Establishing Webuye Health and Demographic Surveillance Site in Rural Western Kenya: Challenges and Lessons Learned

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ABSTRACT

This paper describes the methodologies, challenges and lessons learned in establishing Webuye Health and Demographic Surveillance System (HDSS) in Webuye Division of Bungoma County. The Webuye HDSS was established in 2007 through a collaborative programme between Moi University, (Eldoret, Kenya) and Ghent University (Ghent, Belgium.) through the Flemish Interuniversity Council (VLIR), university cooperation for development (UOS) in Flanders framework. The goal for establishing the HDSS was to provide reliable and comprehensive demographic, health and economic data to inform health policy and planning at local and national levels**.** The data were collected by households visit within the community twice a year, using field interviewers from the local community. The participatory data collection methods used enhanced locals' interests to take part in data collection processes.

Challenges encountered include insufficient funding, refusals to participate by some household members, modalities for coping with future anticipated community fatigue, responsibility to protect both the University and community, threat by other programmes operating in the area and staff retention.

Despite these challenges, the Webuye HDSS has been successfully established and maintained for the last 4 years. To overcome the challenges establishing and running Webuye HDSS, thorough explanation of the concept to both stakeholders and the community was found to be of utmost importance.

BACKGROUND

Historically, the demographic surveillance system (DSS) is the process of monitoring births, deaths, causes of deaths, and population dynamics data over time [9]. This approach has been considered as the cornerstones of public health research, particularly in investigating and tackling health disparities[Ref: ibidem], and nowadays the process have an added value of collecting data on other determinants of health. This inclusive approach is operationally defined as Health and Demographic Surveillance Systems (HDSS) which is a set of field and computing operations designed to prospectively collect and analyse demographic and health related data of well-defined populations in clearly defined geographic areas [7]. The HDSS sites play a critical supplementary role of generating high-quality, longitudinal, population-based health and demographic data and this fills the gap left by government registering systems. In many low and middle income countries, such as those in sub-Saharan region, many people are born and die before being formally registered in government systems [1-4]. Often demographic data that is obtained comes from censuses or other transversal sample surveys in the community. However, these surveys and censuses may be fraught with errors with some omissions of still births, peri-natal deaths, and deaths from households that closed down. Moreover multiple reporting of individuals and demographic events where the concepts of "household" and "family" are not clearly differentiated; and the fact that these data quickly become out of date[1;2;4-6].

An international network of demographic surveillance systems (DSS) now operates mostly in sub-Saharan Africa and Asia where thirty-eight DSS sites are coordinated by the International Network for the Continuous Demographic Evaluation of Populations and Their Health in developing countries (INDEPTH) [7-9;12]. Three of these sites are in Kenya [1].

Webuye Health and Demographic Surveillance System was established in 2007 by the collaborative research programme between Moi University (Kenya) and Ghent University (Belgium) through the Flemish Interuniversity Council (VLIR), university cooperation for

development (UOS) in Flanders framework. It is a component of the Health Science Project within this programme, and is run by staff from the schools of Medicine (MUSOM) and Public Health (MUSPH) of Moi University. The establishment of the site was a natural progression of the Moi University's Community Based Education and Service (COBES) programme, which emphasizes teaching of students as well as provision of service in the community[13]. The main objective of the site is to provide reliable and comprehensive demographic, health and economic data to inform health policy and planning at local and national levels as well as being a community 'classroom' for teaching, medical practice and research. The expertise support to set up the Webuye HDSS was received from CDC Kisumu-HDSS and from the INDEPTH-Network.

PROJECT SITE

Webuye HDSS is located in Webuye Division of Bungoma County, approximately 380km west of Nairobi. The County borders the Republic of Uganda to the West and lies between latitude 0 25.3' and 0 53.2' north and longitude 34 21.4' and 35 04' East. It covers a land area of 3032 km2 or a quarter of the former western province [14].

The County is mostly inhabited by people of the Luhya ethnic group. The population of the county is estimated at 1.37 million according to the 2009 population and housing census report [15]. It is evenly distributed with an average population density of 453 persons per square km. There are heavier population concentrations in the main urban centres and around major factories. These include Pan African Paper Mills in Webuye, Nzoia Sugar Company, Bungoma Town, Kimilili, Sirisia, Malakisi Tobacco Leaf Centre, Chwele and Tongaren. Urban population is about 30 per cent of the total.

The main economic activity is small scale with maize, sunflower, sugarcane, coffee, tobacco, potatoes, beans, sorghum and millet being some of the main crops as well as cattle and chicken raring. Of the total labour force of about 565,000, 52 percent are engaged in agricultural

production which provides 60 percent all household incomes; 19 percent wage employment and 13 percent urban self employment [14].

Typical characteristics of the population include high unemployment, low participation of locals in commercial enterprises, low agricultural productivity, child labour due to high school dropout rate, high dependency ratio, high population growth and a high youth/adult ratio. Most households are poor with 61% of the population living below poverty line and generally social amenities like water and electricity are not readily available to the majority [14;15].

Webuye Division has 5 administrative locations with a total population of 230,252 persons living in area of 269.1 km^2 in 2009 . Webuye HDSS covers four administrative locations with total area of 130km^2[14;15]. Figure 1 is a map showing the six sub-locations within these four locations.

FUNDING

The Webuye HDSS is mainly funded by the collaborative programme between Moi University and VLIR- UOS [16] The vision of the programme is to improve the socio-economic welfare of western Kenya through human capacity building, development of innovative research and extension strategies, review and development of curricula and working with stakeholders to address and resolve problems identified in the community[16]. Other sources of funding for Webuye HDSS come from the nested research studies carried out at the site.

SITE ADMINISTRATION

The site operates under the general direction of the Scientific Committee of Moi University-VLIR-OUS Health Sciences Project which is a multi-disciplinary team. The team guides the site's research agenda and reviews new and on-going projects. It reports to University Management through the Moi University_VLIR UOS Steering Committee and works closely with the Community Advisory Board, which is the stakeholder taking care of the interests of the community.

There is a Site Manager who is responsible for the day to day running of the site with an office located at the Webuye District Hospital. The team under him includes the Data Manager, Data Quality Checkers (2), Data Entry Clerks (5), Field Supervisors (5), Community Interviewers (32), and a Secretary. Studies conducted within the Webuye HDSS use the reference laboratory at the Moi University School of Medicine in Eldoret.

METHODS

Ethical Considerations

This project received study approval no FAN:IREC000653 of the joint Institutional Review and Ethical Committee (IREC) of Moi University and Moi Teaching and Referral Hospital (MTRH)

Community Sensitization and Mobilization

In the initial stages, meetings were held with the stakeholders, who included government officials, church leaders, local leaders and Webuye District Hospital administration, to explain the concept of the HDSS and how it will be conducted. Questions were raised on a variety of issues including how the project would benefit the community and the possibility of securing employment in the project. After these issues were addressed, the stakeholders and the community accepted the project. Following community acceptance, additional educational and sensitization activities commenced. Several *barazas [17]* (local community meetings), were conducted in each sub-location within the 4 locations to allow community members to ask questions about the proposed site. The *barazas* were usually attended by the Chiefs (Locational administrator), Assistant Chiefs, *bakasa* (village elders) and the villagers.

Recruitment and Training

The site manager and the data manager were competitively recruited through an open, nation-wide advertisement. The candidates for these positions were required to have a minimum academic qualification of bachelors' degree in a relevant field. The CI's were also competitively

recruited and employed on a 3-month contract twice a year. They were required to have completed at least four years of high school and must be residents of the surveillance area. Field supervisors were selected from among the team of community interviewers.

Before the commencement of the baseline survey, the field teams received classroom and field-based training. This was to ensure proper understanding of the concept of HDSS and the accurate completion of questionnaires and utilization of all the relevant tools used in the field in accordance with INDEPTH recommendations [18]. The training modules included an overview on the HDSS operations, use of Personal Digital Assistants (PDAs), use of Geographical Positioning Systems (GPSs) units, community entry techniques, questionnaire administration and standardization. At the end of the training, each participant was required to take and pass a Human Subjects Protection (HSP) test on social and behavioral research ethics as required by IREC. A pilot study was carried out in an adjacent area before the baseline survey. Refresher trainings are subsequently conducted prior to each update cycle. Additional trainings are conducted for all the other additional studies.

Mapping the Webuye HDSS

The entire Webuye HDSS was mapped during the baseline census (Fig. 1). The mapping team visited each homestead in the HDSS and took the geo-coordinates. Mapping was performed using a differential Global Positioning System (GPS) [19]. The digital coordinates of family compounds and other sentinel sites such as markets, schools, health facilities, churches, and water sources were taken using the GPS units (Trimble Navigation, Limited, Sunnyvale, CA). The coordinates captured from each compound were used to create a digital map used to identify these compounds. They then assigned each household a unique code and painted this code on the door.

Data Collection

Prior to data collection at baseline, verbal informed consent was sought from the head of the household. The area and its sub-units and households mapping was carried out through a GIS-based approach. The baseline census, which took 4 months, was carried out in November 2008 using paper questionnaires only. Subsequently data collection is carried out twice a year with each cycle lasting 3 months.

A household is defined as a group of people who regularly eat from the same "pot" regardless of whether they live or sleep in the same homestead. [Ref] A resident is defined as an individual who has lived in the Webuye HDSS surveillance area continuously for a period of at least four calendar months prior to the interview date [7].

Information collected includes an assigned household code; name and assigned code of household head; number of inhabitable rooms; name and code of sub location and the GPS coordinates for each homestead. Other information collected included: demographic information for each household member; household drinking water type and source; household possessions including domestic animals, land size and use; type of fuel used for cooking; lighting source; land ownership; tenure status of the dwelling place; waste disposal methods and source of finance for the household members.

Data Management

A quality control system was put in place at every stage of data collection to ensure data quality. In this system, completed data collection questionnaires are first checked in the field by the field supervisors for completeness after which the questionnaires are sent to the field office where they are reviewed by data quality checkers for completeness, logic and consistency. The incorrectly filled questionnaires are returned to the respective CIs for correction. The correctly filled questionnaires are then passed on for data entry into the database. After data entry,

questionnaires are checked again through automated internal consistency checks and those found to be incomplete are again sent back to the CIs for verification and correction.

The data management system is modeled on the Household Registration System [20; 21]. This model ensures accuracy and consistency of the database specifically for longitudinal follow-ups of individuals over a long period of time. All data are stored in a Mysql structured database (Mysqlab Inc, 2011).

Data Use

Data collected are first analyzed and the results shared with stakeholders including Ministries of Health and the community. It will be published for general consumption by researchers.

CURRENT STATUS

Webuye HDSS has been in operation for four years. It has carried out six update cycles since the baseline census. It has registered a total population of 77,000 people in 13,333 households and 9,784 compounds within the area. Figure 2 is a map showing the distribution of the compounds within the six administrative sub locations. The information collected include longitudinal follow-up data on the births, deaths, morbidity, socio-economic status, pregnancies, immunizations, parental survival, water, sanitation and health seeking.

In addition to the regular update of the demographic-events data, there have been nested studies carried out within the Webuye HDSS. These include: Prevalence of Intestinal worms in children under 5 years of age; Prevalence of malaria in children under 5 years of age; Type and level of disabilities among the residents; Causes and treatment of jiggers from the infested households; Assessment of cardiovascular risk factors among the residents; Assessment of the quality of water; Survey on the availability, accessibility and affordability of antimalaria medicine in retail outlets; and a survey of injuries in children below 18 years of age.

CHALLENGES

Challenges encountered up to this point have been few. These include inadequate funding, refusal by some individuals to participate, loss of good workers to other employers who offer better terms. One has to be aware all the time of the enormous responsibility to protect the community and university image. The other major challenge likely to occur later is community fatigue.

To address the challenge of protecting the image of the University and that of the community, Webuye HDSS established a community advisory board with the responsibility of advising the management on issues of community interest. Regular interactive meetings with the community for feedback and sharing with them about their concerns. The HDSS has developed a strict field standard operating procedures in line with the university's policy and ethical standards in research. This ensures that the field staff do not contravene both the University and community norms that may raise conflict.

To address the challenge of community fatigue, Webuye HDSS intends to conduct studies to understand the causes of fatigue and how to deal with it. The HDSS has also been providing incentives to the community such as employing people from the community and conducting annual free health days in partnership with the faculty, staff and students of Moi University. The HDSS also engages the community to participate in the decision-making process within the through the Community Advisory Board. Prior to the launch of each cycle, the HDSS conducts a launch. During these launches, the HDSS keeps the community engaged by providing feedback on the studies already conducted and respond to the questions that are raised by the community.

Inadequate funding is being addressed by continuously developing more nested research studies to attract more funding to sustain the HDSS. Fund raising through the donor community and local partners is also being exploited to find strategic partners in implementing some community health intervention projects.

Risk of losing staff to other programmes working within the surveillance area has been addressed through development of staff incentives that motivate the staff. Some of these incentives include continuously providing in-house training that sharpens the skills of the staff. Where possible, the HDSS collaborates with the other programmes to find areas of synergy between them to ensure resource sharing and reduce competition.

The HDSS addresses the challenge of refusals by some villagers to participate in the project through continued sensitization and education on the importance of participating the Webuye HDSS activities, and how this contributes to the development of interventions that benefit the nation as a whole. This has proven successful thus far as the coverage has increased since the baseline census.

LESSONS LEARNED

In the 4 years that the Webuye HDSS has been in operation, many lessons have been learned. and can serve to when setting up an HDSS in other area in developing countries First, collaboration with colleagues from complementary institutions, both public and private is crucial. Developing strong institutional relationships provides a good opportunity for cordial relationships and existence. Noteworthy, leadership in any of the collaborating institutions is transitory in nature. However, this should not affect the fundamental relationship that exists. A strong institutional partnership and a stable research team with strong interpersonal relationships remain crucial to achieve the longitudinal studies goals. Running a HDSS requires a multidisciplinary approach, and the scientific team should comprise experts in the field of data management, data analysis, community outreach and Information and Communication Technology).

Second, HDSS in general plays a significant role in filling the gaps in the Health Management Information Systems (HMIS) nationally [1]. It is therefore imperative that the management of the HDSS sites take up their role in the national health information system agenda. Fostering good inter-site relationship, and between individual sites and government can greatly improve

information flow in the health sector, thereby enhancing speed and accuracy in decision-making at the various levels. This relationship should be of symbiotic nature such that HDSS sites collect accurate and timely information and share it with government. Government on the other hand should support HDSS activities by providing the needed infrastructure upon which the HDSS sites operate and lobby on behalf of the HDSS sites for funding to support the HDSS activities [22].

Third, a cordial HDSS-community relationship is vital. Survival and success of the HDSS sites largely depends on this. Employing community Interviewers from the community improves the relationship with the community. This helps the HDSS to understand and respect the communities' cultures and related traditions. Designing interventions that contravene local traditions or conducting studies in a manner that is offending to the local population can antagonize the cordial relationship between the two sides. Indeed, HDSS sites have a duty to maintain this relationship and to continually provide feedback to the community on the outcomes of the interventions carried out. The feedback mechanisms need to be elaborate and exhaustive and must include all the stakeholders, starting from the district to the household level. It is also important to ensure that the stakeholders from the community are adequately informed prior to conducting any field activity.

Fourth, an understanding of all the parties (stakeholders, funders and the community) concerning the activities to be carried out and use as well as sharing of data is extremely important as it avoids conflict that could arise at a future date [9].

Fifth, it is important to keep the staff well trained and motivated at all times. Field activities are particularly exhaustive both physically and psychologically. The accuracy and reliability of the data received from the field is, to a large extent, dependent on the interviewing skills and morale of the field worker. Within a limited resource constraints context and insufficiency of funding,

like the situation faced, other kind of incentives can help to keep all staff motivated. This has to be planned ahead of the HDSS establishment.

Finally, running a HDSS site is expensive and sensitive to time. Proper advance planning is important to avoid staggering the planned activities and thereby ensuring accurate measurement of the variables of interest.

CONCLUSIONS

Implementing a HDSS site provides several challenges, however there are enormous benefits of a HDSS especially the generation of timely and representative data from the community that not only supplements health facility generated data, but also facilitates formulation of local health interventions, which are community friendly. Nonetheless, whatever the challenges and obstacles encountered, we learned that these can be overcome if the concept of the HDSS was explained and was acceptable to the stakeholders and the community. By sharing our challenges in setting up the Webuye HDSS, we hope these experiences and the techniques used in solving them will inform others who wish to start HDSS in other parts of the sub-Saharan Africa to address local health issues.

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AUTHOR CONTRIBUTIONS:

All the authors participated in the design of the project. CJS, VN, AAO, RD and BOK drafted the manuscript. PA, JDM, WPO, MT, DVB, DM, EM, DC, DOO, EOW participated in the review of the manuscript.

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FIGURE 1: MAP SHOWING THE WEBUYE HDSS ENUMERATION AREA

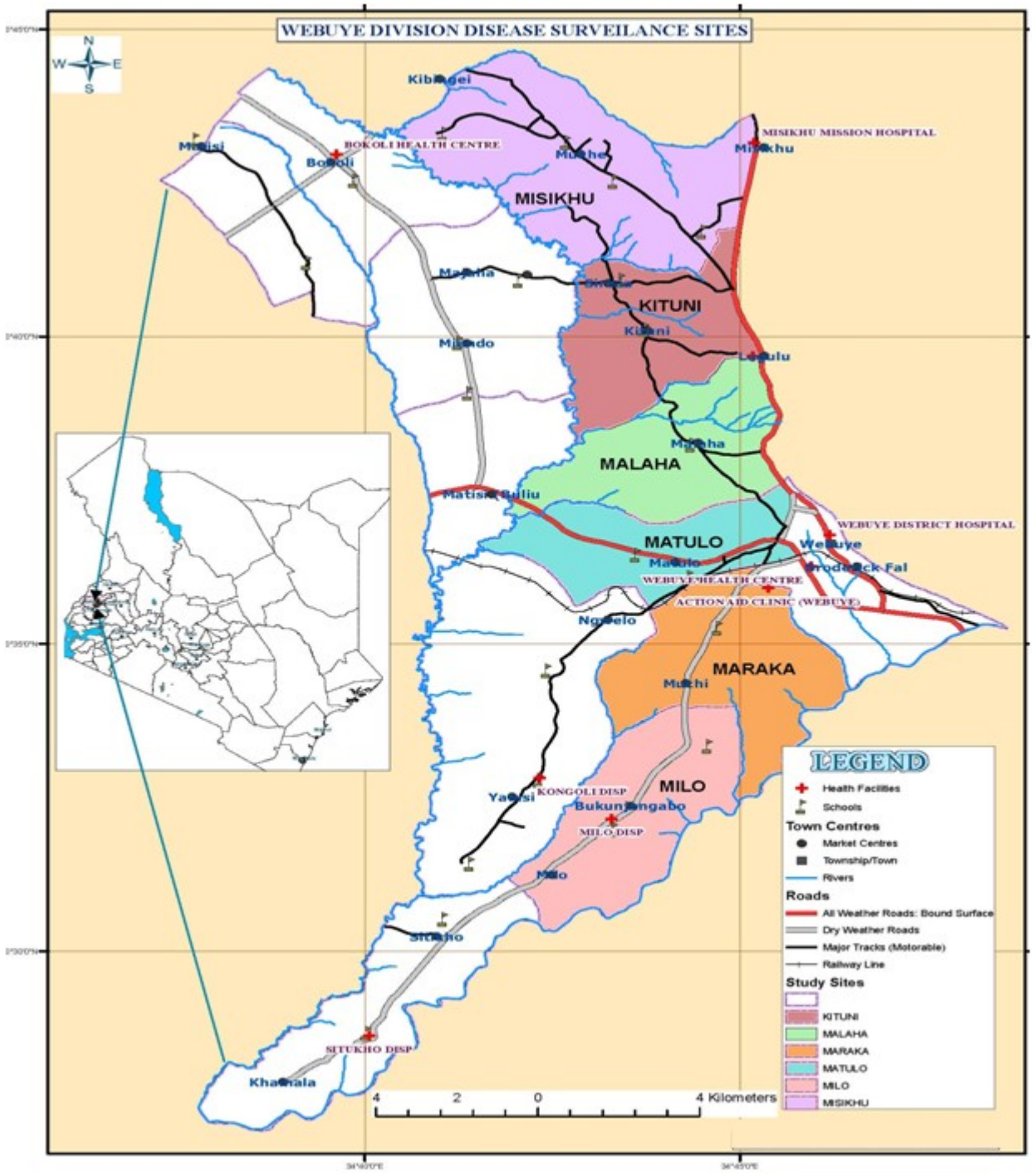

FIGURE 2. MAP SHOWING THE DISTRIBUTION OF HOUSEHOLDS IN WEBUYE HDSS