



National Institute for Medical Research

POLICY BRIEF

Building Evidence from Research for Action

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A 3Ms national surveillance platform to detect and respond effectively to public health events in Tanzania

Key messages

- Strong health information systems (HIS) are the backbone of strong health systems which are central to achieving better health outcomes.
- The Tanzania, Ministry of Health, Community Development, Gender, Elderly and Children runs the routine Health Management Information System (HMIS) as the major source of public health surveillance data
- Several other sectors, agencies and institutions are involved in different aspects of the HISs
- The systems are run in parallel and independently, and are not centrally coordinated and sharing of information between them is minimal
- There is a weak relationship between stakeholders, which result into limited utilization of both population surveys and research data for disease control and prevention
- Attempts and initiatives to integrate the HISs in Tanzania are at a snail's pace, sector specific and poorly networked
- This policy briefs proposes the establishment of a multi-sectoral, multi-disease and multi-indicator (3Ms) platform that integrate the existing surveillance systems to provide support to effective detection and prompt response to public health threats

through the Integrated Disease Surveillance and Response (IDSR) strategy. However, today the scope of surveillance is much broader than just collecting, analysing and interpreting health facility based-data. In recent years, it has also been realized that collaboration between animal and public health sectors is critical in improving the management of zoonotic disease threats – hence the need to share data. It is critical for an effective surveillance system to incorporate other data sources such as research, demographic surveys, vital statistics and civil registration, antimicrobial resistance and systematic surveys. To date, data from surveillance systems, other than IDSR are neither captured nor usually used for planning and public health response in Tanzania. Most of these other health information systems (HIS) operate in silo with different tools, scope and focus, stakeholders, levels of access, and duplications, all of which require coordination and optimization. Given this large number of partly overlapping, complementary and interdependent HISs, it is important to consider a multi-sectoral, multi-disease and multi-indicator (3Ms) type of integration to enhance accessibility and utilization of the public health data to consolidate the national disease surveillance system. In this policy brief, it is proposed to create a common platform for a multitude of customized health information systems; powerful enough to support all health-related information and legal aspects; as well as general enough to serve as a basis for a wide variety of health information systems.

The Problem

In Tanzania, several government ministries, agencies and research and academic institutions, are involved in managing different aspects of the health information systems (HIS). Some of this

Executive summary

In Tanzania, public health surveillance system is based on routinely collection of epidemiological data from health care facilities and implemented

information is relevant to disease surveillance. The systems run in parallel and independently, not well coordinated and sharing of information between them is minimal. Each of the existing system operates its own data collection and utilization framework. In addition, an epidemic intelligence that encompasses activities related to early warning functions is almost non-existent. A warning of an impending epidemic can help

relevant authorities and communities to prepare and take immediate actions to reduce morbidities and mortalities. Through collection of routine surveillance data, environmental and other ecological factors, areas likely to have an emerging disease outbreak, hotspots and populations which might be at high risk, can timely be identified and acted upon promptly using variety of innovative scientific methodologies.

Table 1: Health Information Systems in Tanzania

Sources	Products	Area of focus	Indicators
Research Institutions	Research evidence	Multiple	Burden (Prevalence, Incidence) Associations Factors Point to point variations
MoH/PORALG	HMIS/IDSR data	Multiple	Burden (Incidence) Notifications Variations (moderate spaced)
RITA	Civil Registration and Vital Statistics	None	Demographics
NBS	DHS Census THMIS	Malaria HIV	Variations (widely spaced) Socio-demographic
MoLF	Animal disease surveillance	Multiple	Burden (incidence) Notifications

Key: MoH= Ministry of Health; PORALG= President's Office, Regional Administration and Local Government; NBS= National Bureau of Statistics; MoLF= Ministry of Livestock and Fisheries; DHS= Demographic and Health Survey; THMIS=Tanzania HIV and Malaria Indicator Survey

The Tanzania Ministry of Health, Community Development, Gender, Elderly and Children (herein after referred to as Ministry of Health) runs the routine Health Management Information system (HMIS) as the major source of information for decision making and planning. Ifakara Health Institute and the National Institute for Medical Research run a number of Demographic Surveillance Sentinel sites (Rufiji, Ifakara, Magu, Korogwe), generating both epidemiological and demographic information. In addition, health research institutions are increasingly generating evidence based information of which national reports and publications are readily available. The National Bureau of Statistics (NBS) conducts population and housing census, and demographic and health surveys, every ten and five years, respectively. Other potential sources of

health information include the civil registration and vital statistics (births and deaths) by the Registration, Insolvency and Trusteeship Agency (RITA) operating under the Ministry of Justice and Constitutional affairs. For vital registration, the role of Ministry of Health is minimal as it related to notification only despite the fact that health care facilities are the main generators of these data (MoHSW, 2007).

Many of the epidemic diseases are known to be highly sensitive to long-term changes in climate and short-term fluctuations in weather. In Tanzania, meteorological data are made available daily by the Tanzania Meteorological Agency (TMA), yet they are rarely used in monitoring occurrence of diseases. Moreover, both private and public research and academic institutions

independently conduct population-based as well as animal and public health surveys that generate important information that could be used for disease surveillance purposes.

Community engagement has long been an important part of both human and animal health (Ndiaye et al., 2003; Azhar et al., 2010; Mariner et al., 2012, Marquet et al., 2012). Currently, public engagement is being transformed through participatory surveillance systems that enable the community to directly report on disease events via information technology and communication (ICT) tools (Wójcik et al., 2014). These systems encourage the regular, voluntary submission of syndromic, health-related information by the general public using digital technologies. A number of participatory surveillance systems have been described (Friesema et al., 2009; Parrella et al., 2009; Brooks-Pollock et al., 2011; Stone et al., 2016) and have demonstrated their accuracy and sensitivity, their ability to provide more timely measures of disease activity, and their usefulness identifying risk groups, assessing burden of illness and informing disease transmission models. Despite the relevance of inclusion of community information in surveillance, there are a few Community-based Disease Surveillance programmes in Tanzania and most of them are still on research basis (Karimuribo et al., 2017); and the information collected is not captured or integrated in the national disease surveillance system run by the government ministries (public/animal health).

Despite the multitude of health information systems described above, the HMIS is currently the only and core source of the IDSR data. There are still a number of challenges in the accessibility and utilization of the data generated. Sentinel surveillance and research outputs are weakly incorporated or consolidated in the HIS of the Ministry of Health and not used in the planning and implementation of the disease surveillance in the country (MoHSW, 2015). Data from this core surveillance system is not utilized to its full potential, even within the sector itself. The situation is characterized by weak stakeholder's relationship and networking resulting into limited utilization of data for disease control and

prevention, duplication of surveillance efforts, delays in response to disease outbreaks and other public health emergencies, and technically use of proprietary diverse data capture and storage systems that are not inter-operable (MoHSW, 2007). Moreover, the systems lack strategic policy guidelines and a national platform that coordinates and brings together the existing surveillance systems to provide epidemiological links of public health threats.

As part of an effective global response to disease transmitted between animals and humans (Morens & Fauci, 2013), there have been calls for integrating surveillance of zoonotic disease events in human and animal populations. However, to date there have been few examples of such data integration. Implementation of integrated animal and human surveillance systems for zoonotic diseases is of interest to strengthen disease surveillance in Tanzania.

Policy options

Given this large number of partly overlapping, complementary and interdependent public health HISs in Tanzania, it is important to consider the need for integration to enhance the accessibility and utilization of the systems to consolidate the national disease surveillance strategies. Indeed, the integration of HISs is currently a necessity for cost-effective programmes in resource-limited settings. The key reason for the need towards integration is to bring transformation in the health sector to streamline, interconnect and compress its mandate implementation processes. As the information systems are currently poorly coordinated, it follows from this policy recommendation that they also need to be more integrated.

The backbone of the future, comprehensive and integrated health information system/surveillance is expected to be electronic-based. It is proposed to create a common platform for a multitude of customized information systems; powerful enough to support all health-related data as well as general enough to serve as a basis for a wide variety of health information systems. It is recommended here that Tanzania adopts an open-source programming, with

appropriate safeguards, in order to facilitate interoperability between different sources of data and foster sustainability of the system put in place. This will facilitate the linking of multiple or related occurrences and forecast or predict future health events and generate composite disease surveillance indicators that integrate and synthesize information from multiple systems to inform all actors and alert the system.

To prepare the country for impending epidemics, this national platform should develop capacity

for infectious disease early warning system. Computer models and satellite images, research institutions' expertise, national meteorological and other government agencies, local field reports and community observations will all allow better understanding of what is happening, where, and what is likely to happen in terms of disease occurrence. Predictive surveillance system using monitored environmental variables, linked to a disease system, is expected to provide prior information of epidemics.

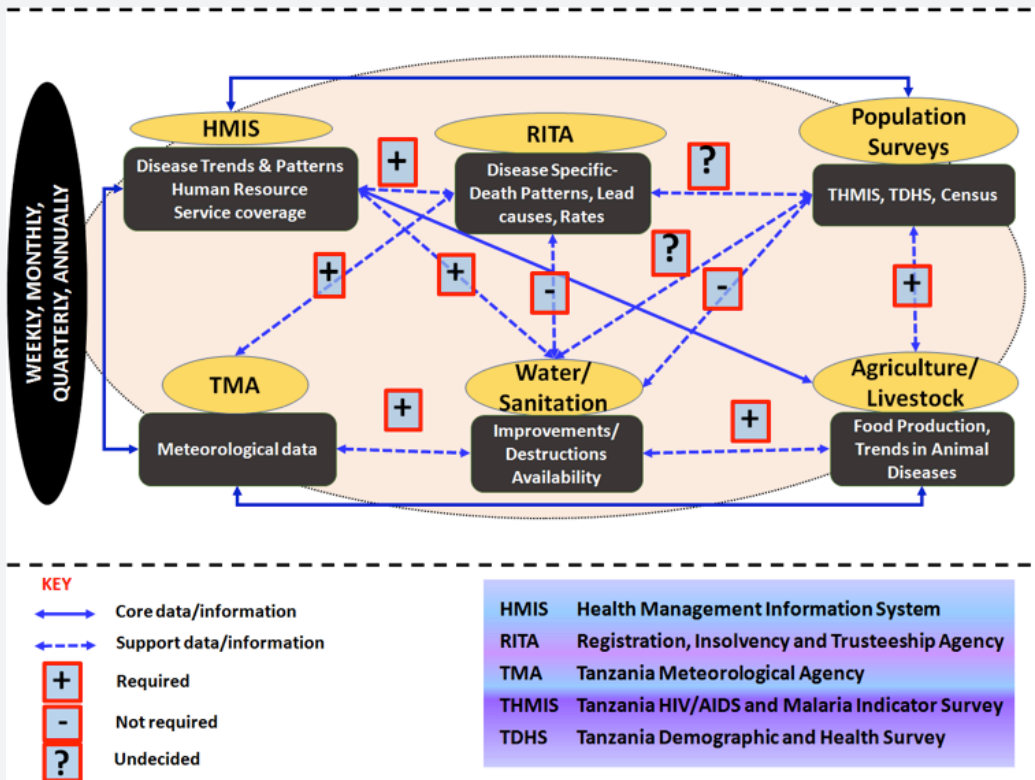


Figure 1: A proposed layout of possible sources of data and information to generate Routine Composite Surveillance Indicators (Indicators will be developed at a predefined periods and consolidate data from all relevant sources)

Implementation considerations

To address the challenges of multiple disease surveillance and other HISs, there is need to develop an electronic platform that will combine data from multiple surveillance databases such as research programmes, HMIS, population based surveys, syndromic surveillance, sentinel surveillance, behavioural risk factors surveillance, or other community based surveillance initiatives to allow their interoperability. The aim is to make full use of epidemiological surveillance and research information in preparing the community to take action before a health emergency happens. The proposed platform will have the following components: (i) a technical/driver desk to design, build and generate consolidated surveillance indicators; (ii) a communication desk to share and respond to the public inquires and guide response teams; (iii) Geomatics desk/unit for production of maps providing spatial variation of consolidated indicators; (iii) early warning system unit for prediction and forecasting of epidemics and monitoring of events; and (iv) unit for training on skills development, analysing and interpreting complex composite surveillance indicators. There will be a continuing analysis and review of scientific publications, technical reports, routine health data and demographic statistics to feed to different units/desks. Information and triggers from syndromic surveillance (i.e. the community) will not be used for routine indicators, however, will follow a similar multi-dimensional information linkage to guide response team. The goal is to make data readily available and help speed up the process of dissecting the information and putting programmes in place to stop epidemics.

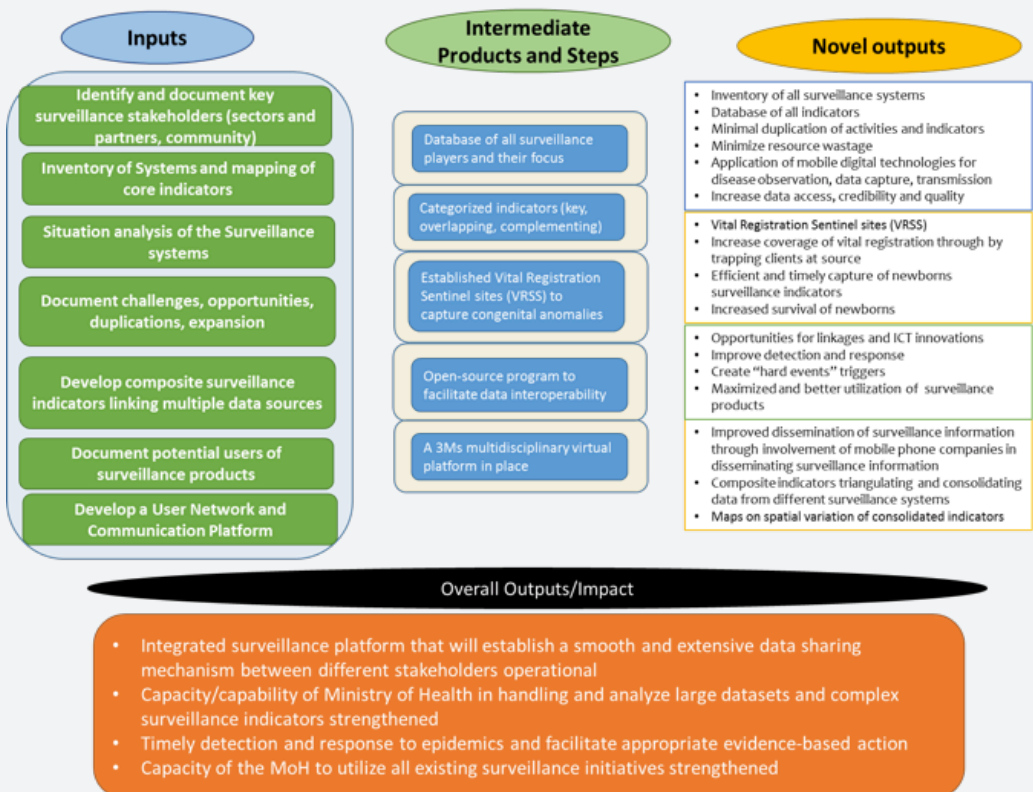


Figure 2: A proposed 3Ms National Surveillance Platform for Public Health Events

To start with, a virtual One Health platform may be established and operationalized. This virtual platform will be composed of members of the departments of disease control of the government ministries responsible for human and animal health, researchers and other relevant experts. Others may include veterinarians, epidemiologists, ecologists, mathematical modelling experts, software developers, and climate scientists.

The proposed platform is in line with the National Health Sector Strategic Plan (HSSP) IV (2015-2020) and the Tanzania's One Health Strategic Plan (TOHSP), 2015-2020. The HSSP emphasizes that health sector will continue to take practical measures to protect the health and wellbeing of Tanzanian population against international spread of diseases and other public health threats, through several measures, including strengthening surveillance systems (MoHSW, 2015). The TOHSP focuses on five thematic areas which include training, advocacy and communication; preparedness and response; research; disease surveillance, prevention and control; and coordination. The platform will foster improved utilization of surveillance data for action and avoid delays in response to emergencies through linking of health indicators with other information or services such as climate data/products that can add value to accurately inform health risks.

While establishing the platform, there are potential challenges that need to be addressed. Data sharing between different ministries/sectors, agencies, institutions and programmes is likely to be a new phenomenon and it may attribute to reluctance in readiness to share data; Lack of adequate skilled personnel to design and manipulate complex data systems has been a constraint for many institutions, and has been attributed to issue of poor data quality. Other challenges included data restructuring to allow linkage; data quality and integrating the surveillance platform with existing system such as DHIS2. To address these challenges, there is need to: (i) provide training of personnel involved in data management while implementing the process; (ii) establish multidisciplinary, multisectoral and multiagency task force to steer the implementation of the integration process and management of the platform; and (iii) engage e-Government Agency as regards to issues pertaining to electronic data security; (iv) engage key actors to agree on the terms for data sharing and standardized thresholds for emergency triggers for public health risks management and launching of the platform.

Competing interests

The authors declare that they have no competing interests.

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About the Institutions

National Institute for Medical Research is a public health research institution established by the Act of Parliament No. 23 of 1979 with the mandate to carry out, co-ordinate, monitor and control health research in the United Republic of Tanzania

Sokoine University of Agriculture was established on the 1st July 1984 by Parliamentary Act No. 6 of 1984. Through its College of Veterinary and Medical Sciences, SUA conducts a number of research on surveillance of human and animal diseases.

Southern African Centre for Infectious Disease Surveillance is a One Health Virtual Centre that links academic and research institutions involved with infectious diseases of humans and animals in Southern and Eastern Africa. It was formed in 2008 with Sokoine University of Agriculture, in Tanzania, as the Lead Institution

Muhimbili University of Health and Allied Sciences was established by Article 1 of the Charter of Incorporation in 2007. MUHAS offers programmes in Medicine, Dentistry, Pharmacy, Nursing, Public Health, Traditional Medicine, Laboratory and Allied Sciences at undergraduate and postgraduate levels. Research features prominently in the institutional focus.