Fixing Health Systems

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Crunching the Numbers

Using evidence about the population's health helps to effect change

The lack of population-based data in many developing countries hinders the development of effective programs. In two districts of Tanzania, a Demographic Surveillance System is providing vital information enabling health planners to determine the overall effectiveness of the health system and monitor the status of the population. As a result, they can plan and budget health care services more strategically.

IDRC: P. Bennett

Gathering vital demographic data relies on the efforts of a small army of enumerators.

The Rufiji demographic surveillance station at Ikwiriri is housed in a pleasant yet unexceptional building: a long, white structure with a tin roof and blue doors, set on a pastoral plot of land that includes a garden, a gnarled tree, and several flag poles. Inside the building is a scene of quiet concentration: staff sit before computer screens, feeding the machines with endless fragments of information. These will coalesce into a complete, coherent picture of the health and population characteristics of rural communities on the Indian Ocean coast of Tanzania.

The flickering screens and constant electronic hum at the Ikwiriri data station tell only half of the story. Operating a Demographic Surveillance System (DSS) like this one requires a blend of high-tech number-crunching ability and low-tech legwork. The other key function of the DSS — gathering the information that will be tallied and interpreted with the help of computer programs — relies on the efforts of a small army of bicycle-equipped enumerators who ride through a 1813 square kilometre section of the district, visiting every family that lives within this "sentinel" area.

The process began several years ago, when enumerators conducted an initial census, using precoded forms to gather baseline data on household composition, socioeconomic status, and other basic indicators. Since then, those intrepid cyclists have been returning regularly to update information

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on residents' health status and other circumstances, noting any changes and recording significant events (such as pregnancies, births, deaths, and changes in marital status).

"Currently our database is standing at 85 000 people and these are in about 20 000 households," says Rufiji DSS Coordinator Eleuther Mwageni, hinting at the volume of work involved in continuously updating the district's health statistics. "We are doing the surveys in rounds. One round takes 4 months so we visit each of the 20 000 households three times a year."

Despite the labour-intensive nature of the process, DSS sentinel monitoring is increasingly seen in the developing world as the best and most cost-effective alternative way of collecting in-depth longitudinal data so essential to improving health, alleviating poverty, and achieving other essential social goals. Ensuring that health care systems meet the most pressing needs of the population, for instance, requires a solid understanding of which diseases contribute (and in what proportions and trends) to death and disability at the household level. Historically, no country has made significant gains in health and social welfare without developing the ability to track births, deaths, and the causes of death.

One billion uncounted

Unfortunately, many countries in the developing world have an inadequate or no system for registering vital information. For example, of the 57 countries that make up the

World Health Organization's Africa and Southeast Asia regions, only 8 have usable vital events data, and only 1 has complete coverage of death. It is believed that, within the poor countries of the globe, there are one billion people whose births and deaths are never registered — no official or government agency ever acknowledges that these people exist.

Although DSS systems are not intended to serve as nation-wide registries of births and deaths, they can offset the temporary lack of national registries by creating representative snapshots of sentinel populations that can be generalized to convey information to policymakers about population health, fertility, poverty, and other critical social, economic, and environmental issues. Since information from a demographic "sentinel" can be applied to broader areas with similar population composition and conditions, DSSs provide a much less costly means of generating evidence for policymaking until countries can afford to establish comprehensive nation-wide vital event registration as done routinely in middle- and high-income countries.

Reforming health care

In Tanzania, demographic surveillance has been a crucial component of ongoing efforts to reform health care delivery. For a number of years, District Health Management Teams (DHMTs) in the large-population districts of Rufiji and Morogoro have worked with the Tanzania Essential Health Interventions Project (TEHIP) to increase the efficiency of district health systems by trying to ensure that funds are allocated more proportionally to key interventions for the major local causes of death and disability.

There have been several stages to this process. The first was to determine the prevailing local "burden of disease" — to try to arrive at an accurate portrait of which diseases cause what amount of harm. The challenge then became finding ways of retooling the budgeting process so that funds could be directed more proportionally to interventions designed to address the major causes of mortality. Conversely, knowing to what extent specific diseases contributed to the local mortality rate served to alert district health planners when they were spending proportionally too much to combat diseases that have a lesser impact on public health.

One result of this process in both Rufiji and Morogoro is that DMHTs decided to increase support for Integrated Management of Childhood Illnesses (IMCI) and to fighting malaria. Applied alongside a budgetary top-up of less than US $1 per capita, and the introduction of several capacity building exercises to increase the overall efficiency of the local health systems, this reordering of budgetary priorities has led to significant health improvements in both districts. The average decline in child mortality in the two districts, for example, has been more than 40% over 5 years.

A comprehensive picture

How did district planners learn that malaria and the cluster of childhood illnesses addressed by IMCI should become their highest budgetary priorities? One way to determine the local burden of disease is to analyze death records at hospitals and community health facilities. The problem, however, was that "we found that about 80% of all the deaths [in rural districts] occurred at home," says TEHIP Research Manager Don de Savigny.

By contrast, the DSS — the mechanism chosen to determine the local burden of disease — offers high rates of accuracy because it includes all residents within the sentinel area. Once enumerated, the only ways a person can drop out of the DSS registry are by migrating out or by dying. And every resident who is born into the area or migrates in from another district will become a part of this rolling survey when the enumerators return to communities for their thrice-yearly data updates. In addition, the use of a network of 150 "key informants" ensures that no deaths go unnoticed. These key informants learn of and report any deaths that occur within the DSS study area. Information is passed along to a supervisor, who attempts to visit the household within 2 weeks and verify that the death has taken place.

Other mechanisms keep validity high. All deaths are subject to a "verbal autopsy," designed to identify the probable cause of death. A specially trained interviewer visits the household between 2 and 4 weeks after the death has occurred. Given the sensitivity required when collecting information from bereaved families, conducting verbal autopsies is the sole task of these interviewers. The interviews follow a standardized format that takes several hours to complete. The advantage of such a thorough interview — rich in detail and context — is that it minimizes the chance of a misdiagnosis. In cases where symptoms — for instance, fever — could be caused by a number of conditions, the contextual information could help to point more precisely to the cause of death. After the verbal autopsy has taken place, independent physician panels review the results to determine the direct and underlying causes of each death.

A useful feedback loop

In Morogoro (where a DSS has been operating since 1992) and Rufiji (where a DSS was established in 1998) the availability of current information on local mortality rates has served two purposes. Not only did the data allow health planners to appreciate the major proportional components of the burden of disease and to allocate funds accordingly, but it also made it possible — given that the data is continuously updated — for DHMTs in the sentinel zones to receive rapid feedback on whether their efforts to target the biggest killers were successful. Such a feedback mechanism is useful for retooling strategies and adjusting goals over time.

It was recognized from the beginning that DMHTs would face obstacles in their efforts to grasp the burden of disease concept. Perhaps the biggest was the unwieldy mass of quantitative numerical demographic and epidemiologic information generated by the DSS. Studying and extracting practical messages and knowledge from the cumbersome books of charts and numbers produced by population surveillance would not be possible for district health planners.

The "burden of disease profile tool" developed by TEHIP helps to solve that problem. One of a series of simple management and planning tools, it is a user-friendly computer application used by the DSS that converts DSS statistics into clear graphical representations. The graphs produced by the tool express burden of disease information in terms of "intervention addressable shares." These graphics are compiled into an annual profile — the "burden of disease profile"— as a booklet of captioned graphics giving district planners quick insights into a broad array of population health parameters at the household level. This means that health planners can get a quick sense of the largest contributors to mortality and of what interventions they should invest in (and in what proportions) to improve population health. This adaptable tool is now being made available to other DSS sites in Africa to assist in the communication of their data to decision-makers.

A multicountry solution

Indeed, DSS is a resource that can be used in many parts of the developing world. The concept was originally put into practice in Bangladesh in the 1960s. In 1998, representatives of 17 DSS field sites drawn from 13 countries established a new international umbrella organization known as the INDEPTH Network (www.indepth-network.org). The network's mandate includes promoting and advocating evidence-based public policy formulation using DSS. INDEPTH also serves its members (now more than 40 sites) by raising technical standards and promoting methodological development and the sharing of information across borders.

The range of research to which DSS is being applied has also expanded. Increasingly, it is seen as essential for monitoring trends related to poverty reduction strategies, education, food security, and the environment, in addition to gathering and compiling household health information. For example, DSS is now being used to help assess equity in health outcomes and in access to health and other social services as national poverty alleviation efforts are applied.

One service recently begun in Tanzania is using DSS to correlate household income with access to health care and health outcomes. Data is collected from the DSS sentinel areas using proxies of income and expenditure (e.g., level of ownership of items such as bicycles, wristwatches or radios, condition of housing, and access to services such as water and electricity) to determine household socio-economic status. With households placed on scale ranging

from "poorest" to "least poor," it becomes possible to determine if poverty levels have any relationship to general levels of health and to the use of health services. This research could help pinpoint ways of increasing the pro-poor nature of health service delivery.

Using the DSS as a policy tool is also cost-effective. Since enumerators already make thrice-yearly visits to all households in a sentinel area, adding an extra set of questions would not entail great additional expense. Applied to a range of issues such as health, poverty reduction, food security, and environmental issues, the DSS system thus becomes an increasingly economical tool for generating evidence for action on a broad spectrum of public policy concerns.

The need to expand

Given the vital role that DSS surveillance played in health reforms in Rufiji and Morogoro, TEHIP recommends the more widespread use of this data-gathering mechanism. *Fixing Health Systems*, recently published by IDRC, argues that countries lacking a functional vital events registry need at least two DSSs — one rural and one urban.

Countries in which health risk patterns are more diverse would need a greater number. Governments should also view DSS as an important resource that can produce several streams of in-depth longitudinal information — on demographic and health status, poverty indicators, equity indicators, etc.

Fixing Health Systems' authors also point out that the presence of a DSS can help bring about other important policy reforms. For example, adoption of the sector-wide approach (SWAp), where funds from international donors are pooled to be used by local authorities in ways consistent with their overall planning, is seen as an effective means of making international development funding more responsive to local needs. In the past, however, many donors have been reluctant to support SWAp because of concerns over accountability: they need to be able to demonstrate that their particular contribution has led to specific results. The presence of a DSS can provide that evidence quickly as mortality rate statistics yields a clear picture of whether or not particular policy initiatives are working.

This case study was written by Stephen Dale on behalf of IDRC's Communications Division.

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More information on demographic surveillance systems in Morogoro and Rufiji can be found in *Fixing Health Systems,* by Don de Savigny, Harun Kasale, Conrad Mbuya, and Graham Reid. The book describes the Tanzania Essential Health Interventions Project — its origins, impact, important lessons, observations, and recommendations for decision-makers and policy analysts. The full text of the book is available on a thematic Web dossier, which leads the reader into a virtual web of resources that explores the TEHIP story: **www.idrc.ca/tehip**. More information on demographic surveillance systems in general and in other settings can be obtained at: www.indepth-network.net

Fixing Health Systems is part of IDRC's *In_Focus* Collection, which tackles current and pressing issues in sustainable international development.
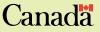
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