

Demographic Surveillance Systems in Burkina Faso: The Case of Nouna Health Research Centre

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Introduction

Demographic surveillance systems (DSSs) continue to be established in rural Africa to collect good and reliable demographic and health data on the populations in these areas. The objective is to ameliorate the persistent problem of insufficient health information. Linked to specific health research questions, DSSs can be an important source of information for health policymakers.

The Nouna Health Research Center is located in the Health District of Nouna in the North-West area of Burkina Faso, some 300 kilometers from the capital of Ouagadougou. Burkina Faso is a West African state with a population of about 11 million.¹ The health system is divided into 11 administrative health regions, which comprise 53 health districts altogether. Each of the districts covers a population of 200,000–300,000 individuals. At least one health care facility in each district is a hospital with surgery capacities.² The districts themselves are subdivided into smaller areas of responsibility that are organized around either a hospital or a *Centre de Santé et de Promotion Sociale* (CSPS), the primary health care facility in the Burkinian health system.

The Nouna Health District covers an area of 7,464 square kilometers, which is identical to the administrative province of Kossi. With a population of 240,000 inhabitants, this district has a population density of 32 inhabitants per square kilometer. It covers 16 CSPSs, one district hospital, and one medical center. The DSS area is part of the health district it covers an area of 1,775 square kilometers, with 55,000 people. The population density of this area is about 31 individuals per square kilometer. This population is distributed in 41 villages and the city of Nouna, a semi-urban center.

DSS activities

Objectives of the DSS

The DSS in Nouna was established to meet the following objectives:

- to provide a platform for multidisciplinary health research projects;
- to provide information to health planners and policymakers;
- to follow and evaluate health interventions; and
- to monitor a population over time in a geographically delimited area.

Data collection

The first baseline census, which took place in 1992, collected demographic information on all individuals in the study area. The baseline census for the semi-urban area took place in January 2000.

Two censuses were held in 1994 and 1998 to verify and supplement the data from the previous censuses. Censuses are planned every two years to provide a clear picture of the study population at certain fixed

points in time. In the meantime, the population is monitored by a system for vital events registration. Previously conducted as a monthly activity, vital event registration was designed as a three-month cycle data collection system, beginning in January 2000. All of the households in the surveillance area are covered. The previous procedure included an interviewer visit to the key informant of the village to acquire information about any vital events in the village. Now, the seven interviewers visit each household and inquire about all the members previously registered or actually living in the household. The interviewer identifies any new vital events that have taken place since the previous visit. Registered events include births, deaths, pregnancies, and migration in/out of the household, as well as data related to these events.

Deaths that were detected during the vital events registration are investigated further through means of a verbal autopsy questionnaire. The interviewer confirms a death by asking in a diplomatic way if the individual is present. In case of a negative response, the interviewer asks for further information on the circumstances of the death. The form used by the interviewers includes identification information retrieved from the DSS. For ethical reasons, the interviews are held three months after a death has occurred. Subsequently, two physicians evaluate the filled-in questionnaires. In the case of differing diagnoses, a third physician evaluates the questionnaire under scrutiny. The cause of death is accepted if at least two medical doctors agree on one cause; otherwise the cause of death is specified as unknown. During data collection, the interviewers use preprinted household registration forms for data collection to reduce errors. Three field supervisors are employed to safeguard the quality of the collected data in the field by the following means: they inspect the questionnaires, supervise the interviews, control five percent of the total number of interviews, blind control-interviews, and correct the questionnaires.

Data Management and Analysis

The Nouna DSS uses a locally developed database based on MS Access. The database is capable to register longitudinal information and check data consistency. The current database will soon be converted to HRS II, a generic household registration software distributed by the Population Council.

A data entry supervisor regularly checks the data. During data entry, the data entry clerk reports problematic questionnaires to a supervisor, who tries to resolve the problem. Complicated problems are sent to the database manager, who can decide to contact the field team to investigate the cause of the problem further. The database team and the field team work together closely, so most inconsistencies are resolved quickly.

Demographic Indicators Generated by DSS and Some Results

The following indicators were produced by the 1998 control census covering the rural part of the area under surveillance. The population size was 30,886 individuals, distributed among the following main age groups: 0–4 years, 18.3 percent; 5–15 years, 29.9 percent; 15–64 years, 47.7 percent; and 65+ years, 4.1 percent. The proportion of women is 50.1 percent. The annual growth rate is 1.5 percent, with a fertility rate of 6.6 percent. Compared to the 1996 national census, most of the indicators present a similar picture with no significant differences. The mean household size is eight individuals, and the dependency ratio is 109.8. Migration is dominated by internal movements and, to some extent, by the external movement from the center of the country to the river banks in this zone.

A number of studies have been performed based on the Nouna DSS population. Baltussen et al. demonstrate the feasibility of eliciting disability weights using a culturally-adapted visual analogue scale (VAS)³. The authors suggest that the preferences of health professionals on disability weights could be used as a proxy for those by lay people with only small deviations.

In Sankoh et al., a subset of the Nouna DSS data is analyzed by concentrating on the clustering of total childhood mortality (children under age five) in the study area.⁴ They used a space and space-time scan statistic proposed by Kulldorff to identify clusters and test for their statistical significance.⁵ Several

statistically significant clusters of higher childhood mortality rates were identified from different sets of villages. One specific village was identified consistently in the study population indicating a nonrandom distribution of childhood mortality. The authors conclude that their "study may be regarded as a first step in prioritizing areas for follow-up public health efforts."

In another recent study, Würthwein et al. discuss the measurement of the local burden of disease (BOD) with respect of years of life lost (YLL), using the same DSS population.⁶ The DSS data exhibit the same qualitative BOD pattern as the Global Burden of Disease Study (GBDS), but with different ranking of the diseases. They recommend that "local health policy should be based on local BOD measurement, rather than on extrapolations that might not represent the true BOD structure by cause."

Research agenda related to the DSS

The DSS provides a platform for multidisciplinary health systems research. Linked to the DSS, our research agenda comprises qualitative studies (illness perception and home treatment strategies, perceived priorities for intrahousehold resource allocation), clinical studies (drug trials, micro-nutrient supplementation studies), parasitological studies (*Plasmodium falciparum* multiplicity), and entomological studies.

Opportunities for Linking the DSS and the HMIS

Motivations for Linking DSS and HMIS

Parallel to the DSS component of the research center is another major information system in the health district: the routine reporting system for the management of health services (HMIS). It comprises a monthly reporting system, from the health facilities to the district level and further on to higher administrative structures. While the two systems are basically disjunctive with respect to their procedures, their aims and observed objectives still overlap to a certain degree. This is especially obvious for data related to morbidity, mortality, and natality. A closer look at both systems could reveal opportunities to link them in order

- to verify comparable results,
- to complement missing results, and
- to gain new insights on the basis of merged results from both systems.

The task, therefore, is to observe both systems with regard to their purpose, structure, procedures, and limitations to find differences and similarities that could promote or prohibit a link between them.

Different Stages of Data Processing

When looking at complex systems, it is always useful to break them into smaller units. To compare the DSS and the HMIS, it seems to be most promising to elaborate distinct levels of data processing according to stages that both systems have in their respective information chains. On each level it can then be observed

- which type of information is available in which granularity,
- how and at what cost this information was produced,
- how valid the information is, and, as a result,
- under what conditions the information from the two systems can be linked.

From the objects under observation, up to the observing subjects, the following broad stages are prevalent in both systems:

- Data are being produced by objects in the real world.
- These data are collected and stored in operational data stores designed to directly support activities in the real world.

- The operational data are consolidated, aggregated, and reduced into data stores that were designed to directly support analysis.
- The reduced data are compiled, analyzed, and transformed into results as a basis for decision making.

The analysis of the two systems should be done, therefore, on the levels of the expected results, the reduced data, the operational data, and the real world.

Linking Individuals and Patients

The observed objects of the DSS are the people who live in a geographically defined area and their demographic events, including their causes of death and, to a certain degree, their illness episodes. The observed objects in the HMIS are basically the health services provided within a clearly defined area and their clients who are using these services (those who are not using the services usually remain unknown). Linking the two systems on this level could provide answers to whether the services really are achieving the targeted coverage, and whether the self-diagnoses recorded in the DSS can be verified in the services. While it is easy to match the targeted villages, it is extremely difficult to identify the individual people seeking health services. ID cards for individuals could provide a solution, but they are costly to implement and have serious limitations.

Linking Operational Data

Linking operational data from the two systems can directly match observed cases from the DSS with cases seen at health services. In both systems, the granularity of the data goes down to the level of the single case and the single day. Operational HMIS data on service activities are stored on paper in the facilities—e.g. patient/case registers. The health services don't have digitized case recordings. The first challenge on this level, therefore, lies in physically transmitting the data. If this barrier is overcome, cases and individuals have to be matched. This effort is being made for specific studies by searching the register books manually, but is surely too costly for routine linkages.

Linking Analysis Data

In the HMIS, the operational data are aggregated locally for service management and reported to higher levels in the administrative hierarchy. In Nouna, the aggregated data are entered into the computer. The granularity of the data is normally no finer than a month per health facility, except for some diseases under special observation, for which the granularity goes down to a week. As in other HMISs, the quality of the aggregated data cannot approach that of a DSS, since data collection is not and may not be the primary activity of health services. For this reason, the monthly summary reports of health services that lie within the focus area of the DSS are entered again at the center. Via the Geographical Information System (GIS), it should be fairly easy to link those data to DSS data, which are aggregated to the same level as the HMIS data. The primary benefit of the DSS for the HMIS here is providing reliable data on the size of the catchment population of a facility, but it can go beyond that.

Linking Results

Research results from the DSS and the center in general have to be applicable outside the research area. They have to be set in relation to comparable studies in other settings and to observations of the health services, locally and nationally. Results are exchanged at conferences and meetings or disseminated in publications. Special topics are covered by dedicated consultancies carried out by the center.

Conclusion

DSS and HMIS can potentially profit from each other and already do so to a certain extent. If the specific potentials and limitations of each system are taken into account, it should be possible to gain a fair benefit from linking the two systems at a reasonable expense.

¹ *African Development Indicators 2000*. Washington: World Bank, 2000.

² *Statistiques Sanitaires*. Ouagadougou: Burkina Faso Ministry of Health, 1996.

³ Baltussen RMPM, Sanou M., Sommerfeld J, Würthwein R, Eliciting Disability Weights Using a Culturally-Adapted Visual Analogue Scale (VAS) in Rural Burkina Faso, Discussion Paper Series, University of Heidelberg, 2000.

⁴ Sankoh, OA, YeY, Sauerborn R, Müller R, and Becker H. Clustering of childhood mortality in rural Burkina Faso. *International Journal of Epidemiology* (in press).

⁵ Kulldorff M, (1997). A spatial scan statistic, *communications in Statistics - Theory and Methods* 26, 1481-1496.

⁶ Würthwein R, Gbangou A, Sauerborn R, and Schmidt CM. Measuring the local burden of disease: A study of years of life lost in rural Burkina Faso. *International Journal of Epidemiology* (in press).