

Infectious Disease Surveillance and Health Information Systems in Tanzania: the need for a rational way of managing diseases

L.E.G. Mboera

National Institute for Medical Research, Dar es Salaam, Tanzania

Introduction

Disease surveillance ought to be an important component of public health programme in every country (Berekelman et al., 1994). It has three essential purposes. One is to monitor the progress of ongoing interventions for disease reduction (John et al., 1998). Second, disease surveillance is essential for early detection of outbreaks in order to initiate investigations and control measures (Berekelman et al., 1994, John et al., 1998). Third, surveillance data is important for planning at both district and national levels.

The Ministry of Health uses five separate surveillance systems to monitor infectious disease in Tanzania. These include the Health Management Information System (HMIS); Integrated Disease Surveillance and Response (IDSR); Infectious Disease Week Ending (IDWE), Tuberculosis/Leprosy Programme; Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome-Sexually Transmitted Infection (HIV/AIDS/STI) and Acute Flaccid Paralysis (AFP)/Poliomyelitis programme. Each system collects information and submits it to relevant authority, vertically. While HMIS, and IDSR cover a wide range of diseases (Mboera et al., 2001a), the other three surveillance systems are disease specific, vertically and donor oriented.

Health Management Information System

The Health Management Information System (HMIS) is the major system for collecting and analysing epidemiological information in Tanzania. The HMIS was introduced in Tanzania between 1993 and 1997 to replace the old system known as the Health Information System (HIS). The HMIS covers the entire spectrum of the health system from the health facility, district, regional, to the national levels. At the health facility level (dispensary, health centre and hospital), HMIS is made up of various registers, tally sheets and a data entry book, which is used to consolidate all data. Through simple calculations, basic performance indicators are derived and the health facility management is required to take action using these indicators. The HMIS system includes 12 "books" of forms, registers, and reports that health workers use to report all types of diseases and health services. In addition, the books require health workers to compile data in some basic ways for analysis: by age, by gender, top 10 diseases, etc.

Data from health facilities is quarterly reported to the District Medical Office (DMO) through report forms contained in the Report Book. At the district level, the District Data Processing File (DPF) is the tool used to process data from the health facilities. However, reports of disease outbreaks are sent directly to the DMO for immediate action using separate specific forms. The HMIS at the facility and district level is a paper-based information system. The DMO then reports to the Regional Medical Office (RMO) by filling in special forms contained in the DPF. At the regional level, HMIS is

computerized. The RMO reports to the Ministry of Health where HMIS is also fully computerized and data received are fed into the national HMIS database.

There are only a few studies that have evaluated the HMIS since its inception in 1993 (Mwangu & Otito, 2000; Mboera et al., 2001; Kagonji, 2005; E.A. Makundi et al., unpublished). When assessing the structure and performance of the different surveillance systems in Tanzania in 1998, Nsubuga et al. (2002) found out that of all the systems, HMIS was well covered in health facilities, district and region level. The other disease surveillance systems were found at <20% of health facilities and <75% of medical offices. In another field study, it has also been indicated that HMIS implementation has been successful in the sense that all regions in Tanzania Mainland were using the system (Mwangu & Otito, 2000). In a recent study, Mghamba et al. (2004) found that despite the introduction of IDSR strategy, the HMIS is the keystone of the infectious disease surveillance in the country.

Despite some successes in HMIS, several challenges exist. It has been observed that none of the surveillance systems is adequately being implemented and none of the core or support activities are adequately performed at any level of the health care system (Nsubuga et al., 2002). For instance, HMIS has been hampered by problems of inadequate staffing and inadequate provision of medical supplies (Mwangu & Otito, 2001), as well as poor motivation resulting into poor staff performance (Senkoro et al., 2005). In some health facilities, data collection and analysis tools are not regularly used as required as a result these factors affect the quality and quantity of data collected, analysed and reported. In some disease specific surveillance programme, health facility and districts are poorly involved and data management is done by the national level staff. Data collected in such programme are channelled directly to national level and not utilized by the respective districts.

Other challenges facing these disease surveillance systems have been cited as failure to report diseases of epidemic potential in time, incomplete reporting of notifiable diseases, failure to use available information to follow disease trends, inadequate laboratory involvement in case detection and poor feedback to health workers and communities. (Nsubuga et al., 2002; Mboera et al., 2001a,b; Miller et al., 2003).

Specific Disease Surveillance Systems

Special disease control programmes are identified and operationalised by the national level as priority programmes to get special attention by all health workers. These specific disease surveillance systems all have carefully defined indicators that are measured at all levels of the health system and are included in the reports of all districts nation-wide through a vertical approach and reported quarterly.

Under this category surveillance covers the following specific disease control programmes: (i) HIV/AIDS/STI Surveillance; (ii) AFP/Poliomyelitis Control Programme; and (iii) Tuberculosis/Leprosy Control Programme.

In some cases, the presence of vertical programmes has resulted into duplication of resources meant for surveillance and response purposes. There is underutilisation of surveillance information in decision-making such that the data generated is neither fully analysed nor utilized at district level but rather

been forwarded to higher levels with hardly any feedback (Mbocra et al., 2001b).

In recognition of the problems related to the disease surveillance systems existing in most African countries, the World Health Organization Regional Office for Africa (WHO/AFRO) developed an integrated disease surveillance and response strategy focusing on 19 priority diseases/syndromes in 1998.

Integrated Disease Surveillance and Response Strategy

This epidemiological surveillance system deals mainly with epidemic-prone diseases of both national and international importance; diseases of public health importance and diseases aimed for eradication or elimination. In this system, the epidemic-prone diseases are reported weekly, while the other diseases are reported monthly. For many years the infectious disease week ending (IDWE) has been used to monitor and notify the occurrence of outbreak prone diseases. Until recently, this surveillance system comprised of immediate reporting of the so-called notifiable diseases. Notifiable diseases are those of public health significance that must be reported to health authorities. Usually, these are the *rapid response* diseases. In most cases, even a suspicion of one new case is enough to provoke immediate response. Reporting is usually immediate, by the fastest means possible. Otherwise, all these diseases are usually reported weekly, whether there is a case or not (zero reporting).

Zero (null) reports are used to assess the control of epidemic-prone diseases under the IDWE system. Zero reports indicate that we are looking but no cases have been found. The purpose of notifiable disease system is to detect outbreaks of important diseases, and to take appropriate action to contain them.

The Integrated Disease Surveillance and Response (IDSR) strategy aims at having a sustainable system focussed at the district level by providing needed information for the execution of prompt evidence-based disease control actions designed to result in significant reduction in the current disease burden. The Tanzanian Ministry of Health has identified 13 priority diseases, which have been included in the IDSR strategy. These include acute flaccid paralysis, bacillary dysentery, cerebro-spinal meningitis, cholera, diarrhoea (in <5 years), malaria, measles, neonatal tetanus, plague, pneumonia (in < 5years), rabies (+animal bites), typhoid and yellow fever.

IDSR is aimed to assist health workers to detect and respond to diseases of epidemic potential, of public health importance and those targeted for eradication and elimination. The information collected through this strategy will help health teams to respond quickly to outbreaks, set priorities, plan interventions, and mobilize and allocate resources. The IDSR strategy links community, health facility, district, regional/provincial, and national levels with the overall objective of providing epidemiological evidence for use in making decisions and implementing public health interventions for the control and prevention of communicable diseases.

Tanzania has been a leader among African countries to adopt the IDSR strategy, being the first to conduct an assessment and develop a plan of action in 1998. This was followed by the development of a work plan for integrating and strengthening disease surveillance, establishment of an IDSR Task

- Force (2000), preparation of the National Guidelines for Integrated Disease Surveillance and Response 2001, development of laboratory-networking guidelines (2001), and adaptation and approval of the WHO/AFRO district analysis book (2002).

Current Practice and Performance of IDSR

Reporting

Complete, timely and accurate reporting is the foundation of a country's surveillance system. Completeness and timeliness are key indicators of reporting performance. These are defined as the proportion of expected reports received (completeness), and the proportion of expected reports received on time (timeliness). Although IDSR was operationalised during the end of 2001, little achievements have been realised to-date.

In a recent evaluation (Gueye *et al.*, 2005) the performance of many districts and health facilities were still below the target indicators. Several districts were not using the weekly surveillance reports. Different deadlines were found in the districts for monthly and weekly reports. The weekly reporting period was not standard in most of the districts, although this was less of a problem for monthly reports. Even within the same district the facilities were found to have different days of starting and ending the report week.

Currently, total reporting completeness for districts in Tanzania stands at 33% (range: 7-71%) for monthly reports and 19% (range: 1-48%) for weekly reports. In general, completeness is higher for monthly reports than for weekly reports. None of the districts meet the target of receiving 80% of expected reports. Overall completeness for district reports to the region is relatively higher, 66% (range: 31-90%) for weekly reports and 80% (range: 50-100%) for monthly reports. Overall timeliness of reporting from district to region is only 8% (range 0-19%) for weekly reports and 24% (range: 3-56%) for monthly reports. District reporting to the regions is stronger than facility reporting to the districts. The deadline for the district reports to the region is Thursday for weekly reports and the 15th of the coming month for the monthly reports. On average 47% (range: 1-74%) of expected weekly reports were on time, while the figure was 60% (range: 0-94%) for monthly reports.

Data management and organization are weak at the district and health facility levels. Most districts reports are organized into weekly and monthly folders by year, but these are not always maintained (reports mixed between the two, other reports (non-IDSR) mixed in). Reports are not organized by facility, which could facilitate monitoring of reporting performance.

Different formats are being used for weekly and monthly reports and many reports are hand-drawn on notebook paper.

Accuracy of reports

Data quality is an important issue for a surveillance system. However, accuracy of report is faced by various setbacks:

- ▲ Standard case definitions are not always used for recording diagnoses in registers. In addition, a number of uncommon and/or unknown abbreviations are found in registers, leading to incorrect tallying and reporting of data.
- ▲ Patients are sometimes been registered more than once. For example, a patient was registered in the Outpatient book and also registered in the Inpatient Department. This can lead to inaccurate reports.
- ▲ Reporting is particularly poor among hospitals. For instance, 52% of the hospitals in the districts do not submit any weekly or monthly reports
- ▲ Some health facilities in the districts are not using the HMIS system at all. Data are not recorded in a standard way and incorrect reports were submitted.

Use of Surveillance Data

Analysis of data at the district and facility levels is quite weak. Only a few of the districts carry out some type of trend analysis for diseases. At the facility level, 32% of facilities reported doing any type of trend analysis for priority diseases.

Surveillance and Disease Control Programmes

Surveillance data may be regarded as the backbone of public health decision-making. Skills related to data collection, recording, management, analysis, and evidence-based planning and use are applicable to all disease control programs. Persons trained in these skills may choose to specialize in infectious disease, maternal and reproductive health, non-communicable diseases, environmental health, or any other area of interest. Capacity building in this realm is cross-cutting and will lead to strengthening throughout the national public health system.

The Government needs to make a significant investment in methods and materials that develop a culture of information, particularly at the facility and district levels.

Timely reporting is important for all disease surveillance systems. Facilities must be able to communicate to districts and then districts communicate up to the region and national levels. The IDSR program includes training on the importance of timely reporting. However, in many of the most remote areas of Tanzania, facilities lack radios or mobile phones, and even motivated and skilled staffs are thus unable to send weekly reports to the district on time. Recognizing these limitations, the IDSR program has worked with DHMTs through follow up visits to identify potential solutions to communications obstacles, such as developing criteria for choosing which facilities will receive newly purchased radios, and improving relationships between facilities to encourage sharing of communications equipment for disease reporting. While these measures may improve timely reporting, the Government should include a strategy for improving communications with the aim of enabling timely reporting of surveillance data as well as timely provision of feedback to facilities.

Conclusion

Several vertical programmes currently exist in Tanzania to address these critical public health problems. Surveillance is an essential component of each of these programmes. Disease surveillance is required

to measure the magnitude of burden of disease (morbidity and mortality) in populations, to monitor trends over time, to detect and respond quickly to any unusual trends (including outbreaks), to plan for and implement appropriate interventions that will improve the health of the population, and to evaluate the impact of these interventions.

Given the interconnected nature of many health problems, and limited health staff at all levels to focus on surveillance, optimisation of surveillance can best be achieved by coordination and integration of efforts. While vertical programmes can be very effective for meeting programme-specific targets, their disadvantages include likely duplication of efforts by health staff stretched too thin and lack of coordination leading to poor use of limited resources. From the perspective of a national Ministry of Health, whose mission is to safeguard the health of an entire country's population, it is sensible to integrate programmes wherever possible to maximize their impact.

The Ministry of Health needs support to improve the quality of life of the Tanzanian populations through the implementation of evidence-based health interventions. Recent situation analyses have identified weaknesses in data use and response in Tanzania, while recognizing that these are critical components for sound public health decision-making (Miller *et al.*, 2003; L.E.G. Mboera *et al.*, unpublished). All of the vertical programmes have demonstrated a need for more trained, qualified staff to collect, analyse, interpret, and use data for decision-making. These skills are broad-based and can be applied to a variety of public health problems in the country.

The public health infrastructure of a country depends not only on a strong base in epidemiology, but also on a functioning, reliable system of networked laboratories working in tandem with epidemiologists. Epidemiological and laboratory data must be linked. Several programmes have recognized the need for general strengthening of the laboratories in Tanzania. Laboratories play a critical role in case confirmation, and may also conduct more detailed studies such as examinations of drug resistance patterns.

High quality surveillance data collection and use are critical to the success of all public health programmes. Vertical programmes such as HIV/AIDS, TB/Leprosy, EPI and malaria in Tanzania have all demonstrated a need for human capacity development in the area of data collection, management, analysis, and use. Given limited human and financial resources, it would be sensible to invest in broad-based epidemiological capacity building at all levels of the public health system in Tanzania, since these skills – leading to evidence-based decision-making – are applicable to all communicable disease control programmes and also to a wider range of public health programmes. In addition to epidemiology capacity building, there is a need for improving laboratory networks, laboratory capacity, and links between epidemiologist and laboratory technicians to maximize the impact of disease surveillance and improve overall programme management. Laboratory capacity building will even benefit the vertical programmes and a host of other priority communicable disease control programmes in Tanzania, leading to improved diagnostic capabilities and rapid detection of (and response to) outbreaks. Investment in improved communications infrastructure will further facilitate timely reporting and linkages between laboratories and epidemiologists, and will enable trained and motivated health workers to perform their jobs (such as weekly reporting).

References

- Berkelman, R.L., Bryan, R.T., Osterholm, M.T., LeDuc, J.W. & Hughes, J.M. (1994) Infectious disease surveillance: a crumbling foundation. *Science* 264, 368-370.
- Gueye, D., Senkoro, K.P. & Rumisha, S.F. (2005) *Monitoring and Evaluation of Integrated Disease Surveillance and Response in Tanzania, October –December 2003*. Bethesda, MD: The Partners for Health Reformplus Project, Abt Associates Inc.
- John, T.J., Samuel, R., Balraj, V. & John, R. (1998) Disease surveillance at district level: a model for developing countries. *Lancet* 352, 5861.
- John, T.J., Rajappan, K. & Arjunan, K.K. (2004) Communicable disease monitored by disease surveillance in Kottayam district, Kerala State, India. *Indian Journal of Medical Research* 120, 86-93.
- Kagonji, I.S. (2005) Knowledge, attitude and practice of health workers towards the use of health management information system in Iringa Municipality, Tanzania. *Tanzania Health Research Bulletin* 7, 000-000 (in press)
- Mboera, L.E.G., Rumisha, S.F., Magesa, S.M. & Kitua, A.Y. (2001) Utilisation of Health Management Information System in disease surveillance in Tanzania. *Tanzania Health Research Bulletin* 3, (2), 15-18.
- Mghamba, J.M., Mboera, L.E.G., Krekamoo, W., Senkoro, K.P., Rumisha, S.F., Shayo, E.H. & Mmbuji, P. (2004) Challenges of implementing Integrated Disease Surveillance and Response strategy using the current Health Management Information System in Tanzania. *Tanzania Health Research Bulletin* 6, 57-63.