

Comparison of the Disease Surveillance Data Collection Technologies in Tanzania

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Objective

In the past few years Tanzania has experienced a cell phone technology revolution presenting new opportunities for disease surveillance improvements. This dynamic environment, challenged with resource constraints and the need for a one-health joint effort for disease surveillance and control, calls for evaluation of technologies for better planning and implementation of future information technology projects in disease surveillance.

Introduction

Tanzania has a disease surveillance infrastructure with national, regional and district offices for human and animal disease surveillance. Electricity shortages and limited communications infrastructure create a challenge for a rapid information exchange of the disease surveillance information. Cell phones revolution provided 75.8% mobile network coverage of the population and 45% of land area [1] in 2005-2013 [2]. At the moment 98% of the district centers are covered with the network. The network growth is expected at a pace of 17-25% annually throughout 2015 [1].

The following technologies become available for nation-wide use in surveillance: 1) online voice, 2) SMS, 3) mobile web, and 4) Android applications on cell phones. These technologies have different advantages for disease surveillance that are evaluated for proper application.

Methods

The following set of criteria was developed for technologies evaluation:

- 1) Technology Availability (TA) – availability now and in 3 years to the health and veterinary disease surveillance end-users in Tanzania
- 2) Technology Sustainability (TS) – ongoing costs of technology sustainment, such as infrastructure use cost (e.g. cost of the SMS messages); technologies with high costs are not acceptable and the lower the cost is the better
- 3) Technology Capabilities (TC) – usability, performance, and data validation capabilities

Basic disease surveillance information flow requirements were analyzed to determine content, volume, layout, and business rules required for data collection. Analysis included case notification IDSR Form 10 with 34 data fields per case and monthly IDSR Form 2B with 4 fields per disease forms.

Existing publications on the state of cell phone penetration and future plans of the cell operators in Tanzania were studied. Information was cross-checked to ensure accurate results of the study. For example, the real-time data of cell coverage of GSM providers was mapped onto the administrative map to determine districts coverage for the country.

Results

Technology Availability (TA) to the 19+ years old population was estimated based on the real number of subscribers per 100, SIMs per person, age group data, phone type profiles and development forecast. The resulted effective TA is presented in the table (see Conclusions section).

Technology Sustainability (TS) per message is the best for the Android application and mobile web at 0.03 TSH and 70 TSH for SMS. The voice technology is the most expensive with a cost for one call at least at 25-120 TSH/min.

In terms of the Technology Capabilities (TC) the Android application provides the most capable solution including support of off-line mode and usability. Web-capable phones provide similar capabilities except of the off-line mode. The SMS technology and voice call remain behind: the SMS lacks end-user data validation and requires coding tables making application challenging for large case-based notifications and aggregate reports; the voice calls are the most limited in capabilities and also lack data quality control.

Conclusions

Cell phone revolution in Tanzania presents an opportunity to improve disease surveillance with new technologies. The best technology on capability and sustainability is an Android-based application with somewhat limited technology availability in 2013. The mobile web capability is second best for capability and sustainability and is much more advantaged on the availability. The forecast for 2016 show significant improvement of technology availability providing strong foundation for future information technology systems implementation in Tanzania.

Technology	TA in 2013 [estimate]	TA in 2016 [estimate]
Cell phone	63%	83%
Android-based	15%	38%
Web-capable (Feature phones and Smart phones)	55%	83%

Keywords

Disease surveillance; Mobile technology; Tanzania; Android; One Health

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