Archives of Public Health

https://doi.org/10.1186/s13690-026-01995-z

Article in Press

Profiling the disease burden in Teso subregion during community-based medical education and research services at Soroti University: a prospective study protocol

Received: 24 December 2025

Accepted: 12 June 2026

Published online: 18 June 2026

Cite this article as: Opito R., Odiit A., Akurut H. *et al.* Profiling the disease burden in Teso subregion during community-based medical education and research services at Soroti University: a prospective study protocol. *Arch Public Health* (2026). https://doi.org/10.1186/s13690-026-01995-z

Ronald Opito, Amos Odiit, Hellen Akurut, Emmanuel Ayikobua Tiyo, Joash Okoboi, Letizia Maria Atim, Clement Munguiko, Lawrence Obado, Bonniface Oryokot, Fred Kirya, Ruth Muhindo, David Aderu, Patrick Lubogo, Stephen Econyu, Simon Icumar Omeke, Samuel Kabwigu & Amos Deogratius Mwaka

We are providing an unedited version of this manuscript to give early access to its findings. Before final publication, the manuscript will undergo further editing. Please note there may be errors present which affect the content, and all legal disclaimers apply.

If this paper is publishing under a Transparent Peer Review model then Peer Review reports will publish with the final article.

ARTICLE IN PRESS

© The Author(s) 2026. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by-nc-nd/4.0/.

ARTICLE IN PRESS

Profiling the disease burden in Teso subregion during community-based medical education and research services at Soroti University: A prospective study protocol

Authors: Ronald Opito[1**], Amos Odiit[2], Hellen Akurut[1], Emmanuel Ayikobua Tiyo[3], Joash Okoboi[4], Letizia Maria Atim[5], Clement Munguiko[6], Lawrence Obado[7], Bonniface Oryokot[8], Fred Kirya[9], Ruth Muhindo[10], David Aderu[11], Patrick Lubogo[12], Stephen Econyu[13], Simon Icumar Omeke[14], Samuel Kabwigu[11], Amos Deogratius Mwaka[15].

Author Affiliations

[1]Department of Public Health, School of Health Sciences, Soroti University, Uganda. [2]Department of Pediatrics, School of Health Sciences, Soroti University, Uganda. [3]Department of Physiology, Soroti University, School of Health Sciences, Uganda. [4]Department of Biochemistry, School of Health Sciences, Soroti University, Uganda. [5]Department of Mental Health, School of Health Sciences, Soroti University, Uganda. [6]Department of Nursing, School of Health Sciences, Soroti University, Uganda. [7]Department of Biomedical Laboratory Sciences, School of Health Sciences, Soroti University, Uganda. [8]The AIDS Information Centre, Kampala Uganda. [9]Department of Surgery, School of Health Sciences, Soroti University, Uganda. [10]Department of Anesthesia, School of Health Sciences, Soroti University, Uganda. [11]Department of Obstetrics and Gynaecology, School of Health Sciences, Soroti University, Uganda. [12]Department of Pharmacology,

ARTICLE IN PRESS

School of Health Sciences, Soroti University, Uganda. [13]Department of Library and Information Sciences, Soroti University, Uganda. [14]Katakwi District Local Government, Uganda. [15]Department of Internal Medicine, Faculty of Medicine, Gulu University, Gulu, Uganda.

**Corresponding Author: Dr. Ronald Opito, dopito@sun.ac.ug. Orcid: https://orcid.org/0000-0002-6183-6851.

Abstract

Background: Community-based medical education and research services (COBMERS) place medical students in primary health care facilities to strengthen their skills in community health service delivery, teamwork, leadership and professional ethics within limited-resource settings. Beyond training, COBMERS enables universities to generate evidence on local disease epidemiology, transmission dynamics, and control practices, resulting in a tangible, contextualized impact on the communities. There is however limited data on disease profile in Teso subregion, with limited epidemiological research in the area. This prospective study aims to profile the disease burden in the Teso subregion through COBMERS, thereby informing community-level interventions and health policy.

Methods: The study will employ convergent parallel mixed-methods design, integrating quantitative and qualitative approaches. Quantitative components will include cross-sectional surveys to determine prevalence of non-communicable diseases (NCDs), neglected tropical diseases (NTDs), and

ARTICLE IN PRESS

infectious diseases, complemented by prospective cohort studies to assess temporal trends. Qualitative data will be gathered through focus group discussions and key informant interviews to explore community perceptions, health system capacity, and effectiveness of preventive measures. A community-based participatory research (CBPR) approach will guide all phases, ensuring that research is co-designed with community members, health practitioners, and local authorities. Medical students, under the supervision of faculty and site mentors, will serve as primary data collectors, integrating research with their COBMERS training.

Discussion: The study is expected to provide evidence on the prevalence, trends, and risk factors of major diseases in the Teso subregion, alongside community perspectives on health priorities and barriers to care. Findings will stir up debates to inform tailored interventions, strengthen primary health care, and guide policy formulation. Additionally, embedding research within COBMERS is expected to build local research capacity among site mentors and students, fostering sustainability and continued community-university collaboration. This protocol therefore provides an integrated framework that combines epidemiological surveillance, community engagement, and capacity building. By leveraging COBMERS and CBPR, the study seeks to provide actionable evidence to reduce the burden of NCDs, infectious diseases, and NTDs while promoting health system resilience in Eastern Uganda.

Key words

ARTICLE IN PRESS

Disease burden, COBMERS, community, non-communicable diseases, epidemiological surveillance, medical students.

Text box 1: Contribution to literature

- The disease burden in Teso, more especially non-communicable disease and neglected tropical diseases are not well profiled, as the region and the country focus more on infectious diseases.
- There is limited evidence on the integration of community based medical education with disease surveillance in the primary health care facilities.
- This study integrates epidemiological disease surveillance with community based medical education in rural settings and provides an opportunity for service learning for the

ARTICLE IN PRESS

nues to
ble and
w that
ections,
unt for
gender
ses and
ted [2].
crease,

with a case notification increasing sharply from 29,640 cases in 2020 to 72,768 in 2024 with significant clustering observed in Northeastern Uganda [3].

On the other hand, non-communicable disease (NCD) burden has been rapidly increasing in Uganda and other sub-Saharan African (SSA) countries in the last decades, with significant variation in prevalence by sex and socioeconomic statuses, yet little progress is being made in implementation of prevention strategies [4,5]. Several individuals remain undiagnosed with

ARTICLE IN PRESS

these NCDs [6] and approximately 53% of all-cause mortality have been attributed to NCDs among adults in Eastern Uganda [7].

Despite the changing disease burden in Uganda, epidemiological disease profiling in Teso remains limited, and fragmented with the few studies focusing on infectious diseases [8], and national aggregates masking critical district-level variations that drive disparity in health outcomes.

Soroti University, established in 2015 as Uganda's 9th Public University operates a community-based medical education and research services (COBMERS) program that places medical students in rural health facilities as part of their service learning. This model creates a unique opportunity for systematic, community level disease surveillance in the region.

COBMERS aims to develop a complete medical worker who understands primary healthcare and teamwork for improved health of the population [9]. Research has been incorporated into medical education in many medical schools worldwide, with a focus of teaching research skills and the subsequent applications of those skills after graduation [10,11].

However, the potential of COBMERS program to generate sub-regional epidemiological disease profile has not been explored. Profiling the disease burden in Teso sub-region will leverage Soroti University's COBMERS program to generate the first comprehensive, district level disease profile to directly inform resource allocation, enable targeted interventions and contribute to Uganda's national health sector strategic plan.

ARTICLE IN PRESS

Problem statement.

There is no consolidated and current profile of disease burden across Teso sub-region. The limited attempts to understand the disease and health problems of the region by Soroti University students and staff [12–14], are fragmented with no clear impact observed. Existing regional and national reports often mask local variations, and the lack of granular up-to-date local data affects health planning where local health officials lack evidence to allocate limited resources to high burdened diseases and makes prevention efforts reactive rather than targeted.

Therefore, this research project will leverage Soroti University's COBMERS program to document disease prevalence, trends, distribution and their determinants. The resulting evidence base will inform district health planning and guide targeted community interventions to reduce preventable morbidity and mortality in Teso sub-region.

ARTICLE IN PRESS

Research Project Objectives.

The overall objective of this prospective study is to profile the burden of diseases in Teso subregion through community based medical education and research services.

The specific objectives are outlined below.

ARTICLE IN PRESS

Assess the prevalence of common non-communicable diseases (NCDs) in Teso subregion and the capacity of the health workers to diagnose and manage them.

Non-communicable diseases (NCDs) are chronic diseases that are non-transmissible and usually result from an interplay of genetics, environmental, behavioral, and physiological factors[15,16]**.** Such diseases include mental health conditions, cardiovascular disease, cancers, diabetes and , chronic lung disease among others [16,17]. Risk factors for non-communicable diseases are diverse, and more lifestyle related as compared to infectious diseases. Some of the noticeable risk factors include physical inactivity, poor diet, excessive alcohol consumption and tobacco use. Others include elevated blood pressure, sugar and lipids in blood [18]. Most risk factors for non-communicable diseases are thus modified.

There has been an exponential increase in the burden of NCDs in Sub-Saharan Africa (SSA) in the past two decades, driven by risk factors such as physical inactivity, poor diet, air pollution, high blood pressure and diabetes among others [19]**.** Because of the harm they do to the nation's socioeconomic development and the morbidity and mortality associated with them, NCDs are currently a significant public health problem and therefore, it is important to design interventions to curb increasing mortality and morbidity due to them.

Although there has been an increasing burden of NCDs, SSA healthcare systems remain inadequately prepared to face this challenge [20]**.** A survey

ARTICLE IN PRESS

among 47 African countries done in 2020 revealed that no country was fully ready to integrate NCD services into primary health care [21]. Notwithstanding the fact that the Uganda Ministry of Health has prioritized NCD prevention, early diagnosis, and management, research on the capacity of public sector health facilities to address NCDs is limited [22]. We therefore aim at unearthing the barriers to detection of NCDs in the community, therefore improving the capacity of community health centers to detect and manage non-communicable diseases.

The study will determine the prevalence of non-communicable diseases and act as a baseline for targeted intervention. The study will help identify barriers to optimum service delivery such as health worker knowledge gaps, logistical barriers and personnel gaps among others. This information will be the basis for targeted intervention and improvement of service delivery for NCD prevention and management. In this study, community perceptions on management of NCDs shall be obtained and used in the design and implementation of programs for improvement of diagnosis and management of NCDs that are appropriate to the setting. Data from the study will help us design an intervention to improve detection and management of NCDs at community health centers. Early detection and proper management of non-communicable diseases will reduce morbidity and mortality, hence improving community productivity. This may lead to overall economic growth of the community. The intervention can also be scaled up to other areas of the

ARTICLE IN PRESS

country hence promoting the country's economic growth through reduction of morbidity and mortality.

To determine the trends of common infectious diseases over a period of 10 years. (TB, Malaria, UTIs, hepatitis B, STIs, RTIs etc.) within the Teso sub-region and assess effectiveness in the preventive measures over the same period.

Infectious diseases pose a significant public health challenge globally and particularly in low-income countries such as Uganda. These diseases contribute substantially to morbidity, mortality, and economic burden in communities, necessitating a comprehensive understanding of their prevalence, distribution, and impact on healthcare systems [23]. In Uganda, infectious diseases such as malaria, HIV/AIDS, tuberculosis, diarrheal diseases, and respiratory infections are major contributors to the disease burden [24–27].

ARTICLE IN PRESS

Localized studies specifically focusing on the burden of infectious diseases among patients attending community health facilities in the Teso Sub-Region are limited. Understanding the epidemiological landscape and trends in transmission of infectious diseases in this context is crucial for informing evidence-based healthcare strategies and improving health outcomes. Targeted and community tailored interventions aimed at reducing the morbidity and mortality associated with infectious diseases are needed to enhance current efforts. By gathering robust data on disease prevalence,

ARTICLE IN PRESS

demographic characteristics, clinical presentations, and healthcare utilization patterns, this study seeks to inform targeted interventions, optimize resource allocation, and ultimately reduce the burden of infectious diseases in the Teso Sub-Region.

To establish the prevalence of common NTDs (Schistosomiasis, Onchocerciasis, trypanosomiasis etc.) around wetland communities in eastern Uganda and the effectiveness of control measures.

Neglected tropical diseases (NTDs) continue to afflict billions of individuals in silence, particularly in SSA, with profound effects, accounting for 14.5 million disability-adjusted life years (DALYs) [28]. Schistosomiasis is observed as the most common NTD, leading to 11,792 deaths globally per annum and reducing the average lifespan of an infected individual by over 20% [29].

The financial impact of schistosomiasis coupled with decreased animal yields and increased animal mortality also presents a significant burden to the communities affected by it.

Current control strategies predominantly rely on preventive chemotherapy, mainly using praziquantel. However, there are reports of emerging drug resistance and the high cost of chemotherapy, especially in resource-limited settings. Additionally, the continuous interactions between livestock, humans, and contaminated environments perpetuate reinfections, hindering disease elimination efforts. Recent cuts in funding for schistosomiasis control further exacerbate these challenges [30–33].

ARTICLE IN PRESS

Therefore, this study aims to establish the prevalence of schistosomiasis around water bodies in eastern Uganda, determine community and health worker perspectives and treatment approaches and document its findings to inform policy and interventions.

Methodology

Study Design.

This study will employ convergent parallel mixed-methods design, where quantitative and qualitative data will be collected simultaneously and then merged to provide a comprehensive understanding of the research questions. Data integration and triangulation will be done at the point of interpretation of results from the different sources to complement the findings. The quantitative study will employ cross-sectional surveys for prevalences while prospective cohort studies will be conducted to analyze the trends of community disease prevalences and incidences (NCDs, NTDs and infectious diseases).

ARTICLE IN PRESS

We shall use a community-based participatory research (CBPR) approach to conduct qualitative studies to examine the local understanding of disease burden and co-design acceptable preventive measures. The community will participate in the problem analysis to give priority areas for the research and in data collection process to provide oversight and monitoring of the research process, in addition to deciding how the findings should be locally disseminated and utilized. The use of CBPR is justified because it addresses

ARTICLE IN PRESS

power imbalance that can distort participant responses, enhances validity by grounding data collection and interpretation in lived community experiences, and increases the relevance and uptake of findings by ensuring research questions and solutions reflect community priorities [34–37]. The study designs are summarized in table 1.

Study area (Soroti University and Teso region).

The study will be conducted by a team of researchers and students from Soroti university. Soroti university is one of the public universities in Uganda established by an Act of Parliament in 2015 to provide science based high education services to the country (https://sun.ac.ug/). The university is in Arapai, Soroti City East, Soroti City, 7 kilometers along Soroti-Moroto road. The university is rapidly growing with a students' population of about 500 and this is projected to increase exponentially in the next five years (https://sun.ac.ug/). The university offers training in health education to students of medicine, nursing, laboratory science and physiotherapy, and is in the process of expanding to provide more undergraduate medical education in the areas of midwifery among others. As part of their training, the pre-service health workers are exposed early and routinely to the community through community based medical education and research services (COBMERS). This process involves placing students to the primary health care facility, not routinely used as a teaching hospital, for a specified period, usually 4-6weeks to enable them to get acquainted with provision of

ARTICLE IN PRESS

community health services, teamwork and develop positive attitudes towards the community.

Soroti University has identified ten (10) sites in Teso subregion to act as COBMERS sites. These sites include Katakwi Hospital, Amuria Hospital, Kaberamaido Hospital, Atutur Hospital, Kalaki HCIV, Bukedea HCIV, Kumi HCIV, Serere HCIV, Ngora HCIV and Kapelebyong HCIV. These sites can be expanded, and some replaced based on the need and the situational assessment of the suitability (in terms of students' accommodation and availability of site tutors). Additionally, there are eight (8) lower health facilities within Soroti City identified to introduce students to COBMERS in their earlier years of study. These facilities include, Eastern Division HCIII, Soroti HCIII, Princess Diana HCIV, TASO Soroti Center of Excellence, Kichinjaji HCIII, Western Division HCIII, Marie stopes Uganda Soroti Center, and Murapesuru HCII. Besides these lower health facilities, the students are placed for their routine clinical exposure in Soroti Regional referral hospital which is the main referral hospital for Teso sub-region. In addition to the 10 sites in Teso, there are some sites in Lango, Northern Uganda, that is Alebtong HCIV, Dokolo HCIV and Apac District Hospital which are being assessed for accreditation. These sites will provide comparisons to the Teso sub-region.

The Teso sub-region is located in Northeastern Uganda and comprises of 10 districts of Serere, Soroti, Soroti City, Ngora, Amuria, Kalaki, Kapelebyong,

ARTICLE IN PRESS

Kaberamaido, Katakwi, Kumi and Bukedea, with a total population of approximately 2,500,000 [38].

Study Population.

To assess the capacity of health workers in Teso subregion to diagnose and manage NCDs, the study population will be the health workers from Teso subregion working in HCIIIs, HCIVs and district hospitals. For the prevalence of different NCDs in the region, the study population will be children (Pediatric NCDs like Acute kidney injury, early onset diabetes and congenital heart diseases) and adults (Hypertension, Diabetes, Cancers, etc.) both coming to the facilities-COBMERS sites and in the community who will be accessed by the students while conducting their home visits.

To determine the trends of infectious diseases and the prevalence of common neglected tropical diseases, all the community members susceptible to the infectious and neglected tropical diseases will be the study population. The trends will be determined through monthly and annual review of hospital-based records on the infection rates.

Sample Size calculation and sampling procedures.

Quantitative Study. The sample size per site for quantitative study will be estimated using the Krejcie and Morgan Table (1970). For all the sites, the population served is more than 100,000 people, so the sample size per site will be 384 participants for the quantitative study.

ARTICLE IN PRESS

Sample size for Qualitative Study. The sample size for qualitative study will be determined based on different approaches as outlined below.

1. Using the CBPR approach which we have adopted for this study, there will be dialogue meetings with the community members to identify key questions which need to be answered per research objectives. We shall have at least 2 community dialogue meetings per COBMERS site regarding the research priorities and conduct health education sessions based on the identified needs.

2. Each COBMERS site will conduct at least 4 focused group discussions (FGDs) of 8-10 members per group to get a deeper community understanding of the problem being studied and their recommendations for local solutions. This will be followed by the key informant interviews (KIIs) of opinion leaders in the community to get their understanding of the problem and proposed community solutions to the problems. The FGDs and KIIs will be used to explore topics such as management of NCDs and NTDs in the community. The principle of data saturation shall be used to determine sample size [39,40]. We expect to reach saturations by about two to three FGDs per site; 20 FGDs in total.

3. KIIs will be conducted with the health facility staff and in charges to establish their capacity in diagnosis and management of NCDs in the region. We shall conduct interviews until the point of data saturation is reached, that is, the point when two or more interviews shall not generate any new

ARTICLE IN PRESS

information/perspectives [39,40]. We hope to reach point of data saturations by about four to six interviews per site: 50 interviews in total.

Data collection procedures

Quantitative data.

Data will be collected with investigator administered questionnaire and data abstraction tools, installed into android phones of students loaded with the online Kobo toolbox software (https://www.kobotoolbox.org/).

As part of their COBMERS program, students who will work as research assistants (RA) to collect data in the community will be trained in the use of online data collection tools and basic analysis techniques and they will be required to conduct site specific analysis and present reports to the department of Public Health. The research assistants (RA)/students will be trained on the data collection method to use, consenting process, interview technique and use of the kobo toolbox for online data collection. This training will be conducted on a yearly basis prior to sending students to the field for COBMERS, since there will be different cohorts of students per year. They will also be trained on the disease burden in the region and the priority diseases for the study. Additionally, the research assistants will train on how to handle special populations like the children, people living with HIV, pregnant and breastfeeding mothers.

The RA will approach the clients during the day when they have come to receive medical services at the study sites, explain the purpose of the study and take them through the consenting processes for those who will accept to

ARTICLE IN PRESS

participate in the study. For community-based surveys, the students (RAs) will work with the site supervisors, the village health teams and local council one chairpersons to map the community and identify households or community points for the interviews to be conducted.

The prospective participants will be allowed to ask questions regarding the study. After their concerns are addressed, the study participants will be offered informed consent forms. The target participants for the community and facility-based surveys will be adults of consenting age, 18 years and above and the interview will be conducted in local languages, Ateso and Kumam, with few interviews conducted in English. The RAs/Students who know the local language will be the ones to ask the questions, while the other students will moderate the interview process.

Qualitative Data collection Approach.

Since we shall use community based participatory research approach, the community will play a pivotal role in the study. The Focused Group Discussions (FGDs) will be conducted with the community members to identify the disease burden which they think are priorities for the university and the health sector.

Four FGDs will be conducted per COBMERS site, each comprising of 8-10 participants aged 18 years and above and purposively selected based on their relevance on the research topics. The FGDs will be conducted at community levels, mobilization done by the village health teams (VHTs) and the interviews will be conducted by the students, where they will assign within

ARTICLE IN PRESS

their groups roles for interviewers, observers and moderators. The students will be joined by the researchers as observers. The FGDs will be conducted in local languages (Ateso and Kumam) and will take about 45-60 minutes each addressing community concerns of common disease burden and priority for research and will be audio recorded for transcription.

KIs will be used to identify the capacity of the health facilities to diagnose and manage NCDs, the control measures for NCDs and infectious diseases, whether they are working or not, and their opinion on why the interventions are not controlling the diseases. The KIs will also be used to identify the priority research areas in the region and interventions that can be done to curb the disease burden. The participants focused for KIs are the district health teams, including the DHO, assistant DHOs, facility in charges, VHTs, political and administrative leaders of the districts and religious leaders and interviews will be conducted in their respective offices. 10-12 KIs will be conducted per COBMER site to include a mix of the study participants and enable reaching saturation on the area of the research. The KIs will be conducted in English, by the students while for their COBEMRS placement and they will be joined by the researchers who will be observers of the interview processes. Each interview will take about 45 minutes and will be audio recorded for transcription later.

ARTICLE IN PRESS

Data Management and analysis.

Data from this study will be managed centrally at the Department of Public Health, School of Health Sciences of Soroti University. The quantitative data

ARTICLE IN PRESS

collected online will be saved into the central database at the department and managed by an expert data manager/biostatistician who will be specifically responsible for data management and analysis.

Quantitative Data Analysis.

Data from the Kobo toolbox software will be downloaded onto an excel sheet in a password protected laptop at the end of every day of data collection. The COBMERS site mentors will review the data at the end of every data collection period for consistency and then upload it into the database. Data cleaning will be done at each COBMERS site by the team and inconsistent and inaccurate information will be removed, or verification made, more so for the already existing records. The cleaned data will be downloaded from the database, then exported from excel to STATA version 16.0 statistical software for further management and analysis.

ARTICLE IN PRESS

Data will be analyzed at three different levels. At univariate level, the socio-demographic and medical characteristics such as age, marital status, and community disease profile for both NCDs and Infectious diseases will be summarized and presented in form of frequencies, percentages, median, mean, and standard deviation.

Geospatial maps will be generated to show the distribution of both NCDs and infectious diseases while trends analysis for the infectious and neglected tropical diseases will be generated over time to show the changes in the disease profile.

ARTICLE IN PRESS

Generalized linear models such as modified Poisson regression models will be used to conduct multivariate analysis. First, we will perform a bivariate analysis by regressing each independent variable to the outcome and later subject all variables with biological relevance or confounders to a multiple regression, adjusting each variable with the sociodemographic characteristics. Results from the final models will be presented as adjusted prevalence ratio. From bivariable and multivariate analyses, predictors whose 95% confidence interval (CI) do not include the null value (1.0) will be considered statistically significant.

Qualitative Data Analysis.

The purposively selected key informants and focus group discussions will be interviewed. The qualitative interviews of key informants will help to identify the capacity level for the diagnosis of NCDs in the health facilities, while focused group discussions will be used to identify community perceptions of common health problems and why they are persisting besides the interventions in place.

Qualitative data will be analyzed using thematic approaches. The audio recorded data will be transcribed verbatim and entered in Nvivo software for processing and further analysis. Data will be read and re-read to identify emergent and recurrent themes and concepts to develop a coding tree. Codes will be applied to label the text, and once all the text has been coded, memos, and display matrices will be developed to summarize and compare each code in detail for sub-themes, nuances, and patterns.

ARTICLE IN PRESS

Qualitative data will be analyzed at group level (providers and service recipients). Using content and thematic analysis to categorize verbal or behavioral data for purposes of classification, summarization, and tabulation. Key themes and trends emerging from the data will be used in relation to the objectives of the study. These will then be used to triangulate quantitative data. Direct quotations from the interviews and FGDs will also be used to support the interpretations. Typical quotes will also be selected and included in reports to emphasize the reasons for the reported quantitative performance.

Table1: Summary of the study design by objective, proposed participants and areas of community participation.

Study Objectives	**Study design**	**Dependent Variable**	**Independent variable**	**Proposed Sites and Participants**	**Areas o community Participatio**
Assess the prevalence of common non-communicable disease (NCDs) in Teso subregion and the capacity of the health workers to	Mixed method design. Quantitative to assess the prevalence, while both quantitative and qualitative to assess the capacity of	Prevalence of a specific NCD eg Diabetes, Hypertension etc defined using standard definitions and diagnoses.	Sociodemographic and lifestyle characteristics, family history and exposure to known risk factors. Training in NCD diagnosis and Management, availability of diagnostic kits	4 COBMERS Sites, including Katakwi, Kaberamaido. Bukedea and Serere HCIV for the prevalence studies while the capacity assessment	Provide a input on wha they think ar the commo NCDs an how they ar managed locally in th community. The healt facility sta will als

ARTICLE IN PRESS

diagnose and manage them.	the health facilities to diagnose and manage NCDs.	Readiness of health workers to diagnose and manage NCDs.	and essential medicines for management of NCDs.	will be done in all the health facilities in the region, from HCIII up to district hospitals. This will also include private facilities.	provide a input into th capacity assessment and what the think could b done t improve th diagnosis an management of NCDs in th community.
To determine the trends of common infectious diseases over a period of 10 years within the Teso sub-region and assess the effectiveness in the preventive measures over the same period.	Quantitative Methods for trends and qualitative methods to assess the intervention effectiveness	Trends in infectious disease transmission	Rainfall patterns, age categorization, health system factors and the interventions designed for control	All COBMERS sites	Identification of th infectious disease control measures which seen effective an acceptable t the community members.
To establish the	Quantitative and	Prevalence of common	Wetland availability and	4 COBMERS sites near	Identification of th

ARTICLE IN PRESS

ARTICLE IN PRESS

prevalence of common NTDs around wetland communities in eastern Uganda and the effectiveness of control measures.	Qualitative design	NTDs in the wetland areas.	seasonality, activities in the wetlands, control measures in place, health systems factors	wetlands, Kapelebyong, Kaberamaido Hospital, Kalaki HCIV, Serere HCIV and Bukedea HCIV.	common NTDs in thei areas and th community preventive strategies which ar effective.

Note: *NCD=non-communicable diseases, COBMERS=Community-based medical education and research services, NTDs=Neglected tropical diseases, HC=Health center.*

Quality Assurance and Control,

Since the data will be collected by students during their community placement for COBMERS, they will first undergo didactic training on research methodologies, focusing on quantitative and qualitative data collection methodologies, ethical processes in data collection, consenting processes and quality assurance approaches. In addition, the data collection will be supervised by the site mentors and the researchers during their field support supervision. Specifically, the research investigators will join the students during qualitative interviews.

The data collection tools will be pretested in Princess Diana HCIV for its consistency and accuracy in collecting the required information. The survey questionnaires and data abstraction tools will then be uploaded into Kobo

ARTICLE IN PRESS

toolbox, which has additional quality control measures to ensure accurate data is collected.

Quality assurance and control for the qualitative study will be maintained by ensuring the trustworthiness of the study through following the Lincon and Guba model (1985), That is, **Credibility** will be enhanced through rigorous data collection and analysis which will involve member checking and triangulation. **Dependability** will be achieved by ensuring transparent and well-documented research processes, detailed descriptions of data collection, transcription and analysis procedures, with a clear audit trail. **Confirmability** will be ensured by keeping a **reflexive journal** and an **audit trail** of the analysis process. **Transferability** will be ensured by providing detailed description of the research context, user personas, user journey maps and any specific conditions that might affect user behavior and connecting specific user insights to theories or conceptual frameworks to ensure the work has wider applicability.

ARTICLE IN PRESS

Status and timelines of the study

This study has been cleared for data collection by the Uganda National Council of Science and Technology (UNCST) and ready for recruitment of study participants. The participant recruitment will start in January 2026 and will be continued on a yearly basis based on the study objectives, while data analysis and reporting of the study will be on a continuous basis. For the first year of the project, recruitment of study participants will start in January 2026 and be completed in June 2026 while data collection is expected to be

ARTICLE IN PRESS

completed by June 2026. Data analysis and report writing for year 1 is expected to be completed by December 2026. The timelines for trends analysis using facility-based records are summarized in table 2 below for each year of the study.

Table 2: Proposed study timelines.

Activity/Year	Year 1 2026				Year 2 2027				Year 3 2028				Year 4 2029				Year 5 2030			
	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D	J-M	A-J	J-S	O-D
Capacity Assessment of Health facilities	■																			
Qualitative assessment of NCD and infectious disease management in the region		■																		
Conduct baseline surveys for prevalences of NCDs and Infectious diseases		■																		
Data analysis and report writing			■	■		■				■				■				■		
Dissemination of Results							■				■				■				■	■
Renewal of ethics approval				■				■				■				■				
Determine the prevalence of NTDs					■	■														
Determine the annual trends of NCDs, Infectious Disease and NTDs					■				■	■			■	■			■	■		

Note: *NCD=non-communicable diseases, NTDs=Neglected tropical diseases, J-M=January to March, A-J=April to June, J-S=July to September, O-D=October to December.*

Dissemination Plan.

This study will adopt CBPR approach and as such the first plan for dissemination is to the community where data is collected from. This will be

ARTICLE IN PRESS

done on an annual basis as students are posted to the community for their COBMERS practice.

Additionally, annual dissemination seminars will be organized at the university to disseminate the research findings to key stakeholders, including the university staff, leaders of community-based organizations, local political leadership, district health officers and in charge of the COBMERS sites. The officials from the Ministry of Health will also be invited to join the dissemination meeting to enable the results to feed into policy and inform programming.

The results will be presented during national and international scientific conferences for greater impact. In addition, the findings will be published in peer-reviewed journals to allow sharing with a wider audience.

ARTICLE IN PRESS

Community Engagement and Involvement strategies.

The strategies to be applied for community engagement and involvement for this study will include.

1. **Community Entry** which will involve meeting with community leaders, health workers and local authorities to introduce the research team and study objectives. In addition, the researchers will conduct a stakeholder analysis to identify key partners and influencers in the community to design the most effective strategies for stakeholder management. This is done continuously each time the students are sent to the community for their COBMERS placement. The students first meet with the district leadership and facility

ARTICLE IN PRESS

management before being introduced to the community by the facility teams and the village health teams (VHTs).

2. **Community Sensitization.** Organizing community meetings and public forums to raise awareness about the study. This will be done as part of the COBMERS activities by the students when they are placed at the communities for their medical training and COBMERS supervisors (researchers) when they move to the community for support supervision. In addition, the students and the supervisors will use local media channels and engage local health workers to disseminate information. An additional research dissemination meeting will be organized on an annual basis to target the local health workers and the policy makers at the Ministry of Health.

3. Participatory Research Methods. The research will adapt the use of participatory research approaches (e.g., community mapping, focus group discussions) to involve community members in data collection and analysis while ensuring that research methods are culturally safe and adapted to local contexts. This will ensure sustainability of research. The input from community will be incorporated into the proposal during the review and renewals so that the subsequent activities are aligned to community priorities.

4. **Capacity Building.** The research will provide training and capacity-building opportunities for local healthcare providers and community members to enhance their research skills and knowledge and support the

ARTICLE IN PRESS

development of local research capacity to promote sustainability and ownership. One of the objectives of this study is to assess the capacity of the health workers to diagnose and manage NCDs in the region. The finding will help the research team to design a customized capacity building program to target the management of NCDs in the local context.

5. Feedback and Dissemination. We shall regularly share research findings with the community through community dialogue meetings organized and facilitated by students when they go for COBMERS placement and ensure that research results are actionable and inform local health policy and practice. An additional research dissemination meeting will be organized on an annual basis to target the local health workers and the policy makers at the Ministry of Health.

ARTICLE IN PRESS

Discussion

This protocol describes a comprehensive, mixed-methods approach to profiling the burden of disease in the Teso subregion, integrating epidemiological surveillance with community-based participatory research (CBPR) through the COBMERS platform. By combining quantitative prevalence and trend analyses with qualitative exploration of community perceptions, the study is designed to generate both robust epidemiological data and contextually grounded insights that can inform policy and practice. The convergent parallel design strengthens the study’s capacity to address complex, interlinked health challenges. Quantitative analyses will provide objective measures of the prevalence and trends of NCDs, infectious

ARTICLE IN PRESS

diseases, and NTDs, while qualitative engagement will ensure that local perspectives, priorities, and lived experiences shape the interpretation of findings and the design of interventions. The CBPR approach—anchored in established partnerships with health practitioners, community members, and non-governmental organizations—ensures that the research process is collaborative, culturally safe, and oriented toward sustainability [41].

A key innovation of this study is its integration with COBMERS, which not only facilitates data collection across diverse settings but also embeds capacity building for site mentors and health worker trainees. This dual focus on evidence generation and workforce development is expected to strengthen local health systems and foster a culture of continuous learning and improvement.

The findings are anticipated to have direct policy relevance, offering evidence-based recommendations for disease prevention, control, and health system strengthening in the Teso subregion. Best practices identified through the study can be adapted for use at national and potentially global levels, while alternative approaches to disease control can be piloted and refined locally.

Potential limitations include reliance on routine health facility data, which may vary in completeness and quality, and the possibility of wide confidence intervals for some estimates due to small sample sizes in subgroups. These will be mitigated through rigorous data cleaning, triangulation with qualitative findings, and cautious interpretation of results.

ARTICLE IN PRESS

In summary, this protocol outlines a strategically designed study that bridges epidemiological surveillance, community engagement, and capacity building. By leveraging the COBMERS platform and CBPR principles, it aims to produce actionable evidence that advances both academic knowledge and public health impact in Eastern Uganda.

List of abbreviations

COBMERS	Community-based medical education and research services
CBPR	Community-based participatory research
MRRHREC	Mbale Regional Referral Hospital Research and Ethics Committee
VHTs	Village Health Teams
FGDs	Focused group discussions
NCD	Non-communicable diseases
WHO	World Health Organization
NTDs	Neglected Tropical Diseases
CMNN	Communicable, Maternal, Neonatal and Nutritional Diseases
COPC	Community oriented primary health care
HMIS	Health Management Information System
DALY	Disability adjusted life years.

ARTICLE IN PRESS

Declarations:

Ethics approval and consent to participate

ARTICLE IN PRESS

Ethical approval for this study was obtained from Mbale Regional Referral Hospital Research and Ethics Committee (MRRH-REC), **No. MRRH-2024-437** and registered with Uganda National Council of Science and Technology (UNCST), Registration **No. HS6508ES**. The study will be conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All participants will be informed about the purpose of the study, assured of confidentiality, and provided written consent prior to participation. Participation will be voluntary, and respondents may withdraw at any time without consequence. The roles of the participants in the study will be explicitly explained to them before recruiting them to be part of the study. For the participants below 18years, parental consent will be obtained from their parents/guardians prior to participation, and assent will be obtained from the minors themselves. The participants for FGDs and KIs will be requested in addition to consent for audio recording of the interviews to easy transcription and further analysis. Consent waivers have been provided by REC for studies involving use of secondary individual patient level data and aggregate data from the HMIS forms.

ARTICLE IN PRESS

Consent for Publications

Not applicable

Availability of data and materials

Not applicable

Competing Interests

The authors declare no conflict of interest

ARTICLE IN PRESS

Funding

This research project is receiving local funding from the government of Uganda through Soroti University research and innovation funds.

Author contributions

All authors have made equal and substantial contributions to the development of this proposal and seeking administrative clearance and community engagements for the research work.

Acknowledgement

The authors would like to acknowledge Soroti University for providing funding for this research project. In addition, we acknowledge all the districts and health facilities which have accepted to work with us as COBMERS sites and the mentors for the mentorship they provide to students while they are for their placement. In a special way, we would like to acknowledge and appreciate the contribution of the community gatekeepers, the Local council I leaders, VHTs and other opinion leaders for always welcoming and guiding our students during their stay in the community.

ARTICLE IN PRESS

References.

1. Steve Bicko Cygu , Betty Nabukeera LE, Shakira B, Collins G, Maureen N, Michael O, , David Amadi HOO, et al. Understanding the demographic and socioeconomic determinants of morbidity in Eastern Uganda : a retrospective analysis of the Iganga- - Mayuge health and demographic surveillance data. BMJ Public Heal. 2024;1–12.

ARTICLE IN PRESS

2. World Health Organization. World malaria World malaria report report [Internet]. Geneva: World Health Organization; 2023. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023

3. Augustus Aturinde GA and RI. Spatio-temporal trends , distribution and prediction of tuberculosis incidence in Uganda (2020 – 2025). BMC Infec. 2026;

4. Kraef C, Juma PA, Mucumbitsi J. Fighting non- - communicable diseases in East Africa : assessing progress and identifying the next steps. BMJ Glob Heal. 2020;1–8.

5. Kibria GM Al, , Ankita Meghani, Charles Ssemagabo, Adaeze WosuID , Tryphena Nareeba, Collins Gyezaho, Edward GaliwangoID J, Kaija Nanyonga, George W. Pariyo, Dan Kajungu, Elizeus Rutebemberwa D, Gibson G. Geographical , sex , and socioeconomic differences in non-communicable disease indicators : A cross-sectional survey in Eastern. PLOS Glob PUBLIC Heal [Internet]. 2024;1–14. Available from: http://dx.doi.org/10.1371/journal.pgph.0003308

6. Kwarisiima D, Balzer L, Heller D, Kotwani P, Byonanebye D, Petersen M, et al. Population-Based Assessment of Hypertension Epidemiology and Risk Factors among HIV-Positive and General Populations in Rural Uganda. PLoS One. 2016;1–11.

7. Natukwatsa Davis, Adaeze C. Wosu, Donald Bruce Ndyomugyenyi, Musa

ARTICLE IN PRESS

Waibi DK. An assessment of non-communicable disease mortality among adults in Eastern Uganda , 2010 – 2016. PLoS One [Internet]. 2021;2010–6. Available from: http://dx.doi.org/10.1371/journal.pone.0248966

8. Ssentongo SM, Ojok B, Opito R, Oryokot B, Esabu M, Odit A, et al. Prevalence and risk factors of neonatal sepsis in the neonatal intensive care unit at Soroti Regional Referral hospital, Uganda: a retrospective study. BMC Pregnancy Childbirth [Internet]. 2025;25(1):1226. Available from: https://doi.org/10.1186/s12884-025-08433-y

9. Himashree Bhattacharrya, Gajendra Kumar Medhi, Star Pala, Amrita Sarkar, Ophelia Mary Kharmujai WL. Early community-based teaching of medical undergraduates for achieving better working skills in the community. J Educ Health Promot [Internet]. 2018;(January):1–6. Available from: 10.4103/jehp.jehp_153_18

10. Sheng G, Lee J, Chin YH, Jiang AA, Mg CH, Rishi K, et al. Teaching Medical Research to Medical Students : a Systematic Review. 2021;945–62.

11. Knight SE, Wyk JM Van, Mahomed S. Teaching research : a programme to develop research capacity in undergraduate medical students at the University of KwaZulu-Natal , South Africa. BMC Med Educ [Internet]. 2016;1–8. Available from: http://dx.doi.org/10.1186/s12909-016-0567-7

12. Nagudi LD, Kateregga J, Munguiko C, Akurut H, Opito R. Uptake and

ARTICLE IN PRESS

Completion of Human Papilloma Virus Vaccination by Adolescent Girls Attending Primary Healthcare Facilities in Soroti City, Northeastern Uganda; A Cross-Sectional Study. J Nur Healthc. 2025;10(1):1–8.

13. Akol M, Opito R, Oryokot B, Akurut H, Kalema J, Chekwoti M, et al. Prevalence and factors associated with teenage pregnancy among girls aged 13 to 19 years in Atutur sub-county , Kumi district , Eastern Uganda : a community-based cross- sectional study. 2025;

14. Ekinu J, Ayikobua ET, Icodu E, Akurut H, Akot OO, Oder S, et al. Department in a Rural District Hospital in Uganda . Factors Associated with Cervical Cancer Screening Uptake Among Women Attending Outpatient Department in a Rural District Hospital in Uganda . A Cross-Sectional Study. 2025;1411.

15. World Health Orgnaization. Noncommunicable diseases [Internet]. World Health Organization. 2023 [cited 2024 Sep 21]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

16. unicef. Non-communicable diseases [Internet]. unicef. 2021. Available from: https://data.unicef.org/topic/child-health/noncommunicable-diseases/

17. World Health Orgnaization. Global action plan for the prevention and control of noncommunicable diseases. WHO. 2013.

ARTICLE IN PRESS

ARTICLE IN PRESS

18. Gokul Sarveswaran, Vaitheeswaran Kulothungan PM. Clustering of noncommunicable disease risk factors among adults (18–69 years) in rural population, South-India. Diabetes-and-metabolic-syndrome-clinical-research-and-reviews [Internet]. 2020;14(5):1004–14. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1871402120301624?via%3Dihub

19. World Health Organization (WHO) African Region. Noncommunicable diseases [Internet]. World Health Organization. 2017. Available from: https://www.afro.who.int/health-topics/noncommunicable-diseases

20. Schwartz JI, Dunkle A, Akiteng AR, Birabwa-Male D, Kagimu R, Mondo CK, et al. Towards reframing health service delivery in Uganda: The Uganda Initiative for Integrated Management of Non-Communicable Diseases. Glob Health Action. 2015;8(1):1–7.

21. Tesema AG, Ajisegiri WS, Abimbola S, Balane C, Kengne AP, Shiferaw F, et al. How well are non-communicable disease services being integrated into primary health care in Africa: A review of progress against World Health Organization's African regional targets. PLoS One [Internet]. 2020;15(10 October):1–15. Available from: http://dx.doi.org/10.1371/journal.pone.0240984

22. Rogers HE, Akiteng AR, Mutungi G, Ettinger AS, Schwartz JI. Capacity of Ugandan public sector health facilities to prevent and control non-

ARTICLE IN PRESS

communicable diseases: An assessment based upon WHO-PEN standards. BMC Health Serv Res. 2018;18(1):1–13.

23. World Health Orgnaization. Global burden of disease and injury series, Volume IV. The global epidemiology of infectious disease. Vol. IV. Geneva; 2004.

24. Kalyesubula R, Mutyaba I, Andia-biraro I, Alupo P, Kimuli I, Nabirye S, et al. Trends of admissions and case fatality rates among medical in-patients at a tertiary hospital in Uganda ; A four-year retrospective study. 2019;1–14.

25. UNAS, CDDEP, GARP-Uganda MY& W. Antibiotic Resistance in Uganda : Situation analysis and recommendations (pp.107), Kampala, Uganda. Uganda national academy of sciences, Center for Disease Dynamics, Economics and Policy. kampala; 2015.

26. World Health Orgnaization. World malaria report 2022 [Internet] [Internet]. World Health Organization. 2022. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

27. Chakaya J, Petersen E, Nantanda R, Mungai BN, Migliori GB, Amanullah F, et al. The WHO Global Tuberculosis 2021 Report –not so good news and turning the tide back to End TB. Int J Infect Dis. 2020;(January).

28. World Health Orgnaization. Global report on neglected tropical

ARTICLE IN PRESS

ARTICLE IN PRESS

diseases. 2023.

29. Jiang H, Zhou J, Xia M, Li G, Di J, Mao F, et al. Life expectancy and healthy life expectancy of patients with advanced schistosomiasis in Hunan Province, China. Infect Dis Poverty. 2023;12(1):1–11.

30. Odiere MR, Rawago FO, Ombok M, Secor WE, Karanja DMS, Mwinzi PNM, et al. High prevalence of schistosomiasis in Mbita and its adjacent islands of Lake Victoria , western Kenya. 2012;2–9.

31. Aula OP, Mcmanus DP, Jones MK, Gordon CA. Schistosomiasis with a Focus on Africa. 2021;1–40.

32. Mcmanus DP. Schistosomiasis — from immunopathology to vaccines. 2020;355–71.

33. Hala Elmorshedy, Robert Bergquist, Amel Fayed, Wafaa Guirguis, Ensaf Abdel-Gawwad SE and RB. prevalence one . Many of them (67%) did not utilize the health centre at all compared to 26% of the people in the low- prevalence village . Interestingly , private clinics were seen as the primary source of health care by both villages , but more frequ. Infect Dis Poverty. 2020;63–75.

34. Israel BA, Eng E, Schulz AJ, Parker EA. Methods for community-based participatory research for health. John Wiley & Sons; 2012.

35. Hacker K. Principles of community-based participatory research. Community-based Particip Res. 2013;1–22.

ARTICLE IN PRESS

ARTICLE IN PRESS

36. Duke M. Community-Based Participatory Research [Internet]. Aldenderfer M, editor. Oxford Research Encyclopedia of Anthropology. Oxford University Press; 5AD. p. 0. Available from: https://doi.org/10.1093/acrefore/9780190854584.013.225

37. Krishnan A, Tandon R, Nongkynrih B, Delhi N. Relevance of Community - Based Participatory Research in Community Medicine Training. 2020;

38. Uganda Bureau of Statistics. National Population and Housing Census 2024_Final report Final report [Internet]. Vol. 1, UBOS. Kampala; 2024. Available from: http://libdcms.nida.ac.th/thesis6/2010/b166706.pdf

39. Francis JJ, Johnston M, Robertson C, Glidewell L, Entwistle V, Eccles MP, et al. What is an adequate sample size? Operationalising data saturation for theory-based interview studies. Psychol Health [Internet]. 2010 Dec 1;25(10):1229–45. Available from: https://doi.org/10.1080/08870440903194015

40. Guest Greg, Bunce Arwen, Johnson Laura. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. Field methods [Internet]. 2006 Feb 1;18(1):59–82. Available from: https://doi.org/10.1177/1525822X05279903

41. Lucero J, Wallerstein N, Duran B, Alegria M, Greene-moton E, Israel B, et al. Development of a Mixed Methods Investigation of Process and Outcomes of Participatory Research. J Mix Methods Res. 2016;

ARTICLE IN PRESS