

Uganda Learning Hub For Immunisation Equity

BURDEN OF ZERO DOSE CHILDREN IN PASTORALIST, HARD TO REACH AND UNDERSERVED COMMUNITIES: A CASE STUDY OF MUBENDE DISTRICT, UGANDA

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Uganda Learning Hub for
Immunisation Equity Team

Report on a **Burden of zero dose children in pastoralist, hard to reach and underserved communities:** A case study of Mubende district, Uganda

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EXECUTIVE SUMMARY

Background:

Uganda continues to register significant progress in immunisation coverage since 2020 for most routine antigens with an average coverage of 90%. Despite the progress, pockets of zero dose (ZD) and under-immunised children (UIC) exist. Data from DHIS2 shows that the EPI program registered 109,338 ZDC and 313,467 UIC as of the end of 2023, suggesting that a substantial number of children are not protected from vaccine-preventable diseases. However, given that DHIS2 captures information for only children who interact with the health system, this data underestimates the true burden of ZDC and UIC which may affect programming and tracking of progress towards the immunisation goals. With these challenges, there is a need to understand who, where, why and how many ZDC and UIC exist, so as to inform the design and implementation of interventions to reach them.

Methods:

The Uganda Learning Hub for immunisation equity (LH) conducted a cross-sectional, mixed methods targeted community survey from March to August 2024 in three High-Risk Communities (HRCs) in Mubende district (i.e. underserved community in Kiruuma sub-county, hard-to-reach community in Butoloogo sub-county and pastoral community in Kigando sub-county). We sought to characterise ZDC, UIC and missed communities in Uganda and understand the barriers and challenges of reaching them. Specifically, we aimed to: i) estimate the burden of ZDC, UIC and untimely immunisation, ii) characterise the ZDC and UIC, iii) determine the factors associated with ZDC and UIC, and iv) understand the barriers to reaching the ZDC and UIC in three High-Risk Communities (HRCs) in Mubende district. The study population included children aged 4.5 months (18 weeks) to 23 months and the respondents in the survey were the mothers/primary caregivers of the children.

Quantitative data collection and analysis:

Systematic sampling was used to select households to participate in the survey. A questionnaire was administered to the mothers/primary caregivers to capture information on social-economic status of the household, demographics of the child and primary caregiver, immunisation status and barriers to accessing immunisation services. When available, immunisation cards were used to document details of the vaccines and dates when they were received. Global Positioning System (GPS) coordinates were captured for all enrolled households for mapping and visualisation. Data was analysed using STATA. The primary outcome of the survey was the proportion of ZDC defined as children aged 12 to 23 months who had not received the first dose of DPT by the time of the study.

Secondary outcomes included:

i) proportion of UIC, defined as children aged 12 to 23 months with the first dose but missing the third dose of DTP vaccine at the time of the survey; ii) untimely immunisation, defined as proportion of children aged 4.5 – 11 months that had not received any single dose of DPT or had not received DPT3 by the time of the survey; iii) factors associated with ZDC, UIC children and untimely immunisation. A total of 860 children aged 12-23 months and 465 children aged 4.5-11 months were enrolled in the survey. Data was analysed for only participants that had complete data on the key outcomes (777 (90.3%) of the children aged 12-23 months and 465 (100%) children aged 4.5-11 months).

Qualitative data collection and analysis:

To gain better understanding on survey findings, two participant dialogues were conducted with Village Health Team (VHT) members and 19 in-depth interviews (IDIs) were conducted with mothers/caregivers of ZDC from the hard-to-reach community (Butoloogo sub-county) and pastoral community (Kigando sub-county). Data were analysed manually using a root cause analysis approach to understand the reasons why the caregivers had not taken their children for vaccination. The research assistants who collected the data were engaged during the analysis to understand the context of the collected data.

Findings:

Table 1: The summary of key findings

Objective	Findings
The burden of ZD, UI and untimely immunisation in the surveyed communities	<ul style="list-style-type: none"> The overall burden of ZDC in the surveyed communities was 12.7%, and it varied by community (i.e. 17.9% in the underserved community, 15.9% in the pastoral community and 4.9% in the hard-to-reach community). The overall burden of UIC in the surveyed communities was 7.1%, and it varied by community (i.e. 5% in the underserved community, 9.6% in the pastoralist community and 6.4% in the hard-to-reach community). The overall burden of untimely immunisation was 27.5%, and it varied by community (i.e. 33.6% in the underserved community, 38% in the pastoralist community and 12.3% in the hard-to-reach community).
Characteristics of ZDC and UIC	<p>Socio-demographic characteristics of ZDC and UIC:</p> <ul style="list-style-type: none"> Many ZDC (48.5%) were born out of health facilities (at home or with assistance of traditional birth attendants (TBAs). Most of the caregivers (35.4%), of ZDC were aged 25-34 years, had attained primary level education (69.7%), were biological mothers (74.2%) and had attended ANC during pregnancy (88.6%). Most caregivers of both ZDC (46.5%) and UIC (46.3%) mentioned that radio was their main source of information on immunisation. <p>Proximity of households with ZDC and UIC to nearest health facility: Kigando sub-county (the pastoralist community) had many ZD (37.2%) and UI children (46.2%) residing within 3.2 Km from the nearest health facility. On the other hand, Kiruuma sub-county- (the underserved community) had the highest number of households with ZDC (44.2%) located beyond 9.7 Km of the nearest facility. In Butoloogo sub-county the highest number of ZDC (53.8%) and UI children (41.2%) resided within 6.4–9.7 Km from the nearest health facility.</p>

Objective	Findings
Factors associated with ZDC	<ul style="list-style-type: none"> The odds of being ZDC were 2 times higher when the grandparents were the primary caregivers compared to when the mother was the primary care giver (aPR=2.28 95%, CI 1.19-4.36, p<0.001). Children born in the community (at home or with assistance of traditional birth attendants (TBAs)) had more than twice the odds of being ZDC as compared to children born in public facilities (aPR=2.27 95% CI 1.60-3.23, p<0.001).
Caregiver barriers to accessing immunisation services	The barriers to ZDC accessing immunisation services were: i) caregivers who are not the mothers of the children, especially the grandparents, prioritize providing for other basic needs over immunisation; ii) negative health workers attitude (health workers scold caregivers for misplacing vaccination cards, missing appointments and poor dressing); iii) knowledge gap on immunisation among caregivers (some caregivers don't know the immunisation schedule and generally do not appreciate the need for immunisation); iv) fear of side effects and adverse events following immunisation (AEFIs); v) language barrier by Immigrants from Rwanda hindered them from seeking immunisation services; vi) poor health of some mothers hindered them from seeking immunisation services ; vii) family disruption makes it challenging to track the child's immunisation status; viii) family tradition (family doesn't immunise); ix) children undergoing treatment for special conditions such as club foot had been advised to delay vaccination; x) long distance to health facilities and outreach posts, and xi) gender dynamics where immunisation is perceived as a woman's role (contextual barrier).

Abbreviations: DHT, District Health Team; EAF, Equity Accelerator Fund; HF, health facility; NMS, National Medical Stores; RED/REC, Reaching Every District/Reaching Every Child; UNEPI, Uganda National Expanded Programme on Immunisation; UI, under-immunised; UIC, under-immunised children; ZD, zero-dose; ZDC, zero-dose children.

Conclusion:

The overall burden of ZDC in the surveyed communities was 12.7% (i.e. 17.9% in the underserved community, 15.9% in the pastoral community and 4.9% in the hard-to-reach community), while the UI burden was 7.1% (i.e. 33.6% in the underserved community, 38% in the pastoralist community and 12.3% in the hard-to-reach community). Children born out of the health care system and those under the care of their grandparents are more likely to be ZDC and targeting these children for interventions may be an effective strategy in reducing the ZD burden. Physical access for immunisation services may not be a major barrier to seeking immunisation services as there were households with ZDC and UIC that were located within 3.2 Km from the nearest health facility. Key barriers to reaching ZDC include children being taken care of by non-biological caregivers, negative health worker attitudes, knowledge gaps, fear of side effects, language barriers, poor maternal health, disrupted families, cultural resistance, medical advice delaying vaccination, long distances to facilities, and gender-based role perceptions. We found that zero dose is a complex problem embedded in cultural and family dynamics; therefore, community structures are key in identifying and reaching the ZDC.

RECOMMENDATIONS

Below we present near and medium-term recommendations.

Near term

1. National (MoH/UNEPI) and sub-national (district) stakeholders should support health facilities and high-risk communities to reach ZDC through targeted interventions like frequent and consistent outreaches.
2. During social mobilization for immunisation, community health structures (VHTs, and LCs) should look out for children with the following special characteristics: i) are under the care of non-biological parents ii) are born outside health facilities (TBA/home) iii) have caregivers with prolonged illnesses and iv) whose parents are not staying together.
3. Health workers, local leaders and VHTs should be encouraged to educate the community about i) the importance of immunisation ii) the vaccine preventable diseases iii) Uganda's immunisation schedule iv) where to access immunisation and v) the anticipated side effects of vaccination and how to manage them.

Medium Term

1. National (MoH/UNEPI) should support the sub-national (Mubende district) to:
 - a. Expand services to high-risk communities especially in underserved areas such as Kiruuma sub-county through the construction of more health facilities within the communities.
 - b. Upgrade existing lower-level health facilities to higher service-delivery levels so that they can meet the high demand for immunisation services.
2. Future studies should:
 - a. investigate reasons for poor health worker attitudes. The findings may provide evidence on how to better improve health worker attitudes to ensure client-centred care.
 - b. Explore the role of gender in immunisation uptake.
3. There is a need for a digital data capture system that collects information at both community and health facility levels to enable timely and a more accurate identification of ZD and UI children. This will also minimise reliance on immunisation cards to track the child's immunisation status.

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ABBREVIATIONS

aOR	Adjusted Odds Ratio
CDC	Center for Disease Control and Prevention
CHAI	Clinton Health Access Initiative
CI	Confidence Interval
EAF	Equity Accelerator Fund
HRC	High Risk Community
IDRC	Infectious Diseases Research Collaboration
JSI	John Snow, Inc.
OR	Odds Ratio
PR	Prevalence ratio
TBA	Traditional birth attendants
UBOS	Uganda Bureau of Statistics
UI	Under immunised children
UNICEF	United Nations International Children's Emergency Fund
ZDC	Zero Dose Children

OPERATIONAL DEFINITIONS

Zero-dose children (ZDC):

Children aged 12 - 23 months who had not received a single dose of DPT at the time of the survey.

Under immunised (UI) children:

Children aged 12 - 23 months who received DPT1 but had not receive DPT3 at the time of the survey.

Untimely immunisation:

Children aged 4.5 - 11 months that had not received DPT3 by the time of the survey.



1.0 INTRODUCTION

Great strides have been made in improving immunisation coverage globally, with more than 300 million children vaccinated in 2020, preventing about seven million future deaths. [1] Despite this achievement, about 25 million children were unvaccinated or under-vaccinated in 2021, including 18 million children who did not receive any vaccine (zero-dose). [2, 3] Zero-dose children (ZDC) are children who have not received a single dose of Diphtheria, Tetanus, and Pertussis-containing vaccine by 12 months of age. ZDC comprise nearly half of the child deaths caused by vaccine preventable diseases. [4]

Whereas children who are under-immunised (UI children; those missing the third dose of diphtheria, tetanus, and pertussis-containing vaccine (DTP3) have had contact with the health system, ZDC often lack access to essential health services which include immunisation. The underlying barriers to this access are complex and interconnected. They stem from sociocultural barriers, health system challenges, and economic vulnerabilities. [5] Many of these children are from poor homes or marginalized groups residing in urban areas, hard-to-reach communities, and conflict settings. [4] In addition, gender-related barriers at the individual, household, community, and health systems levels negatively impact efforts to reach zero-dose children in some settings. While women are often disproportionately tasked with childcare responsibilities, many mothers lack decision-making power, are unable to access resources needed to reach health facilities, and/or do not have partners who are engaged or supportive of child immunisation. [6] Recent research indicates that children of more empowered mothers are often less likely to be unimmunised than children with less empowered mothers as measured by indicators of social independence and other gender equity-related domains. [7, 8]

In Uganda, immunisation is managed by the Uganda National Expanded Program on Immunisation (UNEPI) with support from partners such as World Health Organization (WHO), United Nations International Children's Emergency Fund (UNICEF), Clinton Health Access Initiative (CHAI), PATH, Centers for Disease Control and Prevention (CDC), and John Snow, Inc. (JSI). Immunisation in the country is a key public health intervention aimed at reducing morbidity, mortality, and disability due to vaccine preventable diseases. As part of this, the government of Uganda, through UNEPI, aims to ensure that every child and priority population at risk of vaccine-preventable disease is fully vaccinated. Despite the efforts to increase vaccination coverage in Uganda, many children in the country are missing out on these lifesaving vaccinations. [9]

Factors that have been associated with no or under-immunisation of children in the country have included low maternal education, low socioeconomic status, living in rural locations, and belonging to ethnic minority groups. [10] Recent research indicates that ethnicity and religion may lead to differences in vaccination. These variations in immunisation coverage by ethnicity is maintained even after adjusting for affluence, maternal education, and location of residence, indicating that ethnicity-related variables are important drivers of vaccination disparities in some countries. [11] To address the ZDC burden, some communities, recognized as chronically having low immunisation coverage, have been identified in the country.

These communities, referred to as High-Risk Communities (HRC) have been targeted for interventions to accelerate progress on equity in immunisation. Some of the HRCs include pastoral communities, urban slum dwellers, and inhabitants of isolated and hard to reach areas. These

communities are of interest as they often have limited access not only to immunisation services but to other health services as well.[12] They also have socioeconomic disparities, and often suffer from gender-related constraints.[13] With the highlighted challenges, these communities are often exposed to disease outbreaks, which can spread quickly, compromising the health and development outcomes of the children.

Rationale

The UNEPI has expanded service delivery nationally, resulting in significant improvements in DPT3 coverage from 91% in 2011 to 97% in 2021.[14] This has been achieved through routine immunisation within the health facility and enhanced by outreach services for populations living in areas with limited access to fixed services.[15] In addition, strategies like radio talk shows, mass campaigns, and static and outreach programs have been adopted to address socio-cultural practices that discourage immunisation and negative beliefs and attitudes towards immunisation. Although these efforts have led to increases in vaccination coverage, many children in the country remain under/unimmunised. To ensure that no child is left behind, 52 districts and 7 cities have been identified and prioritized to receive interventions aimed at reducing the number of ZDC and UI children as part of the Equity Accelerator Fund (EAF). These districts were selected based on the burden of the ZDC and the presence of the HRC groups.

To support the effective design and implementation of context-specific interventions under the EAF platform, there is a need to appreciate who, where, why, and how many ZDC, UI children, and missed communities exist and how these can be reached and supported. In addition, there will be a need to assess implementation outcomes and effectiveness

of EAF interventions following their rollout. This evaluation and learnings will be important in informing UNEPI about the interventions that work well and should be scaled up to other districts, and to identify those that are not working that may need to be adjusted or dropped. As part of the Uganda Learning Hub for Immunisation Equity, we conducted a targeted community survey in three HRC communities in Mubende district to characterise the ZDC and UI children in the three communities. Results from the survey will inform UNEPI and other implementing partners on the burden of the ZDC and UI children in these and similar communities, where the children are, where they can be found and what are the barriers to their access to immunisation services. The survey results will also act as a baseline for evaluating the EAF interventions rolled out in these communities.

Survey objectives

General objective

To characterize ZDC, UI children and missed communities in Uganda, and understand the barriers and challenges to identifying and reaching them.

Specific objectives

1. To estimate the burden of ZD, UI and untimely immunisation in three High Risk Communities in Mubende district.
2. To characterize the ZD and UI children in the three High Risk Communities in Mubende district.
3. To determine the factors associated with ZD children in the three High Risk communities in Mubende district.
4. To understand the barriers to reaching ZD and UI children in the three High Risk communities in Mubende district.



2.0 METHODOLOGY

2.1 Survey setting and population

The targeted community survey was conducted between 24th March and 9th June 2024. The survey was conducted in three (3) HRC's in Mubende district. Mubende District is in the Central region of Uganda and is one of the largest districts in the country. The total population of the district was estimated at 688,819 and the fertility rate at 7.5 births per woman according to the 2014 population and housing census. [16] The community of Mubende is composed of people of different social and ethnic origins making them a vulnerable population for ZDC. Agriculture is the main economic activity in the district.

2.2 Selection of Mubende district for the targeted survey

Mubende is one of the three focus districts for the Uganda Learning Hub for Immunisation Equity activities in Uganda. The three focus districts (Wakiso, Mubende, and Kasese) were selected for the hub activities in consultation with UNEPI and partners because: i) they have low DPT1 coverage; ii) they are targeted for interventions to address the zero-dose challenge under Gavi's EAF; iii) they have high numbers of ZDC children based on DHIS2 and the Institute of Health Metrics and Evaluation (IHME) data; and iv) they have communities that are considered to have immunisation inequities. Of the three districts, Mubende district was selected for the targeted survey because it had the highest number of the ZDC.

2.3 Selection of the study communities

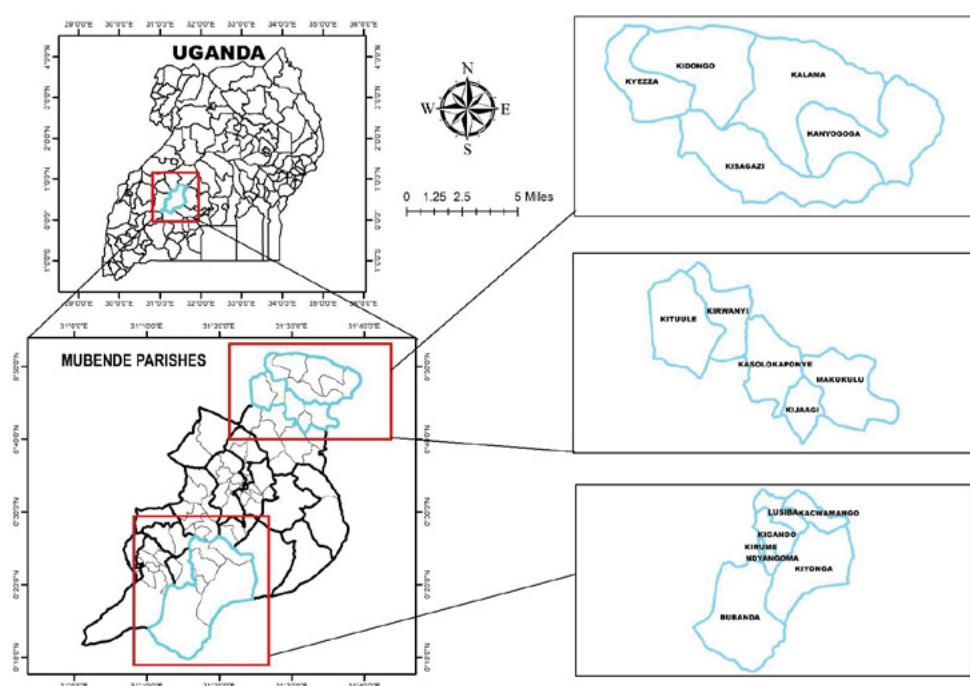
Three study communities, including one predominantly pastoralist community (Kigando sub-county), one under-served community (Kiruuma sub-county), and one hard to reach community due to the topography (Butoloogo sub-county) were purposively selected for the survey. A community in this survey was defined as a group of people living in the same place or having a particular or similar characteristic in common. The selection of the three communities was informed by findings of the rapid assessment that was conducted in Mubende districts between August 2023 and March 2024.

As part of the rapid assessment, five sub-counties (Kiruuma, Kigando, Kasambya, Butoloogo, and the South division) were highlighted as having underserved communities and highest burden of ZDC in the district. To select the three communities for the targeted community survey, the HRCs within the five sub-counties were listed, and using this list, a sub-county was purposively selected to represent at least one HRC. Careful consideration was made to ensure the representation of various HRCs in the selection. From each of the sub-counties, parishes most affected by the disparity were selected in consultation with the DHT. Figure 1 shows the map of Mubende district highlighting the surveyed sub-counties and their corresponding parishes. Table 1 provides details of the characteristics of the three communities and parishes included in the targeted survey.

Table 2: Characterisation of the communities participating in the survey

High risk communities (HRC)	Total no. of parishes	Parishes selected	Characteristics
Under-served community (Kiruuma sub-county)	5	<ul style="list-style-type: none"> • Kirwanyi • Kituule • Makukulu • Kasolokamponye 	<ul style="list-style-type: none"> • Predominantly rural • One health facility (level II) serving the whole sub-county • Mining community • Adults spend long periods of time in mines (away from home) affecting health seeking behaviours.
Pastoralist communities (Kigando sub-county)	7	<ul style="list-style-type: none"> • Dyangoma • Bubanda • Kiyonga 	<ul style="list-style-type: none"> • Predominantly rural • Household members move from place to place looking for pasture
Hard to reach community (Butoloogo sub-county)	7	<ul style="list-style-type: none"> • Kanyogoga • Kidongo • Kyeza • Kisagazi 	<ul style="list-style-type: none"> • Rural • Surrounded by the hills (in valleys) • Floods during the rainy season

Figure 1: Map of Mubende district showing the three study communities.



The figure on the left upper corner above illustrates the location of Mubende district on the map of Uganda (highlighted in blue). The figure in the left lower corner shows the three sub-counties in Mubende which were purposively selected for the study—Butoloogo, Kiruuma, and Kigando. The figures on the right show the different parishes which were visited in each sub-county (highlighted in blue).

2.4 Selection of households for the survey

For each community selected (composed of a group of parishes as detailed in Table 1 above), information on the villages within the selected parishes and information on the approximate number of households within each village was obtained from the administrative records at the district. This information was used to estimate the number of households to be enrolled in each of the villages. Using probability proportionate to size, the total number of households to enrol was determined. Once the number of households to enrol from each village was determined, a skip pattern (nth household) was calculated as the total number of households in the village estimated from administrative data divided by the number of households to be enrolled from the village (Table 2).

On the survey day, the team started survey activities by identifying the centre of the village. This was done with the assistance of the local leadership. From this central point, the team dispersed along various feeder roads and routes extending in different directions into the village. This approach was chosen to mitigate household selection bias. Every household served by these feeder roads and routes including households by the roadside and those away from the road but fed by the road were identified, and every nth household was screened for eligibility to join the study. When a household was not eligible for enrolment, the next/neighbouring household was considered for enrolment before resuming the skip pattern. Enrolment of households served by road continued until the boundaries of the village were reached. To prevent double enrolment, completed households were marked with a writing on the door or wall. If the application of the skip pattern led to a household that had already been completed, the next available/neighbouring household was screened for eligibility to join the survey and enrolled if eligible before resuming the skip pattern. All eligible households falling within the sampling frame were enrolled using the following criteria:

1. Have at least one child aged between 4.5 – 23 months.
2. Agreement of the primary caregiver to provide informed consent to participate in the survey.

Households were excluded if they were vacant, or the primary care giver declined to provide informed consent. Screening and enrolment of households within a village was continued until all eligible households within the village were exhausted or when the desired sample size was achieved.

2.5 Inclusion of participants in the study

The survey population included children aged 4.5 (18 weeks) to 23 months and the respondents in the survey were the mothers/primary caregivers of the children. In situations where the enrolled household registered more than one eligible child or multiple births, information was collected for all children. Children were enrolled in the survey if they fulfilled the following eligibility criteria:

- Were aged between 4.5 – 23 months.
- Are usual residents of the enrolled household i.e. have stayed in the household for a minimum of 6 months
- Have written informed consent to participate in the survey from their mother/primary caregiver.

2.6 Sample size calculation

The sample size to estimate the burden and characteristics of ZDC in the survey communities was based on the Leslie Kish 1965 sample size calculation for a single proportion. The proportion of ZDC in Uganda is estimated at 2% (UNEPI 2023). The prevalence of ZDC in the target communities is unknown, however, in this study, we assumed that the target communities will have a higher proportion of ZDC than the national estimates. Assuming a prevalence of 20% in the target community with the highest number of ZDC, and fixing the confidence level at 95%, margin of error at 5.4%, adjusting for a 10% non-response rate and correcting for a 1.283 design effect (referenced from the 2017 Uganda Demographic and Health Survey Report), a total of 297 children aged 12-23 months per community was required to answer the survey objectives.

Table 3: Selection of households to participate in the survey

Subcounty	Parish	Village	Population	No. of HHs per Village	Total No. of HHs in all Parishes	No. of HHs per Community (n=297)	Sampling interval
					4,086	1,449*	5
Butoloogo	Kisagazi	Kisojjo	920	120		25	5
Butoloogo	Kyeeza	Bubenge	942	192		39	5
Butoloogo	Kyeeza	Katagi	904	312		64	5
Butoloogo	Kyeeza	Kifulumambago	1,042	162		33	5
Butoloogo	Kyeeza	Kacuka	992	152		31	5
Butoloogo	Kidongo	Kigooba	1,156	110		23	5
Butoloogo	Kidongo	Nsinamu	1,647	127		26	5
Butoloogo	Kanyogoga	Biwalwe	1,277	142		29	5
Butoloogo	Kanyogoga	Kanyogoga	2,774	132		27	5
					10,023	7,742*	
Kiruuma	Kituule	Sunga	927	252		10	26
Kiruuma	Kituule	Kibagalazi	1,212	482		18	26
Kiruuma	Kituule	Kituule	2,568	772		30	26
Kiruuma	Kituule	Nakasagazi	1,058	582		22	26
Kiruuma	Kirwanyi	Bujaala	1,942	757		29	26
Kiruuma	Kirwanyi	Kirwanyi	1,932	772		30	26
Kiruuma	Kirwanyi	Mulanda	912	402		15	26
Kiruuma	Kasolokampo	Kikyukyulu	1,859	814		31	26
Kiruuma	Kasolokampo	Kibuuza	1,924	404		15	26
Kiruuma	Makukuulu	Lugalama	932	132		5	26
Kiruuma	Makukuulu	Kakonyi	1,711	568		22	26
Kiruuma	Makukuulu	Kyankumba	1,684	564		22	26
Kiruuma	Makukuulu	Kitanda	2,730	604		23	26
Kiruuma	Makukuulu	Bugomba	1,681	637		24	26
Kiganda	Bubanda	Kabaale	1,500	370		70	5
Kiganda	Bubanda	Kisonko	585	147		28	5
Kiganda	Bubanda	Kyankungu	650	120		23	5
Kiganda	Kiyonga	Nyaruteete	455	121		23	5
Kiganda	Kiyonga	Rwakirangala	730	176		34	5
Kiganda	Kiyonga	Rwobushumi	750	180		34	5
Kiganda	Dyngoma	Lugazi A	650	180		34	5
Kiganda	Dyngoma	Lugazi B	475	125		24	5
Kiganda	Dyngoma	Mirembe	950	140		27	5

2.7 Questionnaire development

A single questionnaire adapted from the Uganda Demographic Health Surveys was used to collect survey data. The questionnaire collected information covering all aspects relevant to the survey objectives including information on (i) demographic characteristics of both primary caregiver and eligible children, (ii) child's immunisation status, (iii) community outreach programs, (iv) barriers associated with accessing immunisation, (v) experiences with accessing immunisation services, (vi) knowledge on immunisation and (vii) household characteristics.

Prior to its use, the questionnaire was reviewed by key stakeholders, including UNEPI to ensure content validity and alignment with survey goals. The questionnaire was translated into the three predominant languages spoken in the survey communities (Luganda, Kinyarwanda, and Runyankore). The questionnaire was programmed using Open Data Kit (ODK) collection software to facilitate Computer-Assisted Personal Interviewing (CAPI). This digital data collection method enhanced efficiency, accuracy, and data security during the survey process.

2.8 Training of survey team

The survey team was comprised of 16 members, including 10 research assistants, 2 team leads/supervisors, 1 GIS expert, 1 data quality officer, 1 data manager, and 1 research officer. The team underwent a rigorous three-day training program covering various aspects of the survey including training on the protocol and data collection tools, interviewing techniques, field procedures, questionnaire content (for both English and translated versions), administration of both paper and electronic questionnaire, and using GPS gadgets. Mock interviews were conducted during the training to simulate actual fieldwork scenarios and enhance the team's interviewing skills.



Photo showing part of the survey team during training session

2.9 Pretesting of the questionnaire

The survey questionnaire was pretested prior to use. The pretesting was conducted on 19th March 2024 in Nakisunga sub-county, Mukono district. A total of 10 randomly selected households participated in the pretest. The selection of the pretest community was informed by the administrative data on ZDC burden gathered between June and December 2023. Following the pretest, a debrief session was conducted to evaluate the effectiveness of the questionnaire. Based on the insights from the pretest, modifications were made to the questionnaire, and strategies for participant enrollment during the actual data collection were revised.

2.10 Community engagement

Prior to the commencement of data collection, the survey team reached out to the local council leaders and VHTs. During these engagements, the team leads explained the survey objectives, introduced the survey team members and highlighted the survey's significance within the context of Uganda's immunisation program. Additionally, the team sought guidance from local leaders to navigate the communities effectively during data collection.

2.11 Data collection

a) Household Survey

At the household level, mothers/primary caretakers of children aged 18 weeks to 23 months in enrolled households were interviewed using a detailed structured questionnaire. Survey data was collected by survey teams using hand-held tablet computers. In situations where the identified household had more than one eligible child or multiple births, information was collected for all children.



Data collection at one of the households

Information on immunisation status was collected verbally from the mother/ primary caregiver and was cross-checked with the information on the immunisation card/book when available. Global Positioning System (GPS) coordinates were captured for all enrolled households for use in the mapping and visualization of the identified ZDC.

b) Qualitative data collection.

To gain a deeper understanding of the reasons for ZDC and UIC, two participant dialogues were conducted with Village Health Team (VHT) members from the surveyed villages in the hard-to-reach community (Butoloogo sub-county) and pastoral community (Kigando sub-county). At the beginning of the dialogues, a leaflet containing information about the purpose for the dialogue and numbers of ZDC and UIC by village was shared

with the VHTs. The topics discussed included the role of VHTs with regard to immunisation, the VHT perceptions of the burden of ZDC and UIC in their communities, reasons why ZDC and UIC exist in their communities and how to improve uptake of immunisation services.

Following the participant dialogues, 19 in-depth interviews (IDIs) were conducted with caregivers of ZDC from the same communities, who were identified from the quantitative survey data. Selection of caregivers was based on key findings on factors associated with ZDC and UIC from the survey, which included children born in the community (at home or with assistance of TBAs) and caregivers who were grandparents and the caregiver's age. The topics discussed included the benefits of immunizing children, reasons why their children are zero dose, and how to improve the uptake of immunisation services. Data were collected by two research assistants.

2.12 Data management

a) Quantitative data management

Data from the tablets was transferred at the end of every day to a secure database for storage. Only authorized survey staff were allowed access to stored data. All datasets for analyses were de-identified and no individual-level data is reported as results or included in any external communication.

Data from the GPS devices was extracted and stored on a computer. This was followed by the use of the DNR-GPS (Department of Natural Resource Global Positioning System) application to show all coordinates collected. The same application was used to transform the data into Microsoft Excel for data management and cleaning using Arc-tool box which is part of the GIS applications. This was followed by the use of the general tool in the software to clean the data including: appending, merging, sorting, renaming, and finding/deleting identical data sets. The generalization tool was used to dissolve and eliminate features followed by a projection and

transformation tool which presents the earth as a flat surface. Finally, following this transformations and management, data was used for mapping and geospatial analysis.

b) Qualitative data management

The in-depth interviews and community dialogues were recorded and labelled with a unique identifier and stored in a pre-determined folder in a password-protected computer. Detailed contact summaries were written to summarise key findings from the data, labelled with the unique identifier and shared with team members for review. Audio recordings were transcribed verbatim in the English language. All hand-written paper versions of the interview and dialogue notes were stored in a filing cabinet at the field office. All electronic copies of the interview and dialogue notes and transcripts were labelled and stored in pre-labelled folders in a password-protected computer.

2.13 Data analysis

a) Quantitative data analysis

The primary outcome for the targeted survey was the proportion of ZDC defined as children aged 12 to 23 months who had not received the first dose of DPT by the time of the survey. Secondary outcomes included: 1) UI children defined as children aged 12 to 23 months missing the third dose of DTP vaccine by the time of the survey; 2)

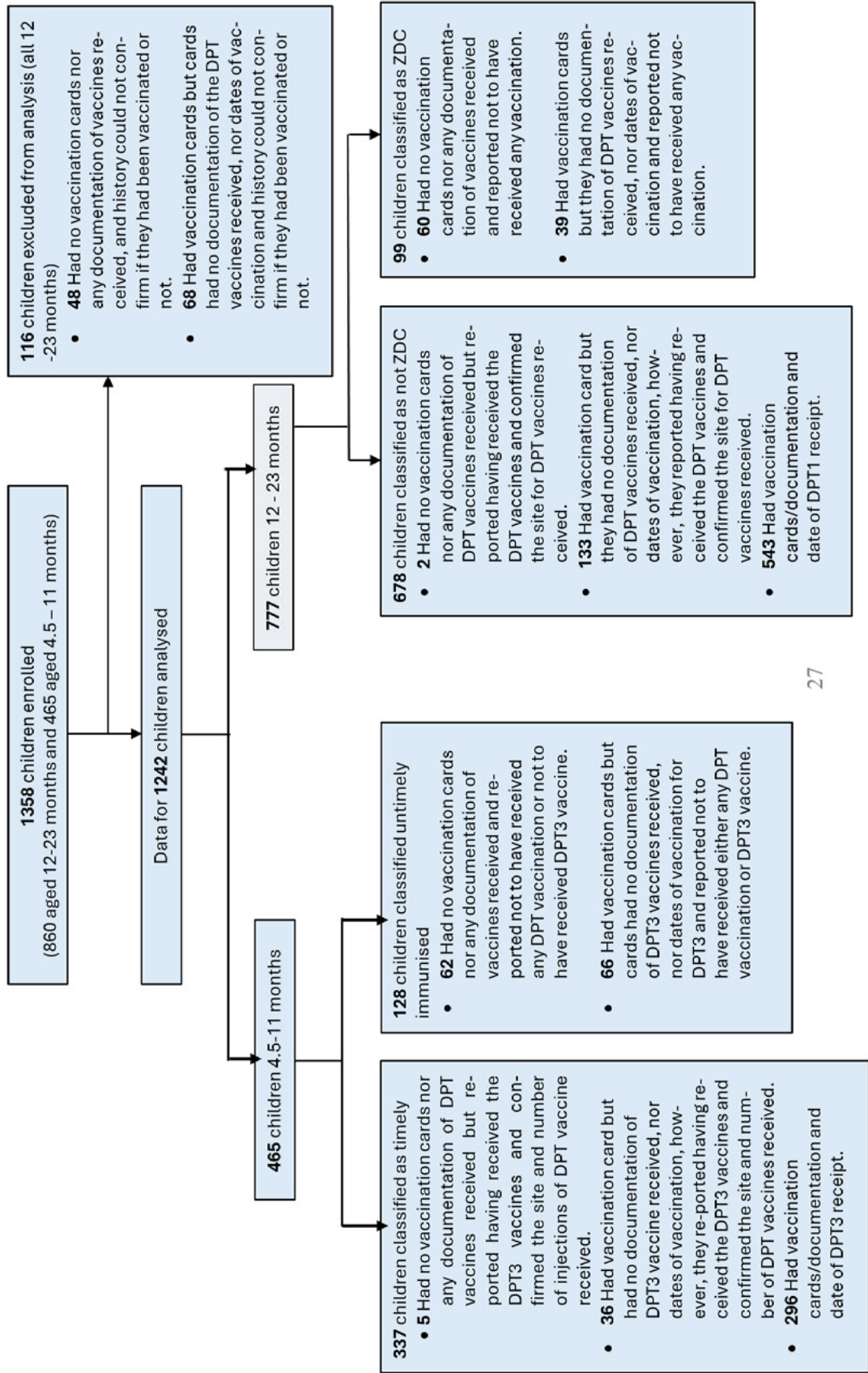
untimely immunisation was defined as children aged 4.5 – 11 months that have not received any single dose of DPT or had not received DPT3 by the time of the survey; 3) factors associated with ZDC, UI children and untimely immunisation.

Data was analysed at three levels beginning with a descriptive summary of all the study variables for the ZDC and Under-immunised communities based on proportions (for categorical variables) and means/medium (for continuous variables). This was followed by bivariate analysis to show the bivariate association of the different outcome variables with the identified independent variables. Lastly, a multivariate analysis was performed to compare populations and assess which variables predict the likelihood of a child being zero dose, under-immunised or untimely immunised. All the analyses were conducted using STATA, version 15, and significance was assessed at the 0.05 level.

Classification of children by outcome

Overall, 1358 children were enrolled in the study including 860 children aged 12 -23 months and 465 children aged 4.5 – 11 months. Analysis was completed for 777 children aged 12 -23 months and for all children 4.5 – 12 months. The reason for exclusion of the 116 children (all in the age group of 12 -23 months) from the analysis was failure to classify them as immunised or not immunised as presented in Figure 2.

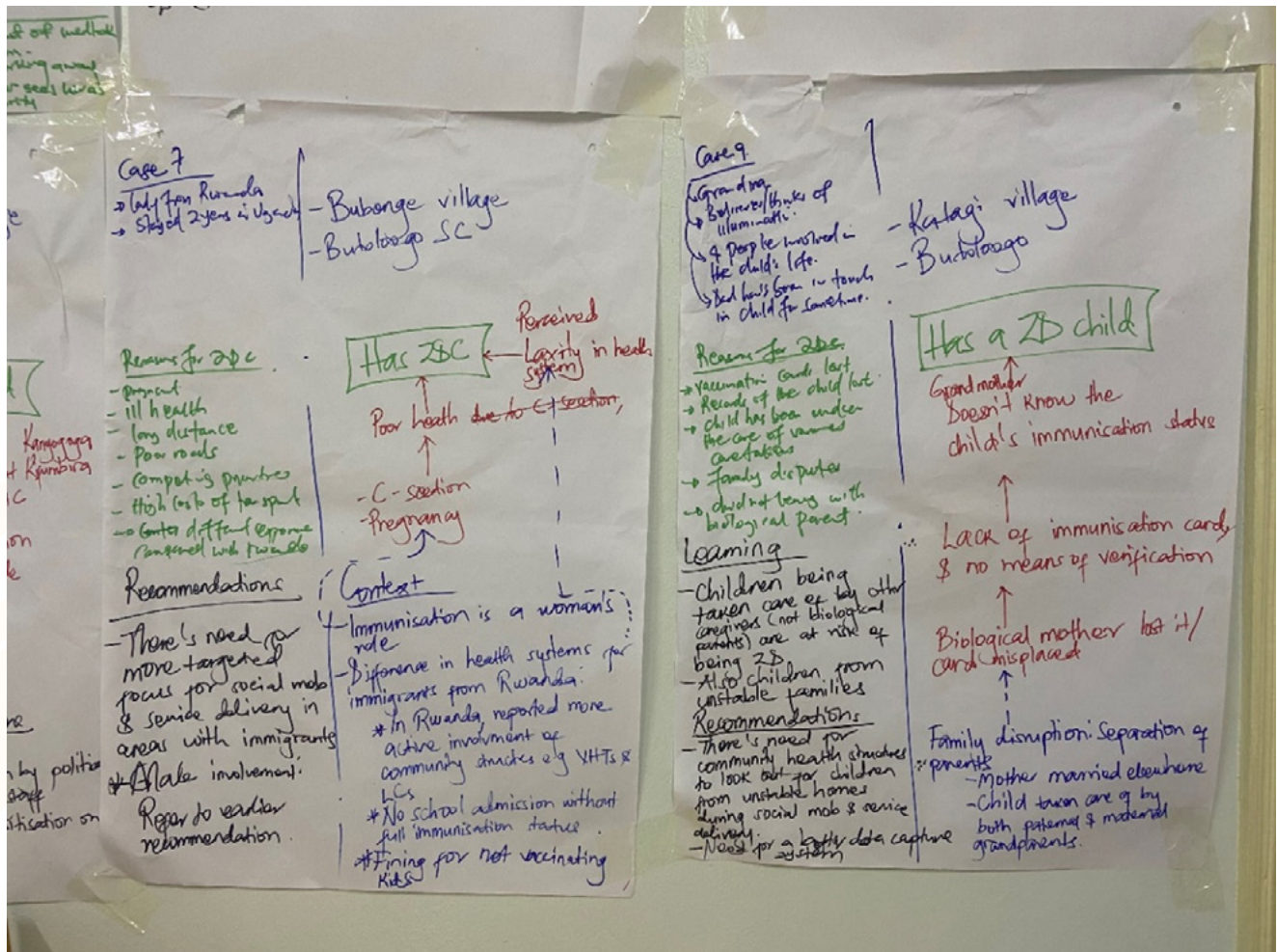
Figure 2: Flow chart showing generation of the outcome variable



b) Qualitative data analysis

A manual method of analysis, using detailed contact summaries from the in-depth interviews and root cause analysis was employed to determine the core barriers to seeking immunisation from caregivers of zero-dose children. The process was led by a senior social scientist and assisted by the research assistants who profiled and provided a comprehensive context on each case highlighting the key reason for not following through with the immunisation schedule. Five other core team members of the study equally participated in the discussions for two weeks.

Figure 3 : An example of a root cause analysis for data from an in-depth interview



The figure presents an example of the root cause analysis process undertaken by the team to gain insights from the in-depth interviews conducted with zero-dose caregivers.

During the analysis and synthesis of the data, each case (in-depth interview participant) was presented by the respective research assistant profiling their demographics, general living and working conditions, relationship to the ZDC, and overall reasons for not immunising. Root cause analysis was done to identify barriers to immunising. Each case was thoroughly discussed and summarised on a flip chart, juxtaposing between the two sub-counties. All reasons for being ZDC were then compiled and synthesised into themes. Themes were generated as patterns that captured barriers. Themes were modified along the synthesis process and related to the outcome of the study.

2.14 Ethical considerations

Approval of the survey was sought from the Makerere University School of Public Health Higher Degrees Research and Ethics Committee (SPH REC) and the Uganda National Council for Science and Technology (UNCST). Administrative clearance was sought from the Ministry of Health and Mubende District Offices. Voluntary written informed consent and assent were sought from respondents prior to interviews. To ensure confidentiality, all data including respondents' names, titles, and contact information were secured in a lockable cabin and only accessible to the study team. Quotes were not attributed to any individuals. Individually identifiable information was not included in any reports or other external communication of findings from the survey.



3.0 FINDINGS OF THE SURVEY

3.1 Enrolment rates

3.1.1 Enrolment of children aged 12-23 months.

The survey was powered to enrol 297 children aged 12 - 23 months in each community (891 children aged 12-23 months). Of these, 860 (96.5%) were successfully enrolled including: 1) 283 (95.3%) in the under-served community (Kiruuma sub-county), 287 (96.6%) in the hard-to-reach community (Butoloogo sub-county), and 290 (97.6%) in the pastoralist community (Kigando sub-county). The reasons for the sub-optimal enrolment rates are as described in Table 3.

Table 4: Reasons for sub-optimal enrolment rates for children aged 12 - 23 months

Community	Reasons
Butoloogo sub-county (Hard to reach)	<p>There was resistance to the survey as several households are opposed to vaccination due to religious beliefs. An example are the households located in Kacuka village, Kyeza Parish.</p> <p>Discrepancy between the number of households registered in the administrative documents compared to what was on ground. In some villages, there were less households than registered which led to difficulties in achieving the estimated number of children aged 12 -23 months from the communities. A case in point was Bubenge village in Kyeza parish.</p>
Kigando sub-county (Pastoralist)	Similar to Butologo, more households were registered in the administrative documents than on ground in some villages like Lugazi B village, creating challenges of achieving the estimated number of children aged 12 – 23 months.
Kiruuma sub-county (Underserved)	Several acres of land had been sold off to an investor resulting in many of the households relocating to other areas thus creating challenges with achieving the sample size.

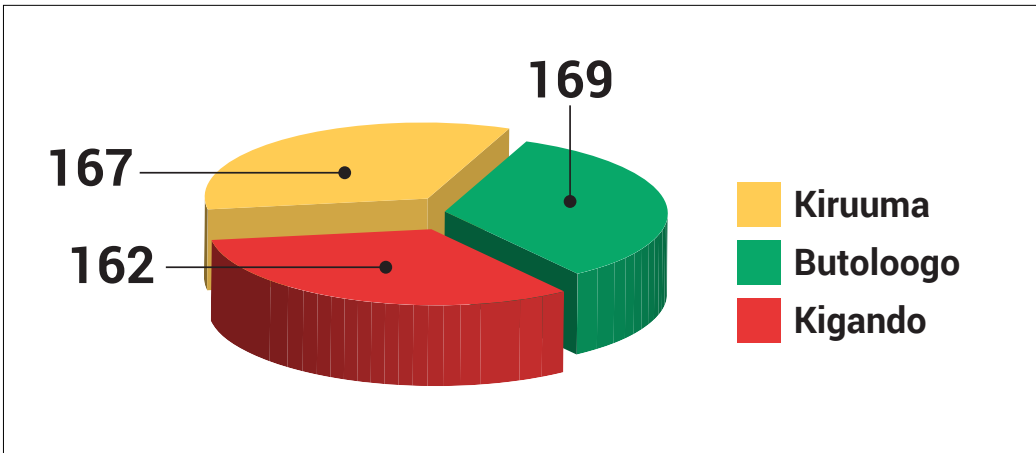
Note: Details of the number of children targeted versus enrolled are highlighted in Annex 1.

Although 860 children aged 12-23 months were enrolled in the survey, this report only includes data for 777 (90.3%) who had complete data for classification of the outcome. Figure 2 provides details of the exclusions and the reasons for their exclusion.

3.1.2 Enrolment of children aged 4.5-11 months

A total of 498 children (167 in the underserved communities, 169 in the hard-to-reach communities and 162 in the pastoralist community) were enrolled in the survey. Of these, the report includes data for 465 (93.4%) children whose outcome could be classified in the analysis. Figure 4 summarizes the enrolment rates of the participants aged 4.5 -11 months in the survey stratified by subcounty.

Figure 4: Number of children (4.5-11 months) enrolled in the survey



The pie chart showing the distribution of the 498 children enrolled in the three selected sub-counties of Kiruuma (Underserved), Kigando (Pastoralist) and Butologgo (Hard to reach) sub-counties in Mubende district.

3.2 Distribution of respondents in the survey areas

Details of household selection have been provided in section 2.6. Figure 5 shows the distribution of the households enrolled in the survey from the three study communities. Also included in the maps are the public health facilities within the region as well as the available immunization outreach centres in the

Figure 5: Distribution of the survey households in Kiruuma Sub-County

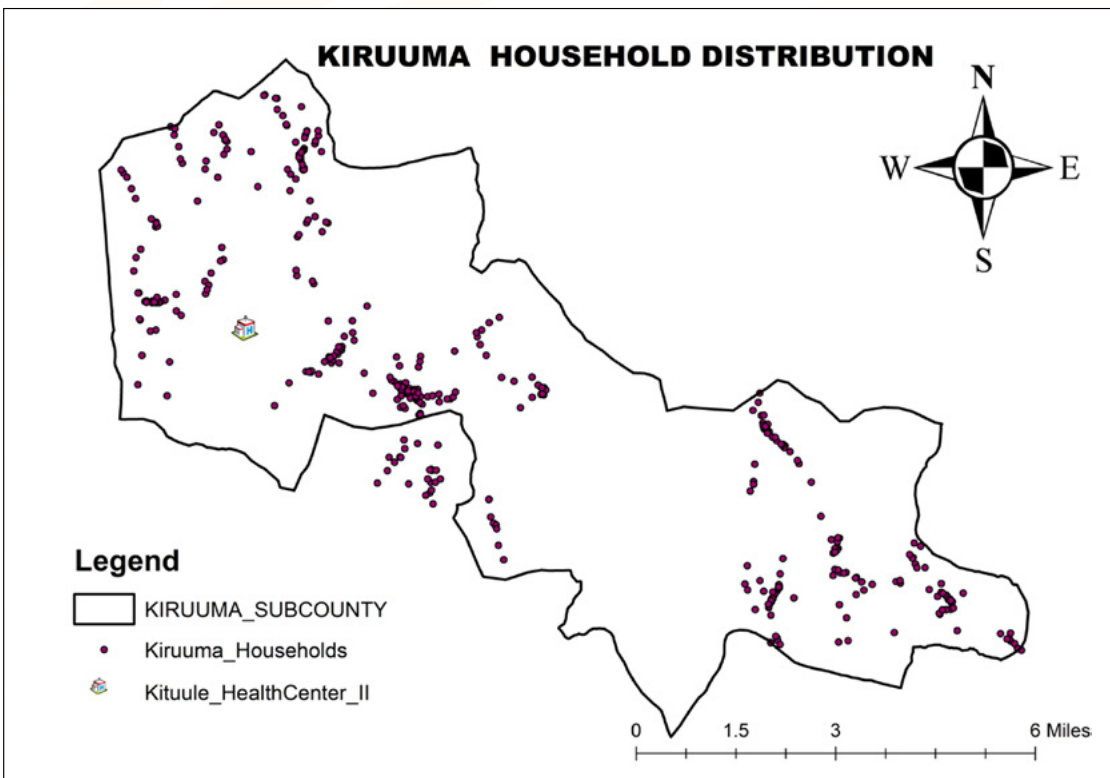


Figure 6: Distribution of the survey households in Kigando Sub-County

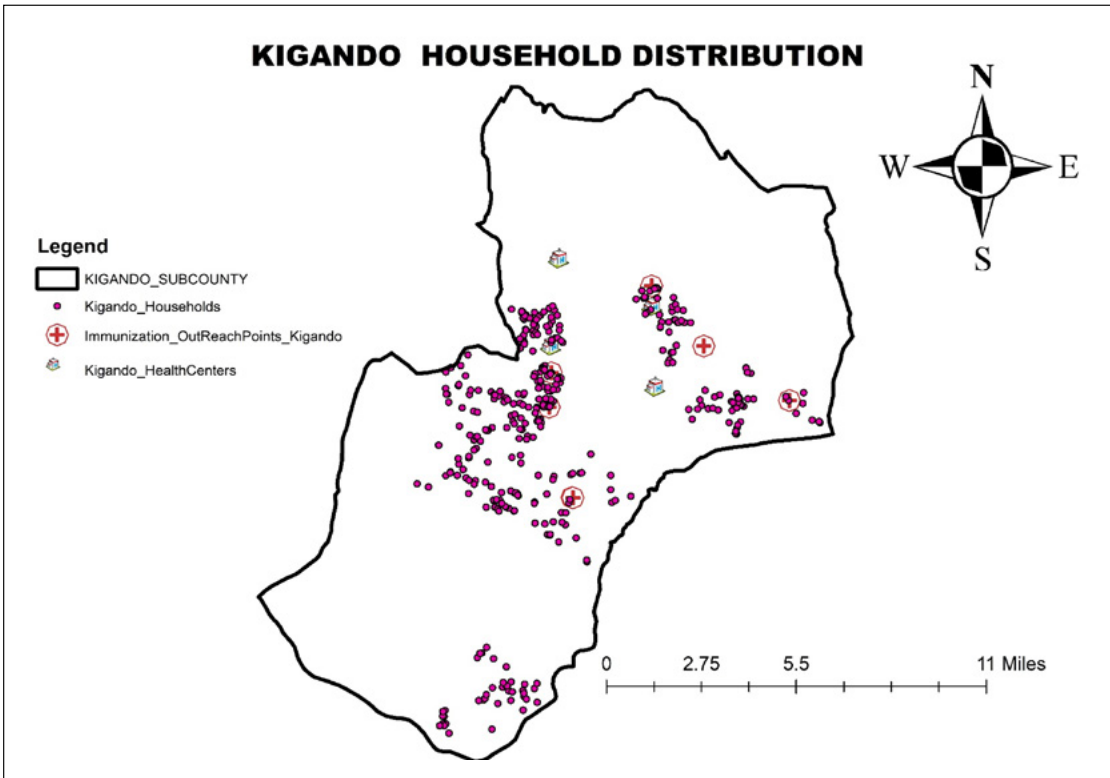
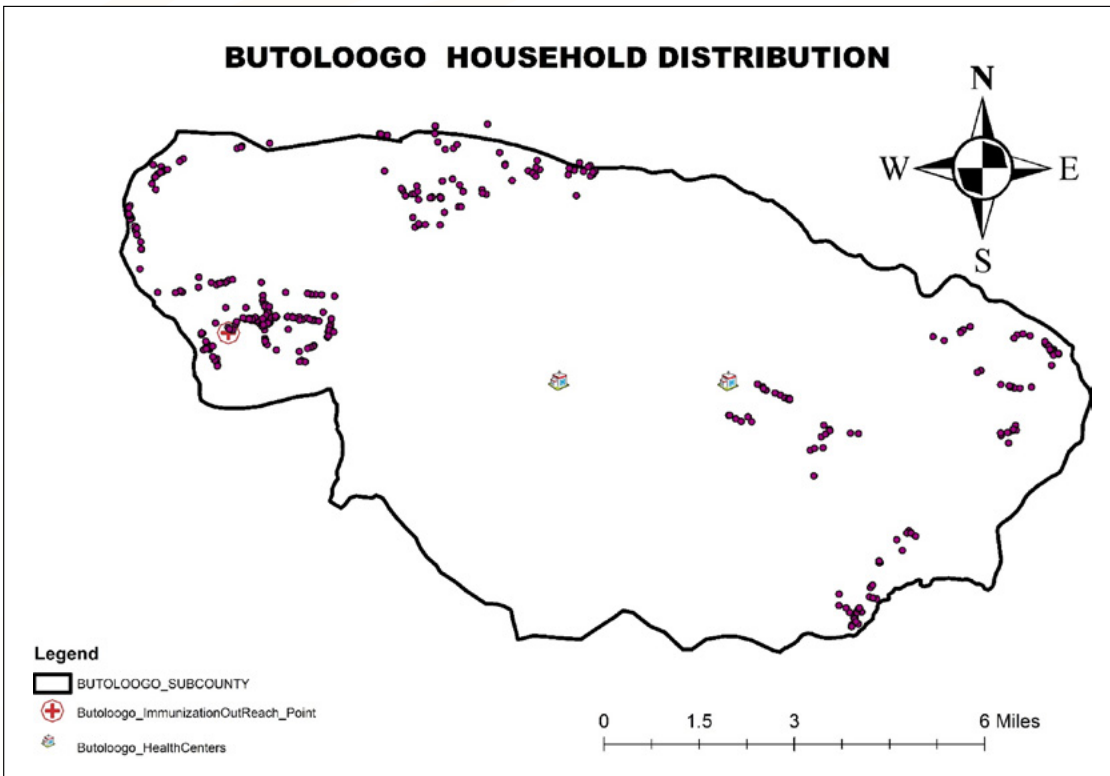


Figure 7: Distribution of the survey households in Butolooگو Sub-County



Distribution of survey households across the three selected sub-counties—Kiruuma (underserved), Kigando (Pastoralists), and Butolooگو (Hard to reach). It also highlights immunisation service delivery points (health centres and immunisation outreach points) and key geographical features like forest reserves and swamps.

3.3 Overall characteristics of the 1,242 children aged 4.5 - 23 months included in the analysis.

3.3.1 Characteristics of caregivers.

Table 4 presents the characteristics of the caregivers of the 1,242 children included in the analysis. Overall, 1219 interviews were conducted with the caregivers. The median (Interquartile range [IQR]) age of the caregivers was 28 (23 -35) and most had primary education (71.2%) as the highest level of education attained.

Table 5: Social demographic characteristics of the enrolled caregivers

Characteristic	Community			
	Kiruuma (%)	Butoloogo (%)	Kigando (%)	Total (%)
N	387	420	412	1,219
Age				
Below 18 years	6 (1.6)	11 (2.6)	6 (1.5)	23 (1.9)
18-24	127 (32.8)	128 (30.5)	125 (30.3)	380 (31.2)
25-34	161 (41.6)	178 (42.4)	169 (41.0)	508 (41.7)
35 or more	93 (24.0)	103 (24.5)	112 (27.2)	308 (25.3)
Sex				
Female	347 (89.7)	353 (84.0)	357 (86.7)	1,057 (86.7)
Male	40 (10.3)	67 (16.0)	55 (13.3)	162 (13.3)
Education level of care provider				
None	54 (14.0)	80 (19.0)	53 (12.9)	187 (15.3)
Primary	279 (72.1)	313 (74.5)	276 (67.0)	868 (71.2)
Secondary /Tertiary	54 (14.0)	27 (6.4)	83 (20.1)	164 (13.5)
Respondents' religion				
Christians	372(96.1)	392(93.3)	395(95.9)	1159(95.1)
Muslims	10 (2.6)	18 (4.3)	12 (2.9)	40 (3.3)
Others	5 (1.3)	10 (2.4)	5 (1.2)	20 (1.6)
Marital status				
Single/Separated/divorced/ widowed	29 (7.5)	45 (10.7)	56 (13.6)	130 (10.7)
Married/Cohabiting	358 (92.5)	375 (89.3)	356 (86.4)	1,089 (89.3)
Respondent is primary care giver				

Characteristic	Community			
	Kiruuma (%)	Butoloogo (%)	Kigando (%)	Total (%)
No	8 (2.1)	17 (4.0)	35 (8.5)	60 (4.9)
Yes	379 (97.9)	403 (96.0)	377 (91.5)	1,159 (95.1)
Employment status				
Unemployed	132 (34.1)	141 (33.6)	109 (26.5)	382 (31.3)
Employed	255 (65.9)	279 (66.4)	303 (73.5)	837 (68.7)

3.3.2 Socio-demographic characteristics of the 1,242 children aged 4.5–23 months that are included in the analysis.

Table 5 summarizes the social demographic characteristics of the children enrolled in the survey. Of the 1,242 children included in the analysis, 61.2% were in the 12–23 months age-group. Most of the children were born in a health facility (66.8%) and majority (80.7%) had at least one sibling.

Table 6: Social demographic characteristics of the children enrolled in the survey (N=1242)

Characteristic	Community			Total n (%)
	Kiruuma n (%)	Butoloogo n (%)	Kigando n (%)	
Child's age in months (grouped)				
4.5-11	152 (38.8)	163 (37.9)	150 (35.7)	465 (37.4)
12-23	240 (61.2)	267 (62.1)	270 (64.3)	777 (62.6)
Sex				
Female	209 (53.3)	226 (52.6)	198 (47.1)	633 (51.0)
Male	183 (46.7)	204 (47.4)	222 (52.9)	609 (49.0)
Place of birth				
Health facility	237 (60.5)	300 (69.8)	293 (69.8)	830 (66.8)
Home/TBA	109 (27.8)	115 (26.7)	123 (29.3)	347 (27.9)
Other	46 (11.7)	15 (3.5)	4 (1.0)	65 (5.2)
Ethnicity				
Muganda	130 (33.2)	61 (14.2)	35 (8.3)	226 (18.2)
Munyankole	86 (21.9)	86 (20.0)	321 (76.4)	493 (39.7)
Munyarwanda	109 (27.8)	213 (49.5)	36 (8.6)	358 (28.8)

Characteristic	Community			Total n (%)
	Kiruuma n (%)	Butoloogo n (%)	Kigando n (%)	
Other	67 (17.1)	70 (16.3)	28 (6.7)	165 (13.3)
Number of siblings				
None	74 (18.9)	88 (20.5)	78 (18.6)	240 (19.3)
1 - 3	216 (55.1)	213 (49.5)	207 (49.3)	636 (51.2)
4 or more	102 (26.0)	129 (30.0)	135 (32.1)	366 (29.5)
Religion				
Christian	378(96.4)	399(92.8)	399(95.0)	1176(94.7)
Muslims	11 (2.8)	22 (5.1)	16 (3.8)	49 (3.9)
Others	3 (0.8)	9 (2.1)	5 (1.2)	17 (1.4)
Biological mother alive				
No	1 (0.3)	0 (0.0)	2 (0.5)	3 (0.2)
Yes	391 (99.7)	429 (99.8)	418 (99.5)	1,238 (99.7)
Biological father alive				
No	3 (0.8)	3 (0.7)	4 (1.0)	10 (0.8)
Yes	389 (99.2)	427 (99.3)	414 (98.6)	1,230 (99.0)

Other places of birth: outreaches, on the way to hospital, prison; €Other caregivers: Grandparent, sibling, auntie; Other tribes: tribes across Uganda other than the ones in this table; ¥

3.3.3 Caregiver engagement in community outreach programs

Majority of the respondents (81%) reported having taken their children to outreaches for immunisation, reflecting the potential importance of outreach campaigns to immunisation uptake.

Table 7: Caregiver engagement in community outreach programs

Characteristic	Community			
	Kiruuma	Butoloogo	Kigando	Overall
N	387	420	412	1219
Reported outreach campaigns in the community				
No	220 (56.8)	135 (32.1)	121 (29.4)	476 (39.1)

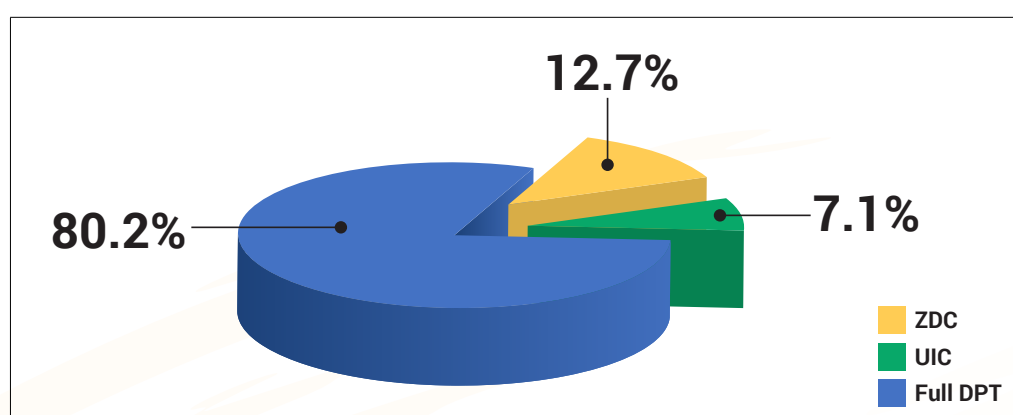
Characteristic	Community			
	Kiruuma	Butoloogo	Kigando	Overall
Yes	157 (40.6)	277 (66.0)	268 (65.0)	702 (57.6)
Don't know	10 (2.6)	0 (1.9)	23 (5.6)	41 (3.3)
Categories of outreach campaigns in the community				
N	157	277	268	702
National immunization days campaign	119 (75.8)	184 (66.4)	129 (48.1)	432 (61.5)
Child Health day campaign	67 (42.7)	155 (56.0)	170 (63.4)	392 (55.8)
Ever participated in any immunization outreach campaigns				
No	51 (32.5)	47 (17.0)	58 (21.6)	156 (22.2)
Yes	106 (67.5)	230 (83.0)	210 (78.4)	546 (77.8)
Child ever immunized during outreach campaign				
No	53 (33.8)	42 (15.2)	38 (14.2)	133 (19.0)
Yes	104 (66.2)	235 (84.8)	230 (85.8)	569 (81.0)
Reasons why the child was not immunised at an outreach campaigns point.				
N	53	42	38	133
High costs	1 (1.9)	0 (0.0)	4 (10.5)	5 (3.8)
Long distance	4 (7.6)	5 (11.9)	7 (18.4)	16 (12.0)
Partner/ relative refused	0 (0.0)	0 (0.0)	2 (5.3)	2 (1.5)
Not informed of immunization out	10 (18.9)	12 (28.6)	12 (31.6)	34 (25.6)
Do not know the immunization points	1 (1.9)	2 (4.8)	1 (2.6)	4 (3.0)
Child already immunised	12 (22.6)	5 (11.9)	5 (13.2)	22 (16.5)
Child not around	3 (5.7)	1 (2.4)	1 (2.6)	5 (3.8)
Child not born	2 (3.8)	2 (4.8)	3 (7.9)	7 (5.3)
Child not of age	5 (9.4)	5 (11.9)	1 (2.6)	11 (8.3)
Didn't have money	0 (0.0)	1 (2.4)	2 (5.3)	3 (2.3)
Not interested	1 (1.9)	0 (0.0)	1 (2.6)	2 (1.5)
Others	14 (26.4)	9 (21.4)	6 (15.8)	29 (21.8)

3.4 OBJECTIVE 1: Burden of ZD, UI and Un-timely immunisation in the survey communities

3.4.1 Burden of Zero dose children and UI in the Survey communities

Zero-dose children in this report are defined as children aged 12-23 months who had not received a single dose of DPT by the time of the survey. Of the 777 children aged 12-23 months included in the analysis, 99 had not received DPT dose putting the overall prevalence of ZDC at 12.7% in the survey communities. Under-immunised children in this report are defined as children aged 12-23 months who had received DPT1 but not received DPT3 by the time of the survey. Overall, 55 children had received DPT1 but had not received DPT3, putting the overall prevalence of UI children at 7.1% in the survey communities (Figure 6).

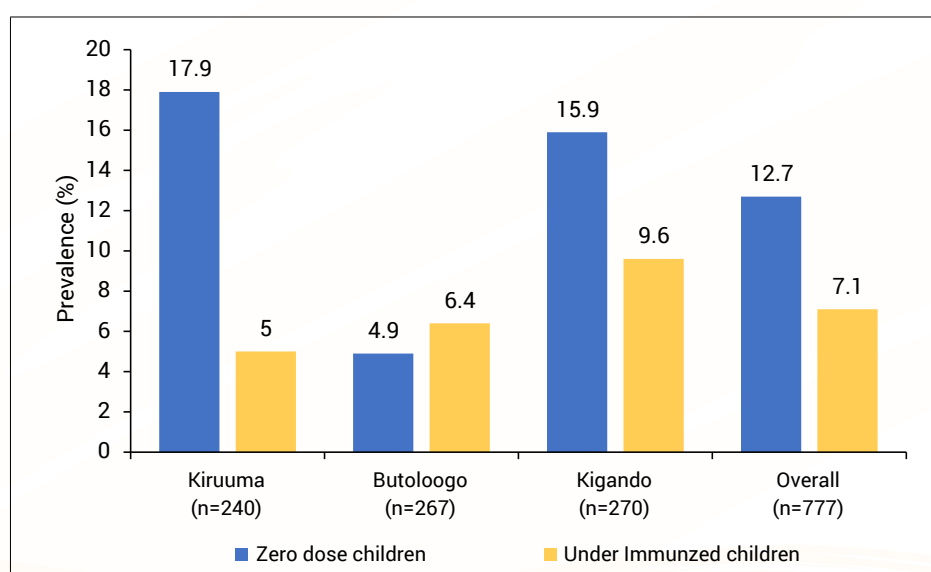
Figure 6: Burden of ZDC and UI children in the survey communities



ZDC: Zero doze children, UIC: under immunised children; and Full DPT: Full DPT immunisation

On stratification by study community, the burden of ZDC was highest in Kiruuma (under-served community; 17.9%) followed by the pastoralist communities in Kigando (15.9%). On the other hand, the prevalence of UI children was highest in Kigando (9.6%) followed by Butologo (6.4%). The burden of ZDC and UIC by study community is presented in Figure 7.

Figure 7: Proportion of Zero-dose and under-immunised children in the three high-risk communities (N=777)



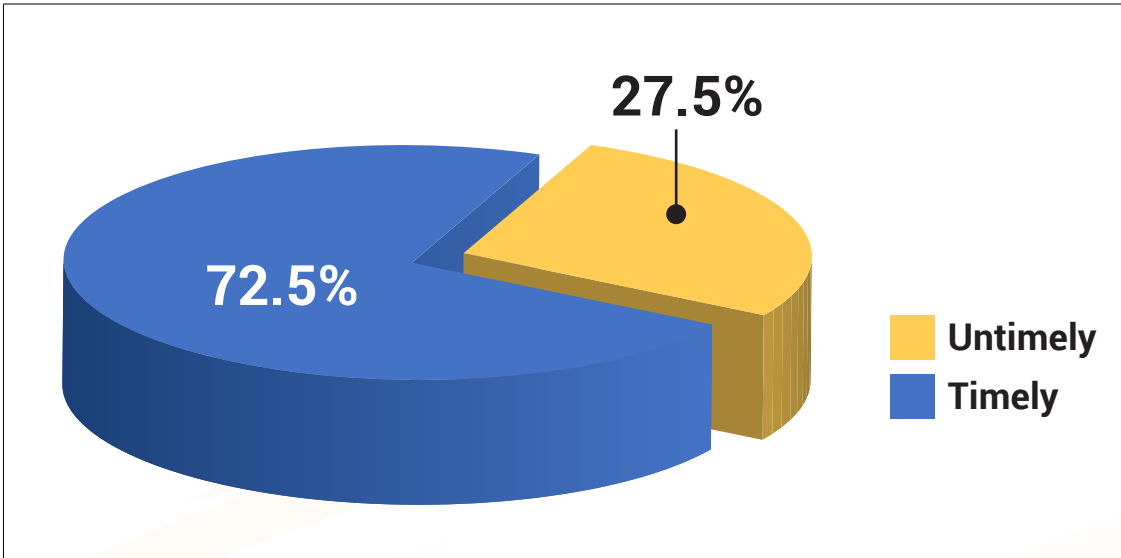
The figure shows the overall prevalence of ZD and UI children and breaks down the prevalence in each of the selected sub-counties of Kiruuma, Butologo and Kigando.

Note: For the burden of ZDC and UI by village, refer to Annex 2.

3.4.2 Burden of Untimely Immunised children in the survey communities

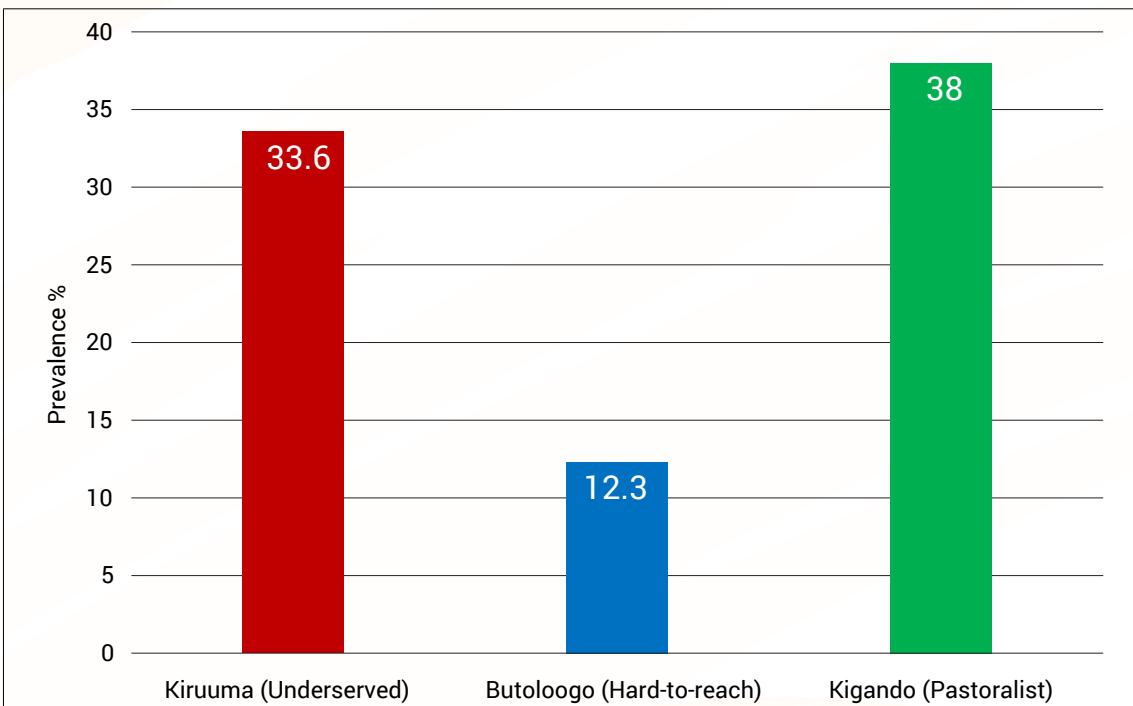
Untimely immunised children are defined as children aged 4.5 – 11 months who have not received DPT3 by the time of the survey. Overall, 128 had not received DPT3 vaccine putting the overall prevalence of untimely immunisation at 27.5% in the survey communities (figure 7).

Figure 8: Proportion of timely and untimely immunization in the study communities



On stratification by study community, the burden of untimely immunization was in highest in Kigando sub-county (Pastoralists) at 38%. This was closely followed by Kiruuma sub-county (Underserved) at 33.6%. Figure 8 presents the burden of untimely immunization by study community.

Figure 9: Burden of untimely immunisation by study community



As highlighted in the table 7 below the proportions of children without DTP 1, among children aged 4.5 – 11 months and those aged 12-23 months are relatively similar. Given that the data was collected at one-point in time, reflections on the observed trends may be better provided after a repeat survey.

Table 8: A comparison of number of children without DPT 1 among children aged 12 - 23 months and 4.5 - 11 months

Community	Number of children without DPT1 (%)	
	Survey estimates (children aged 4.5-11 months)	Survey estimates (children aged 12-23 months)
Butoloogo subcounty	5 (3.1%)	13 (4.9%)
Kigando subcounty	22 (14.7%)	43 (15.9%)
Kiruuma subcounty	28 (18.4%)	43 (17.9%)

3.5 OBJECTIVE 2: Characterization of ZD and UI children in the survey communities

3.5.1 Characteristics of ZD children in the survey communities

Table 7 presents the child and caregiver characteristics of the 99 children classified as ZDC. Kiruuma and Kigando contributed the same number of ZDC (43.4%). There were slightly more male ZDC compared to the females. Interesting to note is that there were equal numbers of ZDC born at home or with assistance of a TBA (48.5%) as was at healthy facilities. Majority of the primary caregivers of ZDC were their biological mothers (74.2%) although fathers and grandparents were often mentioned as the primary care-givers. When we stratified by study sub-county, these the characteristics of the ZDC were similar across the different study areas as shown in Annex Table 3.

Table 9: Characterization of ZDC in the three high-risk communities in Mubende district

Characteristic	Category	Frequency (%)
Sub-county (n=99)	Kiruuma	43 (43.4)
	Butoloogo	13 (13.2)
	Kigando	43 (43.4)
Child's sex (n=99)	Female	46 (46.5)
	Male	53 (53.5)
Child's birthplace (n=99)	Health facility	48 (48.5)
	Community (Home/TBA)	48 (48.5)
	Others/Don't know	3 (3.0)

Characteristic	Category	Frequency (%)
Child's ethnicity (n=99)	Muganda	16 (16.2)
	Mukyankole	48 (48.5)
	Munyarwanda	17 (17.2)
	Other (specify)	18 (18.2)
Number of siblings (n=99)	None	1 (1.0)
	1-3	46 (46.5)
	Four or more	35 (35.4)
	No response	17 (17.2)
Child's religion (n=99)	Christian	95(96.0)
	Muslims	2 (2.0)
	Others	2 (2.0)
Caregiver's age (n=99)	Below 18 years	2 (2.0)
	18-24	31 (31.3)
	25-34	35 (35.4)
	35 or more	31 (31.3)
Caregiver's gender (n=99)	Female	80 (80.8)
	Male	19 (19.2)
Education level of caregiver (n=99)	None	17 (17.2)
	Primary	69 (69.7)
	Secondary/Tertiary	13 (13.1)
Caregiver's marital status (n=99)	Single	7 (7.1)
	Married/Cohabiting	82 (82.8)
	Separated/divorced/ widowed	10 (10.1)
Relationship with primary caregiver (n=99)	Biological mother	69 (69.7)
	Biological father	13 (13.1)
	Biological grandparent	10 (10.1)
	Biological aunt	1 (1.0)
	Other	6(6.1)

Characteristic	Category	Frequency (%)
Caregiver's employment status (n=99)	Unemployed	40 (40.4)
	Employed	59 (59.6)
Mother attended ANC during pregnancy ¹ (n=70)	No	8 (11.4)
	Yes	62 (88.6)
Duration of stay in the village	< 1year	7 (7.1)
	1-5 years	38 (38.4)
	More than 5 years	54(54.5)
Main source of information on immunisation (n=99)	Community meetings	6 (6.1)
	Radio	46 (46.5)
	Television	3 (3.0)
	Word of mouth	29 (29.3)
	Others	15 (15.2)

¹Only assessed for caregivers who were the biological mothers.

3.5.2 Distribution of ZDC in the survey communities

Table 8 shows the proximity of households with ZDC to the nearest health facility in the surveyed communities. In all the survey communities, there were some households with ZDC located within 3.2 Km to nearest facility. Kigando sub-county (pastoralists) had the highest number of ZDC within 3.2 Km of the nearest health facility. On the other hand, Kiruuma sub-county which is an underserved community had the highest number of households with ZDC located beyond 9.7 Km of the nearest facility (44.2%).

Table 10: Proximity of households with zero dose children to nearest health facility

Distance from nearest health facility	Number of households	Percentage of households
Butoloogo sub-county (Hard to reach community) (N=13)		
Less than 3.2 Km	03	23.1
Within 3.2-6.4 Km	03	23.1
Within 6.4- 9.7 Km	07	53.8
Beyond 9.7 Km	00	0
Kigando sub-county (Pastoralist community) (N=43)		
Less than 3.2 Km	16	37.2
Within 3.2-6.4 Km	11	25.6
Within 6.4- 9.7 Km	10	23.3

Distance from nearest health facility	Number of households	Percentage of households
Beyond 9.7 Km	06	13.9
Kiruuma sub-county (Underserved community) (N=43)		
Less than 3.2 Km	07	16.3
Within 3.2-6.4 Km	16	37.2
Within 6.4- 9.7 Km	01	2.3
Beyond 9.7 Km	19	44.2

Figure 10 shows the distribution of households with ZDC in the surveyed communities in relation to the geographic features like forests, water bodies and hills and distance to the nearest health facility. Generally, all the surveyed communities were hilly in topography with a mixture of forest reserves and water bodies. Notably Butolooogo sub-county had more hills compared to the other surveyed sub-counties.

Figure 10a: Distribution of households with ZDC in Butolooogo sub-county (Hard to reach community)

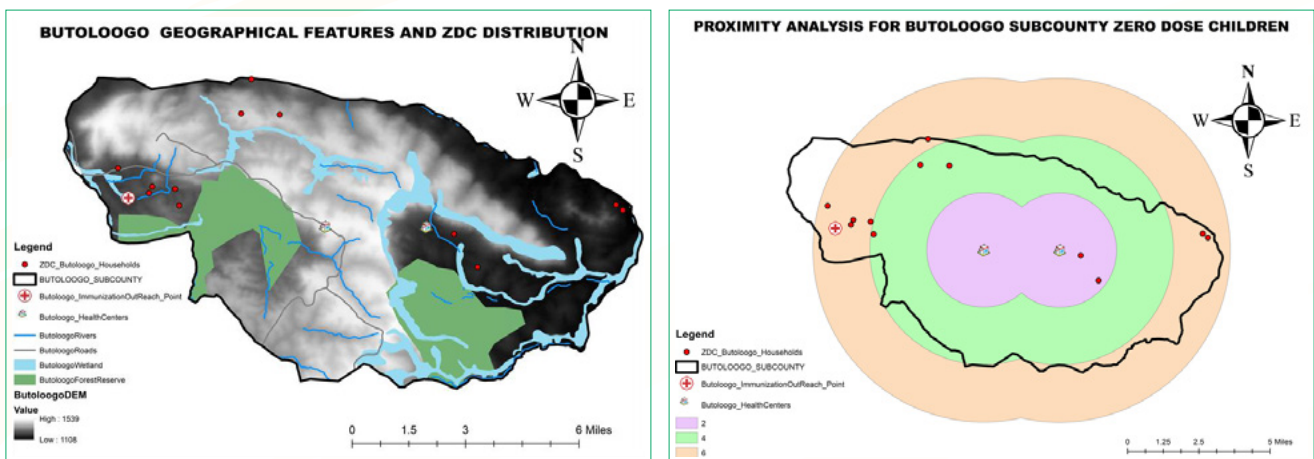


Figure 10b: Distribution of households with ZDC in Kigando sub-county (Pastoralist community)

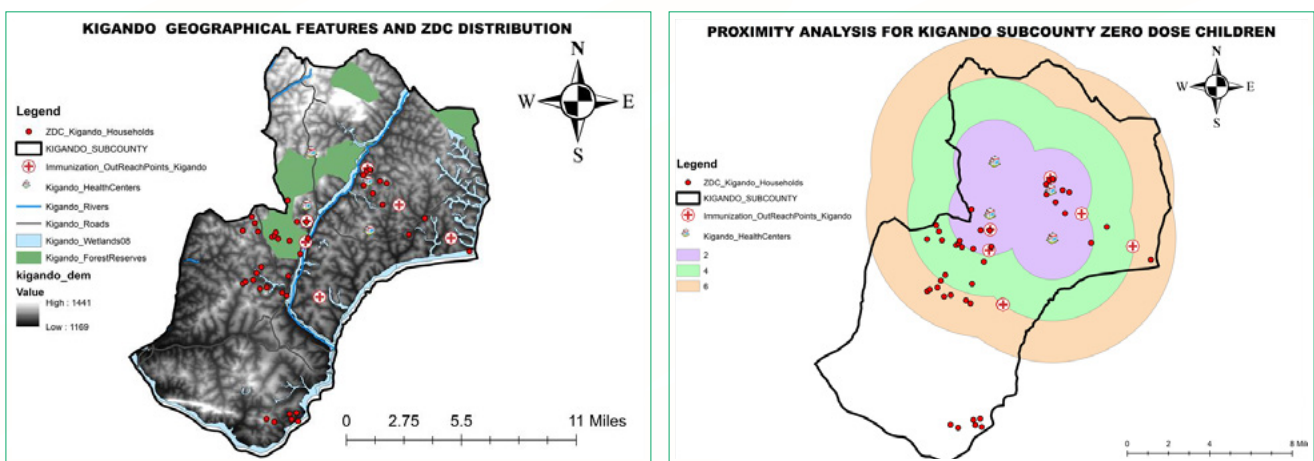
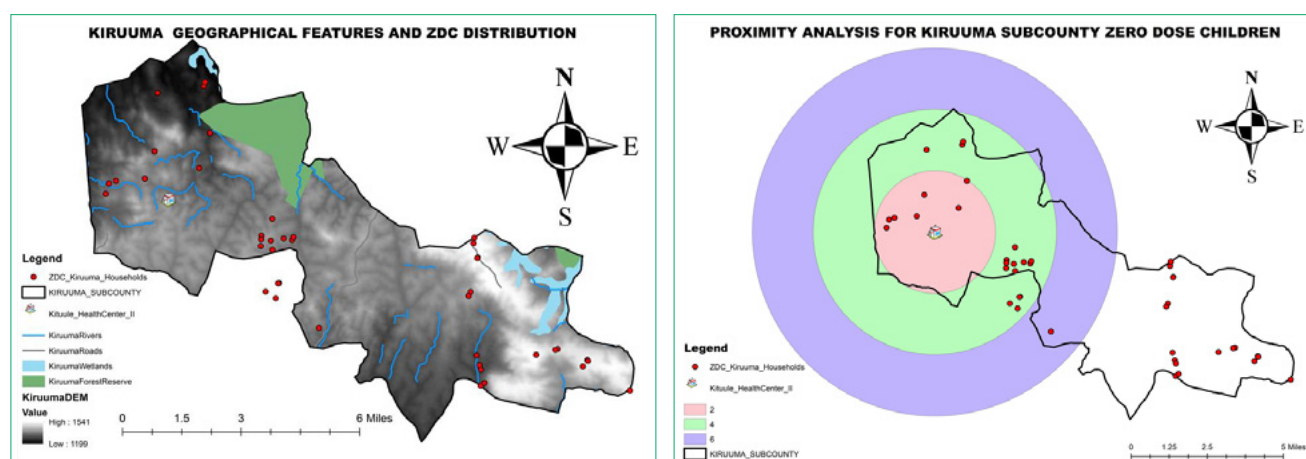


Figure 10c: Distribution of households with ZDC in Kiruuma sub-county (Underserved community)


3.5.2 Characterization of UI children in the survey communities

Table 9 presents the child and caregiver characteristics of the 55 under immunised children. Majority of the UIC were from Kigando sub-county (pastoralists community; 47.3%). As was observed with ZDC, there were slightly more male UIC (51%) compared to the females. Unlike the observation with ZDC, majority of the UIC (72.7%) were born at a health facility. Majority of the caregivers of UIC had attained primary level education as the maximum level of education (76.4%), were the biological mothers (87%) of the children and had attended ANC during pregnancy (97.9%). The Annex 4 highlights characterization of UI children by study community.

Table 11: Characterization of UI children in the three high risk communities in Mubende district

Characteristic	Category	Frequency (%)
Child characteristics		
Sub-county	Kiruuma	12 (21.8)
	Butoloogo	17 (30.9)
	Kigando	26 (47.3)
Sex (n=55)	Female	27 (49.1)
	Male	28 (50.9)
Place of birth (n=55)	Health facility	40 (72.7)
	Community (Home/TBA)	11 (20.0)
	Others/Don't know	4 (7.3)
Ethnicity (n=55)	Muganda	6 (10.9)
	Mukyankole	24 (43.6)
	Munyarwanda	20 (36.4)
	Other	5 (9.1)

Characteristic	Category	Frequency (%)
Number of siblings (n=55)	1-3	22 (40.0)
	Four or more	19 (34.5)
	No response	14 (25.5)
Religion (n=55)	Christians	46 (83.6)
	Seventh Day Adventist	6 (10.9)
	Muslims	1 (1.8)
	Other	2 (3.6)
Caregivers' characteristics		
Age (n=55)	17 or below	4 (7.3)
	18-24	17 (30.9)
	25-34	18 (32.7)
	35 or more	16 (29.1)
Sex (n=55)	Female	49 (89.1)
	Male	6 (10.9)
Education level (n=55)	None	4 (7.3)
	Primary	42 (76.4)
	Secondary/Tertiary	9 (16.4)
Marital status (n=55)	Single	2 (3.6)
	Married/Cohabiting	49 (89.1)
	Separated/divorced/widowed	4 (7.3)
	Married/Cohabiting	49 (89.1)
Relationship with care giver (n=54)	Biological mother	47 (87.0)
	Biological father	5 (9.3)
	Biological grand parent	2 (3.7)
	Biological aunt	0 (0.0)
Employment status (n=55)	Unemployed	15 (27.3)
	Employed	40 (72.7)
Mother attended ANC during pregnancy ¹ (n=48)	No	1 (2.1)
	Yes	47 (97.9)
Duration of staying in the village(n=55)	< 1year	5 (9.1)
	1-5 years	26(47.4)
	More than 5 years	24(43.6)

Characteristic	Category	Frequency (%)
Main source of information on immunisation (n=55)	Community meetings	3 (5.6)
	Radio	25 (46.3)
	Television	8 (14.8)
	Word of mouth	11 (20.4)
	Other	7(13)

¹Only assessed in caregivers who were the biological mothers.

Distribution of UI children in the survey communities

Table 10 shows the proximity of households with UI children to the nearest health facility in the surveyed communities. Similar to what was observed with the ZDC, majority of the UI children in Kigando sub-county (pastoralist community) lived within 3.2 Km of the nearest health facility (46.2%). On the other hand, most of the UI children in Kiruuma sub-county (underserved community) resided within 3.2-6.4 Km of the nearest facility and those in Butolooogo sub-county lived within a 6.4- 9.7 Km radius of the nearest health facility.

Table 12: Proximity of households with under immunised children to nearest health facility

Distance from nearest health facility	Number of households	Percentage of households
Butolooogo sub-county (Hard to reach community) (N=17)		
Less than 3.2 Km	00	0
Within 3.2-6.4 Km	05	29.4
Within 6.4- 9.7 Km	07	41.2
Beyond 9.7 Km	05	29.4
Kigando sub-county (Pastoralist community) (N=26)		
Less than 3.2 Km	12	46.2
Within 3.2-6.4 Km	04	15.4
Within 6.4- 9.7 Km	03	11.5
Beyond 9.7 Km	07	26.9
Kiruuma sub-county (Underserved community) (N=12)		
Less than 3.2 Km	04	33.3
Within 3.2-6.4 Km	06	50.0
Within 6.4- 9.7 Km	00	00
Beyond 9.7 Km	02	16.7

Figure 11 is a map of the sub-counties showing the distribution of households with UIC in the surveyed communities in relation to the geographic features like forests, water bodies and hills and distance to the nearest health facility.

Figure 11a: Distribution of households with UIC in Butuloogo Sub-county (Hard to reach community)

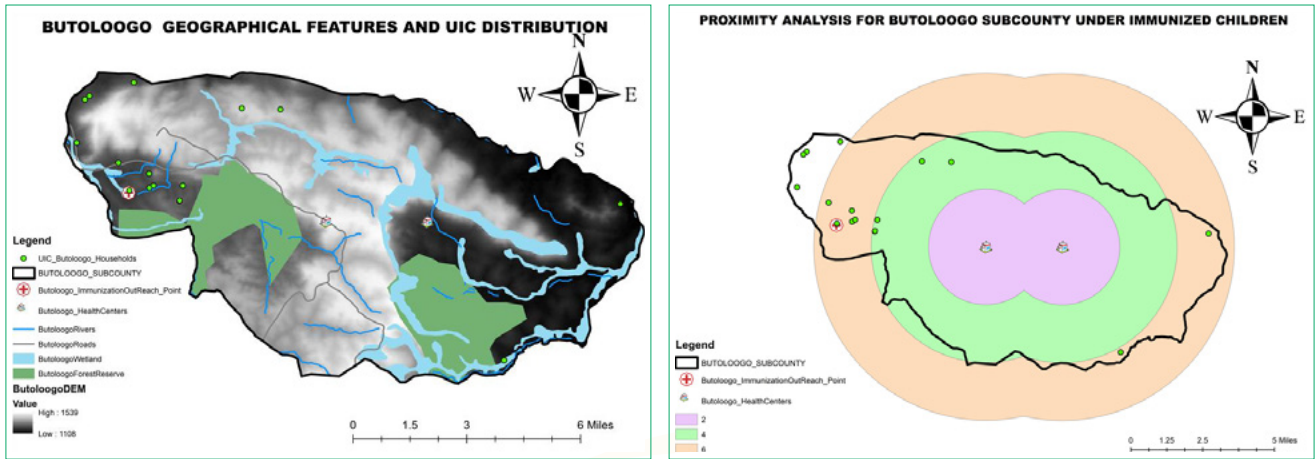


Figure 11b: Distribution of households with UIC in Kigando sub-county (Pastoralist community)

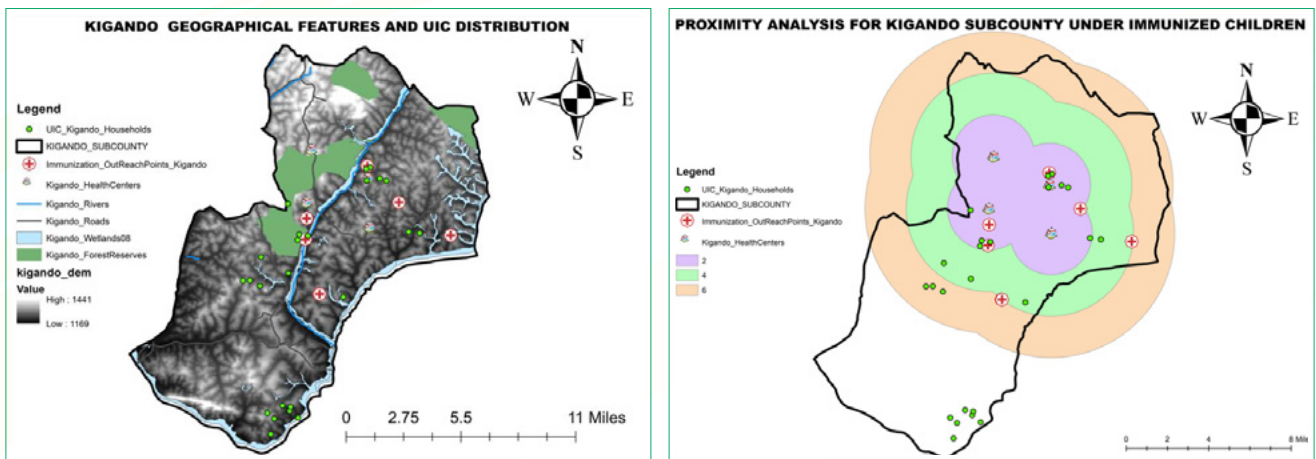
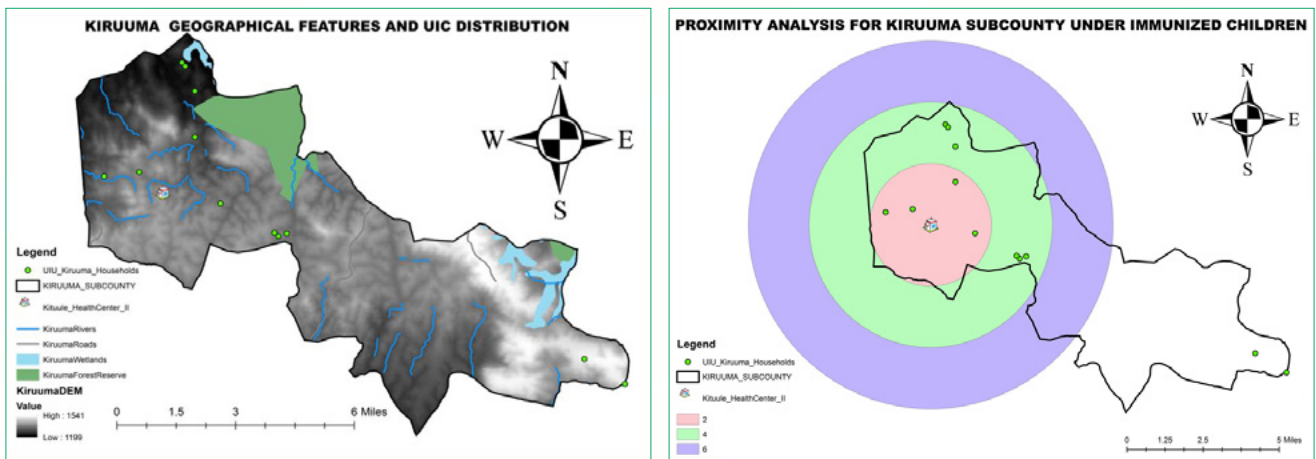


Figure 11c: Distribution of households with UIC in Kiruuma sub-county (Underserved community)



3.6 OBJECTIVE 3: Factors associated with being zero dose.

3.6.1 Childhood factors associated with being zero dose.

Table 11 shows child factors associated with being a ZDC. Factors significantly associated with being ZDC at multivariate analysis included the community/sub-county where the child lived and place of birth. Children living in the Kiruuma sub-county (underserved community) were more likely to be ZDC than those in the other communities. Children born at home or under care of the TBA were two times more likely to be a ZDC compared to children born in health facilities (aPR=2.30 95% CI 1.61-3.30, p<0.001).

Table 14: Child factors associated with ZDC in the survey communities

Characteristic	n/N (%)	Univariable analysis		Multivariable analysis	
		Crude PR (95% CI)	p-value	aPR (95 %CI)	p-value
HRC					
Underserved (Kiruuma)	43/240 (17.9)	1	-	1	-
Hard to reach (Butoloogo)	13/267 (4.9)	0.27 (0.15-49)	<0.001	0.27 (0.15-0.48)	<0.001
Kigando (Pastoralist)	43/270 (15.9)	0.89 (0.60-1.31)	0.549	0.79 (0.54-1.15)	0.215
Sex					
Male	53/391 (13.6)	1	-	-	-
Female	46/386 (11.9)	0.88 (0.61-1.27)	0.495	-	-
Place of birth					
Health facility	48/534 (9.0)	1	-	1	-
Community (Home/TBA)	48/206 (23.3)	2.59 (1.80-3.74)	<0.001	2.30 (1.61-3.30)	<0.001
Others/Don't know	3/37 (8.1)	0.90 (0.29-2.76)	0.857	0.72 (0.23-2.20)	0.559
Wealth index					
Very poor	40/262 (15.3)	1	-	1	-
Poor	49/416 (11.8)	0.77 (0.52-1.14)	0.191	0.75 (0.52-1.09)	0.135
Less poor	10/99 (10.1)	0.66 (0.34-1.27)	0.216	0.76 (0.39-1.48)	0.412

Characteristic	n/N (%)	Univariable analysis		Multivariable analysis	
		Crude PR (95% CI)	p-value	aPR (95 %CI)	p-value
Religion					
Christian	95/740 (12.8)	1	-	-	-
Others	4/37 (10.8)	0.84 (0.33-2.17)	0.722	-	-
Number of siblings					
None	18/148 (12.2)	1	-	-	-
1 - 3	46/400 (11.5)	0.95 (0.57-1.58)	0.830	-	-
4 or more	35/229 (15.3)	1.26 (0.74,2.14)	0.398	-	-

3.6.2 Caregiver factors associated with Zero Dose Children.

Table 12 below shows caregiver factors associated with having a ZDC. Overall, children whose primary caregiver was their biological mother were less likely to be ZDC compared to those who had other primary caregivers (e.g. father, grandparent). Additionally, children whose primary caregiver were grandparents were two times more likely to be ZDC compared to those whose primary caregiver was their biological mother (aPR=2.35 95%, CI 1.22-4.53, p=0.01).

Table 15: Caregiver factors associated with Zero Dose Children

Characteristic	n/N (%)	Univariable analysis		Multivariable analysis	
		Crude PR (95% CI)	p-value	aPR (95% CI)	p-value
Age					
< 18	2/16 (12.5)	1	-	-	-
18-24	31/224 (13.8)	1.11 (0.29-4.22)	0.881	-	-
25-34	35/325 (10.8)	0.86 (0.23-3.27)	0.827	-	-
35+	31/212 (14.6)	1.17 (0.31-4.46)	0.818	-	-
Relationship to child					
Mother	70/634 (11.0)	1	-	1	-
Father	16/99 (16.2)	1.46 (0.89-2.41)	0.136	1.44 (0.88-2.36)	0.143
Grand parent	10/28 (35.7)	3.23 (1.86-5.62)	<0.001	2.35 (1.22-4.53)	0.010

Characteristic	n/N (%)	Univariable analysis		Multivariable analysis	
		Crude PR (95% CI)	p-value	aPR (95% CI)	p-value
Other	3/16 (18.8)	1.70 (0.60-4.83)	0.320	1.33 (0.40-4.48)	0.644
Level of education					
None	17/125 (13.6)	1	-	1	-
Primary	69/550 (12.6)	0.92 (0.56-1.51)	0.750	1.07 (0.63-1.81)	0.814
Secondary/ Tertiary	13/102 (12.8)	0.94 (0.48-1.84)	0.851	1.25 (0.61-2.55)	0.547
Marital status					
Single/ separated/ divorced	17/84 (20.2)	1	-	1	-
Married/ Cohabiting	82/693 (11.8)	0.58 (0.36-0.94)	0.026	0.65 (0.38-1.10)	0.105
Employment status					
Employed	59/522 (11.3)	1	-	1	-
None employed	40/255 (15.7)	1.39 (0.96-2.02)	0.086	1.32 (0.91-1.91)	0.143
Cost of transport to nearest immunisation point					
<10,000	59/550 (10.7)	1	-	1	
>10,000	10/46 (21.7)	2.03 (1.11-3.70)	0.021	1.64 (0.96-2.80)	0.072
No/unknown cost	30/181 (16.6)	1.55 (1.03-2.32)	0.036	1.26 (0.83-1.92)	0.274

Consistent with the quantitative findings, the qualitative findings indicated that grandparents whose grandchildren were found to be zero dose did not prioritise immunisation. In both Kigando and Butoloogo sub counties, it was common to find grandmothers taking care of several grandchildren whose parents were not in position to take care of them at that time as their mothers went to work or got married. In most of these cases, the biological fathers of the children were either unknown or had abandoned the children. In some families, these children were considered illegitimate and not treated as those that are perceived to be legitimate. Overall, there was limited, or no financial support being received from their parents and most of the children had not been sent with their vaccination cards. In most of these scenarios, the grandparents who were old and weak also played the role of being breadwinners. Some of the grandparents reported that when the children were brought to them, they were malnourished, and their priority was to ensure that they revived their nutritional status and provided basic needs. Amidst competing priorities, immunisation was missed.

“But if this comes when you have other children you take care of and they also give her to you and the child came when she was feeding on milk the child was young that you couldn’t just leave her there. You can’t just leave a child of 1 year and 1 month, you just leave her there without giving her milk and remember milk every month it is 15,000/=, every month 15,000/= remember there is nothing they give you and again you take the child to Buganyi, no I saw that I cannot manage and I left her”. (IDI_Grandmother, Kanyogoga village, Butoloogo subcounty)

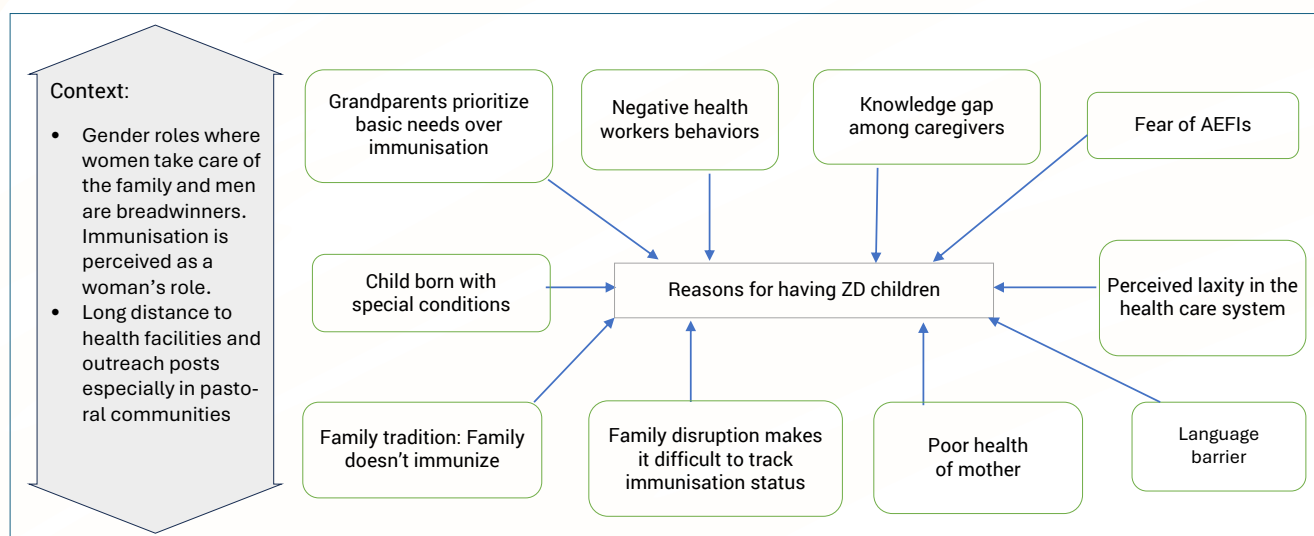
“.....In addition, in my community we have young women and men who produce children and cannot afford to take care of them, and they take them to their grandparents. Most of the grandparents are old and cannot effectively take these children for vaccination since they are old and weak and are not financially capable to effectively take these children for vaccination on time. Some of these grandparents also do not usually know the time or month this child was born and the vaccination doses they have had so far. This discourages these grandparents from taking these children for vaccination because they do not know what to tell the doctors when asked about the birth details of the child” (VHT_Butoloogo subcounty)

"Now for you don't you see it? For you aren't you seeing it? When a child has a father, you tell the father the child is like this and this, like the child is sick. A child that doesn't have a father burdens you because now how do I tell you that? She is a burden to you in everything. Even if I don't give you other answers, in everything a child that doesn't have a father burdens you." (IDI_Grandmother, Kibaale village, Kigando subcounty)

3.9 Barriers to accessing immunisation services in the study communities.

The findings from the spatial analysis indicated that most households with ZDC in Butoloogo and Kigando sub-counties were not located far from the nearest health facility where immunisation services could be accessed. This suggested that there were other reasons that could explain the existence of ZDC in these communities. Through the qualitative assessment, we explored reasons that could explain why there were ZDC in Butoloogo and Kigando sub counties. Figure 12 summarizes findings from participants dialogues with VHTs and in-depth interviews with caregivers of ZDC in the hard-to-reach community (Butoloogo sub-county) and pastoralist community (Kigando sub-county).

Figure 12: Reasons for having zero dose children and key contextual issues



The figure highlights the barriers highlighted by caregivers of ZD children drawn from in-depth interviews and the participant dialogues that were conducted. The contextual barriers were gender dynamics and long distances to immunisation service delivery points.

1. Fear of Adverse Events Following Immunisation (AEFIs)

Fear of AEFIs was a major barrier to uptake of vaccination. Caregivers expressed fears of AEFIs such as death and disability. One family reported an experience of death following immunisation which had made them decide never to immunise their children. Fever and excessive crying following immunisation were common fears that caregivers worried about following immunisation and there was limited knowledge on why they occurred and how they could be managed. In addition, some caregivers had fears that the government was using immunisation to control the population by causing cancer, disability, and infertility.

“Before I gave birth, I heard that they vaccinated children and some of them died, others fell sick yes... One was from here in our home. They took him for vaccination. They took him there and he was vaccinated. It caused him to fall sick and later he died. He was like eight months. I was around. They took him and he was vaccinated, then he was like as if he had developed malaria. Then he later died. The family knew that the problem was caused by the vaccines he was injected and so they could not take him back to be injected again. I also fear taking him there now. Suppose he dies. I have never vaccinated all of my three children. (IDI_Mother, Kyankungu village, Kigando subcounty)

“..... In my community, there is a woman with a child below 2 years that is not fully vaccinated. The reasons she gives for not vaccinating the child fully is that the child cries the whole night on the day she is vaccinated and that when the child cries at night, the husband tells her to take her child outside. This discourages her from taking her child for more vaccination.....” (VHT_Butologo subcounty).

“.....When they immunise children, they get diseases, that children become infertile, they can't produce, you hear that when they take the injection, their arms get disabled. At times when children receive injections at hospitals, the arm gets swollen, they get fever and go to the hospital again and even when the child doesn't get disabled, they get sick and suffer...” (IDI_Mother, Rwakirangala village, Kigando subcounty)

2. Knowledge gap among caregivers

Some caregivers did not appreciate the importance of immunisation. Others were of the view that a child could survive without immunisation. The belief that immunisation wasn't important was in part influenced by some religious sects such as Bagorozi who did not believe in modern medicine. One of the grandmothers that was interviewed thought that since her grandchild had not been immunised at birth, it was better to wait till the child made two years when their body was strong enough to withstand the strength of vaccines. A young mother aged 17 thought that since the child had not been immunised at birth, she did not need to get vaccines after that. Another mother did not think it was important to take the child for immunisation after 6 months.

“I never took it serious but now I wanted to take him for vaccination, but others told me to wait so that she first makes 2 years. So, I was asking her mother that when you see her make 2 years, you come and tell me, I take her for vaccination. People told me that since she missed to be vaccinated with the first jabs, that I should leave her and she starts at 2 years...me I said I would start taking my children for vaccination when they are still young. Those things of taking old children for vaccination I don't know them yes so they said no it needs you first wait and she makes 2 years then you start taking her for vaccination ... That when she starts being vaccinated before she makes 2 years, that the vaccinations will affect her badly... because she never started with them when she was young yes so she first waits for her bones to be stronger yes ... that's what they said and I also left it” (IDI_Mother, Mirembe village, Kigando subcounty)

“For me I thought you only have to immunise a child if they have been immunised at birth, now that I had not immunised my child at birth and had even missed all those doses, I thought there was no need.” (IDI_Mother, Kataji village, Butoloogo subcounty)

“..... After seeing that I had not vaccinated my children for over seven months, I found it improper to take them for vaccination after such a long time. So, I decided to just leave the children unvaccinated for the vaccines they missed since I had defaulted on taking them for vaccination for a long time. I believed that the vaccines would not be effective if they received them at such an old age. (IDI_Mother, Kabaale village, Kigando subcounty)

“But what is the reason as to why you also want the children to be vaccinated? Because I see my children who are not immunised don't get sick so easily and even those who are immunised frequently get sick and they always admitted in hospital as well.....” (IDI_Mother, Rwakirangala village, Kigando subcounty)

3. Fear of being reprimanded by health workers

Some caregivers reported not taking their children for immunisation because they feared being reprimanded by health workers. The main reason that they reported for being reprimanded by health workers was not having immunisation cards. Other reasons included presenting with children who were poorly dressed, or children who had not received any vaccines or who were behind on their vaccination schedule.

“Me there is nothing else because I said when I go to the health worker and I explain to her such, she can even abuse me. She may say why didn't you care so that they bring the vaccination card, so those ones also made me lose morale, do you know how the health worker when she is vaccinating the way she abuses women?” (IDI_Mother, Kanyogoga village, Butoloogo subcounty)

“They can quarrel when they find that some vaccination injections were missed” (IDI_Mother, Kisonko village, Kigando sub-county)

The other thing I feared was that the health workers would abuse me for my failure to bring my children for vaccination on time..... (IDI, Mother, Kabaale village, Kigando subcounty)

“..... this is because when you return, they abuse you especially there in Kifumbira health centre, they abuse you even if the card got a slight damage and they abuse you seriously and when you are humble mother and you go there, they don't pay attention on you as you may return when you have not produced.....” (IDI, Mother Kanyogoga village, Butoloogo subcounty)

“I cannot go back there since when you go there when you lost the card or records, they abuse you. So, me I have never gone back. They abuse you; you see even though you delay going for immunisation like 2 months without going there they abuse you. (IDI_Mother, Kanyogoga village, Butoloogo subcounty)

4. Caregiver advised by health workers to delay immunisation for a child born with special conditions

In one case in Kigando sub county, a mother reported that she had not sought immunisation for her child because he was born with club foot and was undergoing therapy. She had been advised by health workers at the regional referral hospital to have the child immunised at one year to avoid disrupting the care the child was receiving for club foot if he encountered adverse effects following immunisation.

“Now this boy was born with clubfoot ...So the health workers said vaccinating him is when he has made one year, we [the family] have to vaccinate him for 6 months, 9 months and for 1 year and he stops there. So now we haven't vaccinated him against anything because at the health facility they stopped us now he puts on shoes at night...They said when you vaccinate him, he cries the whole night. His legs are tied so they said we have to leave him ...and at night that's when he would be fine meaning that when you vaccinate him that he will spend the whole night crying but when he has already made a year even if he cries, they body is okay it doesn't have any problem” (IDI_Mother, Rwobushumi village, Kigando subcounty).

5. Family tradition where they do not immunise

In one case in Kigando sub county, a family with a zero-dose child had deep-rooted beliefs that immunisation caused severe effects such as death. These beliefs had been held for generations and none of the family members had been immunised. The caregiver reported that having gotten married in that family she could not go against a tradition that had been held for generations. Besides, in a patriarchal society such as this one, the child was seen as belonging to the man's clan.

“..... Every family has its own acts. I believe even in your family you may have your own. You may have something that you do not use but that does not mean that we defer from the government or against it. (Interviewer hums in agreement) No we don't. But we as a family, we don't immunise children.... (IDI_Mother, Rwakirangala village, Kigando subcounty)

“..... And when you want to build a family, you follow the rules of your husband's family and not the rules you left at your home. I don't have a child; the child belongs to the man. If the man immunises his child, I have no complaint. I accept and tick because it's his family's rule. (Interviewer hums)” (IDI_Mother, Rwakirangala village, Kigando subcounty)

Interestingly, the caregiver reported that the father of the zero-dose child had not been an illiterate man. She said that he ran a clinic where he took part in immunising other children but did not immunise his own children.

“Yes, it's known to us and those that you see are not the first because the man died having even the daughters in law but even the married boys never immunised. But that does not mean that he died an illiterate. Even in Mbarara where he was, he had a clinic. He even campaigned for immunisation and even immunised others, but he never immunised his own because of reasons known to him. (IDI_Mother, Rwakirangala village, Kigando subcounty)

6. Family disruption making it difficult to track immunisation status

The instability of a biological mother in a home arising from ill-health or marital problems greatly impacted the immunisation status of the children. In one family in Kigando, the mother was mentally ill, and this had made it difficult to track the immunisation status of children as she frequently left the home. Her mental health challenges had negatively affected her relationship with her spouse and in laws. In her absence, her husband who perceived immunisation to be a woman's role and her mother-in-law could not take the child for immunisation. Interactions with our respondents indicated that ensuring that children were immunised was perceived as a woman's role in the home. Women were seen as primarily in charge of taking care of the family including ensuring the family members were healthy while men were considered breadwinners. This perception was held by both men and women that we interviewed, and it came through in most of the interviews.

“..... I think she has a problem. When her dad used to tell her to do chores and she refused, he beat her heavily and she was about to die. She was even taken to a hospital and she is like that, she became like a mad person. When the husband blames her, she disappears to the neighbours or even goes to her parent’s home. even now, she is not around, she takes the children along and she doesn’t immunise them., the last time she brought these ones back and disappeared again when my son went back to pick her and he was fined to buy them soda....” (IDI, Grandmother_Kisonko village, Kigando subcounty)

“...As you can see, she over moves with them to her home and while here I would tell her to immunise but she would come up with all sorts of excuses that it is far, I can’t carry the baby on my back, look for money for boda boda and sometimes I wouldn’t be having the money.....” (IDI, father_Kisonko village, Kigando subcounty)

In scenarios where families were disrupted sometimes the children lived with different relatives at different times making it difficult to track their immunisation status as their immunisation card were misplaced.

“..... At first Mariam’s mother separated with my son, she had her for a while then she took the child to her own mother (Mariam’s grandmother) but she couldn’t handle her. Then for her he got married somewhere, after a month, the husband told her to take back the child to the father, so she took mariam to mum, who didn’t handle her, so after a month they called me to pick her, they didn’t bring mariam with her card, so where could I have started from taking her for immunisation....” (IDI, Grandmother_Katagi village, Butologo subcounty)

7. Poor health of the mother hinders them from seeking immunisation services

In cases where the mother was grappling with poor health, especially in cases where they had undergone surgery and it took them a while to recover, they were unable to take the children for immunisation. This was happening in a context where health facilities and outreach posts were reported to be far, immunisation was considered a woman’s role and there was limited support from the men. Notably, after recovery some mothers thought it was too late to take the child for immunisation as several months had gone by.

“Another time, I was sick and I saw that I will not manage the journey and the child missed 3 times. My husband couldn’t take the child for immunisation because it’s a woman that is responsible for the child... It’s the woman that takes care of the child most.. IDI_Nsinamo village, Butologo sub-county

“.....For my case, the thing that is preventing me from taking my children for vaccination on time was poor health. I was operated for some illness 6 months back and during that time I would not be able to take my children for vaccination because I was recovering from the surgery. I would not be able to even sit on a motorcycle due to the surgery wound I was nursing. This illness and recovery prevented from taking my children for vaccination on time....” IDI, Mother_kabaale village_Kigando sub-county,

“..... After my surgery, I spent seven months to heal from the surgery that I had gone through. Throughout all that time, I had not taken my children for vaccination. After seeing that I had not vaccinated my children for over seven months, I found it improper to take them for vaccination after such a long time. So, I decided to just leave the children unvaccinated for the vaccines they missed since I had defaulted on taking them for vaccination for a long time. I believed that the vaccines would not be effective if they received them at such an old age. The other thing I feared was that the health workers would abuse me for my failure to bring my children for vaccination on time.....” IDI, Mother_Kabaale village_Kigando sub-county

“.....sometimes when they tell us to take our children for immunisation and I don't have money and as such I see taking a child for immunisation with no money then it becomes a problem because my husband is hooligan (a muyaye,) and he has nothing to worry about he doesn't help me, he drinks alcohol everyday.....” IDI_Mother_Katagi village,_Butoloogo sub-county

8. Language barrier

In Butoloogo sub-county where we found many immigrants from Rwanda, a mother of a zero-dose child reported that she decided not to take her child for immunisation because she could not speak English, Luganda or any other language used in the area making it difficult for her to communicate with the health workers.

“I don't understand Luganda we had just come in this place. What language would I have used to explain to the health workers about the immunisation card I had left in Rwanda and the doses the child had received.” (IDI_Kifumambogo village, _Butoloogo sub-county)

“.....In my area Katagi, I believe the data shows 3 children in my community are not vaccinated. I also believe that the number could be more than this. This is because Katagi absorbs very many people from areas like Rwanda, Burundi etc. These people sometimes face language barrier and do not also know the various places where the children are vaccinated from leading to them not vaccinating their children at all or defaulting on vaccination.....” (VHT_Butoloogo sub-county)

9. Perceived laxity in the Ugandan healthcare system when it came to enforcement of immunisation

There were many immigrants in Butoloogo Sub-County mostly from Rwanda. The immigrants from Rwanda perceived the Ugandan health care system as relaxed with no enforcement efforts when it came to immunisation as compared to the health system in Rwanda. They reported that in Rwanda there was active participation of community health structures in immunisation activities whereby families that absconded from immunisation were followed up and fined. In addition, children who were not immunised were not admitted into schools. With the already existing challenges immigrants encountered with an inability to speak the local language and in a context of perceived laxity of the Uganda health system, they did not seek immunisation services.

“..... You see; in Uganda, the government leaders don't push the parents/ families to take their children for vaccines whereas in Rwanda, if you miss even one day of vaccinating your child, the government sends a health worker to your home to vaccinate your child. How I wish we had such leadership in Uganda.....” (IDI_Mother_Bubenge village,_butoloogo sub-county)

“In addition, In Rwanda, if your child is not fully vaccinated, the government fines you and the child cannot be admitted at school or even receive other services...” (IDI_Bbenge village, _Butoloogo sub-county)

4.0 DISCUSSION

Burden of ZD, UI and untimely vaccinated children in the surveyed communities.

This survey highlights the presence of missed communities despite the high immunisation coverage in Uganda. We found pockets of zero-dose children (ZDC) and under-immunised children (UIC) within high-risk communities in Mubende district. Of the surveyed children (777), 12.7% were ZD, while 7.1% were under-immunised. Our estimates in this survey are twice the national estimate of 6% based on WHO/UNICEF 2022 and DHIS2 2022 national estimates.¹ Our ZD estimates are also higher than the Uganda Demographic Health Survey (UDHS) estimate of 2%.² A comparison of children aged below one year who missed DPT 1 shows higher estimates in our survey (Kigando 14.7%, Butoloogo 3.1% and Kiruuma 18.4%) compared to DHIS2 estimates (Kigando 4.3%, Butoloogo 15.3% and Kiruuma 14.8%) implying that the actual ZDC burden may be higher than what is reported in DHIS2. These results suggest that access to immunisation services is a bigger challenge than utilisation of immunisation services in the surveyed communities. It also highlights data quality issues of DHIS2 which include: i) unreliable denominators and ii) exclusion of children who do not interact with the health system in DHIS2 reports. Our results show the urgent need for a data capture system that collects data at the community level or data triangulation to have a more accurate estimate of ZDC burden.

Why does the burden differ by high-risk communities (HRC)?

A key factor associated with ZD was place of residence. Underserved communities in Kiruuma have the highest burden of ZDC, and the pastoralist communities of Kigando have the highest burden of UI children. This may partly be explained by the fact that Kiruuma sub-county is served by one health facility (Kituule Health Centre II), which serves 5 parishes. According to the national policy,

a Health Centre II is supported to serve 1 parish (i.e. has 2 health workers and, receives PHC funding to serve 1 parish). As such, the health centre has inadequate capacity to offer immunisation services to the entire sub-county. This highlights the need to increase the number of service delivery points for immunisation. Additionally, Kiruuma sub-county has several communities opposed to immunisation services because of religious beliefs including the “Abagoloji” and followers of “Owobushobozi Bishaka” and negative perceptions. Furthermore, the recommended distance for public health facilities to households in Uganda is generally within a 5-kilometer radius. This guideline aims to ensure that a significant portion of the population has reasonable access to healthcare services. However, most of the ZDC in Kiruuma were located beyond 9.7 km from the nearest health facility. This underscores the role that distance plays in seeking health services including immunisation.

Kigando sub-county also had a significant number of ZDC identified through the survey. The sub-county is predominantly inhabited by pastoralist communities, with households frequently searching for water and pasture for their livestock. Notably, most of the ZDC were residing within 3.2 Km of the nearest health facility, suggesting that distance is not the primary barrier to accessing immunisation services for pastoralist communities.

In contrast, Butoloogo sub-county (hard to reach community) had fewer numbers and proportions of ZD and UI children than other study areas. Residents in Butoloogo sub-county seek services from two health centres (Butoloogo HC III in Butoloogo sub-county and Butawata HC III in Kigando sub-county). Additionally, some households seek immunisation from a private not-for-profit (PNFP) health facility (St. Luke Church of Uganda Health Centre) and immunisation services from nearby districts. This health centre serves as

the immunisation outreach point for Butoloogo Health Centre III. However, some of the outreach points remain distant for most people in the surrounding villages. Most of the ZDC were found between 6.4-9.7 km of the health facility, highlighting the long distances which caregivers must travel to seek immunisation services.

Caregivers' reasons for having ZDC in the surveyed communities.

Our findings showed that children born in the community (at home and children born under the care of TBAs) had higher odds of being ZDC compared to children born in public facilities. Caregivers attributed this to long distances to health facilities and the high trust in TBAs. Despite being banned, TBAs continue to deliver mothers in the community and do not link them to health facilities for immunisation after birth for fear of being reprimanded. Deliberate and strategic efforts to engage national, sub-national and civil society stakeholders is important to address the issues surrounding the work of TBAs.

Furthermore, in our study settings, we found that immunisation was considered a woman's role by both men and women. Amidst competing priorities (including home chores, tending gardens and business) and regardless of their poor health status, some women were expected to ensure that the children were immunised. There was limited or no involvement of men when it came to immunisation in this setting. This finding points to the need for gender-responsive interventions that consider the specific challenges faced by women.

We found that children whose primary caretakers were not their biological parents were more likely to be zero-dose. The absence of a biological mother directly impacted the child's immunisation status negatively. Some grandparents who were charged with the primary responsibility of taking care of the grandchildren had limited financial

resources and prioritised catering for the basic needs other than immunisation. It was common for children living with grandparents to be missing vaccination cards, making it challenging to track their immunisation status. In addition, some grandparents were too weak to travel long distances to health facilities and immunisation outreach posts carrying the babies on their backs. These findings suggest that zero dose is a complex problem that is embedded in cultural and family dynamics. Community structures such as village health teams are better placed (than health facilities) to identify these families, sensitise them, link them to the health facility, and follow them up.

Health system factors also contribute to presence of zero dose children. Some caregivers pointed out their fears of being reprimanded if they presented at the health facility without immunisation cards, if the children were dressed poorly, or had defaulted on their immunisation schedule. Health worker-caregiver interaction needs to be improved to allow for free communication without worrying about being reprimanded. In addition, there is a need for a digital immunisation data capture system at the health facility to avoid relying on the caregiver's immunisation cards to track the child's immunisation status. We found that in some instances the health workers advised caregivers of children undergoing treatment for special health conditions to delay immunisation. As such, health workers must be equipped with accurate information on immunisation for children with special conditions. Caregivers consider health workers to be an authentic and reliable authority regarding health-related matters. Health workers can ride on this to pass on key messages to caregivers regarding what the vaccine preventable diseases are, the possible side effects and how to manage them, emphasise that it's never too late to seek immunisation and advise on how to handle children with special health conditions.

Study strengths and limitations

This survey had several strengths. Firstly, it provided a relevant baseline prevalence of ZD and UI children in a high-burden district (low DPT1 coverage) of Mubende across three HRCs. Mubende will receive targeted interventions under the EAF, allowing for impact measurement in 2025 through an end-line survey. Additionally, qualitative insights were gained from participatory dialogues and IDIs with caregivers of zero dose children providing an in depth understanding of key contextual issues that need to be taken into consideration when addressing the zero-dose problem.

Our survey also had limitations. The findings from the survey communities may not be generalizable to the entire country. Additionally, our sample size was designed to estimate coverage, but not powered enough for many subgroups analysis, which were mostly exploratory. Future studies are needed to further explore those associations.

However, selecting three unique HRCs representing underserved, pastoralist, and hard-to-reach communities—allows for extrapolation to similar areas in Uganda.

5.0 CONCLUSION

The overall burden of ZDC in the surveyed communities was 12.7% while the UI burden was 7.1%. Children born out of the health care system and those under the care of their grandparents are more likely to be ZDC and targeting these children for interventions may be an effective strategy in reducing the ZD burden. Physical access is a barrier to seeking immunisation services in some but not all communities as there were households with ZDC and UIC that were located within 3.2 km from the nearest health facility. Key barriers to reaching ZDC include children being taken care of by non-biological caregivers, negative health worker attitudes, knowledge gaps, fear of side effects, language barriers, poor maternal health, disrupted families, cultural resistance, medical advice delaying vaccination, long distances to facilities, and gender-based role perceptions. We found that zero dose is a complex problem embedded in cultural and family dynamics; therefore, community structures are key in identifying and reaching the ZDC.

6.0 LEARNINGS

Below we present the learning from the survey based on the IRMMA framework.

IRMMA framework components	Learnings
Identify	<ol style="list-style-type: none"> 1. ZDC exist in Mubende district and may be more than what is estimated using DHIS2. However, ascertaining the true immunisation status is currently difficult if based on child health cards which may not be available, or partially completed. 2. VHTs are key in identifying ZDC and UI children. However, given that the presence of ZDC reflects gaps in performance of their work in the community, their role in identifying ZDC may be more effective if done together with other community leaders. 3. Areas with immigrants are vulnerable to having ZDC due to language barriers and perceived differences in the health system by the immigrants.

IRMMA framework components	Learnings
Reach	<ol style="list-style-type: none"> 1. Some children are vulnerable to be systemically missed due to the unique characteristics of their caregivers for instance children in immigrant communities, under the care of grandparents or ill mothers and children in unstable families). 2. In communities that are sparsely populated, and with difficult terrain, identifying and reaching ZD and UI children is costly both in terms of time and financial resources. 3. The availability and good health of a mother is an important determinant of the immunisation status of children. Children under the care of people other than biological parents are susceptible to being ZD or UI children. 4. Despite being banned, TBAs continue to deliver mothers in the community and do not link them to health facilities for immunisation after birth for fear of being reprimanded. Deliberate and strategic efforts to engage national, sub-national and civil society stakeholders is important to address the issues surrounding the work of TBAs.
Monitor and Measure	<p>A community can have multiple pockets of high-risk population groups which poses challenges to identifying and reaching ZDC and UI. The presence of multiple pockets of high-risk population groups calls for disaggregated analysis to the lowest possible level of the community.</p> <p>Lower proportions of the ZDC and UI children in the community may not necessarily reflect better immunisation service delivery (more service delivery points and client-centred services). For instance, in Butoloogo some respondents reported that they received immunisation services from other districts due to the long distance to the facilities within their community.</p> <p>Estimating of ZD and UI children numbers requires continuous monitoring of population mobility for more accurate estimation of denominators. Such mobile communities include pastoralist communities, casual workers and immigrants.</p> <p>Survey estimates of ZD and UI children are higher than the DHIS2 estimates and as such there is need for a system that captures data at community level.</p>

7.0 RECOMMENDATIONS

Below we present near and medium-term recommendations.

Near term

1. National (MoH/UNEPI) and sub-national (district) stakeholders should support health facilities to conduct more outreaches frequently and consistently, especially in underserved areas such as Kiruuma sub-county.
2. During social mobilization for immunisation, community health structures such as (VHTs, LCs,) should look out for children: i) who are under the care of non-biological parents ii) who are born in the community (TBA/home) iii) who have caregivers with prolonged illnesses and iv) whose parents are not staying together, as these pose a risk of missing out on immunisation services.
3. Health workers and VHTs should enhance community sensitization about i) the importance of immunisation ii) vaccine preventable diseases iii) Uganda's immunisation schedule iv) where to access immunisation and v) anticipated side effects of vaccination and how to manage them.

Medium Term

1. National (MoH/UNEPI) should support the sub-national (Mubende district) to:
 - a. Expand services to high-risk communities especially in underserved areas such as Kiruuma sub-county through the construction of more health facilities within the communities.
 - b. Upgrade existing lower-level health facilities to higher service-delivery levels so that they can meet the high demand for immunisation services.
2. Future studies should:
 - a. investigate reasons for poor health worker attitudes. The findings may provide evidence on how to better improve health worker attitudes to ensure client-centred care.
 - b. Explore the role of gender in immunisation uptake.
3. There is a need for a digital data capture system that collects information at both community and health facility levels to enable timely and a more accurate identification of ZD and UI children. This will also minimise reliance on immunisation cards to track the child's immunisation status.

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6.0 ANNEXES

Annex 1: Number of children aged 12 - 23 months targeted versus enrolled

Sub county	Parish	Village	Targeted	Enrolled
Butoloogo	Kisagazi	Kisojjo	25	37
		Bubenge	39	62
	Kyeeza	Katagi	64	117
		Kifulumambago	33	50
	Kidongo	Kacuka	31	28*
		Kigooba	23	39
	Kanyogoga	Nsinamu	26	43
		Biwalwe	29	47
		Kanyogoga	27	33
		Sunga	10	15
Kiruuma	Kituule	Kibagalazi	18	29
		Kituule	30	45
		Nakasagazi	22	27
	Kirwanyi	Bujaala	29	51
		Kirwanyi	30	50
	Kasolokamponye	Mulanda	15	21
		Kikyukyulu	31	35
		Kibuuza	15	23
		Lugalama	5	11
	Makukuulu	Kakonyi	22	38
Kyankumba		22	32	
Kitanda		23	36	
		Bugomba	24	37

Sub county	Parish	Village	Targeted	Enrolled
Kigando	Bubanda	Kabaale	70	90
		Kisonko	28	60
		Kyankungu	23	44
	Kiyonga	Nyaruteete	23	41
		Rwakirangala	34	45
		Rwobushumi	34	57
	Dyangoma	Lugazi A	34	53
		Lugazi B	24	17*
		Mirembe	27	45

Note: The number of children enrolled was less than those targeted

Annex 2: Burden of ZDC and UI children by village

Subcounty	Parish	Village	Number of ZDC	Number of UI children
Kiruuma	Kasolokamponye	Kibuuza	0	0
		Kikyukyulu	5	0
		Bujaala	3	1
		Kirwanyi	5	2
	Kirwanyi	Mulanda	4	1
		Kibagalazi	1	2
	Kituule	Kituule	2	1
		Nakasagazi	3	2
		Sunga	1	0
		Bugomba	5	2
	Makuukuulu	Kakonyi	5	1
		Kitanda	6	0
		Kyankumba	2	0
		Lugalama	1	0

Subounty	Parish	Village	Nunumber of ZDC	Number of UI children
Butoloogo	Kanyogoga	Biwalwe	2	0
		Kanyogoga	3	1
		Kigooba	1	1
	Kidongo	Nsinamu	2	3
	Kisagazi	Kisojjo	0	0
		Bubenge	0	1
		Kacuka	0	1
		Katagi	3	9
	Kyeeza	Kifulumambago	2	1
	Kigando	Bubanda	Kabaale	14
Kisonko			6	1
Kyankungu			6	5
Lugazi		Lugazi A	1	1
		Lugazi B	0	1
Dyangoma		Mirembe	3	2
		Nyarutete	1	1
Kiyonga		Rwakirangala	9	2
		Rwobushumi	3	6

Annex 3: Characterization of Zero Dose Children by High-Risk Community

Characteristic	Community		
	Kiruuma (N=43)	Butoloogo (N=13)	Kigando (N=43)
Child_sex			
Female	23 (53.5)	8 (61.5)	15 (34.9)
Male	20 (46.5)	5 (38.5)	28 (65.1)
Place of birth			
Health facility	17 (39.5)	10 (76.9)	21 (48.8)
Community (Home/TBA)	23 (53.5)	3 (23.1)	22 (51.2)

Characteristic	Community		
	Kiruuma (N=43)	Butoloogo (N=13)	Kigando (N=43)
Others/Don't know	3 (7.0)	0 (0.0)	0 (0.0)
Ethnicity			
Muganda	14 (32.6)	1 (7.7)	1 (2.3)
Mukyankole	9 (20.9)	1 (7.7)	38 (88.4)
Munyarwanda	9 (20.9)	7 (53.8)	1 (2.3)
Other	11 (25.6)	4 (30.8)	3 (7.0)
Number of siblings			
None	6 (14.0)	4 (30.8)	8 (18.6)
1-3	20 (46.5)	7 (53.8)	19 (44.2)
Four or more	17 (39.5)	2 (15.4)	16 (37.2)
Religion			
Anglican	9 (20.9)	2 (15.4)	13 (30.2)
Catholic	20 (46.5)	4 (30.8)	10 (23.3)
Pentecostal/Born Again	11 (25.6)	2 (15.4)	18 (41.9)
Seventh Day Adventist	3 (7.0)	2 (15.4)	1 (2.3)
Muslims	0 (0.0)	1 (7.7)	1 (2.3)
Others	0 (0.0)	2 (15.4)	0 (0.0)
Age (grouped)			
17 or below	1 (2.3)	0 (0.0)	1 (2.3)
18-24	12 (27.9)	3 (23.1)	16 (37.2)
25-34	14 (32.6)	7 (53.8)	14 (32.6)
35 or more	16 (37.2)	3 (23.1)	12 (27.9)
Gender			
Female	37 (86.0)	9 (69.2)	34 (79.1)

Characteristic	Community		
	Kiruuma (N=43)	Butoloogo (N=13)	Kigando (N=43)
Male	6 (14.0)	4 (30.8)	9 (20.9)
Education level of primary care provider			
None	7 (16.3)	3 (23.1)	7 (16.3)
Primary	32 (74.4)	9 (69.2)	28 (65.1)
Secondary/Tertiary	4 (9.3)	1 (7.7)	8 (18.6)
Care giver's religion			
Anglican	9 (20.9)	1 (7.7)	12 (27.9)
Catholic	19 (44.2)	4 (30.8)	11 (25.6)
Pentecostal/Born Again	11 (25.6)	4 (30.8)	18 (41.9)
Seventh Day Adventist	4 (9.3)	2 (15.4)	1 (2.3)
Muslims	0 (0.0)	0 (0.0)	1 (2.3)
Others	0 (0.0)	2 (15.4)	0 (0.0)
Marital status			
Single	2 (4.7)	0 (0.0)	5 (11.6)
Married/Cohabiting	39 (90.7)	10 (76.9)	33 (76.7)
Separated/divorced/widowed	2 (4.7)	3 (23.1)	5 (11.6)
Respondent is primary care giver			
No	0 (0.0)	0 (0.0)	6 (14.0)
Yes	43 (100.0)	13 (100.0)	37 (86.0)
Employment status			
Unemployed	18 (41.9)	4 (30.8)	18 (41.9)
Employed	25 (58.1)	9 (69.2)	25 (58.1)

Characteristic	Community		
	Kiruuma (N=43)	Butoloogo (N=13)	Kigando (N=43)
Mother attended ANC during pregnancy			
No	3 (9.1)	2 (33.3)	3 (9.7)
Yes	30 (90.9)	4 (66.7)	28 (90.3)
Duration of staying in the village			
< 1year	3(7.0)	2 (15.4)	2(4.6)
1-5 years	17(39.6)	5 (38.5)	16(37.2)
More than 5 years	23 (53.5)	6 (46.2)	25 (58.1)
Main source of information on immunisation			
Community meetings	4 (9.3)	1 (7.7)	1 (2.3)
Radio	18 (41.9)	4 (30.8)	24 (55.8)
Television	1 (2.3)	1 (7.7)	1 (2.3)
Word of mouth	14 (32.6)	3 (23.1)	12 (27.9)
Others	6 (14.0)	4 (30.8)	5 (11.7)

Annex 4: Characterization of UI Children by High-Risk Community

Characteristic	Community		
	Kiruuma (n=12)	Butoloogo (N=17)	Kigando (N=26)
Child's sex			
Female	8 (66.7)	13 (76.5)	6 (23.1)
Male	4 (33.3)	4 (23.5)	20 (76.9)
Place of birth			
Health facility	7 (58.3)	13 (76.5)	20 (76.9)
Community (Home/TBA)	2 (16.7)	3 (17.6)	6 (23.1)
Others/Don't know	3 (25.0)	1 (5.9)	0 (0.0)

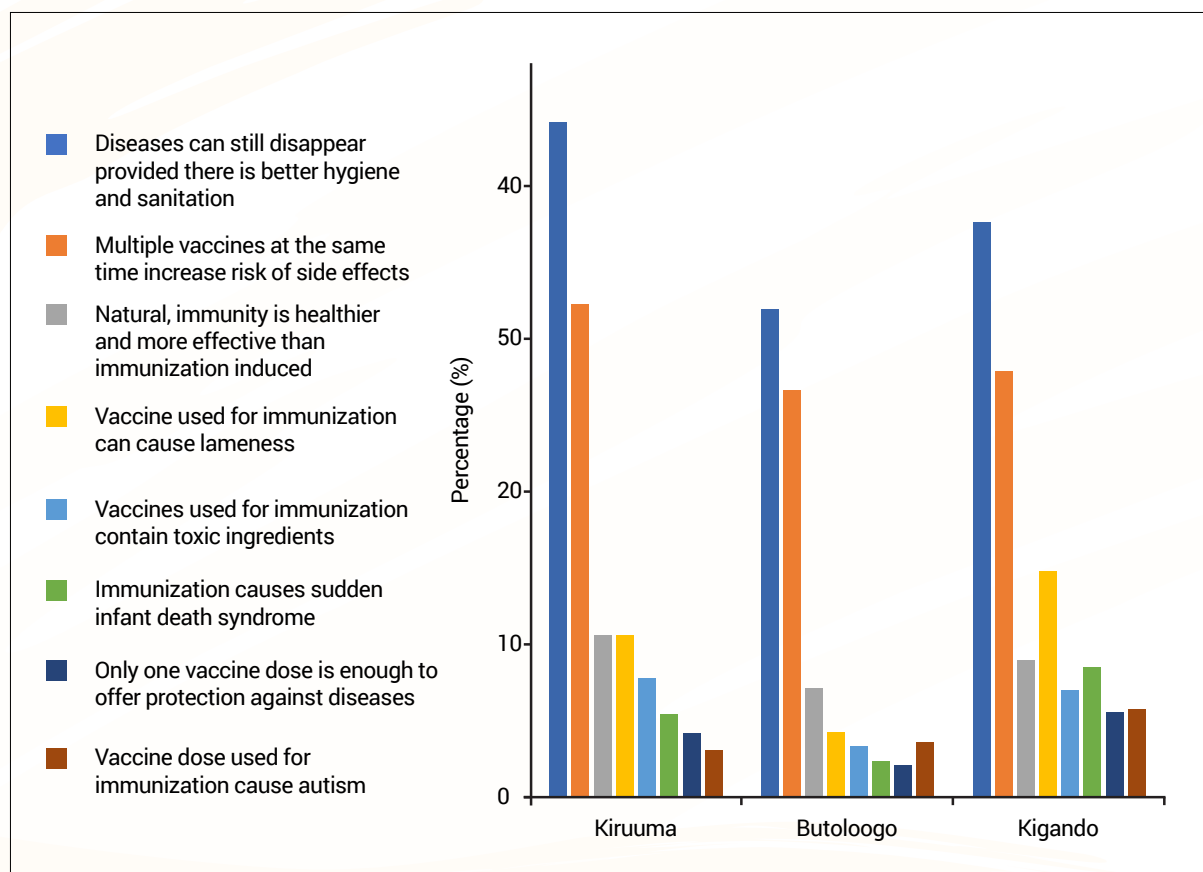
Characteristic	Community		
	Kiruuma (n=12)	Butoloogo (N=17)	Kigando (N=26)
Ethnicity			
Muganda	5 (41.7)	0 (0.0)	1 (3.8)
Mukyankole	1 (8.3)	6 (35.3)	17 (65.4)
Munyarwanda	6 (50.0)	11 (64.7)	3 (11.5)
Other	0 (0.0)	0 (0.0)	5 (19.2)
Number of siblings			
None	5 (41.7)	4 (23.5)	5 (19.2)
1-3	5 (41.7)	7 (41.2)	10 (38.5)
Four or more	2 (16.7)	6 (35.3)	11 (42.3)
Religion			
Christians	11 (91.7)	11 (64.7)	24 (92.3)
Seventh Day Adventist	1 (8.3)	4 (23.5)	1 (3.8)
Muslims	0 (0.0)	0 (0.0)	1 (3.8)
Others	0 (0.0)	2 (11.8)	0 (0.0)
Age (grouped)			
Below 18 years	1 (8.3)	2 (11.8)	1 (3.8)
18-24	3 (25.0)	5 (29.4)	9 (34.6)
25-34	7 (58.3)	3 (17.6)	8 (30.8)
35 or more	1 (8.3)	7 (41.2)	8 (30.8)
Gender			
Female	11 (91.7)	16 (94.1)	22 (84.6)
Male	1 (8.3)	1 (5.9)	4 (15.4)
Education level of care provider			
None	0 (0.0)	2 (11.8)	2 (7.7)
Primary	10 (83.3)	13 (76.5)	19 (73.1)

Characteristic	Community		
	Kiruuma (n=12)	Butoloogo (N=17)	Kigando (N=26)
Secondary/Tertiary	2 (16.7)	2 (11.8)	5 (19.2)
Care giver's religion			
Christians	11 (91.7)	11 (64.7)	24 (92.3)
Seventh Day Adventist	1 (8.3)	4 (23.5)	1 (3.8)
Muslims	0 (0.0)	0 (0.0)	1 (3.8)
Others	0 (0.0)	2 (11.8)	0 (0.0)
Marital status			
Single	1 (8.3)	1 (5.9)	0 (0.0)
Married/Cohabiting	11 (91.7)	15 (88.2)	23 (88.5)
Separated/divorced/widowed	0 (0.0)	1 (5.9)	3 (11.5)
Respondent is Primary care giver			
No	0 (0.0)	0 (0.0)	1 (3.8)
Yes	12 (100.0)	17 (100.0)	25 (96.2)
Employment status			
Unemployed	6 (50.0)	4 (23.5)	5 (19.2)
Employed	6 (50.0)	13 (76.5)	21 (80.8)
Mother attended ANC during pregnancy			
No	0 (0.0)	0 (0.0)	1 (4.8)
Yes	11 (100.0)	16 (100.0)	20 (95.2)
Biological mother is alive			
No	0 (0.0)	0 (0.0)	1 (20.0)
Yes	1 (100.0)	1 (100.0)	4 (80.0)
Biological father is alive			
Don't know	0 (0.0)	0 (0.0)	1 (4.5)

Characteristic	Community		
	Kiruuma (n=12)	Butoloogo (N=17)	Kigando (N=26)
Yes	11 (100.0)	17 (100.0)	21 (95.5)
Duration of staying in the village			
< 1year	0 (0.0)	1 (5.9)	4 (15.4)
1-5 years	8(66.7)	7(41.2)	11(42.2)
More than 5 years	4 (33.3)	9 (52.9)	11 (42.3)
Main source of information on immunisation			
Community meetings	1 (8.3)	2 (12.5)	0 (0.0)
Radio	6 (50.0)	6 (37.5)	13 (50.0)
Television	1 (8.3)	0 (0.0)	7 (26.9)
Word of mouth	1 (8.3)	6 (37.5)	4 (15.4)
Others	3 (25.0)	2 (12.5)	2 (7.7)

Annex 5: Respondents in agreement on immunisation

Figure 13: Proportion of respondents in agreement with selected myths on immunisation



Annex 6: Knowledge about immunisation in the surveyed communities

Characteristic	Overall	Underserved (Kiruuma)	Hard-to reach (Butoloogo)	Pastoralists (Kigando)
N	1219	387	420	412
Child immunisable diseases				
TB	114 (9.4)	44 (11.4)	27 (6.4)	44 (10.4)
Polio	760 (62.3)	244 (63.0)	246 (58.6)	270 (65.5)
Whooping cough	151 (12.4)	41 (10.6)	34 (8.1)	76 (18.4)
Diphtheria	49 (4.0)	23 (5.9)	16 (3.8)	10 (2.4)
Measles	795 (65.2)	269 (69.5)	248 (59.0)	278 (67.5)
Tetanus	232 (19.0)	78 (20.2)	68 (16.2)	86 (20.9)
Hepatitis	39 (3.2)	12 (3.1)	7 (1.6)	20 (4.9)
Diarrhea	52 (4.3)	17 (4.4)	16 (3.6)	20 (4.9)
Cervical cancer	13 (1.1)	3 (0.8)	7 (1.7)	3 (0.7)
Pneumonia	21 (1.7)	6 (1.6)	7 (1.7)	8 (1.9)
Vaccines an infant should get before he/she attains the age of one				
BCG	76 (6.2)	38 (9.8)	22 (5.2)	16 (3.9)
DPT	50 (4.1)	26 (6.7)	15 (3.6)	9 (2.2)
Polio	564 (46.3)	180 (46.5)	198 (47.1)	186 (45.1)
Measles	534 (43.8)	179 (46.3)	185 (44.0)	170 (41.3)
Pneumococcal/PCV	6 (0.5)	3 (0.8)	1 (0.2)	2 (0.5)
Rotavirus	38 (3.1)	21 (5.4)	12 (2.9)	5 (1.2)
Vitamin A	43 (3.5)	23 (5.9)	9 (2.1)	11 (2.7)
Does not know any	445 (36.5)	126 (32.6)	153 (36.4)	166 (40.3)
Declined to respond	26 (2.1)	13 (3.4)	10 (2.4)	3 (0.7)

Characteristic	Overall	Underserved (Kiruuma)	Hard-to reach (Butoloogo)	Pastoralists (Kigando)
Consequences if a child were not vaccinated during the first year of life				
Nothing	31 (2.5)	16 (4.1)	5 (1.2)	10 (2.4)
Child would fall sick	1087 (89.2)	335 (86.6)	388 (92.4)	364 (88.3)
Child would die	182 (14.9)	38 (9.8)	62 (14.8)	82 (19.9)
Family would react	3 (0.2)	0 (0.0)	2 (0.5)	1 (0.2)
Others would react	1 (0.1)	0 (0.0)	1 (0.2)	0 (0.0)
Overall knowledge score				
Mean (SD)	3.1 (2.5)	2.6 (2.2)	2.9 (2.1)	2.9 (2.3)
Median (IQR)	3 (1-4)	2 (1-4)	3 (2-4)	3 (1-4)

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