

Integrated Non-Communicable Disease Surveillance and Response System

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Executive Summary

Integrated surveillance is critical to control infectious diseases and to manage preventative health services. Surveillance involving public health, veterinary, since 2011, the system has facilitated near real-time reporting of animal bites and human and animal vaccine use (almost 30,000 reports) by over 300 frontline health and veterinary workers across a catchment area of 150,000 km² with >10 million inhabitants. Since March 2015, the mobile phone-based surveillance system has been adapted to monitor maternal health (and active interventions) by collecting data on more than 100,000 facility births, maternal and infant deaths, and including more granular data surrounding obstetrical emergencies and their management across 650 health facilities. Through this surveillance system, we are now able to identify where and when obstetrical emergencies are occurring and we are able to successfully dispatch local ambulance services, drone services to deliver blood and other essential items to the 'last mile' as well as facilitating transport services to move pregnant women to higher level health facilities while also mobilizing the destination facility so that they were prepared to intervene to save that woman's life. Additionally, routine paper-based government surveillance systems are typically of very poor quality and cannot be easily extracted for timely evaluation of large-scale interventions and health system outcomes.

Through our low-cost and efficient platform we have begun to tackle the non-communicable disease (NCD) challenges in Tanzania. Strategically reusing and adapting our mobile phone-based system within the national health system to improve knowledge translation, and implementation and use of evidence-based protocols, while preserving the validity of the data collected, improves data quality, timeliness, and completeness while reducing costs of health system monitoring and evaluation. In recognizing that our system strengths allow active (real-time) data and clinically related processes, while allowing health providers to actively intervene and manage a number of evolving threats, we decided to test our system to utilize task-shifting and tailored mobile health tools to tackle the massive burden of cervical cancer in Tanzania (and 6 other countries in East and West Africa) through cervical cancer screening training and monitoring programs among non-physician health providers. These programs use our mobile smartphone-based platform to focus on health provider skills enhancement, same day treatment for precancerous lesions of the cervix (cryotherapy), referrals for cancerous lesions as well as a robust, real-time data monitoring and evaluation system that is accessed by government partners/stakeholders and other users at the local, district, regional and national level.

The platform has been successfully adapted to equip cervical cancer screening providers, performing screening using a visual method under acetic acid with smartphones and our smartphone application, Servical, that is built on the multi-purpose platform for rabies and maternal and child health. These tools allow non-physician health providers to send cervical images and their diagnoses/treatment plans to more skilled health providers and peer-educators/trainers so that that can receive real-time supportive supervision and provide high quality cervical cancer screening services without requiring in-person ongoing training. This program has bridged the resource and health human resource 'gaps' by facilitating supervision of newly trained cervical cancer screening providers from a remote site. This method, developed through Grand Challenges Canada funding in collaboration with the Tanzanian Ministry of Health and other international partners, is called Smartphone Enhanced Visual Inspection with Acetic Acid (SEVIA). As with other applications of the mobile phone-based surveillance system, it collects all data required by the MOH and provides real-time monitoring and evaluation and analytics in the hands of decision makers and supervisors. More than 13,000 women have been screened through the scale-up program in Tanzania and 5 other pilot sites in East and West Africa within the last 2 years.

We have recognized the strength and capability of this very efficient and open-cost platform for rabies surveillance and treatment and maternal and child health system strengthening to facilitate prevention, detection, and treatment service delivery processes in prevalent non-communicable diseases that are impacting many low-income countries like Tanzania on the continent of Africa and elsewhere. These diseases

include hypertension, diabetes, cancers, cardiovascular disease and chronic kidney failure. These diseases are epidemic and progressively killing more people on the continent of Africa than HIV/AIDS, Tuberculosis and malaria combined, and, require training of physician and non-physician health providers, access to real-time patient data (easy to access and use electronic medical record systems), mechanisms to promote continuity of care and patient navigation to access more specialized services through referral pathways at higher level health facilities within national health systems. These components which are essential to managing NCDs are often lacking in health systems built to primarily address infectious diseases and maternal and child health.

The anticipated outcomes of further developing and implementing mobile phone-based surveillance and quality improvement platforms to further tackle non-communicable diseases across health system levels is that the timeliness, quality and utility of critical health data collection will improve while also strengthening support for and level of health provider skills to improve a number of key health outcomes. In addition, the existing, built in capabilities of these platforms will strengthen and expand health education and navigation of patients and other health system users through improving health seeking behavior and accessibility of health services.

Consortium Team

Ifakara Health Institute (IHI) is an autonomous, non-profit health research and training centre. IHI has decades of experience conducting a wide range of health-related research and implementation of evidence-based health interventions in Tanzania, including biomedical and environmental studies, drug trials, and health systems research. IHI is currently considered one of the leading health research institutions in Africa, with an outstanding and long-term contribution in health-related research, training and services. It has a rich and pronounced research portfolio that covers important health challenges including malaria, HIV/AIDS, TB, maternal and neonatal health systems. Research includes clinical trials of new candidate drugs and vaccines to combat malaria, testing, implementing and monitoring new strategies for maternal and newborn health, studying fairness and equity in health sector financing and assessing strategies to improve health care access for vulnerable groups.

IHI brings expertise in maternal health (*Dr. Godfrey Mbaruku*) and public health digital surveillance systems (*Dr. Zac Mtema*). IHI has longstanding relationships with key government stakeholders in public health, including the MOH and then Tanzania Commission of Science and Technology.

IHI will be the consortium leader.

Queen's University (QU) brings a history of strong implementation research regarding mobile health interventions (*Dr. Karen Yeates and Erica Erwin*) for health system strengthening in Tanzania and elsewhere that facilitate task-shifting among health providers and quality improvement in cervical cancer screening and hypertension detection and management within challenging and under-resourced levels of national health systems.

New York University (NYU) College of Global Public Health (*Dr. Olugbenga Ogedegbe and Dr. Ophira Ginsburg*) brings further expertise in implementation of evidence-based task-shifting interventions for non-communicable diseases and in universal health coverage to improve global equity and advocacy around access to prevention, diagnosis and management for cardiovascular disease and women's cancers.

Project Description

While our existing platform centers on providing quality clinical and administrative data in the hands of front-line health workers as well as local and national decision-makers, this is critical yet not sufficient for improving health care provision and strengthening health systems. At present, in the majority of African health systems, this information is uniformly lacking, but it is essential to inform decisions about allocating resources (human and non-human) especially pertaining to non-communicable diseases in health systems that are not currently equipped to recognize, track and manage these competing health threats. Our proposal is to further integrate, develop and strengthen our existing and complementary mobile platform components to further include and improve provision of education and training resources for health providers through real-time accessibility to evidence-based guidelines, decision support algorithms, supportive supervision and patient navigation tools for more complex chronic disease conditions. This integration will lead to further health system strengthening and improve prevention, detection and management of non-communicable diseases.