STUDY SUMMARY

Reducing Ebola Virus Transmission: Improving Contact Tracing in Sierra Leone

During an Ebola outbreak, the rapid identification, diagnosis, and isolation of those infected is essential to preventing the further spread of infection. During the West Africa Ebola outbreak, IPA-Sierra Leone worked with the International Medical Corps and researchers at the London School of Hygiene and Tropical Medicine to test the feasibility and effectiveness of using a mobile-based app for identifying Ebola contacts and monitoring them for symptoms (a process known as "contact tracing"). However, due to the small number of cases in the District, the randomized evaluation was discontinued and researchers changed the design to a demonstration project. The available data and qualitative findings suggest the electronic system holds promise, but that the system would likely work better in an area with better mobile phone coverage. It would also be easier to use for disease monitoring in non-emergency settings. Further rigorous research is needed to understand the impact of using an mHealth app for disease surveillance.

Policy Issue

Since the Ebola virus is spread by close physical contact, most people at highest risk of infection can be identified among the contacts identified by Ebola cases and their families. People with Ebola only become infectious after they start to show signs of the illness, so if these contacts are traced and closely monitored for the early signs and symptoms of Ebola (contact tracing) onward transmission of the Ebola virus can be interrupted within the community by early isolation of new cases of Ebola illness among the contacts.

From 2014-2016, Liberia, Guinea and Sierra Leone experienced the largest Ebola outbreak ever recorded, resulting in over 28,000 reported cases and over 11,000 deaths.[1] Previous Ebola outbreaks had been controlled through contact tracing and isolation. However, the paper-based reporting system that contact tracers were using during the epidemic was inefficient. It required phone calls to relay key information, and required pen and paper reporting, both of which are slow and prone to error. Entering data on mobile devices—rather than on paper and by telephone—had the potential to improve contact tracing, by increasing overall efficiency, and by reducing transmission rates, especially because it allowed symptomatic contacts to enter the healthcare system immediately.

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COUNTRY
Sierra Leone

PARTNERS
International Medical Corps, London School of Hygiene and Tropical Medicine

PROGRAM AREAS
Health, Peace and Recovery

TOPICS
Crisis, Healthcare Quality, Information & Communications Technology (ICT), Mobile Health, Technology Adoption

TIMELINE
2014-2015

The aim of this research was to evaluate to what extent an mHealth application could improve disease surveillance in an emergency setting.

Evaluation Context

The study was conducted in Port Loko District in northern Sierra Leone. Sierra Leone was the country the most severely affected by the outbreak, with 8,706 laboratory confirmed cases and 3,956 confirmed deaths. Study participants were listed contacts of laboratory-confirmed Ebola cases in Port Loko District.

Details of the Intervention

The original study design was a cluster-randomized evaluation to be conducted in all 11 chiefdoms of Port Loko District. The goal of the evaluation was to compare the impact on transmission rates of the standard contact tracing system, using a paper-based system supplemented by ad-hoc phone calls and SMS messaging, to an app-based system where the contact tracers received smartphones installed with the Ebola Contact Tracing (ECT) app.

The ECT app was a customized three-tier smartphone application developed using Dimagi's CommCare platform, an open-source mobile platform for electronic data capture and case management. The app was field tested, piloted, and refined iteratively before deployment in mid-April 2015. The app had three modules plus an SMS-based alert system:

1. **Registration stage**: Following confirmation that a suspected case was a laboratory-confirmed Ebola case, the case and their contacts were registered on the ECT app by trained District Health Management Team (DHMT) staff using an electronic SIM-enabled tablet at the DHMT Data Office.
2. **Assignment stage**: Contact tracer coordinators (one per chiefdom) assigned the contacts registered for each confirmed Ebola case to a contact tracer in their chiefdom.
3. **Visitation stage**: The contact traver entered data on the ECT app during the daily monitoring visit of a contact. This was then synchronized to a central server.
4. **Telerivet alert system**: This system was designed to alert the DHMT to symptomatic contacts identified using the ECT app through an automated SMS dispatch built into the platform.

Due to the small number of cases in the District, the randomized evaluation was discontinued in June 2015 and researchers changed the design to a demonstration project. At that point, the app was also introduced to the five comparison chiefdoms in the district to maximize the data collected using the app. At the recommendation of the local WHO staff, the paper-based system continued to be used alongside the mobile phone app as it was the standard national system in use, and there were concerns that data collection might fail altogether if the mobile app was to fail.

As well as the quantitative evaluation of the app, an independent qualitative review of the study was

conducted in September 2016, comprising semi-structured interviews and focus group discussions (FGD) with contact tracers, coordinators, and district level staff.

The intervention and research were made possible through funding from the German Agency for International Cooperation (GIZ).

Results and Policy Lessons

Because the design was changed to a before-after study, the research team was not able to rigorously measure the impact of the mobile-app based system on transmission rates compared to the paper-based system. However, the demonstration project and qualitative interviews provided several insights into the feasibility of using an electronic contact-tracing system in this context.

The findings suggest, for example, that the accuracy, completeness, and security of the data was improved with the smartphone app. However, the duration for some steps of the app were also longer than anticipated, including a relatively long time from case confirmation to registration (median 18 hours). Using the app, the median time from case registration to contact assignment, and also from contact assignment to first visit were both almost 24 hours. These long durations reflected multiple challenges including connectivity issues, the fact that many of the field staff lacked prior experience using smartphones, and technical challenges using the software.

Qualitative findings:

All of the contact tracers and coordinators had previously used a mobile phone but few (less than 5 percent) had used a smartphone. Their general feedback was that the ECT app was preferable to the paper-based form as it was faster and more accurate to use, but there were challenges in using both the smartphone and the app. Advantages included the elimination of the coordinators' travel time to receive the lists of contacts from the district, the ability to accurately monitor large numbers of contacts, and the relative ease of transporting a phone compared with carrying paper forms.

Suggested improvements related to the app included better network coverage, improved battery life and quality of phones, the need for further training on syncing, increased compensation to offset charging fees, better strategies for overcoming distances to charging booths, more refresher training for contact tracing and monitoring using the study phones.

Researchers believe that there would be fewer challenges in a context with greater network coverage, or in a non-emergency setting. Further, they believe a simpler app design structure would have mitigated some of the problems.