected village within their jurisdiction. Systematic random sampling was then used to pick the households from which the child's mother or caregiver was interviewed. The total number of households with children aged 9-24 months in

each village was divided by the predetermined sample size for each village to get the sampling interval for the respective village. The immunization card was checked to confirm the immunization status. Where there is no child immunization card, that household was dropped, and where the mother/caregiver was not at home, 2 attempts were made to visit the home again to interview the mother or caregiver.

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## Eligibility criteria (Inclusion and exclusion) Inclusion criteria

The study included all mothers/caregivers of children aged 9-24 months whose child immunization cards were available, present during the study period, and had stayed within the village in the last 12 months in Agali Sub County.

#### **Exclusion criteria**

The study excluded all the mothers/caregivers of children aged 9-24 months in the Agali subcounty who were too sick to give information, not willing to give information freely, and those with mental illness.

## Data management Data collection

An interviewer-administered structured questionnaire was used to get the required data. The data collector visited the households with eligible children in selected villages until the proportionally allocated sample size was achieved. The measles vaccine received by the child was copied by the data collector after asking mothers/ caregivers to bring the vaccination card of the child. If no vaccination card, the child was disqualified from participating in the study. Additional information concerning the measles vaccine was directly obtained from the mother/caregiver of the child using the questionnaire.

## **Data entry and cleaning**

The data entry and cleaning were done in Epidata version 3.1. Data was checked for completeness, and correctness at the end of every day, it was then cleaned for missing values. Then during data entry, the quantitative data was coded before entry and analysis. After the entry of the whole questionnaire, the soft copy of each questionnaire was once again cross-checked with its hardcopy to avoid missing values and other inconsistencies before analysis.

#### **Data analysis**

All filled questionnaires were checked for completeness, consistency, and accuracy before the analysis. Then the data was coded, and cleaning and entry were carried out using Microsoft Excel software. Then, the data was cleaned for inconsistencies and missing values. The analysis was done using SPSS software version 20. Descriptive statistics such as frequencies, percentages, and cross-tabulations were used to summarize the data. Bivariate and multivariate logistic regression was done to find the factors associated with the

uptake of the measles vaccine among children. The multivariate analysis was performed to test associations between the dependent variable (uptake of measles vaccine) and the independent variables as factors and also in dealing with confounding factors. In multivariable logistic regression, multiple regression was used where all factors that were found to be associated with the uptake of measles vaccine at bivariate analysis were entered as covariates, and uptake of measles vaccine as the dependent variable, and the backward elimination method was used to select significant confounders. A significant association was declared at p  $<\!0$ .05.

## Quality control (validity and reliability) Validity

To ensure validity, the research questions were well-defined and specific, the researcher conducted a thorough literature review to understand existing research related to measles vaccination, used an appropriate research design, and selected a representative sample to ensure that the findings could be generalized to the broader population.

## Reliability

To ensure reliability, the researcher documented research methods, standardized procedures, and materials to be used. The researcher conducted a one-day training for the two research assistants who thereafter were sent for field testing of the study tools to assess the clarity and suitability, in the area which was not included in the study. A total of ten questionnaires were distributed for the pre-test with close supervision. The same equipment and protocol were used for each participant to ensure consistency and peer review was used to identify potential sources of error or suggest improvements which enhanced the reliability of the research findings.

# **Ethical Considerations and Approval Approval**

The study adhered to ethical guidelines and obtained necessary approvals from relevant authorities. The proposal was presented before the faculty of the public health research committee for approval. An approval letter was taken to the authorities of Lira district (the DHO), Agali subcounty (LSI chairman), and the local authority in the selected villages where permission was granted to conduct the study.

#### Consent

Written informed consent was obtained from the mothers/caregivers of the eligible children ensuring their voluntary participation. Participation was entirely voluntary and participants were informed of the right to withdraw from the study at any time without facing any consequences.

### Confidentiality

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Assurance was given to participants that their responses would be kept confidential and used for this study only. The researcher did not use identifiers like names, actual places of residence, phone numbers, and other identifiers in questionnaires. The information in the field was coded and fed into a computer with a password to prevent unauthorized access. The names of the participants were not included in any report or publication. In the most unlikely event that the personal details of the participant leaked out, the investigator would help the participant to obtain psychosocial support.

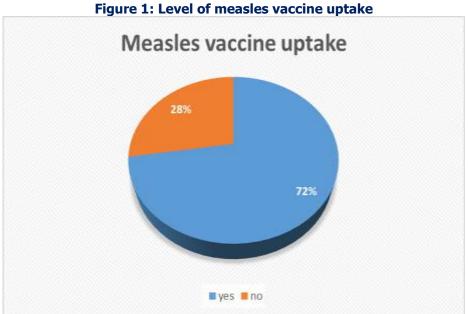
## **Privacy**

The privacy of the participants was given the utmost consideration by not recording the voices of the participants, protecting their data from unauthorized access, and interviewing them individually in a scheduled place. Code numbers were used to identify participants.

#### **RESULTS**

#### Level of measles vaccine uptake

Data was collected from all the 385 participants anticipated from the sample size calculation, i.e. 100% response rate was achieved. Based on the immunization card, 279 (72%) of children had received the measles vaccine.



*N*= 385 *Source: Primary data* 2024)

### Factors influencing the uptake of measles vaccine among children aged (9-24) months

The majority of caregivers were females (88.1%), between 15-35 years (83.9%), in a marital relationship (95.8%), of Christian religion (99.2%), had attained primary education (79.0%), knew the correct age at which the child should be vaccinated against measles (72.5%), were aware of the importance of measles vaccination and had received information about measles vaccination (82.6%). Most perceived the measles vaccine as safe (93.5%), and effective (95.3%) while the majority depended on VHTs (71.4%) as a source of information about measles vaccination.

Table 1: Maternal/caregiver factors

Variable 1: Maternal/caregiver factors  Paramtons (9)				
Variable	Frequency(n)	Percentage (%)		
Maternal/caregiver age (N=385)	222	02.0		
15-35	323	83.9		
36-55	57	14.8		
56-75	5	1.3		
Sex (N=385)	16	11.0		
Male	46	11.9		
Female	339	88.1		
Marital status (N=385)	260	0.5.0		
In a marital relationship	369	95.8		
Not in a marital relationship	16	4.2		
Religion (N=385)	202	00.2		
Christianity	382	99.2		
Islamic	3	0.8		
Relationship to the child (N=385)	220	0.5.0		
Mother	328	85.2		
Father	45	11.7		
Guardian	12	3.1		
Caregiver level of education (N=3		44.5		
No formal education	45	11.7		
Primary education	304	79.0		
Secondary education	25	6.5		
Tertiary education	11	2.9		
Household head level of education				
No formal education	29	7.5		
Primary education	269	69.9		
Secondary education	74	19.2		
Tertiary education	13	3.4		
Adult number in the household (N		00.5		
1-3	356	92.5		
4-6	29	7.5		
Measles vaccination age (N=385)	250	<b>70.7</b>		
Correct	279	72.5		
Wrong	106	27.5		
Awareness of the importance of m		0.4.0		
Yes	363	94.3		
No	22	5.7		
	n regarding measles vaccination(N			
Yes	318	82.6		
No	67	17.4		
Scars of vaccination site (N=385)	277	07.0		
No	377	97.9		
Yes	8	2.1		
Fever after vaccination the last tir	,	22.2		
No	86	22.3		
Yes	299	77.7		
Perception of measles vaccine effe		05.2		
Yes	367	95.3		
No	18	4.7		
Perception of measles vaccine safe	• •	02.5		
Yes	360	93.5		
No	25	6.5		
•	rmation about measles vaccination			
No	301	78.2		
Yes	84	21.8		

VHT as a source of i	information about measles vaccina	tion (N=385)	
Yes	275	71.4	
No	110	28.6	
Health worker as a s	source of information about measle	s vaccination (N=385)	
No	192	49.9	
Yes	193	50.1	
Radio/TV as a source	e of information about measles vac	ccination (N=385)	
No	336	87.3	
Yes	49	12.7	
Church/worship pla	ce as a source of information abou	t measles vaccination (N=385)	
Yes	2	0.5	
No	383	99.5	
School as a source of	f information about measles vaccin	ation (N=385)	
No	376	97.7	
Yes	9	2.3	

*N*= 385 Source: Primary data 2024)

#### **Discussion**

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### Level of measles vaccine uptake

In this study, the measles vaccination uptake of children was confirmed using immunization cards. The study found that the level of measles vaccination uptake was 72.0%. The measles vaccine uptake in the Agali sub-county was below the national target of at least 95% as recommended by WHO. The uptake was slightly higher than that of a study carried out in the Busia district (71%) (Birikire, 2018) and Mwingi central sub-county in Kenya (68.9%) (Kanyiru, 2020). The differences in the results of the studies above could be due to differences in study settings, sample size, and methodology.

It was also lower than that of a study carried out in Tanzania (88.2%) (Mkopi et al., 2021). This variation might be due to the difference in access to vaccination services and community awareness towards child immunization. Tanzania is slightly more stable economically compared to Uganda, this further enhances their ability to finance healthcare and hence improved measles vaccination services. The quality of vaccination services might determine the likelihood of measles vaccine service utilization and hence higher chances of vaccination uptake.

## Factors influencing the uptake of measles vaccine

Mothers/caregivers who were not in a marital relationship were less likely to have taken their children for vaccination against measles (aOR;0.305,95% CI,0.097-0.95, p=0.042). This study is supported by a study carried out in Ethiopia which indicated that unmarried women were 3.52 times more likely not to take their children for vaccine uptake compared to married women (Mekonnen et al., 2019) because it employed similar research methods. A similar cross-sectional study carried out in Ghana found that marital status was an independent predictor of immunization status(Adokiya et al., 2017). These studies were similar

because they employed a similar research design and both were carried out in a village setting. This could be due to the mother/caregiver not in a marital relationship lacking social support, financial support, and someone to remind them to take their children for measles vaccination. It could also be due to a lack of a significant person to discuss the vaccination of the child with or a lack of someone to be involved in child care with, which makes them psychologically unstable. It could also be due to these caregivers having unplanned pregnancies. This implies that marital status can influence healthcare-seeking behavior, and access to healthcare services hence interventions targeting individuals not in a marital relationship may help improve vaccine coverage in this group.

Mothers/caregivers coming from households where the head attained at least primary education as the highest level were 20.3 times more likely to vaccinate their children (AOR: 20.297, 3.291-125.174, p=0.001) compared to those where the head had no formal education. This study was consistent with other studies done in various parts of the world, showing that household head education is associated with vaccine uptake(Rammohan et al., 2012) because it employed a similar research design, and data collection methods and both studies were carried out in a village setting. This could be because these household heads were able to read and understand the information on the immunization cards and hence encouraged the caregivers to take their children for vaccination against measles. It could also be possible that these household heads had learned about the six major killer diseases while at school and therefore understood the importance of taking their children for vaccination against measles. In addition, several studies have shown that household head education is an empowerment route that leads to greater receptivity to information concerning public health aimed at boosting child vaccination rates. This empowerment tends to improve health-seeking behavior through changing attitudes, traditions, and beliefs, increasing autonomy, and decision-

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making. Education also helps build social networks that provide good health behavior-related information and find available healthcare services. This implies that household head education is important in influencing health-related decisions and underscores the need for educational interventions to improve vaccine acceptance. Targeted interventions aimed at individuals in households with lower levels of education could help improve vaccine coverage in these groups.

#### **Conclusion**

The uptake of the measles vaccine among children aged 9-24 months was low compared to the recommended national target of 95%. Factors influencing measles vaccine uptake include the marital status of the mother/caregiver, level of education attained by the head of the household, and reception of reminders for vaccination by mothers/caregivers.

## **Limitations of the study**

The study only employed a quantitative approach and hence missed out on the qualitative data which always complements the quantitative data. To address this, the researcher engaged in observations within the study environment to gather contextual and non-verbal information that quantitative data might have missed.

Self-reported information obtained from questionnaires might have been inaccurate or incomplete. To address this, rigorous training for data collectors was implemented to ensure they could probe effectively and clarify any ambiguous responses, enhancing the accuracy and completeness of the data collected.

#### **Recommendations**

The importance of education and social support in promoting vaccination should be emphasized, particularly among caregivers with lower education levels or those not in a marital relationship.

The study highlights the importance of health system factors such as reminder systems in promoting vaccine uptake. Strengthening these aspects of the health system could lead to improved vaccination coverage.

#### **Acknowledgment**

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#### List of abbreviations

MCV: Measles-Containing Vaccine

SPSS: Statistical Package for Social Sciences

WHO: World Health Organization

MoH: Ministry of Health

Km: Kilometres

VHTs: Village Health Teams DHO: District Health Officer LCIII: Local Council III

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#### **Conflict of interest**

No conflict of interest declared

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