



Education, Economic Status, and Cultural Contexts of Community Engagement with Immunization Services in Lakes State, South Sudan: A Mixed-Methods Study

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Abstract

Low uptake of routine immunization is still a public health worry where information access, household resources, and community shape health service decisions. This study sought to establish the perspectives of parents or caregivers towards education, socio-economic factors, and cultural context and their relationship with community engagement with immunization. The mixed-methods research was conducted using a questionnaire, key informant interviews, and focus group discussions. Specifically, the study involved 65 participants and 10 key informants and two focus groups. The quantitative analysis involved determining frequencies and percentages of the responses provided by the participants. Similarly, the qualitative data were analyzed thematically. Most of the respondents (63.1%) had no education, while 53.8% were in households with more than five members. Most participants agreed (90.7%) that community engagement with immunization increased with education. In the same way, 92.3% agreed that parents or caregivers with better education had children who were fully immunized. On the issue of economic status, most participants (84.6%) agreed that income levels determined access to immunization services. With regard to cultural context, 87.6% of the respondents said that community engagement with immunization involved health-related taboos and norms. Finally, 92.3% of the participants agreed that cultural beliefs influenced the low levels of engagement with immunization programs. Qualitative findings also revealed limited public knowledge about immunization, financial and cultural barriers, and the influence of access to information and service-related issues. The study finds that community involvement with immunization depends on education, socio-economic status, culture, and service issues.

Subject Areas

Medical Education

Keywords

Immunization Services, Community Engagement, Education, Economic Status, Cultural Context

1. Introduction

Immunization remains a public health intervention to eliminate the vaccine-preventable diseases and decrease childhood disease and deaths [1] [2]. Even though the global immunization coverage has increased over the past few decades, there are still gaps in the immunization coverage. According to WHO and UNICEF [3], 90% of infants globally received at least one dose of a diphtheria, tetanus and pertussis-containing vaccine in 2025, while 85% completed the three-dose DTP series. An estimated 13.5 million children received no vaccine during their first year. Despite this progress, an estimated 13.5 million children remained zero-dose in 2025, while 7.3 million infants received their first DTP dose but did not complete the schedule [3]. The gaps of immunization coverage reflect inequities in coverage and completion of the key immunization services to vulnerable populations [2].

The regions with the highest number of unvaccinated children in the world remain in Sub-Saharan Africa. During 2022, about 7.7 million children aged between 12 and 23 months in the African region were not vaccinated with any single dose while other children took doses of vaccine but did not finish their vaccination schedules [4]. Previous studies have shown that socioeconomic status, knowledge and education, community social determinants of health, access to services, norms in the community, health care trust, and sociocultural environment are some factors causing inequity in vaccination coverage and completion [5] [6]. Those factors may play different roles in different contexts; therefore, they need to be defined and assessed in context.

South Sudan continues to face challenges in implementing routine immunization services in situations of displacement, instability, limited health infrastructure and unequal distribution of access to the health services. The WHO and UNICEF report presents persistent gaps in immunization coverage in South Sudan [3]. A study conducted in the traditional Western Lakes State of South Sudan revealed variations in the percentage of children who had received routine vaccines from Rumbek Centre, Rumbek North, Rumbek East, and Wulu [7]. These circumstances seem to be an ideal environment for the investigation into the community engagement with immunization in Lakes State. Education, the economic status and cultural context are three themes of community engagement that are also connected to immunization. Education is what community members know about health and the vaccine schedule, economic status reflects a household's so-

cioeconomic standing and its access to health services, and cultural context reflects community norms, traditional or religious beliefs, and how people perceive vaccine safety. These three themes were recently published as a contribution based on a real-life community experience of vaccination; however, their relevance is context-dependent. Addressing these three themes may contribute to the evidence of the lived realities of the community in Lakes State.

The study aimed to determine the perceived associations between education, economic conditions, cultural context, and community engagement with immunization services in Lakes State. We used a descriptive mixed methods research design: the quantitative tool captured the study participants' perceptions, while the qualitative approach gave us in-depth, real-life evidence of the community's experiences. The study aimed to achieve three objectives: firstly, to establish how people perceive the relationship between the level of education and the community's participation in immunization services; secondly, to establish how they perceive the connection between their economic status and involvement in these services; and thirdly, to determine how they perceive the relation of their cultural background to the community's involvement in immunization services in Lakes State.

2. Literature Review

2.1. Theoretical Framework

The study is primarily informed by the Social Ecological Model (SEM) proposed by McLeroy and colleagues [8]. The model hypothesizes that health-related behavior and community engagement are influenced by factors at different interacting levels including the individual, interpersonal, organizational, community, and policy levels [8] [9]. In this study, education is conceptualized at the individual level as knowledge and understanding of immunization, economic status at the household and community levels as the availability of resources and conditions of access, and cultural context at the interpersonal and community level as social norms, religious beliefs, and traditional practices. Community engagement with immunization is thus explained in relation to the social and service environment rather than individual-level factors.

SEM hypothesizes that interdependence exists between the various levels of analysis. Individual-level education is embedded in familial and community interpersonal systems, while the economic status of a household is experienced in the context of the broader community and institutional environments [8]. Cultural practices and social norms interact with informational cues, familial expectations, and health service contexts [10]. Such an argument explains the ways in which the participants discussed immunization engagement in relation to individual education, household economic status, cultural practices and norms, informational context, transportation, affordability, and accessibility. The framework is appropriate for this study because it informs the understanding of the broader social and institutional contexts in which immunization engagement occurs.

Andersen's Behavioral Model of Health Services Use [11], is adopted as the second theoretical framework. This model assumes that health service use is determined by predisposing, enabling, and need factors [12]. In this study, education is considered a predisposing factor while economic resources, affordability, and informational accessibility are viewed as enabling factors. Cultural and social norms are additional contexts in which immunization engagement occurs. The behavioral model is appropriate for this study because it guides the analysis of immunization service use from the perspective of a community of users rather than an institutional one. Together with SEM, the model provides a comprehensive understanding of the study phenomenon by informing the relationships between community contexts and individual health service use. As a descriptive study using a mixed methods design, this study aims to explore the phenomenon of immunization engagement and utilize the theoretical frameworks for emergent analysis. The two theories are complementary in that they inform different levels of analysis. SEM provides a broad explanatory framework by emphasizing the social, interpersonal, community, organizational, and policy contexts of immunization engagement, while Andersen's model focuses on individual health service use and its community and institutional determinants. The combined application of the two frameworks allows for an in-depth exploration of the relationship between individual immunization engagement and broader community contexts. The theoretical framework is consistent with the research questions since the latter emphasize describing the phenomenon rather than establishing causal relationships between the various constructs.

2.2. Review of Empirical Studies

Education and Immunization Engagement

Education is often considered in the context of childhood immunization research because of its importance in caregivers' learning about health and health-related information, immunization schedules, and vaccine preventable disease. Recent studies demonstrate that educational factors and access to information about immunization are associated with children's vaccination experiences, though the nature and scope of the link may vary depending on the context and study design. For instance, in an investigation of 674 children who attended primary healthcare facilities in Cape Town, South Africa, Nnaji *et al.* [13] identified that children of caregivers with less education were more likely to experience missed opportunities for vaccination (OR = 3.53, 95% CrI: 1.13 - 11.03). Similarly, participants who had received immunization-related messages in the recent past were less likely to be exposed to missed opportunities for vaccination, which demonstrates the importance of caregivers' level of education as well as their access to relevant information. The review by Parsekar *et al.* [14] revealed that educational and communicative strategies were integral components of successful interventions in low- and middle-income countries, aimed at overcoming barriers to routine immunization. The review highlighted 142 impact evaluation studies

which demonstrated that sensitization/educational programs, use of media, and provision of written/pictorial reminders were common strategies for addressing knowledge-related and attitude-related barriers to immunization, while access, social processes, health system capacity, and service quality were additional key areas which should be considered together with education and information dissemination. However, the reviewed literature did not identify a direct link between the level of education and people's immunization behaviors.

Recent qualitative studies also contribute to the general understanding of the role of education in childhood immunization. Gichuki *et al.* [15] identified that perceived benefits of vaccination, cultural beliefs and practices, social influences, healthcare worker attitudes and behavior, and access to services were common themes emerging from informal caregivers' perspectives on childhood immunization in Nairobi's informal settlements. Also, according to the research conducted by Wong King Yuen and his colleagues [16], the participants identified a number of barriers to childhood immunization for newcomer families in Alberta, including the absence of trusted and multilingual information, issues related to scheduling and attendance, the necessity of increased counselling provided by medical professionals, and problems related to recording and vaccination retention. The qualitative evidence complements the findings of quantitative studies by demonstrating how immunization-related knowledge and information are embedded in people's lives and health service experiences.

Overall, the recent literature demonstrates that education and accessibility of immunization information are key factors which influence caregivers' engagement in childhood immunization. Nnaji *et al.* [13] and Parsekar *et al.* [14] utilized quantitative methods, whereas Gichuki *et al.* [15] and Wong King Yuen *et al.* [16] employed qualitative approaches to investigate the role of education in childhood immunization. The studies differ in terms of population groups, outcome variables, and research designs, but they all highlight the importance of addressing the role of education in improving people's knowledge about immunization and building a sustainable framework for engagement in immunization activities. Moreover, most of the recent articles were published in non-South Sudanese journals, which suggests that the body of literature which directly addresses the role of education in immunization in rural farming and pastoralist communities in Lakes State is limited.

Therefore, the present study sought to address this gap in the literature by investigating the role of education in childhood immunization. The quantitative component of the study focused on caregivers' perceptions of immunization, whereas the qualitative component aimed to explore these communities' understandings of knowledge, understanding, and access to immunization-related information. For this reason, the findings of the current research should be considered as evidence which describes the extent to which education influences engagement in immunization in the studied communities, rather than provide a direct link between the two.

Economic Status and Immunization Engagement

Studies often investigate the association between financial status in households and childhood vaccination as the ability to pay for vaccines affects the capacity for the caregiver to utilize vaccine services. Recent studies have revealed that there are social and economic determinants of the vaccine coverage in low- and middle-income countries. For example, William *et al.* [17] did a systematic review and analyzed the vaccination status of 6059 children of the age between 12 and 23 months in Nigeria. The wealth status was analyzed as one of the social determinants of childhood immunization. The significant higher odds of being fully vaccinated with basic vaccines were shown in children from rich households compared with children from poor households (AOR = 3.21, 95% CI: 2.06 - 5.00, $p < .001$) after covariates adjustment. In addition, in another study it was observed that socioeconomic and spatial inequality in zero-dose vaccination in marginalized communities in Ethiopia. The magnitude of the contribution of the monetary status to social and economic inequality was 38.93%, and the contribution of the distance to health facilities, was 61.03% [18]. Generally, the evidence demonstrated that financial inequity was systematically explored in terms of spatial accessibility aiming to address the gap in childhood vaccination coverage.

The evidence from the other reviewed articles further supplements the understanding of social and economic factors in influencing immunization coverage. Ilesanmi *et al.* [19] evaluated the trends in measles immunization coverage using the registry data of 16,582 children in Saskatchewan, Canada. It was concluded that the proportion of children who were highly prosperous and received measles vaccination was consistently higher than that of the most deprived children in the reviewed period. Besides, the researcher also demonstrated that resource constraints have hindered the access to immunization and vaccine coverage as well as identified caregiver concerns and service delivery gaps. These findings suggest that socioeconomic circumstances, together with service-related and caregiver-level factors, should be taken into account when interpreting differences in immunization coverage.

Ekezie *et al.* [20] carried out a systematic review of vaccination communication strategies and uptake in Africa, covering 41 studies from 14 African countries. The review addressed 13 vaccines, with childhood vaccines making up a substantial share of the evidence. It pinpointed lack of vaccine information, difficulties with access, and high cost as major barriers to vaccination communication and uptake, while better vaccine education, reminders, trust-building efforts, and community involvement emerged as facilitators.

The review thus offers relevant support for taking access to information, community engagement, and perceptions of vaccination services into account when interpreting respondents' accounts of immunization practices in the present study. They also varied in terms of the populations, variables, outcomes and analytical methods. Williams *et al.* [17], for example, investigated the association between household wealth and basic vaccination coverage through multivariable lo-

gistic regression. Bikis *et al.* [18] investigated inequalities in zero-dose vaccination through decomposition analysis. Ilesanmi *et al.* [19], used registry-based analysis of coverage of measles immunization with qualitative evidence through semi-structured interviews with medical professionals. Ekezie *et al.* [20], on the other hand, integrated evidence from 41 studies in 14 African nations in a meta-analysis of vaccination communication, barriers and facilitators to vaccine uptake. Such variances in method were considered when examining the results of the studies in the interpretation of the quality of evidence of the current study and comparing to qualitative insights.

Thus, the reviewed studies indicate that financial status is one of the determinants of vaccination coverage, which is manifested in the level of affording vaccination costs. Nonetheless, the analysis of the monetary status is intertwined with other factors such as the distance, which may affect the ability of a person to reach a health facility. Therefore, financial inequity is not the sole determinant of immunization coverage but is more consistent with the concept of access to immunization services, which includes a range of barriers from monetary to transportation-related. Although the evidence on the relationship between financial status and immunization coverage is growing, little is known about the perspectives of caregivers in rural agrarian and pastoralist communities of Lakes State, South Sudan, on the financial circumstances influencing their engagement in immunization. Hence, this study aimed to explore the association of respondents' perceptions of financial circumstances with community immunization practices with a focus on access, affordability, distance, transportation, and access to vaccination information.

Culture, Norms, and Immunization Engagement

There have been increased studies on the connection between cultural and communal factors and vaccination decision-making, since families and communities help in forming attitudes towards immunization and health issues. Qualitative studies carried out in Nigeria, Uganda, and Guinea show how such factors interact in the context of people's vaccination choices. Bell *et al.* [21] analyzed 158 interviews with caregivers, fathers, and influencers, finding out that the motivation for children's vaccination was driven by interpersonal dynamics and interactions with governmental and health institutions. This literature therefore conceptualizes the role of culture and community to the level of the normative context. Research among disadvantaged and hard-to-reach populations reveals similarly that cultural and social considerations intersect with access and vaccination-related experiences. A systematic review that included 104 studies in 19 European countries reported that among disadvantaged groups, vaccination uptake was associated with the accessibility of health services, language, vaccine literacy, perceived risks, the severity of the disease and its consequences, and the benefits of vaccination [20]. This review thus recognizes the global impact of culture and norms by not stating that lack of vaccination is due to culture which is mediated by other factors like access to health care etc.

Similar findings have been depicted in the African literature that the existing gaps in information, access and affordability, and social mobilization, vaccination information, trust building and community engagement as characteristics influence the vaccination communication process in the continent. An example of Kenya-based evidence illustrates the way social and cultural factors influence vaccination experiences, in as much as Odero *et al.* [22] had reported in their study that the under-vaccination, non-vaccinations and missed opportunities was subjected to by religion, place of residence, maternal education level, wealth and place of delivery. From a review of secondary data set from 11,997 children aged 0 - 23 months based on the Kenya Demographic and Health Surveys, their work revealed that while there were associations found between social and cultural variables and vaccination, the secondary analysis nature of the research required survey data to state associations. By contrast, Bell *et al.*'s [21] qualitative study design enables rich description of the social and cultural processes related to the demand for vaccination. Differences in research questions and methods therefore shape how and to what extent researchers conceptualize the contribution of social and cultural factors to vaccination decisions.

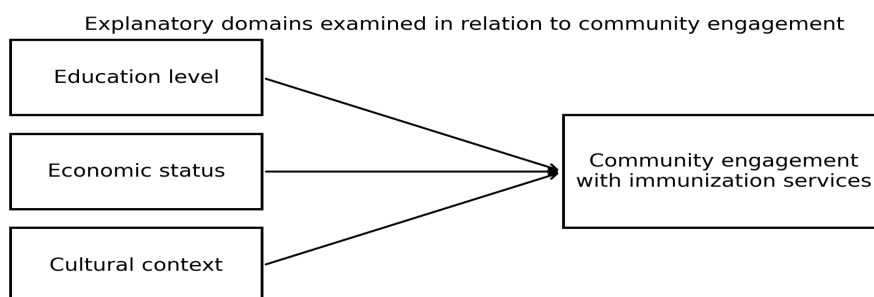
Overall, recent literature reports sufficient agreement that cultural and community influences are part of the context of vaccination uptake although there is less agreement on the relative contribution of such influences to vaccination experiences and access. Studies also varied in terms of design, including qualitative interviews, systematic reviews, and secondary analysis of survey data. Additionally, much of the literature informing this review comes from countries other than South Sudan, and there is limited context-specific research on how local norms, religious beliefs, postpartum practices, and perceptions of vaccine safety and efficacy are experienced within rural agrarian and pastoralist communities in Lakes State.

This study therefore addressed a gap in the literature by conceptualizing culture and community as a domain of engagement with immunization services. While quantitative findings reported associations between respondents' perceptions of cultural norms and taboos, qualitative accounts reported postpartum practices, religious beliefs, social norms, and concerns about vaccination. These findings must be understood as reported experiences and perceptions within Lakes State; they do not claim to represent generalizable experiences or causal mechanisms among specific cultural or religious groups about immunization attitudes and behaviour.

2.3. Conceptual Framework

The study conceptualized education level, economic status, and cultural context as explanatory domains related to community engagement with immunization services. The framework does not imply a causal pathway. It reflects the structure of the research questions and the descriptive nature of the evidence. Community engagement was understood in terms of participation in immunization pro-

grammes, including commencement, continuation, and completion of childhood immunization. **Figure 1** summarizes the conceptual framework for the study.



Note. The framework represents the domains examined in relation to community engagement and does not establish causal direction.

Figure 1. Conceptual framework for the study.

3. Methodology

The study used a mixed research design that integrates methods from the quantitative and qualitative traditions to examine the relationship between education, economic level, cultural setting, community participation and immunization service delivery. This allowed for qualitative narratives about the study population's experiences and views to add an understanding to quantitative findings. The convergence of quantitative and qualitative evidence is very helpful in examining the association between a complex phenomenon such as a social or health issue and multiple forms of evidence [23]. The research was conducted in the Rumbek East and Rumbek Centre counties of Lakes State, South Sudan. In 2017, Rumbek East and Rumbek Centre counties had populations of 153,550 and 232,752 respectively and Rumbek East and Rumbek Centre counties have been used in the immunization setting in Lakes State previously.

The child's mother/caregiver was the study unit. The inclusion criteria were: 1) adult father, mother or caregiver of a child 12 - 59 months of age, 2) residing in Rumbek East or Rumbek Centre in Lakes state and 3) lived in the selected areas at least seven months. Households without children and caregivers who did not meet the minimum residence requirement of seven months in the selected area were excluded. The methods used to select the study unit for the household survey was a stratified sampling procedure where the two counties formed the two strata (Rumbek East and Rumbek Centre). Of the 65 questionnaires, a proportional sample was taken from each county relative to the projected population, with Rumbek East accounting for about 39.75% of the combined projected population of the two counties, and Rumbek Centre accounting for 60.25% of the combined projected population. The two counties' projected populations of 25.83 Rumbek East and 39.17 Rumbek Centre (accounting for the relative population of each county) of the 65 respondents, respectively, were used to proportionately allocate the sample size between the two counties, which resulted in a sample size of 26 respondents from Rumbek East and 39 from Rumbek Centre. After lists of house-

holds had been obtained from local administrative authorities within each county, the households were numbered in each list and then a sample was obtained from each county by simple random sampling where the number of respondents to be surveyed was taken from the proportional sample. Households were visited and respondents interviewed; in households with multiple eligible respondents, the youngest eligible child was used to select the eligible child caregiver respondent. This method ensured that the county samples reflected the relative proportionate size of the respective counties.

Qualitative data was integrated in the household survey by polling specific questions to the most knowledgeable, experienced and/or involved people in community health and immunization. Using purposive sampling, 10 key informants were identified for interview from the following categories: 2 ministries of health officials, 2 community members, 3 health workers and 3 community health administrative officials. A further 2 community discussions (one with women and one with men) of 12 respondents also took place. The qualitative study of key informants and community experiences provided additional information on education and engagement, access, economic status, health systems and service elements, community elements and cultural beliefs that surround immunization. As the persons involved in the study work in health and the government, they represent both a service-delivery and a community perspective on immunization. The separate gender-based group discussions provided another perspective.

Data from household structured questionnaire, guideline of in-depth interview of key informants and guideline of FGD Questionnaire; The questionnaire includes socio demographic information, 5 points Likert- scale questionnaires and open-ended questionnaires. The questions of Likert scale in order to explore relationship of education, economic condition, cultural context, community participation and immunization service. The response categories of Likert item ranging from “strongly agree” to “strongly disagree” and coded 5 for “strongly agree” and 1 for “strongly disagree” respectively. The questionnaire comprises of 12 statements and 3 dimensions (education-5; economic-4 and cultural -3). The items from questionnaire were checked for clarity, appropriateness and relevance to the study objective; were pre- tested to identify the ambiguity with regard to wording, sequencing and administration procedures; after pretesting, were corrected accordingly; content validity was established by determining whether the set of items actually were representative of the study objective [24].

Quantitative answers were entered and calculated from within the SPSS computer program. The analysis based on frequencies, percentages, crosstab tables and descriptive statistics. The interpretation of the Likert-scale answers can be summarized as essentially summing of the answers into each of the five available possibilities, and tabulating the distribution (skewedness) of this sum. In interpreting the results, I would look for major tendencies of the distribution of answers across the five possible answers (that is, how many would agree, disagree, undecided). The interpretation of the quantitative data was descriptive based on

1) the reported perceptions of the importance of education, the importance of economic status, the specific cultural context, community participation, and satisfaction with services, and 2) the distribution and frequency of answers without trying to treat this distribution as contributing factors to education, economic status, cultural context, community participation and immunization.

Qualitative data from the key informant interviews and focus group discussions was thematically analyzed as described below to complement the quantitative data and contribute to the development of context and explanation for the quantitative results. Thematic analysis had several steps [25] including: reading through all of the interview and discussion material; identifying and coding relevant ideas or statements; aggregating more than one code into a single category; comparing participant response across and within groups of participants; and, identifying and clarifying themes. The thematic analysis process used to analyze qualitative data provided a rigorous approach to identifying patterning and issues of importance in qualitative data (when conducted in a manner in line with the purpose of the research). In the qualitative analysis participant narratives were gathered on knowledge and information, affordability, transportation, distance to health facilities, social norms, religious beliefs, postpartum practices, engagement with the community, and safety concerns related to the vaccine were identified and then compared to the patterning observed in response data.

Quantitative and qualitative data were combined to contextualize, and compare, evidence of emerging patterns of responses and emerging themes qualitatively in the three domains. Lack of education and knowledge hindering engagement with immunization (qualitative theme) was matched by the high quantitative concordance that education and knowledge was important. In the education domain, a quantitative theme was high concordance that caregiver income was associated with immunization status of a child, statistically probably unimmunized, contrasted with more variation in quantitative responses on whether or not a child from a poor household was unimmunized. The qualitative data elaborated on transport costs and distances, accessibility of cheap household resources, demands and responsibilities. Access to information was the foundation for access to and use of services, but also revealed two dimensions of engagement: access and actual immunization. Quantitative agreement between community rules, taboos, and cultural beliefs was comparable with that of social norms, religious practices, postpartum practices and concerns about vaccine safety, and explained the qualitative data without any suggestion of causal relationships [23]. Visits, coverage, completion, or uptake of immunization were not cross checked with immunization registers.

Permission to carry out the study was obtained from University of Nairobi's ethics committee and other relevant local authorities before data collection. All respondents were aware of the study, its purpose and results and all the respondents voluntarily signed a consent form to participate and had the right to refuse or withdraw at any time without any consequences. All the respondents were as-

sured of confidentiality and anonymity by assigning code to the respondents instead of their names in the record and report. All the respondents felt at ease to answer the question because the answers from questionnaires, FGD and informants interview were utilized solely for this study and that information confidentiality were safeguarded through signing of informed consents. This approach ensures the uniformity in the process between the quantitative and qualitative segments such that the evidence produced matched the study goals and was able to sufficiently reflect the perceptions and lived experiences of respondents' about childhood immunization services in Rumbek East and Rumbek Centre counties in lakes state.

4. Findings

Respondent Characteristics

All the 65 questionnaires that were distributed were recorded as having been completed and submitted; hence the return rate was 100 percent. 53.8 percent were female while 46.2 percent were male. The majority of the respondents (81.5 percent) were married. Education status of the respondents was fairly poor, with 63.1 percent having no education, 27.7 percent having primary education, and 9.2 percent having secondary education. Over half (53.8 percent) had households with more than five members. As far as occupation is concerned, 63.1 percent were farmers and 36.9 percent were pastoralists. The findings are summarized in **Table 1** below.

Table 1. Characteristics of respondents.

Characteristic	Category	Frequency	Percentage
Gender	Female	35	53.8
	Male	30	46.2
Marital status	Married	53	81.5
	Single	12	18.5
Education	No education	41	63.1
	Primary	18	27.7
	Secondary	6	9.2
Household size	1 - 3	18	27.7
	4 - 5	12	18.5
	More than 5	35	53.8
Occupation	Farmer	41	63.1
	Pastoralism	24	36.9

Note. n = 65. Percentages are based on the 65 completed questionnaires.

Education Level and Community Engagement

The descriptive findings indicate substantial agreement among respondents re-

garding the perceived relevance of education to community engagement with immunization services. For the statement that community engagement increases with increasing education level, 73.8% of respondents strongly agreed and 16.9% agreed, giving a combined agreement of 90.7%. Similarly, 92.3% either strongly agreed or agreed that children whose parents or caregivers had higher levels of education were more likely to be fully immunized. In addition, 90.8% agreed or strongly agreed that immunization coverage was more likely to be higher where parents had knowledge of symptoms of vaccine-preventable diseases. The findings are as summarized in **Table 2**.

Table 2. Education level and community engagement with immunization services.

Statement	Strongly agree %	Agree %	Undecided %	Disagree %	Strongly disagree %
Education level is related to commencement, continuation, and completion of immunization.	18.5	43.1	4.6	29.2	4.6
Parents/caregivers with higher education are more likely to take children for immunization.	6.2	47.7	9.2	29.2	7.7
Community engagement increases with increasing education level.	73.8	16.9	3.1	3.1	3.1
Immunization coverage is more likely to be higher where parents have knowledge of vaccine-preventable disease symptoms.	55.4	35.4	4.6	1.5	3.1
Children of parents/caregivers with higher education are more likely to be fully immunized.	36.9	55.4	1.5	3.1	3.1

Note. Percentages are based on n = 65.

The qualitative findings provided further context to these responses. Participants frequently referred to knowledge and understanding when discussing education and immunization. One participant explained:

“Parents without education will not know the important of immunization to their children whether it is beneficial to them or not but those with education know the benefits of immunization to their children than parents without education, they are easy understand and allow their children to be fully immunized against preventable diseases.”

Another participant similarly stated:

“Education level affect immunization in Lakes state because parents with education have quick understanding of important of immunization to their children than those without education.”

These accounts indicate that participants viewed education partly in terms of knowledge and understanding of immunization and its perceived benefits. Participants also referred to misconceptions, social norms, and limited prioritization of immunization. One focus group participant stated:

“Yes, the level of education affects immunization coverage in our community because; they lack knowledge on important immunizations, they don’t prioritize immunization as lifesaving intervention, they have misperception about vaccination Belief in social norm and value of their ancestors of not be immunized at their time.”

The key informant interviews provided similar perspectives. One key informant stated:

“Education role key plays in healthy behaviours that including immunizations. Lack of education can potentially lead to misconceptions about vaccines.”

Another key informant highlighted the importance of accurate information:

“Lack of accurate information on essential family care practices affect immunization of children under five years.”

Taken together, the quantitative and qualitative findings show a high level of respondent agreement regarding the perceived relevance of education, knowledge, and understanding to community engagement with immunization services. The qualitative accounts further indicate that participants referred to inadequate information, misconceptions, social norms, and perceptions of immunization services when explaining their views on education and immunization. This result is consistent with the review conducted by Ekezie *et al.* [20], in which high-quality vaccination education, the building of trust, and community participation were identified as significant facilitators of vaccination communication and uptake in various African settings. The findings therefore represent respondents’ perceptions and qualitative accounts rather than evidence of a statistically tested or causal relationship.

Economic Status and Community Engagement

Economic conditions were perceived as relevant to community engagement with immunization services, although responses varied across the statements. As presented in **Table 3**, 84.6% of respondents agreed or strongly agreed that parents’

Table 3. Economic status and community engagement with immunization services.

Statement	Strongly agree %	Agree %	Undecided %	Disagree %	Strongly disagree %
Poor households are more likely not to have children vaccinated, whereas wealthier households are more likely to do so.	15.4	24.6	23.1	33.8	3.1
Parents’/caregivers’ income levels determine access to immunization services.	7.7	76.9	1.5	7.7	6.2
Wealthier people tend to be more informed about the importance of immunization services than poorer people.	24.6	35.4	4.6	32.3	3.1
Immunization coverage is unrelated to income and is associated with other non-economic factors.	6.2	46.2	33.8	12.3	1.5

Note. Percentages are based on n = 65.

or caregivers' income levels determine access to immunization services. Similarly, 60.0% agreed or strongly agreed that wealthier people tend to be more informed about the importance of immunization services. In contrast, only 40.0% agreed or strongly agreed that poorer households were more likely not to have their children vaccinated, while 36.9% disagreed or strongly disagreed and 23.1% were undecided. These responses indicate that respondents more consistently associated economic status with access to immunization services than with vaccination status.

The qualitative findings provided contextual explanations for these responses. During the focus group discussion, participants were asked whether there was a link between household income and immunization uptake in their area. One participant explained: *"There is no much different because most of the households are living in same condition and most of them are farmers and pastoralists, they have the same economics status but when it comes for immunization, the household with high income may seek immunization services even if health facilities are far away from their residential as compared to the households with low level of income. The households with high income may have access to immunization information through radio or mobile phones."* Another participant stated: *"Children of mothers who were rich were two times more likely to receive full vaccination than children whose mothers were poor."* Similarly, another participant noted: *"Some households cannot afford to seek immunizations services for their children because of their economic condition."*

These accounts illustrate how participants described economic status in relation to transport, affordability, distance from health facilities, and access to information. The findings also show some variation in participants' views, consistent with the quantitative responses. Overall, the quantitative and qualitative findings suggest that economic status was perceived mainly as part of the broader access environment surrounding immunization services rather than as a uniform explanation of children's vaccination status.

Cultural Context and Community Engagement

Cultural context produced the strongest and most consistent pattern across the three domains examined. The findings are summarized in **Table 4** below.

A combined 87.6% of respondents strongly agreed or agreed that community

Table 4. Cultural context and community engagement with immunization services.

Statement	Strongly agree %	Agree %	Undecided %	Disagree %	Strongly disagree %
Community norms and taboos influence health behaviours.	53.8	33.8	4.6	3.1	4.6
Cultural taboos are obstacles to informed community understanding of immunization programmes.	32.3	53.8	4.6	7.7	1.5
Low community engagement in immunization programmes is associated with existing cultural beliefs.	64.6	27.7	1.5	4.6	1.5

Note. Percentages are based on n = 65.

norms and taboos influence health behaviours. Likewise, 86.1% agreed or strongly agreed that cultural taboos are obstacles to informed community understanding of immunization programmes. The strongest response was for the statement that low community engagement in immunization programmes is associated with existing cultural beliefs, for which 92.3% agreed or strongly agreed.

Qualitative findings provided further context to these responses. Participants described cultural and social beliefs surrounding immunization. One FGD participant stated: *“Culture plays a great role in community engagement in immunization because of social norms, practices and attitudes toward immunization services because they don’t support immunization in some place, for example Catholic Church at some point informed their congregations not to go for TT campaign to get immunization. Also, some people believed that these vaccines may cause impotent in boys or infertility in women.”*

A key informant described a postpartum practice in Lakes State: *“Cultural practice which occurs in Lakes State is that a woman should continue stay indoors for 40 days after giving birth. This prevents child from accessing immunization services for the new-born.”* Another key informant described religious beliefs in some communities: *“In some communities, there are a few sects that hold to the principle of non-use of drugs, relying only on one’s faith in all settings. This encompasses to immunization of children.”*

Taken together, the quantitative and qualitative findings indicate that respondents and participants described community engagement with immunization in relation to cultural norms, postpartum practices, and religious beliefs. The quantitative responses show high levels of agreement with statements concerning these issues, while the qualitative accounts illustrate how such beliefs and practices were described in specific community contexts. The two sets of findings therefore complement each other by showing both the extent of agreement among respondents and the range of experiences and perceptions reported by participants. These findings describe perceived associations and contextual experiences rather than establishing a causal relationship between cultural or religious factors and immunization engagement.

5. Discussion

The study found that community engagement with immunization services in Lakes State was described across three interconnected dimensions: education, economic conditions, and cultural context. Education and culture received the highest levels of respondent agreement, while economic conditions were more consistently associated with access to services than with children’s vaccination status. The qualitative findings provided further context through accounts concerning knowledge, information, affordability, distance, transportation, social norms, religion, postpartum practices, and concerns about vaccine safety. These findings are consistent with the Social Ecological Model (SEM), which assumes that health-related behaviour and community engagement are situated within interacting individual, interpersonal, organizational, community, and wider environmental

contexts [8] [9]. They also correspond with Andersen's Behavioral Model of Health Services Use, particularly the distinction between predisposing characteristics and enabling resources [11]. In this study, education was relevant to knowledge and understanding, while economic conditions were described mainly through resources and access. Cultural factors were situated within interpersonal and community contexts. Since the study was descriptive, these theoretical relationships are used to interpret respondents' perceptions and reported experiences rather than to establish causality.

The findings on education broadly agree with previous evidence linking caregiver education and access to immunization information with vaccination experiences. Nnaji *et al.* [13], for example, reported an association between lower caregiver education and missed opportunities for vaccination among children attending primary healthcare facilities in Cape Town. Parsekar *et al.* [14] similarly identified educational and communication interventions as important components of strategies addressing knowledge and attitude-related barriers to routine immunization. The current study is consistent with this literature at the level of respondents' perceptions. Specifically, 90.7% of respondents agreed or strongly agreed that community engagement increased with education, while 92.3% associated higher caregiver education with complete immunization. The qualitative findings further linked education with knowledge, understanding, misconceptions, and access to accurate information. These findings support the SEM assumption that individual-level knowledge and education are situated within broader social and service contexts. They also correspond with Andersen's model, in which education represents a predisposing characteristic associated with health-service use. However, the current study differs methodologically from studies such as Nnaji *et al.* [13] because it did not statistically test education against verified vaccination outcomes. The agreement therefore represents a perceived relationship rather than an independently established association.

The findings on economic status provide a more mixed picture and therefore require a more cautious interpretation. Although 84.6% of respondents agreed or strongly agreed that income levels were related to access to immunization services, only 40.0% agreed or strongly agreed that poorer households were more likely not to have their children vaccinated. Qualitative accounts similarly emphasized transport, distance, affordability, and access to information rather than economic status as a uniform explanation of vaccination status. This pattern is partly consistent with Williams *et al.* [17], who reported better basic vaccination outcomes among children from wealthier households in Nigeria, and Biks *et al.* [18], who identified monetary conditions as an important component of inequality in zero-dose vaccination in Ethiopia. It also agrees with Ilesanmi *et al.* [19] and Ekezie *et al.* [20], who identified resource constraints, access barriers, distance, and communication-related factors in vaccination experiences. The difference is that the current study found less consistent agreement when economic status was framed directly in relation to vaccination status. This does not necessarily contradict the

previous studies because the studies examined different populations, outcomes, measures of socioeconomic status, and analytical approaches. The finding is particularly consistent with Andersen's model, which conceptualizes income, transport, affordability, and access as enabling conditions for health-service use. It also supports the SEM assumption that household economic circumstances interact with community and organizational conditions, including the location and accessibility of immunization services.

Cultural context showed the most consistent pattern in the current study. A total of 87.6% of respondents agreed or strongly agreed that community norms and taboos influence health behaviours, 86.1% viewed cultural taboos as obstacles to informed understanding of immunization programmes, and 92.3% associated low community engagement with existing cultural beliefs. The qualitative findings added context through accounts of social norms, religious beliefs, postpartum practices, and concerns about vaccine safety. These findings agree with Bell *et al.* [21], who demonstrated the importance of interpersonal and social-ecological contexts in understanding demand for childhood vaccination in Nigeria, Uganda, and Guinea. They also correspond with Ekezie *et al.* [20] who identified social, informational, and service-related conditions among factors associated with vaccination access in disadvantaged populations, and with Odero *et al.* [22] who reported associations between vaccination outcomes and demographic and socioeconomic characteristics, including religion and maternal education, in Kenya. The current findings therefore support the SEM assumption that immunization engagement is embedded within interpersonal and community environments. They also indicate why cultural context should not be considered in isolation from information, access, and service conditions. The qualitative findings were reported as experiences and perceptions within specific communities and should not be interpreted as evidence that a particular religious or cultural group uniformly opposes immunization.

Overall, the findings support the central theoretical proposition of the study that community engagement with immunization is situated within interconnected social and health-service contexts. The education findings correspond mainly to the individual and predisposing dimensions of the SEM and Andersen model, respectively. The economic findings correspond particularly to the enabling conditions emphasized by Andersen and to the household, organizational, and community levels of the SEM. The cultural findings correspond mainly to the interpersonal and community levels of the SEM and demonstrate the contextual conditions within which health-service use occurs. The findings therefore do not identify a single explanatory factor for community engagement. Instead, they show that respondents described engagement in relation to knowledge and information, available resources and access conditions, and social and cultural contexts. The mixed-methods design strengthened this interpretation by allowing quantitative patterns of agreement to be considered alongside participants' explanations and experiences. The contribution of the study is therefore its context-

specific description of how education, economic conditions, and cultural context are perceived in relation to immunization engagement in Lakes State, while recognizing that these relationships were not subjected to causal or predictive statistical testing.

6. Conclusion and Implications

This study offers insights into the descriptive evidence pertaining to the perceptions and knowledge of the respondent and the qualitative participant regarding education levels, economic levels, and culture in connection with immunization services in Lakes State, South Sudan. Education was highly comparable and agreed upon by the respondents and the qualitative participants. This was mostly in relation to knowledge, understanding, and engagement with immunization. Economic status, on the other hand, was more comparable in terms of access, affordability, transport, distance, and access to information rather than a difference in vaccination status between the poorer and the wealthier households. The cultural context was the most compared domain in which the participants spoke about community norms, taboos, religious beliefs, postpartum practices, and perceptions related to immunization.

The findings suggest the need for immunization programs that combine accessible health information and community dialogue and address practical barriers to accessing immunization services. Communication should address vaccination schedules, vaccine-preventable diseases, and common concerns using locally understandable messages. Engagement with community leaders, health workers, and trusted local actors should take into account cultural and religious groups' sensitivities and should avoid generalizing about these groups. Implications for immunization program planners would include consideration of the factors of distance, transportation, cost, and communications accessibility. It is important to note that the implications are drawn from perceptions and experiences and do not indicate cause-and-effect relationships.

The limitations faced in the research are based on the sample size, which is very small (65 participants), and the fact that only one environment (Lakes State) was used during the research. Additionally, the descriptive design of research cannot establish causality between two variables under investigation. Therefore, the results can be generalized to the study location but not the entire country. Though the qualitative data gathered from 10 key informants and 2 focus group discussions were descriptive and diverse in nature, they do not represent the opinion of the entire population. Future research should use large and diverse sample sizes, qualitative and quantitative research designs, and documented immunization information. There is a need for an analytical and longitudinal research to establish the determinants of immunization service uptake.

Conflicts of Interest

The author declares no conflicts of interest.

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