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mHEALTH COMPENDIUM

VOLUME FOUR

October 2014

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mHEALTH COMPENDIUM

VOLUME FOUR

DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

The African Strategies for Health (ASH) project is a five-year contract funded by the United States Agency for International Development (USAID). ASH works to improve the health status of populations across Africa through identification of and advocacy for best practices, enhancing technical capacity, and engaging African regional institutions to address health issues in a sustainable manner. ASH provides information on trends and developments in the continent to USAID and other development partners to enhance decision making regarding investments in health.

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Our thanks also goes to the people and organizations who submitted project information and whose mHealth applications are featured in this document. They are pioneers in creative and useful mHealth applications that are designed to improve health systems and achieve health goals. We realize that there are many more people world-wide who are actively involved in mobile applications for health. While time and budgetary constraints did not permit a more extensive review, we would like to acknowledge them for their own contributions to the field.

ACRONYMS

ANC	antenatal care
CDC	Centers for Disease Control and Prevention
CIDA	Canadian International Development Agency
CHW	community health worker
DFID	UK's Department for International Development
HMIS	Health Management Information System
ICT	Information and Communication Technology
IDRC	Canada's International Development Research Centre
JHU-CCP	Johns Hopkins Bloomberg School of Public Health Center for Communication Programs
M&E	monitoring and evaluation
MCH	maternal and child health
MEDA	Mennonite Economic Development Associates
MNCH	maternal, newborn and child health
MOH	Ministry of Health
NMCP	National Malaria Control Program
PEPFAR	The United States President's Emergency Plan for AIDS Relief
PMI	The President's Malaria Initiative
RMNCH	reproductive, maternal, newborn and child health
SMS	short message service
TB	tuberculosis
USAID	United States Agency for International Development
WASH	Water, sanitation and hygiene
WHO	World Health Organization

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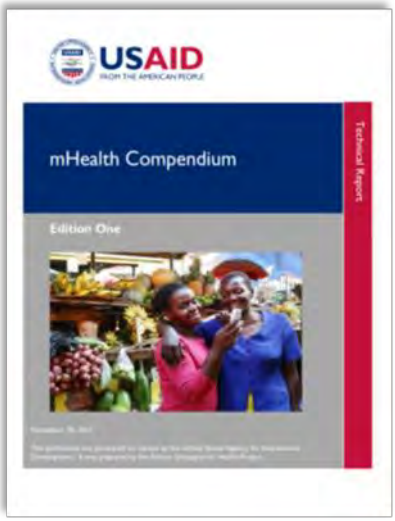
EXECUTIVE SUMMARY

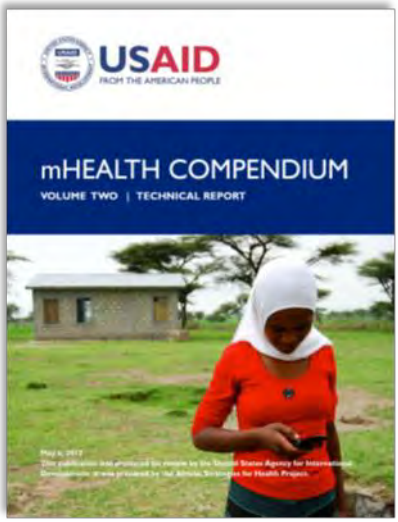
Mobile health (mHealth) is the provision of health services and information via mobile and wireless technologies. Within Africa the mobile phone has become ubiquitous, making mHealth applications an important tool with which to impact the health of Africans. When applied correctly, mHealth can make real contributions to improved health outcomes. mHealth has the potential to address and overcome (1) disparities in access to health services; (2) inadequacies of the health infrastructure within countries; (3) shortage of human resources for health; (4) high cost of accessing health; and (5) limitations in the availability of financial resources.

This fourth volume of the mHealth compendium contains thirty-one case studies which document a range of mHealth applications being implemented mainly throughout Africa, but also in other regions. In order to help USAID missions access relevant mHealth information, this compendium offers project descriptions, publication references and contact information for making further inquiries. Each two-page case study includes an introduction to the health area or problem; a description of the mHealth intervention highlighted; a description of any important results or evaluation findings; lessons learned; and conclusion. In addition, the second page includes a summary of the geographic coverage, implementation partners, and donors, as well as contact information for the implementing partner and donor. The case studies in this compendium have been organized within five programmatic areas: Behavior Change Communication, Data Collection, Finance, Logistics and Service Delivery.

A number of mHealth tools featured in this fourth volume have great potential for contributing to strengthening health systems and supporting the response to disease outbreaks, such as the current Ebola outbreak in West Africa. These tools include the mSOS disease notification system (pages 34 to 35), CommCare's case management and reporting system (pages 32 to 33 and 66 to 67), and the IVR mLearning platform for health workers (pages 68 to 69).

Each individual case studies, as well as case studies from the three previous volumes of the mHealth Compendium, will be assessed and assigned a unique project identifier by the World Health Organization's mobile Technical Evidence Review Group (mTERG) and registered in the mRegistry.org global online repository. The three previous volumes of the mHealth Compendium, which include a total of 85 case studies, can be downloaded at www.africanstrategies4health.org/resources.





INTRODUCTION

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What is mHealth?

eHealth vs mHealth

eHealth is defined by the World Health Organization (WHO)[1] as the cost-effective and secure use of information and communications technologies in support of health and health related fields, including health care services, health surveillance, health literature, health education, knowledge and research. eHealth is a general term which includes four distinct but related components.

- **Mobile Health (mHealth):** Provision of health services and information via mobile and wireless technologies.
- **Health Information Systems (HIS):** Systems to gather, aggregate, analyze and synthesize data from multiple sources to report on health; can include information related to patient records, disease surveillance, human resources, management of commodities, financial management, service delivery and other data needed for reporting and planning purposes.
- **Telemedicine:** Provision of health care services at a distance; can be used for inter-professional communication, patient communication and remote consultation.
- **Distance Learning (eLearning):** Education and training in electronic form for health professionals.

This compendium is focused solely on the mHealth component of eHealth. For the purposes of this paper mHealth includes mobile phones, Personal Digital Assistants (PDAs), tablets, mobile applications and wireless medical devices.

Where is the evidence for mHealth?

Although still limited, the amount of evidence about effectiveness or efficacy of mHealth interventions has recently begun to increase. In recent years, there has been an significant upsurge in mHealth focused health outcomes research—including a few studies published in the Lancet—and reviews that aimed to synthesize the evidence. Some reviews of mHealth studies, such as the February 2013 article by Tomlinson et al. and a 2011 World Bank report point to the lack of high quality and peer reviewed randomized trials to conclude that little is known of the impacts of mHealth interventions.[2,3]

The mHealth research landscape is evolving rapidly. The mHealth Alliance's "mHealth and MNCH: State of the Evidence" report concludes that the increase in rigorous mHealth research has been remarkable, calls for greater investment of resources in studying the effect of mHealth interventions on health outcomes (as does the Bellagio Call to Action on Global eHealth Evaluation), and emphasizes the need to view gaps in the mHealth evidence as opportunities for future research.[4]

In addition to health outcomes research, a number of project evaluations have generated quantitative results that contribute to making the case for investments in targeted mHealth systems at scale in Africa.

Selected findings from mHealth-focused health outcomes research and project evaluation

Mobile money vouchers to increase access to services

Under the transportMYpatient scheme in Tanzania, the use of the M-PESA mobile money system to purchase bus tickets to transport fistula patients to the hospital has contributed to a **200 percent increase** (from 162 in 2009 to 501 in 2012) in the number of annual restorative surgeries at CCBRT (mHealth Compendium, Volume 2. 2012, page 46).

Text messaging health workers to increase quality of care

In Kenya, a randomized trial found that a simple intervention, in which health workers received text messages on malaria case-management, produced a **25 percent increase** in the number of children (N= 1157) with fever correctly treated for malaria. The ensuing cost-effectiveness analysis revealed that at national scale the cost per additional child correctly treated would be only 0.16 USD, even if the effect size was only five percent.[5]

SMS reminders for adherence to treatment

The WelTel randomized trial in Kenya found that HIV patients who received of SMS support (N=273) in combination with active client follow-up by an actual person were **24 percent more likely** to be adherent to antiretroviral therapy (ART) and 19 percent more likely to have suppressed viral loads compared with the control individuals.[6]

SMS-based alert system to monitor pregnancy and reduce maternal and child deaths

One year after the launch of RapidSMS in Rwanda, prenatal care visits **increased by 25 percent**, home deliveries **decreased by 54 percent**, while deliveries at health facilities **increased by 26 percent**. Health officials believe that the system also contributed to reducing the under-five deaths by 48 percent[7] (mHealth Compendium, Volume 1. 2012, page 31). The system has been deployed to all 45,000 community health workers in Rwanda.

SMS reminder system with mobile phone vouchers to improve maternal and neonatal health

Pregnant women in the Wired Mothers intervention group received text messages and an airtime credit voucher to communicate with her healthcare provider in Zanzibar. **Forty-four percent of pregnant women** in the intervention group received four or more antenatal care visits versus 31 percent in the control group.[8] "**Sixty percent of women** in the intervention group delivered with skilled delivery attendance versus 47 percent in the control group. "The intervention produced a significant increase in skilled delivery attendance amongst urban women, but did not reach rural women.[9]" "The perinatal mortality rate was lower in the intervention clusters, 19 per 1000

births, than in the control clusters, 36 per 1000 births. The intervention was associated with a significant reduction in perinatal mortality with an OR of 0.50. Other secondary outcomes showed an insignificant reduction in stillbirth and an insignificant reduction in death within the first 42 days of life.[10]"

SMS-based system for faster delivery of diagnostic test results

In Zambia, Project Mwana used RapidSMS to deliver results from early infant diagnosis of HIV with turnaround times that were on average **nearly 50 percent faster** than normal (mHealth Compendium, Volume 1. 2012, page 69).

Key success factors and lessons learned for mHealth project implementation

The following set of principles represents a concerted effort by donors to capture the most important lessons learned by the development community in the implementation of information and communications technology for development (ICT4D) projects. Having evolved from a previous set of implementer precepts endorsed by over 300 organizations, these principles seek to serve as a set of living guidelines that are meant to inform, but not dictate, the design of technology-enabled development programs.

This current version has been developed in consultation with The Bill and Melinda Gates Foundation, USAID, UNICEF, The World Bank, SIDA, Omidiyar Foundation, The State Department, UNHCR, WFP, UNFPA, UNDP, Global Pulse, UNWomen, and OCHA.

Recently endorsed by the USAID Administrator Rajiv Shah, these principles seek to serve as a set of living guidelines that are meant to inform, but not dictate, the design of technology-enabled development programs.

Principles for Digital Development

1. **Design with the User**
    - Develop context appropriate solutions informed by user needs
    - Include all user groups in planning, development, implementation and assessment
    - Develop projects in an incremental and iterative manner
    - Design solutions that learn from and enhance existing workflows and plan for organizational adaptation
    - Ensure solutions are sensitive to, and useful for, the most marginalized populations: women, children, those with instabilities, and those affected by conflict and disaster

2. **Understand the Existing Ecosystem**
    - Participate in networks and communities of like-minded practitioners
    - Align to existing technological, legal, and regulatory policies

3. **Design for Scale**
    - Design for scale from the start, and assess and mitigate dependencies that might limit ability to scale
    - Employ a "systems" approach to design, considering implications of design beyond an immediate project
    - Be replicable and customizable in other countries and contexts
    - Demonstrate impact before scaling a solution
    - Analyze all technology choices through the lens of national and regional scale
    - Factor in partnerships from the beginning and start early negotiations

4. **Build for Sustainability**
    - Plan for sustainability from the start, including planning for long-term financial health e.g., assessing total cost of ownership
    - Utilize and invest in local communities and developers by default and help catalyze their growth
    - Engage with local governments to ensure integration into national strategy and identify high-level government advocates

5. **Be Data Driven**
    - Design projects so that impact can be measured at discrete milestones with a focus on outcomes rather than outputs
    - Evaluate innovative solutions and areas where there are gaps in data and evidence
    - Use real-time information to monitor and inform management decisions at all levels
    - When possible, leverage data as a by-product of user actions and transactions for assessments

6. **Use Open Standards, Open Data, Open Source, and Open Innovation**
    - Adopt and expand existing open standards
    - Open data and functionalities and expose them in documented APIs (Application Programming Interfaces) where use by a larger community is possible
    - Invest in software as a public good
    - Develop software to be open source by default with the code made available in public repositories and supported through developer communities

7. **Reuse and Improve**
    - Use, modify and extend existing tools, platforms, and frameworks when possible
    - Develop in modular ways favoring approaches that are interoperable over those that are monolithic by design

8. **Address Privacy & Security**
    - Assess and mitigate risks to the security of users and their data
    - Consider the context and needs for privacy of personally identifiable information when designing solutions and mitigate accordingly
    - Ensure equity and fairness in co-creation, and protect the best interests of the end end-users

9. **Be Collaborative**
    - Engage diverse expertise across disciplines and industries at all stages
    - Work across sector silos to create coordinated and more holistic approaches
    - Document work, results, processes and best practices and share them widely
    - Publish materials under a Creative Commons license by default, with strong rationale if another licensing approach is taken

More information on the Principles for Digital Development can be found at: http://ict4dprinciples.org.

Other key mHealth tools and resources

USAID and its implementing partners have developed a number of useful tools and resources for mHealth project implementers. The following list presents a short summary of selected tools and resources:

Databases

- **The mHealth Evidence Database:** This new database includes searchable peer-reviewed and gray literature on mHealth effectiveness, cost-effectiveness and program efficiency, enabling researchers, program managers, funders and other key decision-makers to quickly get up to speed on the current state-of-the-art. (www.mhealthevidence.org)
- **mRegistery.org**: A global mHealth repository of the WHO's mTERG which provides a way for projects to submit descriptions of their mHealth approaches and to be assigned Unique ID for mHealth implementations related to reproductive, maternal, and child health. (www.mregistry.org)
- **The GSMA mHealth Tracker:** A customized tool which collates mobile health products and services around the globe. It tracks solutions in both planning phase and those which have been commercially deployed. (www.mobileworldlive.com/mhealth-tracker)

Training

- **mHealth Basics: Introduction to Mobile Technology for Health:** A new, free, self-paced eLearning course available on the USAID Global Health eLearning Center that provides an introduction to mHealth and an overview of best practices for mHealth solution development. (www.globalhealthlearning.org/course/mhealth-basics-introduction-mobile-technology-health)

Guidelines and Toolkits

- **National eHealth Strategy Toolkit:** A WHO-ITU guide to help governments, ministries, and other stakeholders develop and implement a national eHealth vision, action plan, and monitoring framework. (www.itu.int/pub/D-STR-E_HEALTH.05-2012)
- **The Integrating Mobiles into Development Projects Handbook:** This handbook is intended as a practical and actionable guide to help USAID staff consider the challenges that can impede the realization of a more sustainable and equitable future powered by mobile technology and other digital solutions, and to think critically about when and how to deploy mobile solutions. (www.usaid.gov/sites/default/files/documents/1861/M4DHandbook_August_2014.pdf)
- **Call to Action on Global eHealth Evaluation:** A consensus statement of the WHO Global eHealth Evaluation Group Meeting held in Bellagio, September 2011. (www.ghdonline.org/uploads/The_Bellagio_eHealth_Evaluation_Call_to_Action-Release.docx)
- **Forming Successful Partnerships With Mobile Network Operators:** This GSMA insights paper analyses qualitative research findings and outlines common norms and tactics for successful social sector/operator partnerships and inform a set of best practices to increase the social sector's understanding of how to successfully work with operator partners for mutual benefit. (www.gsma.com/mobilefordevelopment/wp-content/uploads/2014/06/mWomen_Partnerships_Insights_Paper_v3_FINAL.pdf)
- **An mHealth Planning and Implementation Guide: How to Integrate Mobile Technology into Health Programming:** An interactive online guide intended for global health practitioners working to implement mHealth solutions in family planning and reproductive health programs and beyond. (www.k4health.org/toolkits/mHealth-planning-implementation-guide)
- **Making the Journey from Cash to Electronic Payments: A Toolkit for USAID Implementing Partners and Development Organizations:** This Toolkit was created for non-governmental relief and development organizations to guide them in their journey of transitioning from using cash payments to electronic payments in all operational and program payment streams. It is intended to be practical, easy to follow, bite-size, sectional, with guidance on sequencing (ie. some sections are linear while others may be

concurrent). (http://solutionscenter.nethope.org/programs/c2e-toolkit)

- **mHealth Field Guide for Newborn Health:** Developed by the CORE Group, this guide that explains how mHealth serves newborn health through referral and tracking of mothers and infants, decision support for CHWs, CHW supervision, scheduling and tracking postpartum and postnatal visits, and teaching and counseling for mothers and families. (www.coregroup.org/resources/420-mhealth-field-guide-for-newborn-health)

Other

- **mHealth Working Group:** An international community of practice of over 1765 members representing more than 500 organizations in 77 countries with online technical resources an inventory of projects. (www.mhealthworkinggroup.org)
- **Mobile Money for Health:** Authored by USAID Health Financing and Governance project, this paper reviews current use cases and potential applications of mobile money in health. (http://hfgproject.org/wp-content/uploads/2013/12/Mobile-Money-for-Health-Case-Study.pdf)
- **mHealth innovations as health system strengthening tools:** 12 common applications and a visual framework - This framework lays out 12 common mHealth applications used as health systems strengthening innovations across the reproductive health continuum. (www.ghspjournal.org/content/1/2/160.full.pdf)
- **mHealth: Mobile Technology to Strengthen Family Planning Programs:** Commissioned by the USAID High Impact Practices (HIPs) in Family Planning series, this brief highlights evidence in mHealth and family planning programs to date and synthesizes lessons learned for implementation of mHealth programs. (www.fphighimpactpractices.org/resources/mhealth-mobile-technology-strengthen-family-planning-programs)
- **Why Your ICT4D Work Plan Needs Design and Requirements Analysis:** This NetHope blog post discusses the methods, roles and skills needed for strategic design of ICT for development (including mHealth) projects. (http://solutionscenter.nethope.org/blog/view/why-your-ict4d-work-plan-needs-design-and-requirements-analysis)
- **GSMA mHealth Resources:** A website to browse resources by topic (where applicable), region or type, such as case studies, presentations, research and white papers. (www.gsma.com/mobilefordevelopment/programmes/mhealth/resources)

How to use the mHealth Compendium

This mHealth compendium contains 31 studies which document a range of mHealth applications being implemented throughout Africa and, in some exceptional cases, in other regions. While there are a number of existing databases with information on the many pilots being undertaken worldwide, these are often cumbersome and sometimes difficult to navigate. The authors envision that a compendium like this one is particularly needed with regard to mHealth where there is a plethora of activities being funded at the country level. In order to help USAID missions access relevant mHealth information, this compendium describes some of the major mHealth applications being utilized in Africa.

While each two-page case study does not offer an exhaustive description of all aspects of each application, it does offer enough information for those interested in learning further about innovative mHealth applications in the region.

The case studies in this compendium fall under five programmatic areas: Behavior Change Communication, Data Collection, Finance, Logistics, and Service Delivery. While it is acknowledged that some of these interventions can be classified into more than one area, the authors of the compendium have tried to highlight the range and versatility of mHealth as a tool in improving health and well-being. Each of these five programmatic areas is briefly described below.

Behavior Change Communication (BCC)

mHealth interventions are frequently utilized for community mobilization, awareness raising, education, and demand creation. It has been reported that mHealth BCC interventions are the most predominant of all mHealth interventions and also the most successful. This is because current interventions center on the use of low-cost SMS texts to reach various audiences. Important short term behavior changes have been observed, though modest.[11]

Data Collection

Data collection and surveillance can be enhanced by utilizing mobile communication and personal data devices. Instead of sending paper forms, data can be sent more quickly and reliably through electronic methods. This has been shown to increase reliability, make data more readily available (especially data from remote areas), and enhance the quality of the data submitted. Throughout Africa, mHealth applications have been used for a variety of data collection activities, from routine reporting to large national surveys.

Finance

Mobile money applications are increasingly used in Africa to facilitate payment for health services and other expenses associated with seeking care for both private patients and clients enrolled in various community health programs. These mobile money applications allow registered users to load money into their accounts, make transfers to other users (both registered or not), and withdraw money. While registration for these services is almost always free, transactions have a predetermined fee which is often covered by the specific health program or implementing partner supporting the intervention. Examples of how mHealth applications have been utilized include provision of vouchers for family planning clients to access counseling and services, as well as antenatal services, delivery, and postnatal services at participating hospitals.

Logistics

Availability of high quality logistics data has been one of the greatest challenges facing the health care system. Without this data, decision makers cannot adequately manage the supply chain, risking the possibility that patients won't receive the medicines they need. Increasingly, mHealth applications are being utilized to address this issue. Most of these applications allow a lower-level health facility to transmit information regarding their supply of essential medicines to the higher-level facility or warehouse which then provides the commodities. In some cases, these applications have even been utilized by community health workers to ensure they have the basic supplies needed.

Service Delivery

Mobile phones have been used to improve the quality of and access to health care service delivery in a myriad of ways. Applications have been developed that assist health care workers in diagnosing and treating patients, such as the use of phone-based treatment algorithms and SMS reminders to follow up on clients' laboratory results and other services. mHealth has been successfully used to train and retrain health workers. Phone-based applications have also been developed to promote adherence to medications, provide notification of results, and remind patients to keep appointments.

BEHAVIOR CHANGE COMMUNICATION

ANANYA

Shaping life-saving reproductive, maternal, newborn and child health practices and behaviors in India

BEHAVIOR CHANGE COMMUNICATION

Implementation date: April 2011 to December 2015

Despite increased investment and programmatic efforts in recent years, India's maternal, infant, and child mortality rates remain below that of the Millennium Development Goal (MDG) targets. A key approach to the Government of India's strategy for the reduction of child and maternal mortality is the use of community health workers (CHWs), who provide community-based services and help influence both the drivers and barriers to the adoption of reproductive, maternal, newborn, and child health (RMNCH) behaviors. The level of mobile phone ownership among CHWs, which is 85 percent in Bihar State, demonstrates the potential for reaching rural populations through mobile phones with key messages related to RMNCH.

About Ananya

Ananya is a five-year (2010-2015) program funded by the Bill & Melinda Gates Foundation with the goal of accelerating improvement of health outcomes linked to MDGs 4, 5, and 6. The program works in partnership with the State Government of Bihar and ten other implementing organizations including BBC Media Action, which leads the Shaping Behaviors and Practices Project. The project aims to increase knowledge and change attitudes and practices related to RMNCH amongst a population of 104 million people, including 27 million women of reproductive age, through two mobile health technologies called Mobile Academy and Mobile Kunji.

Launched in Bihar in May 2012, Mobile Academy is an Interactive Voice Response (IVR) mobile training course on RMNCH for CHWs, designed to expand their knowledge of life-saving preventative health interventions and behaviors and enhance their capacity to communicate and engage effectively with families. CHWs can access the 190 minute course from any phone, and complete it at their convenience. The curriculum is divided into chapters, lessons, and quizzes with a cumulative pass/fail score. Mobile Academy can train thousands of CHWs simultaneously, at a fraction of the costs of face-to-face training.

Also launched in May 2012, Mobile Kunji is a multimedia service designed to enhance the immediate impact of CHWs during their counseling sessions with families and seeks to build support for healthy behaviors. Mobile Kunji arms CHWs with an audio-visual job aid that is lightweight and makes use of the technology they already own. This job aid includes both an IVR-based mobile service and a printed deck of 40 illustrated cards on a ring, which together communicate essential information on pregnancy and newborn health. A unique short-code at the bottom of each card allows the CHW to play audio content linked to the information on the card, directly to families. The content is delivered in the authoritative yet sympathetic voice of a women doctor character ('Dr. Anita') and is deliberately designed to be both engaging and conversational, and to reinforce the health message illustrated on the card.

Evaluation and Results

As of June 2014, 63 percent of all CHWs trained (38,512) in Mobile Academy and Mobile Kunji had successfully completed the Mobile Academy course. More than 6.9 million minutes of Mobile Academy content were played in Bihar between May 2012 and July 2014, while 9,303,408 minutes of Mobile Kunji content were played between May 2012 and July 2014. As of July 2014, 38,000 unique users, including more than 26,000 CHWs, were calling Mobile Kunji every month.

Carried out by Mathematica Policy Research in 2014, the population-based survey of the Ananya midline evaluation addressed several elements of the Ananya theory of change. It sought to understand changes in women's RMNCH+A practices and their contacts with CHWs (quantity and quality, including use of job aids like Mobile Kunji) and the health system. The results of the survey are in the process of being analyzed. Early analysis concludes that exposure to Mobile Kunji adds substantial value in predicting behavior; is strongly correlated with delivery preparation and complimentary feeding; and serves as a good complement to other job aids and tools used by frontline workers.

Lessons Learned

- Use handset independent technology to make audio services accessible to people's existing phones, on the majority of networks, via a simple voice call.
- Involve State Government in designing the services from the outset.
- Develop content and functionality in collaboration with the target audiences and test, test, test.
- Negotiate sustainable partnerships with all the biggest mobile operators, ensuring common short codes and a 90 percent reduction in commercial tariffs.

Conclusion

BBC Media Action's experience in Bihar State has shown that the Mobile Academy and Mobile Kunji tools have given CHWs credibility in their communities and empowered them to effectively promote and deliver life-saving information. In acquiring knowledge and skills, CHWs status is elevated in the community and they are increasingly seen as respected and knowledgeable professionals. The success of the Shaping Behaviors and Practices Project has led to a planned launch in Uttar Pradesh State, and to the decision of the Ministry of Health and Family Welfare to scale-up these two mobile health technologies nation-wide.

Geographic Coverage: Bihar and Odisha States, India

Implementation Partners: BBC Media Action

Funder: Bill & Melinda Gates Foundation

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Bill & Melinda Gates Foundation | Rahul Mullick, (Rahul.mullick@gatesfoundation.org)

Empowering and Mobilizing People Living with HIV/AIDS

Using phones to promote healthy, positive living in Ghana

BEHAVIOR CHANGE COMMUNICATION

Implementation date: February 2012 to January 2014

Ghana has succeeded in keeping HIV prevalence relatively low (1.3 percent of people aged 15 to 49 in 2013), through strong support of government, NGOs and civil society. These stakeholders support the 90-90-90 target which focuses on ensuring that 90 percent of the population is tested, 90 percent of people living with HIV (PLWHA) are on treatment, and 90 percent of people on treatment have suppressed viral loads. The Empowering and Mobilizing People Living with HIV/AIDS (EMPower II) was a USAID funded project that worked with local organizations to ensure that the most at-risk populations in Ghana have access to necessary HIV prevention information and support services. EMPower II supported the development and transition of support groups into functional NGOs and equipped them with the knowledge, skills, and attitudes necessary for participating in comprehensive HIV and AIDS prevention activities.

About EMPower II

A key component of EMPower II Project was raising awareness among PLWHA about key behaviors that prevent the transmission of HIV. To reach the largest number of people, the Project used bulk text messaging to confidentially communicate important HIV prevention and treatment messages to subscribers. These messages were designed to ensure that PLWHA had the information about HIV transmission (including key behaviors to minimize transmission) and access to treatment and services. The Project conducted a formative assessment among 200+ support group (SG) members, to guide development of message content.

EMPower II provided support to Ghana Network of People Living with HIV and AIDS (NAP+ Ghana) by contracting a local software development firm, DreamOval, to send bulk text messages using a platform called myTXTbuddy. Messaging costs were covered by DreamOval and then reimbursed monthly by NAP+. Staff of NAP+ were trained on the platform, to manage subscribers and messages. To attract subscribers, Lead Trainers and Counselors of PLWHA SGs talked to SGs about the benefits of receiving the messages. The phone numbers of interested people were forwarded monthly to NAP+ and these numbers were enrolled to receive messages. The Project began sending HIV prevention messages via bulk text to voluntary subscribers in November 2012. "Call back" system was available to allow subscribers to get further counseling . Counselors were reimbursed by NAP+ for their time given over the phone counseling.

Additionally, EMPower II adapted INFOREACH (an existing HIV Prevention outreach guide for lead trainers) to suit the particular needs of the project's target groups. INFOREACH covers the 10 key prevention behaviors, including legal issues, family planning, and stigma and discrimination. The INFOREACH content was recorded on mobile phone memory cards and CDs and distributed to Lead Trainers and Counselors for sharing with PLHWA. The recordings were used by Lead Trainers in one-on-one and SG sessions, and for large anti-stigma outreach campaigns. The information was also used by antiretroviral treatment (ART) centers.

Evaluation and Results

By project end, over 850 people were enrolled to receive text messages on HIV and AIDS prevention and treatment. On average, recipients received 8 different messages each month and the system registered an average of 77 total "call-backs" per month.

Qualitative and quantitative methods of data collection were used in the baseline and endline studies to examine changes in knowledge, attitudes, and practices among SG members who received the messages. The qualitative data were collected using mainly focus group discussions (FGDs) with target beneficiaries – men who have sex with men who test positive for HIV (MSM+ve), female sex workers who test positive for HIV (FSW+ve), and community members. In-depth interviews were also held with key stakeholders such as MSM+ve and FSW+ve. Quantitative data were collected using questionnaires administered by a team of trained Research Assistants on one-on-one basis.

The following are highlights of EMPower II beneficiary responses knowledge, attitudes, and practices related to HIV:

- The commitment to partner reduction increased from 52.6 to 72.2 percent (27.1 percentage increase) with FSW+ves with the greatest pledge to reduce their partners.
- The Support Groups became the most preferred source of condom and lubricant supply from 6.8 to 26.5 percent
- The percentage of those who would disclose their HIV status was between 69.3 to 85.7 percent. FSW+ves were noted to be more likely to disclose their status (76.5 to 97.6 percent).
- Increased proportion of respondents with knowledge of their partners' status from 37.5 to 54.4 percent with a percentage increase of 45.1 percent .
- Increased proportion of those on medication was observed – from 71.6 to 91.8 percent with a percentage increase of 28.2 percent. Medication uptake among the FSW+ves became universal at the endline from 64.7 percent. Those who migrated to full ART also increased from 47.6 to 85.2 percent.
- Increased reduction in ART default was also noted – from 60.9 to 39.5 percent, a 35.1 percent decrease. This implies more people were now adhering to their ART regimens. The bulk text messaging was cited to have played a protagonist role in this change.

Lessons Learned

- Involve project beneficiaries in all stages of the project, from design through to the implementation, management, and evaluation
- Even when there are no financial incentives, the receipt of information can be motivation enough to participate in an intervention if the target population is involved enough in the design of the project to personally understand the value of the content

Geographic Coverage: Ghana

Implementation Partners: World Education, Inc., Kharis Foundation, 4-H Ghana; Ghana Red Cross Society, Network Association of PLHIV (NAP+)

Funder: USAID

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Conclusion

EMPower II achieved its project goals and objectives by enhancing the administrative and technical and capacities of the partner NGOs and support groups to effectively lead and participate in the prevention of the spread of HIV in Ghana. Mobile technology played a significant role in the success of EMPower II. The bulk text messaging played a major role in reminding subscribers of issues relating to drug treatment adherence, positive living, and changes in attitude, most significantly towards alcohol and how its consumption can influence unhealthy behaviors. Bulk text messaging also reduced administrative costs for NAP+ by reducing time involved in sending letters to invite people for meetings and informing Regional and district officers of other important decisions, such as shortages of drugs and where people can get their stock.

mCENAS!

Addressing barriers to sexual and reproductive health services for youth in Mozambique

BEHAVIOR CHANGE COMMUNICATION

Implementation date: September 2013 to June 2014

In Mozambique, youth under 15 years of age comprise over 45 percent of the population. Additionally, of married or in-union women above the age of 15, only 11 percent use a method of contraception. Through the USAID-funded Extending Service Delivery Family Planning Initiative (ESD/FPI) project, Pathfinder aims to increase access to and use of contraceptives and high-quality sexual and reproductive health (SRH) services by women and youth in four provinces of Mozambique. The youth strategy of the ESD/FPI projects includes supporting the government to increase young people's access to youth-friendly SRH services and working with community-based organizations and youth peer educators to increase young people's awareness of and demand for services. During the initial two years of project implementation, it became increasingly clear that young people needed access to more information and support to overcome the many barriers they face in accessing and using contraceptive and other SRH services.

Leveraging the growing use of mobile phones in urban and peri-urban areas of Mozambique, Pathfinder developed a comprehensive SMS-based program specifically tailored for youth aged 15 to 24 with different content for those with and without children. The initiative, called mCenas! (English translation: mobile scenes), aims to motivate youth to start or continue using a contraceptive method by increasing knowledge about and dispel common myths around contraception, and address common barriers youth face surrounding the use of contraception.

About mCenas!

mCenas! is an interactive two-way SMS system that is free for clients. Developed through a participatory process informed by formative research, mCenas! has three main components: 1) a behavior change theory-based story delivered through SMS messages that youth can relate to and draw on for further dialogue and reflection with peers (two months of messaging); 2) informational messages about each contraceptive method adapted from FHI360's Mobile 4 Reproductive Health (m4RH) project (one month of messaging); and 3) an interactive "Frequently Asked Questions" (FAQs) function where youth could ask about a range of SRH topics, including more information on contraception. Clients had access to the interactive menus for the entire duration of the project.

Twenty activists enrolled clients through community events, schools and door to door recruitment strategies. As part of the ESD/FPI project, mCenas! complemented and reinforced ongoing interpersonal behavior change activities and improved service delivery for young people. Peer educators were oriented on how to use the SMS stories to generate reflection and dialogue among youth on the barriers and facilitators to use of contraception. In addition, youth were also linked to a youth-friendly hotline called Alo Vida, run by the Ministry of Health, where a live representative could answer questions about contraception and SRH.

Evaluation and Results

A total of 2,005 young people were enrolled in mCenas; 54 percent were 15 to 17 years old, 46 percent were 18 to 24, 57 percent were women, and 33 percent had a child. The system received 10,451 requests for information about sexuality. The most common requests were "Am I ready for sex?" (14 percent), "Masturbation" (9 percent), and "Sexual Pleasure" (9 percent). The most common inquiries about contraceptive methods were on injectables (19 percent), IUDs (13 percent), and implants (12 percent). Despite instructions on how to use the menu-driven system (key words triggered the SMS back to the client), over 8,000 non-conforming, free form texts were received. Approximately half were failed attempts to get information from the menu system while the other half were messages expressing opinions about the story or soliciting more personal advice. Results from a closer analysis will be available in November 2014.

USAID's centrally-funded cooperative agreement, Evidence to Action (E2A), conducted a research study based on the mCenas! project in order to generate evidence of whether a SMS contraception information initiative is socially acceptable and has an impact on the knowledge, attitudes, and self-efficacy of male and female youth aged 18 to 24 in Mozambique. E2A conducted a baseline (December 2013) and endline (June 2014) survey using both SMS and in-person interviews with a sample of young people enrolled in the program. Study results are expected in November 2014.

Lessons Learned

- Utilizing a participatory development process rooted in behavior change theory allowed for the development of a story and a set of FAQs that are responsive to the realities of young people in Mozambique
- Undergoing formative research allowed for the realization of important differences in the barriers to contraceptive use between youth with children and those without children, thereby creating two, more tailored stories
- Pre-tests with young people confirmed the importance of using youth vernacular in the text messages
- There is a need to carefully pretest menu key word systems with SMS projects
- Young people expect high degree of interactivity with a SMS system and therefore it is recommended to create programs that allow for this

Conclusion

mCenas!, the first mHealth program to focus on youth and contraception in Mozambique, provides an important learning opportunity. It is uniquely designed to incorporate narratives – known to be an effective behavior change strategy – with standard informational messages and an interactive menu of FAQs. It will be critical to integrate the content and themes from the stories and messages into the regular activities of the ESD/FPI project, including community mobilization and peer education. This will provide opportunity for reflection and dialogue to reinforce the content of mCenas!, drive changes in behavior, and create a real impact on a young person's choice of whether or not to begin or continue using contraception.

Geographic Coverage: Maputo and Inhambane Provinces, Mozambique

Implementation Partners: Pathfinder International, Dimagi

Funder: USAID through the Extending Service Delivery Family Planning Initiative

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Mobile Information for Maternal Health

Providing voice-based educational messages to improve maternal and child health in Ghana

BEHAVIOR CHANGE COMMUNICATION

Implementation date: 2013 to 2015

Maternal and infant health is an ongoing challenge in Ghana. The lifetime risk of a mother dying during pregnancy or childbirth is one in 35, while one in 24 children die in their first year of life. The outcomes are worse in rural areas with limited access to health services. Fortunately, many of these deaths can be prevented by educating mothers on topics such as when to seek medical help during a difficult birth, proper nutrition, and simple measures to protect against malaria.

To address this challenge, VOTO Mobile partnered with Savannah Signatures to roll out mobile messaging to women in Northern Ghana during and after their pregnancies. During a pilot study of SMS messages, Savannah Signatures found that 80 percent of women subscribing to the original service were non-literate; they were either unable to understand the messages or were dependent on relatives or friends to translate the messages. As a result of this finding, a voice-based solution was developed to engage women across all literacy levels. The original messages, designed by Mobile Alliance for Maternal Action (MAMA), were also adapted and translated into four local languages spoken by the majority of women in the area.

About Mobile Information for Maternal Health

Women usually hear of the program through a local health clinic, or by their peers. They are able to register through the clinic, or text/"flash" a number and receive a call back with an automated prompt to obtain details such as age, location, language and stage of pregnancy . Each mother automatically receives two calls a week in her own language with information on the stage of her pregnancy and suggestions to keep her and her baby healthy. The information is also intended to counteract those traditional beliefs that often prevent women from accessing medical help, even in life-threatening situations.

Every voice subscriber can also opt-in to receive the information via SMS. Through redialing the toll-free number from which they receive the messages, mothers can re-listen to previous messages, contact a live midwife with urgent questions, or unregister from the service. This also allows listeners who were too busy to hear the message the first time around, outside of mobile coverage, or out of battery the chance to catch up on their own time.

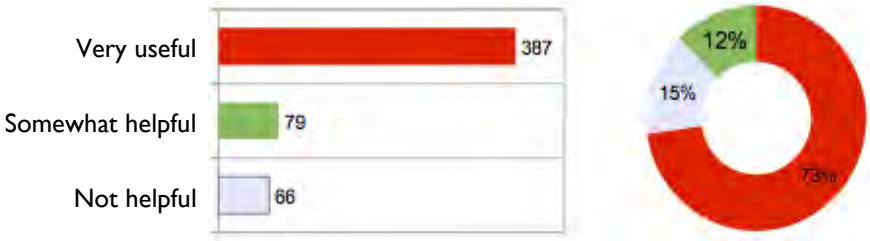
Interactive voice response (IVR) survey questions are embedded into the message to measure if mothers are making healthy decisions and if the content is being retained. Open-ended questions are also asked to receive feedback for improving the quality of the content.

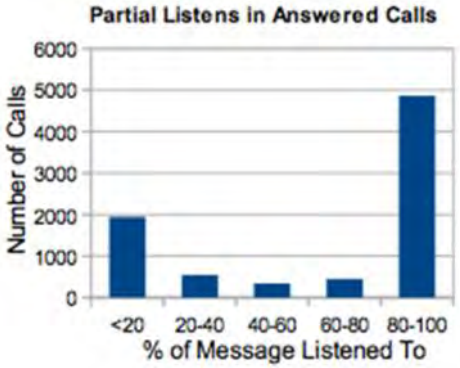
Evaluation and Results

Savannah Signatures and VOTO have been monitoring usage and perceived usefulness of the system. Thus far, the program has placed over 65,000 phone calls and served 5,400 women in Northern Ghana. About 3,500 women have completed the program while the remaining 1,900 are currently enrolled. Approximately 73 percent of women find the calls useful while 15 percent state they are not helpful.

Through active system monitoring and tracking, drop-off rates over time were assessed. It was found that messages lasting 90 seconds or less retain over 70 percent of recipients, resulting in modification of all the program's message lengths into this timeframe. The majority of women also listen to at least 80 percent of the message, indicating mothers appreciate the messages and find them valuable. Those who choose not to listen will end the call at the start of the message, possibly because the time of the call was inconvenient or mothers did not want to hear the messages. Very few women hang up in the middle of the message.

Do They Appreciate It? How useful are the messages you've been receiving each week in helping you with your pregnancy?





Lessons Learned

- Voice enables many opportunities to iterate content throughout the program through the advanced analytics captured, including the exact seconds of content listened to and responses to questions embedding questions within the voice call
- Utilizing an easy registration process and engaging women during the on-boarding process increases program involvement; This can include sending the voice messages while the woman is at the clinic and encouraging her to save the phone number in her phone for future reference
- Translating messages into the local language and incorporating voice messages are crucial to maintaining mother's engagement and comprehension of the material
- It is important to obtain feedback from users to determine and analyze message effectiveness;
- Place key information at the beginning of each mobile message, as not all recipients listen to the entire voice message

Geographic Coverage: Northern Ghana

Implementation Partners: Savannah Signatures, VOTO Mobile

Funder: STAR-Ghana (association of four donors: USAID, DFID, DANIDA, and EU Aid)

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See References on page 89.

Conclusion

Using VOTO's platform, Savannah Signatures is able to provide valuable maternal health information through both SMS and voice-based messaging, ensuring that women of all literacy levels may participate. When making improvements to the system, it will be important to investigate why some women do not find the messages helpful and what can be done to increase permeability, such as utilizing a different communications channel or providing tailored content for different users.

No-Yawa

Mobile services to improve reproductive health among youth in Ghana

BEHAVIOR CHANGE COMMUNICATION

Implementation date: January 2013 to December 2015

In Ghana, only 15.6 percent of all women aged 15-24 use a modern FP method[1]. Yet 68 percent of women (same age group) expressed unmet need for FP[2]. With 13 percent[3] of teenagers pregnant, evidence suggests that many young people are not empowered or lack knowledge to exert their sexual and reproductive rights. Occurrence of teenage pregnancy is significantly higher, up to 23 percent among teens in some regions[4,5]. Though accurate data are limited, a 2004 study showed two-thirds of pregnancies amongst 15-19 year olds were unwanted[6], and according to research conducted by Pathfinder International in 2008, one in seven occurs among women younger than 20 and two in five unsafe abortions occur among women under 25.

To address these needs, Grameen Foundation and its partners DKT International and Marie Stopes International designed the No-Yawa Project in Ghana. Through No-Yawa, which means "No Worries" in local slang, the partners are integrating mobile behavior change information, youth-targeted contraceptive social marketing, and youth-friendly clinic services to create a social movement for improved sexual and reproductive health among youth ages 15-24 years, throughout the Ghana.

About No-Yawa

No-Yawa is a national forum for youth to discuss sexual and reproductive health issues. The initiative offers a toll-free 24-hour hotline, a variety of mobile behavior change content services, and clinics in urban areas where staff have been trained to be sensitive to youth needs and provide safe-haven where young Ghanaians can talk openly about sensitive sexual health issues.

As the lead on No-Yawa's mHealth component, Grameen Foundation created and sends educational SMS and voice messages, plus engaging "story messages", to registered youth in six local languages. The "story messages" supplement educational messages' health facts, to engage youth emotionally on culturally-sensitive sexual health issues that include coercive sex, condom negotiation, teenage pregnancy, abstinence/choices, and peer pressure.

No-Yawa utilizes a Facebook page and project website as additional venues for outreach, and will soon launch mobile web-based interactive educational content, quizzes, chat rooms, and collective story-building services.

Likeability and Relevance of No-Yawa messages	
% users who found messages useful	90%
% users who found messages clear and understandable	85%
% users who changed their behavior as a result of listening to messages	34%
Communication with others about ASRH	
% users who spoke to someone else about what they learned from the messages	62%
% users who told their friends or family to join No-Yawa mobile service	24%
Interest On-Demand Services and Social Media Engagement	
% users who were interested in on-demand messaging service	87%
% users who said they would be willing to pay for on-demand SMS messages	83%
% users who have internet on their phone	97%
Top 2 social media platforms used by clients on their phone	Facebook; WhatsApp
% users who were interested in a No-Yawa App	91%

Evaluation and Results

To date, approximately 126,000 youth have signed up for mobile services across Ghana. A phone-based user feedback survey conducted with a random sample of 40 No-Yawa mobile service clients provided a rapid, early read on youth response to the mobile services:

No-Yawa will continue conducting user feedback surveys with larger samples of respondents to monitor youth response and self-reported outcomes.

Lessons Learned

- Developing locally-relevant content that pushes boundaries while not alienating more conservative youth is a challenge; extensive user-centered design work is critical, combined with ongoing user feedback and revisions
- Keeping content relevant and emotionally engaging requires creating multiple channels for youth to access the information; this also requires that the service provider be highly interactive, with built-in "rewards" such as peer recognition, discounts, and prizes
- Intensive outreach through theatre groups, community radio, and other channels is needed to connect rural youth to the full array of mobile and web-based social media services
- While mobile services were designed for youth, focus groups discussions conducted among adult "gatekeepers" at the start of the program indicated high unmet need among adults for the mobile content; where possible, content for both youth and their guardians should receive messages simultaneously to encourage dialogue and support broader social change.

Conclusion

No-Yawa aims to reach 250,000 young people in Ghana with messaging on sexual health by December 2015. In its remaining months, No-Yawa will focus on achieving wide-scale registration and engagement, updating content based on ongoing feedback from youth and partners, and continuing to introduce technology-based components to increase interactivity and knowledge sharing.

Geographic Coverage: Ghana

Implementation Partners: Grameen Foundation, DKT International, and Marie Stopes International (MSI)

Funder: Embassy of the Kingdom of the Netherlands

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See References on page 89.

DATA COLLECTION

Community-Led Total Sanitation Mobile Surveillance

Tracking water and sanitation data with the DHIS2 Java-based mobile client in Zambia

DATA COLLECTION

Implementation date: 2013

In a country where 80 percent of all disease cases are related to water and sanitation, 50 percent of Zambians are without access to adequate sanitation. By 2015, the Zambian Government plans to halve reduce the proportion of the population without access to an improved sanitation facility by 50 percent (MDG 7). However, since the majority of the population lacks access to sanitation and lives in rural, hard to reach areas, understanding challenges on the ground is difficult. The Ministry of Local Government and Housing needed a clear picture of sanitation and its management in each village in Zambia.

Based on DHIS2 (District Health Information System), Akros partnered with the Government of Zambia to design a comprehensive WASH surveillance system that enables the rapid flow of village-based water and sanitation data. Almost 1,000 community-based volunteers in 28 rural districts across Zambia submit monthly data using simple Nokia feature phones. The data are submitted to a central server and immediately available to decision makers at district, provincial and national levels, allowing them to monitor and respond more quickly to sanitation concerns in each village, engage traditional leaders, and better target interventions.

About Community Led Total Sanitation Mobile Surveillance

Using basic Nokia feature phones running the DHIS2 Java-based mobile client, Community Champions (CCs) submit village-level water and sanitation data. As community-level volunteers demonstrating strong community mobilization skills, the CCs receive basic sanitation training to "trigger" at least ten villages and illustrate the crucial link between sanitation and health status. Triggered villages form Sanitary Action Groups (SAGs), who monitor and support latrine construction in their villages.

Each month, the CC meets with each of the ten SAGs to monitor monthly improvements in access to sanitation at the village-level and collect data that includes the number of improved latrines and adequate latrines, including the four parameters that constitute an adequate latrine.

CCs are the only point of data entry; their work is therefore crucial in understanding challenges on the ground. They are rewarded for timely reporting with airtime, though the phones also allow for feedback from the district level directly to the CC. For example, district personnel may observe in DHIS2 that CCs are not hosting required meetings with sanitation action groups (SAG); in response, district personnel may create a message directly in the DHIS2 interface, which DHIS2 will automatically convert to an SMS and post-sent to CC phones. Many CCs live in remote areas, but the phones have allowed for more interaction and feedback down to the village level.

The CC also provides ongoing education on the data collection framework, troubleshoots latrine construction techniques, and supports behavior change interventions.

Evaluation and Results

In a six-month period, Akros rapidly scaled up the CLTS mobile surveillance to 28 districts across 6 provinces in Zambia, training almost 1,000 CCs and 400 Environmental Health Technicians (EHTs) on phone usage, navigation, and reporting structures.

Decision makers are able to review monthly sanitation data from 10,270 villages throughout Zambia and can pinpoint specific villages with poor access to improved sanitation as well as the limiting factors for ODF attainment. As a result, targeted interventions can be identified to support challenges on the ground. The system gives all decision-makers simultaneous access to real-time data, opening communication channels between various levels from village up to national level. With a strong, decentralized surveillance system in place, the Government can overlay critical water and sanitation data to provide a full picture of WASH practice in Zambia.

Lessons Learned

- Feedback mechanisms are crucial: community volunteers feel supported and motivated through continuous follow-up and supervision. Feedback downwards is equally as important as submission of data upwards.
- Simple mobile devices are easier for CCs to navigate, and have better access to the cellular network than smartphones
- Rewarding CCs for reporting encourages timely reporting
- Empowering sub-district decision-makers such as EHTs and Chiefs with timely data improves accountability on CCs

Conclusion

Mobile surveillance of provides central level decision makers with access to accurate, real-time data and thus allows for targeted, timely interventions throughout the country, even in more remote areas where data was previously hard to obtain.

Geographic Coverage: 28 districts in six provinces across Zambia

Implementation Partners: Akros

Funder: DFID, UNICEF

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See References on page 89.

GIS Mapping of Health Facilities

Identifying health facilities to provide integrated, high-quality maternal, newborn and child health services in Pakistan

DATA COLLECTION

Implementation date: April 2014

Each year approximately105,000 children under the age of five and 3,000 mothers die from preventable causes in Pakistan. Lack of access to quality health care is a primary determinant of high maternal and child mortality in rural Sindh. USAID is implementing a maternal and child health (MCH) program in Sindh to improve the quality of rural health care services. At the end of its five years, the program aims to leave behind 1,000 maternal, newborn and child health (MNCH) centers which provide integrated MNCH and family planning services in rural districts of Sindh. A critical initial step in this process is the identification of health facilities spread across the districts which have the potential to provide integrated, high quality MNCH services.

Taking advantage of advances in smartphone technology, MCHIP/Jhpiego, a component of USAID's MCH program, conducted a Geographic Information System (GIS) census of all health facilities in ten rural districts of Sindh. Quality improvement and facility upgrading activities are concentrated in these ten districts during the first three years of the program.

About GIS Mapping of Health Facilities

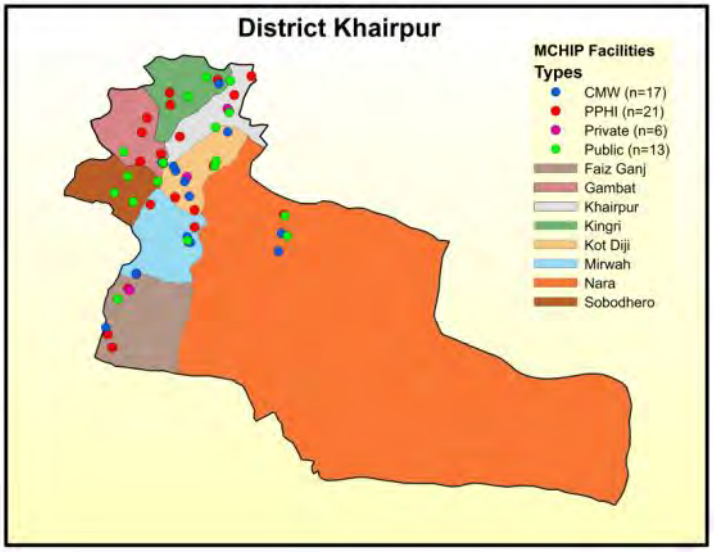
A short, structured instrument was used to collect data on facility ownership status (i.e. public, private or managed by the People's Primary Health Care Initiative (PPHI)), facility opening hours and types of services provided. An application was developed for the Android operating system and 90 data collectors used Samsung Tab 2 smartphones to collect and transmit data on all health facilities identified and visited by them during the census operation. Two photographs, one of the exterior and the other of the interior of each facility were also submitted along with Global Positioning System (GPS) coordinates of the facility.

A web portal was designed to allow data submitted wirelessly through smartphones, to be directly entered in an easily accessible environment. The portal displayed the location of each facility location on Google Maps. It allows a user to conduct searches for facilities by district, public or private sector ownership, and services. In addition, once a user clicks on a particular facility's symbol on Google Maps, the two photographs and all data collected on the facility are shown. The portal makes the data accessible to anyone with internet access that has an interest in getting information on health facilities in rural Sindh.

The map shown identifies 57 service delivery points that the program is working on in Khairpur district. These include facilities managed by PPHI, public sector managed facilities and private sector managed facilities. The database also permits the integration of additional data, such as service delivery statistics from the government's District Health Information System, Lady Health Worker Program's Management Information Systems (MIS), Community Midwife and MNCH Program MIS, and private sector facilities.

Evaluation and Results

Out of 1,425 facilities which provide maternal and reproductive health services in ten rural districts, 687 (48 percent) facilities were under private management (including NGOs), 516 (36 percent) were under PPHI management, and the remaining 222 (16 percent) were under public sector management. About 489 (34 percent) facilities reported providing 24/7 normal delivery services and 134 (9 percent) facilities reported providing caesarian sections around the clock. Of facilities open during any time of the day, about 85 percent reported providing family planning/reproductive health or antenatal care services, and 75 percent reported providing normal delivery services. No information was collected during the census on the quality of care provided at these facilities.



Lessons Learned

- Since the census relied on provider reports, follow-up efforts will need to be made to ensure the accuracy of census data
- Almost all of the private health facilities did not have a record keeping system, making verifying reported information challenging
- An in-depth facility assessment would be needed to determine the actual capacity of each health facility

Conclusion

GIS mapping of health facilities in Sindh, provides valuable information on public and private sector facilities, including times of operation, available services, delivery volume, and images for facility identification. The geographical maps and analyzed data also aid program managers in identifying potential facilities for implementing quality improvement activities and facility upgrades. Integrating datasets around service delivery, quality of care, voucher schemes, and health provider profiles will be a key step to help bolster planning and donor reporting within the province.

Geographic Coverage: Sindh, Pakistan

Implementation Partners: MCHIP/Jhpiego

Funder: USAID

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Ma Santé

Mobile data collection on malaria and child health indicators in Mali and Senegal

DATA COLLECTION

Implementation date: 2011 to 2014

Malaria is a major public health challenge, particularly in resource-constrained settings. According to the World Malaria Report 2011, malaria is prevalent in 106 countries of the tropical and semitropical world, with 35 countries in sub-Saharan Africa bearing the highest burden of cases and deaths. Many malaria-related deaths are due to limited of knowledge of malaria prevention or detection in advanced clinical stages. In the slums of Yirimadjo, Mali, where malaria treatment accounts for 65 percent of the healthcare demand, various factors have caused unnecessary morbidity and mortality. Pregnant women and children under the age of five comprise the majority of the patients, as they are most vulnerable to malaria. By making regular house-visits to check up on the health of young children and pregnant women in particular, Community Health Workers (CHWs) play a vital role in the screening and prevention of common illnesses such as malaria and diarrhea, and encourage clients to seek care in health facilities.

To better monitor the general health in the community and to map specific disease-prone pocket areas within the community, Dutch NGO International Institute for Communication and Development (IICD) assisted Muso Ladamunen, a local NGO working with CHWs, with the introduction of mobile phones and a mobile app called MAMMA which enables CHWs to more easily and rapidly collect data on health indicators and to improve logistical coordination, clinical communication and health surveillance, particularly of malaria, through the Ma Santé Project.

About Ma Santé

The MAMMA app (Mamans contre le Malaria au Mali) is a simple application based on Frontline SMS (a free text messaging software) and pre-installed on feature phones (low-cost mobile phones with limited web access), which are distributed to the CHWs. The application consists of a questionnaire designed to capture data on various health indicators, including malaria indicators, and is filled out by CHWs during their house visits. The collected data are sent by SMS to a database with a web interface allowing the health centers in the area to monitor the health status of the community on a daily basis and respond when needed. If the health facility determines that a patient needs immediate treatment the facility-based health worker either calls or sends an SMS to the CHW who sent the data. The CHW informs the patient and arranges transportation by calling or texting taxi companies.

All CHWs received training in basic ICT skills and learned how to use the mobile phone and MAMMA application. Professional health workers in the local health center were taught how to access the web-enabled data-base and analyze the data collected by the CHWs, and where needed, received ICT skills training as well.

Evaluation and Results

TA pilot involving 50 CHWs in Yirimadjo, Mali was carried out in 2012, followed by scaling-up to another zone in Bamako, and replication in Fatick, Senegal with the French-Senegalese NGO RAES. Once scaled up, the application is to be used by 300 CHWs reaching out to 300,000 people.

The use of the MAMMA application has a positive effect on the fight against malaria. The results from activities during 2011 to 2013 show the following:

- Use of MAMMA enabled CHWs and health facilities to more quickly detect and refer a suspected case of malaria, thus reducing the response time by 65 percent; health clinics and community associations can respond faster to an outbreak of malaria
- Shorter response time and faster referral resulted in a 25 percent increase of young children receiving treatment within 24 hours
- CHWs worked faster and more efficiently, resulting in a 20 percent increase of number of house calls by CHWs, leading to a 22 percent increase of women sleeping under a treated bed net
- By equipping CHWs with a mobile phone, the communication between doctor and CHW has improved as previously communication could only take place face-to-face
- By collecting data on a large scale in a specific community, health facilities are now able to more quickly detect outbreaks of malaria, enabling them to allocate resources where and when needed most

Lessons Learned

- It is possible to train semi-literate people in basic ICT-skills and the use of particular applications like MAMMA as long as the training takes the capacities of the CHWs into account
- When introducing a new tool, make sure there is a clear benefit for the user directly working with the tool
- Scaling up and maximizing the impact that the tool can have, is dependent on the capacities of CHWs

Conclusion

The Ma Santé Project has so far proven to be successful as it indeed strengthens CHWs' work and allows community health organizations to faster and more easily monitor diseases and allocate scarce resources to where it is needed most. The introduction of the tool in other countries is possible, but careful analysis is needed of the context in which the tool is used. The replication in Senegal showed us, that the tool brings less value, as the CHWs in Senegal are more restricted in what they are allowed to do.

Geographic Coverage: Yirimadjo, Mali and Fatick, Sengal

Implementation Partners: Muso Ladamunen (Mali), Sikoroni (Mali), RAES (Senegal), IICD (The Netherlands), Orange (France), Orange Mali (Mali)

Funder: Dutch Ministry of Foreign Affairs, Innovation Working Group (NORAD, mHealth Alliance, United Nations Foundation, WHO, Belgium Development Agency (BTC)

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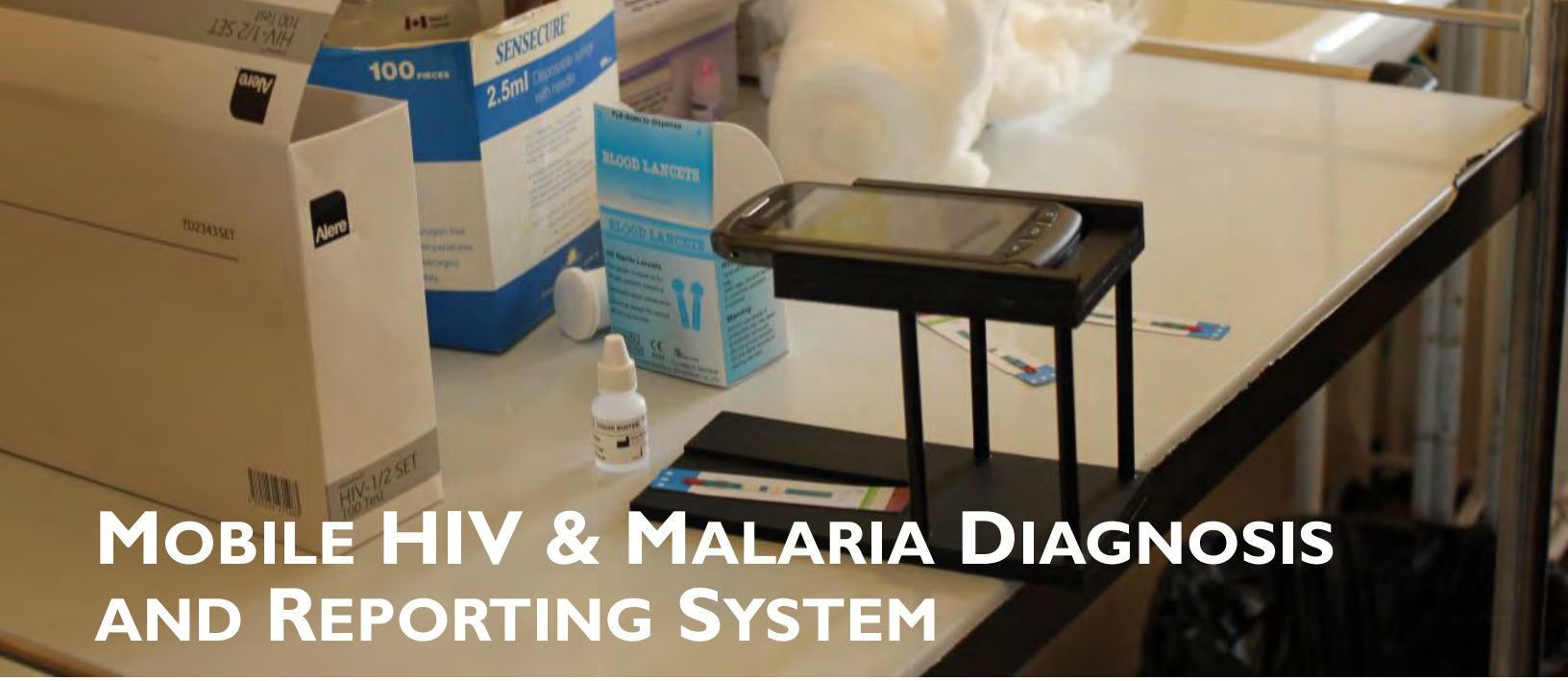

Mobile HIV & Malaria Diagnosis and Reporting System

Improve disease monitoring in Zimbabwe

DATA COLLECTION

Implementation date: October to December 2013

In 2012 and 2013, 15 percent of Zimbabwe's population was HIV positive and half the population was at risk of contracting malaria. Accurate diagnosis of disease is needed to guide patient treatment and timely reporting of results is needed to guide disease control programs. The challenge is that most disease reporting still relies on paper-based systems. These systems often have gaps such as errors in data or delays in reporting. In 2013, Global Solutions for Infectious Diseases (GSID), the University of Washington and Dimagi created a mobile application to analyze and capture RDT results at the point of care and report them to a secure web-server for remote monitoring by public health officials.

About Mobile HIV & Malaria Diagnosis and Reporting System

The Android-based software utilizes CommCare's case management and reporting features, developed by Dimagi, to digitize case report forms and Open Data Kit (ODK) software (developed by the University of Washington) to process, analyze and return RDT results with computer vision algorithms. The mHealth tool seeks to:

- Analyze and deliver RDT results to health care workers (HCWs) at the point of care
- Provide a universal reader capable of reading multiple RDTs from various manufacturers
- Automate data collection and eliminate key sources of errors
- Reduce HCWs' workload by digitizing reporting
- Enable high-level supervision and quality assurance of health workers' RDT administration
- Provide real-time, accurate disease reporting

This system has the capability to photograph and analyze HIV or malaria RDT results. The application captures the type of test used, time, date, and location, as well as allowing the HCW to enter demographic data. The results are transmitted wirelessly to a central, web-accessible database that aggregates the data and provides customized reports for use by health officers. The data assist in tracking and managing patients' cases and monitoring disease trends and health commodity consumption. All data are secured and made available based on the national regulations and guidelines.

Evaluation and Results

Table 1 - Zimbabwe Study Summary (Oct - Dec 2013)				
	HIV		Malaria	
	Number	Positive	Number	Positive
Male	214	17%	749	24%
Female	648	13%	965	20%
Total	**862**	**14%**	**1714**	**22%**

Working with the Zimbabwean Ministry of Health and Child Care (MOHCC), a pilot study was conducted across five sites in Manicaland Province: one provincial hospital, two district hospitals, and two rural health centers. The application was calibrated to read six different RDTs distributed by the MOHCC (three for HIV and three for malaria). During the study, over 2,500 test results were collected (summarized in Table1).

Based on interviews, HCWs said the application was easy to learn and use. Actual data entry required about 90 seconds per result. Moreover, they strongly believed that it would improve their workload, primarily by eliminating paper-based reporting requirements on a daily, weekly and monthly basis.

One of the primary goals was to validate the application by comparing the results from the application to those from visual interpretation by the trained HCWs during actual service provision. The study successfully demonstrated a high concordance between the software and visual interpretations. The results have been submitted for publication.

The GSID project provided one phone per clinic, with 60 nurses sharing 15 phones across five different sites. Each user was given a unique login, allowing multiple users to access CommCare on one phone. Supervisors were able to monitor individual locations and hospital departments' performance through CommCare reports.

During the study, GSID used images uploaded to CommCareHQ to conduct quality assurance, identifying when the nurses were performing RDTs incorrectly (such as using too much solution or applying too much blood to the receptor). Representatives at the Central Lab in Harare were able to follow up directly with specific sites, reviewing proper procedures for performing RDTs.

Lessons Learned

- HCWs can quickly learn and easily incorporate the mHealth application into their existing workflow without major disruptions.
- Relevant data can be easily collected and rapidly reported for remote monitoring by central public health authorities.
- Future studies will need to assess how real-time data can be incorporated with other data sources and used to improve monitoring and management of disease control programs.

Conclusion

After a successful pilot, expanded use of the mobile application would improve health care, from the point of care up through the senior level of MOHCC. For patient-level management, the application provides standardized interpretation of diagnostic results to guide the appropriate care provided by even minimally trained health workers, in resource-limited settings. From the public health perspective, the infectious disease reporting cycle can be dramatically shortened using mHealth, allowing health officers to gather, assess and respond to real-time disease occurrence for improved disease control. Results can be monitored to detect outbreaks and trends of specific diseases can be evaluated to support evidence-based decision making. Accurate supply consumption data will better inform supply-chain managers. Data can also be used by program funders to enhance transparency and provide better monitoring and evaluation at all levels.

Geographic Coverage: Manicaland Province, Zimbabwe

Implementation Partners: Global Solutions for Infectious Diseases (GSID); Dimagi, Inc.; Open Data Kit (ODK), University of Washington; Zimbabwe Ministry of Health and Child Care

Funder: Econet Wireless Zimbabwe

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See References on page 89.

mSOS

Using mHealth to strengthen real-time disease surveillance and response in Kenya

DATA COLLECTION

Implementation date: 2013

In many resource-constrained countries, there are barriers to reporting real-time, accurate and comprehensive information when outbreaks occur. In Kenya, health facilities used paper forms, non-structured SMS and other means to report suspected priority diseases weekly to the sub-counties, while sub-counties used unstructured SMS, phone calls and an electronic web portal system for weekly reporting to the Ministry of Health (MOH). However, it could not be ensured that data moved up to appropriate levels and response to outbreaks all occurred in real-time.

In order to address this critical gap, the MOH, in partnership with Japan International Cooperation Agency (JICA), Japan Science and Technology Agency (JST), Kenya Medical Research Institute (KEMRI) and Nagasaki University Institute of Tropical Medicine (JICA-JST SATREPS project), and in collaboration with Strathmore University Faculty of Information Technology, commissioned the development of mSOS, a mobile SMS-based disease outbreak alert system.

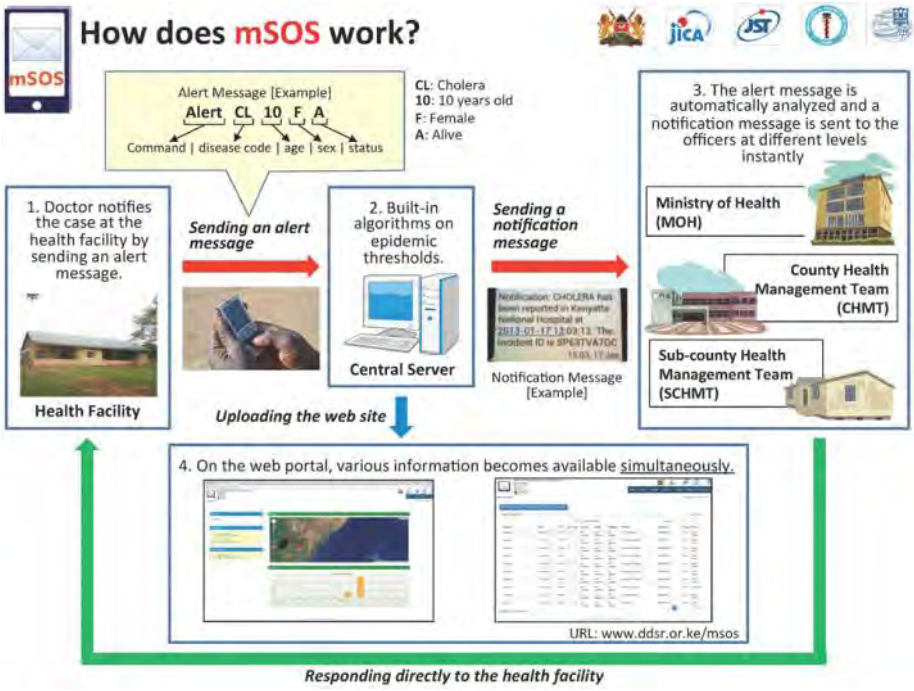
About mSOS

mSOS is a SMS-based disease notification system where health care workers immediately relay information on suspected priority diseases to sub-county, county and national MOH officials by sending structured SMS messages to a toll-free number. The system can be used on both basic mobile phones and smartphones.

mSOS is also equipped with a password-protected web portal where maps, epidemic graphs and tables of suspected incidences (based on SMS notifications sent via mSOS) and response actions (based on reports by the MOH, county and sub-county disease surveillance coordinators) are displayed on the web portal in real-time. All information is displayed and reviewed in real-time, and all data is stored at a server owned by the MOH. MOH officials use these tools to map incidences and plan outbreak containment measures.

Priority diseases are mainly classified into three categories: epidemic prone diseases, diseases targeted for elimination or eradication, and diseases/conditions and events of public health significance. For example, if a physician sees a patient with symptoms consistent with Ebola, he/she can use mSOS to notify the designated MOH officers in real-time so they are equipped with information to take immediate action.

mSOS also sends mass SMS to relay important disease surveillance and response information, such as case definitions and isolation measures, to mSOS-registered users.



Evaluation and Results

A cluster randomized control study was conducted to assess the effectiveness of mSOS. In-depth interviews and documents reviews (clinical registers, surveillance reports, etc.) were conducted at 127 health facilities and 11 sub-county health management offices. The health facilities included public, private and faith-based facilities representing various levels in the Kenya health system, including dispensaries, health centers, district and sub-district hospitals, medical clinics, maternity homes and nursing homes.

In the six-month pilot period (November 2013 to April 2014), 58 out of 127 health facilities were randomly selected to use mSOS. A total of 380 notifications were sent using mSOS. According to the in-charge interviews, 72.4 percent (42) of those who used mSOS thought the system was easy to use and 72.4 percent (42) thought mSOS was helpful in reducing reporting challenges. In addition, 55.2 percent (32) thought mSOS was helpful in triggering a response action. Lastly, 79.3 percent (46) suggested that mSOS should be rolled out nationally. More results will be released in 2015.

The system and has targeted 14 priority diseases since November 2013. To date, mSOS is operating in Kenya in seven sub-counties in Busia County and five sub-counties in Kajiado County. The Kenyan MOH has also expressed interest in national scale-up.

Lessons Learned

- mSOS allowed opportunities to strengthen data collection and research on disease surveillance in Kenya
- The system provided a platform for capacity enhancement, supportive supervision and sensitization of health workers on surveillance activities
- mSOS ensured sustainability by promoting the use of local technology, which enabled modification and system integration to suit various platforms and local needs
- The system enabled student mentorship (students in IT, public health and epidemiology) and learning through engagements with a local university on system development and programming

Conclusion

mSOS, a mobile SMS-based disease outbreak alert system, has revolutionized the approach to disease surveillance and response by making data available real-time. mSOS has the potential to help control the spread of diseases and protect the Kenyan people. Through a wider rollout, there is potential to enhance notification, detection and containment of potential disease outbreaks.

Geographic Coverage: Busia and Kajiado Counties, Kenya

Implementation Partners: AJICA-JST SATREPS Project: Japan International Cooperation Agency (JICA), Japan Science and Technology Agency (JST), Ministry of Health Kenya, Kenya Medical Research Institute (KEMRI), Nagasaki University Institute of Tropical Medicine

Funder: JICA-JST SATREPS Project

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KEMRI | Matilu Mwau, Principal Research Officer (mitsuru.toda@gmail.com)

See References on page 89.

mSpray

An Indoor Residual Spray mapping, monitoring and feedback tool for malaria control in Zambia

SERVICE DELIVERY

Implementation date: October 2014 (Piloted in 2011/2012)

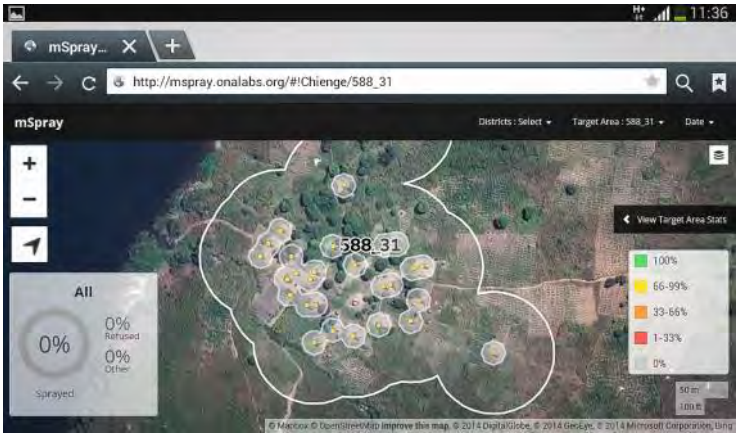
Indoor residual spraying (IRS) along with long-lasting insecticide treated nets (LLINs) form the mainstay of malaria control in Zambia. The country now boasts IRS coverage levels in excess of 35 percent in urban / peri-urban settings. National malaria parasitemia has fallen from 22 percent in 2006 to 14.9 percent in 2012. However, IRS implementation is expensive and requires operations to be as efficient and effective as possible.

Historically, IRS operators recorded spray activities on a paper form, which was then manually aggregated each day before entry into an Excel worksheet, followed by manual cut-and-paste aggregation. This system is labor intensive, error-prone, and too slow to provide data for managers above field level. Akros and partners developed mSpray to provide collection of electronic data in the field, giving spray teams and managers a real-time visual display of spray coverage overlaid on satellite images of target areas. mSpray improves the efficiency of operations and helps teams and managers to monitor whether they achieve desired spray coverage. mSpray is being used during the 2014/2015 spray season by 253 IRS staff across seven high malaria-burden districts in Zambia to guide their operations and monitor their progress in real-time.

About mSpray

mSpray is an IRS tool, primarily accessed through a web browser-based interface, which displays the areas targeted for spraying and identifies the houses within the target areas, all overlaid on satellite maps. These target areas depict the precise number and location of houses to be sprayed. Houses were mapped using satellite imagery, which was far less costly, more accurate and more extensive than the previous ground-based mapping exercises. The target areas encompassing houses were defined by taking malaria burden, operational efficiency and local knowledge into account.

mSpray streamlines, simplifies and increases quantity and quality of data collected. During the spray operations, Team Leaders (TLs) each manage three Spray Operators (SOPs). TLs enter data on their tablets while standing with the SOP at each house, which is sent to the cloud server as soon as a data connection is established. The forms are built in ODK Collect which uses formhub as the data backend service. The spatially-integrated spray data is then visualized on the tablet by the TL showing the location and type of spray point. The spray coverage indicators are updated immediately to reflect the latest form submissions. This immediate feedback of indicators and spray points allow TLs to accurately understand their spray data and make near real -time or in-field operational decisions on spray progress. Additionally, the tool allows for improvements in operational efficiencies by enabling IRS commodities to be delivered to houses targeted for spray activities and by informing planning improvements through more granular data.



Evaluation and Results

While mSpray is currently being implemented for the 2014/2015 spray season, initial evaluation and results from the 2011/2012 spray season pilot are also available. The initial mSpray pilot in Chibombo involved 40 spray operators who visited 15,929 structures over a period of two months. During this trial, mSpray was able to provide feedback on overall spray performance. Initially, feedback was provided around day 30. At this stage it was clear that National Malaria Control Centre (NMCC)-set spray operator targets of 10 to 15 structures per day were not being met. As a result, mSpray was able to identify this issue and highlight the fact that teams were beginning operations late each day. Based on this data, operational changes were made and coverage was dramatically improved (see Figure). mSpray also identified areas missed during spraying that were originally targeted, again allowing spray teams to revisit these overlooked areas. The current mSpray tool has made significant improvements since the pilot.

Lessons Learned

- It is key to understand the importance of spray data feedback during the spray season, instead of post season, as it greatly improves the spray operator performance in reaching their targets
- Operational efficiencies are gained through monitoring spray operator start and end times and by knowing exactly how many structures need to be sprayed and where
- Providing more granular spatially-integrated spray data allows program managers to assess whether high-burden malaria areas that were targeted are actually the areas being sprayed
- Minor challenges were encountered during the rollout of mSpray including unfamiliarity with digital technologies and the need for regular unit recharging; Most of these issues could be addressed through additional training or selection of operators with higher educational background, both issues being pushed by Akros for the upcoming 2014/2015 spray season

Geographic Coverage: Seven Districts in Luapula Province, Zambia

Implementation Partners: African Indoor Residual Spray Program, Government of Zambia Ministry of Community Development Mother and Child Health, and Ministry of Health & Akros

Funder: Africa Indoor Residual Spray Program

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See References on page 89.

Conclusion

mSpray is the first Geographic Information System (GIS)-integrated smartphone data management system for IRS. It is capable of delivering precise, real-time data on spray operator activity, automatically aggregated throughout the reporting hierarchy in easy-to-use maps, charts and graphs. Through rapid reporting, in-field data validation, identification of areas requiring focal spraying, spatially referenced spraying, and data feedback, the application is able to provide valuable results to help improve the implementation and supervision of costly IRS operations, ultimately contributing to a greater reduction in the overall burden of malaria.

mWATER

Social water monitoring in Tanzania

DATA COLLECTION

Implementation date: May 2012 to 2014

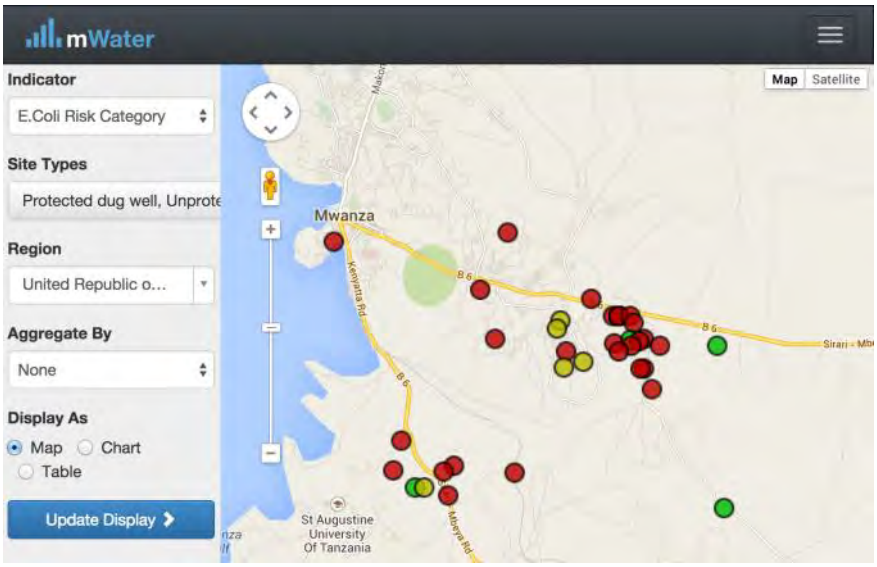
Recent evidence indicates that in spite of the global progress made toward access to drinking water, over 1.8 billion people still drink from a contaminated water source. With diarrheal disease still a leading cause of death for children under five years of age and a growing awareness of the linkages between repeated bouts of diarrhea and malnutrition and stunting, addressing the water quality crisis is critical to achieving better health outcomes and ensuring productive lives for children. The first step toward improving water quality is putting in place an effective method for detecting unsafe water sources so that remediation efforts and new investments in infrastructure can be targeted at the most at risk areas.

About mWater

mWater is a free and open-access mobile platform for mapping sites such as water sources, sharing test results and performing surveys. mWater leverages mobile technology and a central online database to simplify the work of water quality testing. The mobile application is available as a free download on Android smartphones and is also available via the web. Both the Android and web versions work offline and automatically sync with a secure server when a data connection is available. The Android version goes a step further by integrating with the mWater test kit, automatically counting the number of bacteria grown on a test plate and computing the results. All test results can be linked to a site, such as a water point, allowing others to instantly see the new result and all previous data from that location.

The mWater Surveyor portal greatly expands the capacity of the platform, allowing anyone to create and deploy their own surveys to users or groups, visualize incoming data in real time and download the results. Water.org and WaterAid now use this platform to internally monitor their programs by conducting household and community-level surveys of water users. At the end of the USAID-funded project, mWater was able to turn over administration of the groups and surveys to local authorities.

The mWater field test kit and application can detect E. coli, a type of bacteria that indicates fecal contamination of drinking water, based on the World Health Organization's recommended limits for safe drinking water and safe bathing water. Over a one-week period, mWater was able to train participants with no prior experience with smartphones or water quality testing to perform tests with this kit and upload the results, with periodic follow-up by a training coordinator who visited the field sites. A key part of the model was cross-sector engagement between health workers, community development officers and utility workers, who share responsibility for safe drinking water in local communities.



Evaluation and Results

mWater performed a quantitative evaluation of community surveys and platform-use statistics and a qualitative evaluation to assess the experience of participants and policy changes that resulted from the program, in Mwanza, Tanzania. Over the first six months, more than 500 water quality tests were recorded by the 25 participants, who reported that additional information about water safety is in high demand in their surrounding communities. During this time, feedback on how to make the mWater platform more effective was incorporated into the software design. These updates included translating the application into Swahili, combining all tests into a single form, creating printable reports with test results and advice about household water safety that can be posted in public areas.

One critical result that impacted policy was the high level of fecal contamination detected in shallow dug wells throughout the Mwanza. Many local residents and non-profit organizations build these wells to supply drinking water to parts of the city not yet reached by the piped water network. The ubiquitous contamination found is in line with recent international studies (Bain et al 2014, PLoS Medicine), but having local results from the community was a powerful motivating factor in making a policy change away from these sources.

Lessons Learned

- The free and open-access mobile survey platform is a powerful concept for catalyzing investment among organizations who share a vision for high quality monitoring tools that can be easily shared with local communities who lack financial and technological resources.
- Regular in-person support following the initial training is important for uptake of a new innovation among users unfamiliar with the technology.
- Efforts to monitor water quality should incorporate planning and stakeholder input regarding how to present the results to the community.
- Presenting local data, collected by respected members of the community, is a powerful tool to motivate policy change. International estimates are important for setting national and global policy, but local governments respond best to local data.

Conclusion

The mWater demonstration project in Mwanza has shown that local health and utility workers with no background in smartphones or water quality testing can learn to use both of these tools to reliably monitor water sources for contamination. The initial investment by USAID was leveraged to achieve even greater results through a coalition of water organizations that use the rapidly expanding platform in their own monitoring work. Making all of the features available for unlimited use was an important factor in motivating these investments.

Geographic Coverage: Mwanza, Tanzania; Global coverage via a free online platform

Implementation Partners: mWater, Mwanza Urban Water and Sewerage Authority, Mwanza City Council Public Health Office

Funder: USAID Development Innovation Ventures Program

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See References on page 89.

Participatory Monitoring and Evaluation (PartMe)

Participatory mobile data collection to monitor pro-poor health policies in Ghana

DATA COLLECTION

Implementation date: January 2010

SEND Foundation Ghana is a non-governmental organization that operates in many of the rural districts in Ghana. Central to SEND-Ghana's work on health is Participatory Monitoring and Evaluation (PartMe) of pro-poor health interventions and policies. This participatory research generates issues of policy implementation on health for engagement with stakeholders at district, regional and national levels for change. SEND-Ghana gathered data manually but noted a number of challenges using paper tools including delay in receiving and submitting completed questionnaires, data entry and cleaning processes, loss of questionnaires, high mailing costs, high volume of paper, mix-ups of questionnaires, delay in data analysis and reporting and difficulty in disseminating research findings to district partners and other stakeholders.

To address these challenges, the Innovation for Participatory Monitoring and Evaluation (PartMe) project was piloted in 21 districts (in Northern Region, Upper East, Upper West and Greater Accra) and subsequently up scaled to all 50 districts where SEND operates.

About PartMe

PartMe is an ICT for development project that uses technology to facilitate data collection and information dissemination between SEND-Ghana, its grassroots partners, health providers, national health insurance and policy - makers in the health sector in Ghana. The project has developed and deployed an information management tool (customized ODK) to enable mobile data collection. This tool is installed on mini laptops and mobile phones, which have been distributed to the newly formed District Citizen Monitoring Committees (DCMCs). For data collection DCMCs download the surveys, while they have internet access, but during the data collection itself they don't have to be online. Once the data has been collected, internet access is needed to submit the data to a remote server (central database).

At the SEND-Ghana office, SPSS software is being used to analyze the collected data. The findings are used by SEND for advocacy on the accessibility and utilization, as well the quality of implementation of pro-poor health policies. SEND conducted surveys to monitor the National Health Insurance Policy, the Free Maternal Care policy, the Community-based Health Planning and Service Policy. The findings are also being used to enhance the quality of SEND-Ghana's website (http://www.sendwestafrica.org/) by ensuring regular and timely updates on the results of the surveys and advocacy activities.

In addition, a virtual platform (e.g D-Group) is being used to discuss key-issues on pro-poor health policies with stakeholders. The evidence from the reports are used to encourage policy makers to change the policies based on collected evidence and used to start sensitization activities by DCMCs in districts were citizens lack certain knowledge about health policies.

Evaluation and Results

In August 2014 an impact analysis was conducted. Results are expected in December 2014, however internal learning and review meetings conducted give very promising results for the PartMe program:

- 50 Focal NGO's leading the 50 DCMCs effectively use the technology to collect data and improve communication
- 550 members of the DCMCs are trained and able to collect mobile data
- Mobile data collection using PartMe is 70 percent more efficient than paper based collection leading to more quality research reports
- More pro-poor policies have been reviewed based on evidence collected with the PartMe tool
- Based on data from research on the free maternal care policy, a sensitization program towards couples has been conducted in 25 districts reaching 3,200 participants; This has led to increased health seeking behavior by pregnant women, but also towards commitments to improve transport delays between communities and clinics through acquisition of tricycle ambulances
- Based on collected evidence in the free maternal care policy research an outreach program for 55 health professionals (nurses and midwives) in different districts was developed on respectful maternal care

Lessons Learned

- Evidence gathering is essential for effective public policy advocacy
- Using a mobile data collection system is much more efficient than paper based questionnaires
- A feedback system using SMS and Voice messages in local languages strengthened the message spread
- Equipping DCMCs with modern data collection tools and a feedback system gives them local credibility and empowerment; Some of the DCMCs members have been elected or appointed in the district assemblies
- Collecting evidence in 50 districts provides benchmark data to compare districts; This gives input for dialogue with health providers and policy makers to define local action plans to improve health care

Conclusion

The shift from paper to electronic data collection has allowed SEND Foundation to create a better picture of civic involvement in Ghana. Starting this dialogue between DCMCs, local policy makers and health providers has created a focus on local improvements. SEND's activities have also led to an increase in the number of subscribers of the National Health Insurance Scheme.

Geographic Coverage: 50 districts in four regions (Northern Region, Upper East Region, Upper West Region and Greater Accra) in Ghana

Implementation Partners: SEND Foundation Ghana

Funder: Connect4Change partners (Cordaid, IICD, Text to Change)

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IICD | Martine Koopman, Country Manager, Ghana (Tel: +31-703117311 / +31-611276026, mkoopman@iicd.org)

See References on page 89.

Reduction of Maternal Mortality through ICT

Combating maternal and child mortality with text messages in Uganda

DATA COLLECTION

Implementation date: October 2011 to December 2014

Though maternal mortality in Uganda has decreased in the last 15 years – from 527 women per 100,000 live births (1995) to 310 per 100,000 live births (2010) – the rate remains unacceptably high. The greatest risk of maternal death occurs during child birth and in the following first few hours and days of the child's life. A baseline survey carried out by Voices for Health Rights in 2011, found there was a lack of knowledge among pregnant women on what healthcare they are entitled during pregnancy, and services they should seek to minimize complications during pregnancy and birth (e.g. the recommended four antenatal care visits before delivery).

The survey found that only 49.5 percent of pregnant women were aware of danger signs during pregnancy and child birth and only and 26.2 percent were aware of their right to receive healthcare because of their "maternal functions of women including reproduction" (article 33(3) of the 1995 Constitution of Uganda). To better address this gap in knowledge, the International Institute for Communication and Development (IICD) and its Connect4Change (C4C) Consortium partners began supporting the Uganda National Health Consumers' Organization (UNHCO) to implement a program to provide better access to maternal and child health (MCH) information.

About Reduction of Maternal Mortality through ICT

IICD and C4C-partners are supporting UNHCO for three year period with ICT capacity-building enabling them to make MCH information more accessible to all registered beneficiaries within the project areas of Lyantonde, Luweero and Kamuli, and improve client feedback of available health services. During the program (2011-2014) various ICT-based solutions are being used targeting men and women of reproductive age, pregnant mothers, health workers, and community resource persons. These include:

- SMS-campaigns sensitizing communities about maternal and child health issues. Text and voice messages are being sent twice a month
- Text messages from UNHCO are being sent to registered numbers (community members and resource persons) using the same platform to collect feedback on how health service delivery can be improved
- In addition to the text messages, call centers are being used to assess client satisfaction of the participants on the SMS platform with the services they receive
- Reminders are being sent through SMS to pregnant mothers about their antenatal care appointments at health facilities
- Incentives of airtime credit are given out to participants, to encourage more participation
- Training takes place in the use of digital tools to develop user-friendly information / education / communication materials based on experiences/testimonies captured in the communities for showing at health facilities

Evaluation and Results

Thus far, the project has reached 3,170 people, including 800 pregnant mothers. Sixty health workers have been trained in use of ICT to reach out to people in the community. To be able to monitor progress, a baseline study was carried out in November 2012 and follow-up studies in 2013 and 2014. In 2013, the results showed that the number of people being reached by means of ICT quadrupled to 1,845. As a result of this, 19,995 people went to a health facility. Over 60 percent of the patients providing feedback in 2012 had a satisfaction score of >75 percent, however in 2013 this had decreased to 51 percent.

- Other findings from the annual learning workshops and semi-annual progress include:
- ICT solutions have made awareness-creation easier through mechanisms such as video and audio messages that are shared at health facilities and through phone calls
- The use of ICT has reduced delays in collection and analysis of data and, increased efficiency in reporting
- Feedback messages provide UNHCO with better insight on issues affecting healthcare delivery e.g. client feedback highlighted that the number of midwives available in the facilities was low compared to the needs in the districts of Lyantonde, Luweero and Kamuli
- The feedback data has contributed to UNHCO's advocacy for various health related issues such as underfunding of Primary Health Care funds. Now UNHCO has the lead of several Civil Society Organizations who jointly advocate for an increase of the PHC budget to promote preventive measures of diseases with in communities.

Lessons Learned

- The voice messaging component was easily adopted by the community and is also the preferred mode for information dissemination. Future projects targeting similar user groups should take into account that voice might help get a better outreach than text
- Women do have access to mobile phones, but often do not possess the phone which might hinder regular and timely access when needed. For example, data gathered on patient satisfaction by UNHCO, was biased to some extent as the majority of respondents were men

Conclusion

The use of ICT has made it easier for UNHCO to disseminate information and collect and analyze feedback data. Sensitization through SMS, VHTs and regular monthly talk shows has increased the number of people visiting a health facility.

The use of ICT more easily and quickly collect patient satisfaction data has helped to improve the quality improvement mechanisms. It has also increased the cohesion for dialogue, planning and delivery of services.

Geographic Coverage: Kamuli, Luweero and Lyantonde Districts in Uganda

Implementation Partners: Uganda National Health Consumers' Organization (UNHCO)

Funder: Connect4Change Alliance (IICD, Cordaid, Text to Change)

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See References on page 89.

FINANCE

The Mobile Health Research Lab: Mobile Wallet

Investigating how mobile money can be used to pre-pay for healthcare in Kenya

FINANCE

Implementation date: June 2010 to June 2015

The healthcare system in Kenya is stuck in a vicious cycle of low demand and poor supply. On the demand side, only seven percent of women and 11 percent of men have health insurance (Kenya DHS, 2010), with 35.9 percent of total health expenditure paid for out-of-pocket, in cash (Chuma and Okungu, 2014). On the supply side, private healthcare providers have difficulty attracting capital to invest in more services and better quality. Despite the promise of free, publicly provided healthcare, most consumers prefer the service and customer-oriented attitude offered by the private sector. This is evidenced by the fact that more than 50 percent of all healthcare is provided by the private sector. It is forecast that by 2025, the private sector will account for as much as 75 percent of health expenditures, amounting to $1.8-3.1 billion (Open Capital Advisors, October 2012).

In its Mobile Health Research Lab in Nairobi, PharmAccess investigates how mobile technology can be leveraged to turn the vicious cycle of low demand and poor supply into a virtuous one. One of the concepts tested was that of a mobile health wallet (i.e. ring-fenced mobile money that can only be used to pay for healthcare at selected, quality-controlled healthcare facilities).

About Mobile Wallet

The Mobile Health Research Lab in Nairobi was established in 2013 to investigate how mobile money can be leveraged to pre-pay for health-care. The Lab tested various payment mechanisms, including Safaricom's M-PESA—the mobile payment system that converts cash into electronic value (and vice versa) and is used by 80 percent of Kenya's adult population—to enable users to pay and save funds for healthcare with a mobile wallet. The application aims to increase health spending and decrease cash out-of-pocket costs, for example through risk pooling and digitizing healthcare payments. The mobile health wallet facilitates same-day payments and lowering of transaction (overhead) costs for healthcare providers, the creation of a trusted brand for the mobile network operator, increased access to services for the user, and proper accountability of the usage of funds for payers (including reporting).

Evaluation and Results

The Mobile Health Research Lab uses aspects borrowed from Behavioral Economics to observe what people really spend money on, rather than only asking for opinions via self-reported surveys. Apart from performing technical usability tests on the different designs, the Lab collected data on the willingness of healthcare providers to accept mobile payments; service utilization (diagnosis, drugs, and lab tests); user experience with the technology; and customer satisfaction with the service received. In addition to online / real-time transaction and utilization data, the Lab also collected information via (bi-weekly) telephone interviews and focus group discussions. Results and outcomes from mobile health wallet implementation included:

Mobile payments help cut-down on "leakage" at providers (i.e. money disappearing)—estimated at 20-25 percent in the private sector

Visibility of cash flows opens up possibilities for granting loans and advances to further strengthen the financial position of health facilities, allowing them to invest more in better care

Mobile wallet has positive effects on the ability to save and pay for healthcare—women, for example, can no longer be robbed of their cash when walking to a maternity clinic after dark. As a result, more women now come to the clinic for safe delivery, which has a positive effect on maternal and child health

Group savings ("chamas") as well as dedicated health remittances can be stimulated as well

The results and outcomes were obtained by directly gauging the response in test markets. Commercial viability is the best proof-of-concept.

Lessons Learned

- People at the bottom of the pyramid have no difficulty using mobile products/services
- Mobile health wallet allows direct targeting/subsidizing of selected groups (e.g. women with children)
- (Near) real-time data on payments & utilization can be turned into targeted health services
- Mobile (i.e. digital) payments increase the security/safety of patients, and the financial position of clinics (through less leakage)
- Trust is important; The Chama (savings group) members did want to meet, in person, the party who would be holding money on their behalf, and who would be providing the top-up
- Change management is required, and takes time

Conclusion

The mobile health wallet was designed and tested successfully. By channeling funds directly to the patients, they are empowered to vote with their feet, demanding better care at lower prices (strategic purchasing). Providers are encouraged and incentivized to deliver quality services, given access to quality improvement programs, business training and affordable loans. A consortium is now being formed to take the mobile health wallet to national scale.

Geographic Coverage: Nairobi, Kenya

Implementation Partners: Safaricom (Telecom & Mobile Money expertise), AAR (Healthcare & Health Insurance expertise), Dodore Kenya (Enrollment of patients & facilities), PharmAccess (Implementation Lead, Project Design & Donor coordination)

Funder: Amsterdam Diner Foundation, (Dutch) Health Insurance Fund

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See References on page 89.

LOGISTICS

BURNING SPEAR
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The Liberian Agriculture Upgrading, Nutrition, and Child Health (LAUNCH) Project

Monitoring food distribution and improving food security in Liberia

LOGISTICS

Implementation date: June 2010 to June 2015

After nearly a quarter century of civil conflict, Liberia faces enormous challenges to increase access to food and improve nutrition for vulnerable populations. While malnutrition rates have improved slightly in recent years, a 2013 report released by the Liberian Ministry of Agriculture stated that almost 36 percent of the population is malnourished. Since 2010, The Liberian Agriculture Upgrading, Nutrition, and Child Health (LAUNCH) project has worked to improve food security and reduce chronic malnutrition of vulnerable women and children under-5 years of age, in Bong and Nimba counties. The project distributes supplementary food rations monthly to pregnant and lactating women, as well as to families with children under the age of two.

In order to create a cost-effective, efficient, transparent, and accountable supply chain that ensures only targeted people receive rations, LAUNCH developed the Beneficiary Based Commodity Management System (BBCMS). Using the information collected during registration and after distributions, the BBCMS is able to calculate commodity needs for each food distribution point (FDP), as well as validating post-distribution stock levels. All data inputs to the electronic database system were originally paper-based, however significant delays in data entry, difficulty in implementing post-distribution verification processes, and monitoring and evaluation needs, led to the exploration of mobile-based solutions.

About LAUNCH

When new, eligible beneficiaries are identified, the LAUNCH project seeks to have them registered in the BBCMS and receiving their supplementary food rations as soon as possible. Initially, the project aimed to deliver the first set of rations within six weeks of registration. Yet the team was frustrated to find that wait times were well exceeding that target—sometimes by two full months. The registration process, initially paper-based, faced a series of challenges including loss of paper forms, slow data entry and poor supervision. In April 2012, LAUNCH transitioned to a mobile-based registration process that uses Magpi, an open source mobile application, on Nokia E63 and E6 phones.

While this transition facilitated a quicker and easier registration process and improvements to the overall program management, the point-of-distribution system (including reconciliation of receipts and completion of the BBCMS reports) remained paper-based. This was time-consuming on distribution day, since it involved manually comparing recipient tickets with ledgers and using low-quality thumb prints for positive verification of recipients either during or upon review of distribution. It also limited the ability of the commodity management team in Monrovia to verify that rations reached the intended recipients.

In March 2014, LAUNCH tested a two-part mobile intervention in a proof of concept study. First, the mobile registration system was modified using forms built on the SurveyCTO platform on Nexus 7 Android tablets, to include a photo of each beneficiary and all alternate recipients to allow for photo identification. At the point of distribution, a tablet-based system was developed and linked with the BBCMS to allow for photo verification of the beneficiary status and provide a verifiable record of the distribution process by replacing thumb prints with comparison photos from each distribution.

Evaluation and Results

The initial transition from paper to mobile-based registration system in April 2012 greatly improved overall program management and significantly reduced beneficiary wait times. In the first five months of implementation, the average wait time for new beneficiaries receiving rations decreased from 14 to 5 weeks. These shorter wait times have been sustained throughout the duration.

In April 2014, new beneficiaries for two FPDs were registered using the new tablet-based photo registration system, and all previously registered beneficiaries had photos added to their records. In May and June 2014, food distribution at the two pilot FDPs was conducted using the new system, demonstrating that the photo verification concept was feasible. Food distributions have been halted due to the 2014 Ebola outbreak, so the impact of the new system could not be fully evaluated. Based on anecdotal evidence, however, the team feels that the revised system improves on the earlier version and is worth pursuing for future projects with a commodity distribution component.

Lessons Learned

- Fast data transfer has led to faster data processing, and faster delivery of rations to new beneficiaries.
- One-time data entry and logic patterns within the mobile application led to improved data quality for the project as a whole.
- The costs to achieve a high increase in speed and accuracy are low.
- Photo verification systems are a promising new tool to ensure that food aid reaches the intended beneficiaries.

Conclusion

Mobile data collection platforms can play a vital role in improving routine programmatic functions. For programs that track individuals over time, a mobile tool combined with a strong database can greatly improve efficiency, data visibility, and reduce leakages.

Geographic Coverage: Bong and Nimba Counties in Liberia

Implementation Partners: ACDI/VOCA, Project Concern International, John Snow, Inc., and Making Cents International

Funder: USAID Food for Peace

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SERVICE DELIVERY

SAMSUNG

Better Health for Afghan Mothers and Children

Using mobile phones to improve maternal, newborn and child health in Afghanistan

SERVICE DELIVERY

Implementation date: 2010 to 2012

World Vision and its partners designed a mobile health innovation and implemented a research study in Herat Province, Afghanistan, nested within the broader Better Health for Afghan Mothers and Children (BHAMC) project, which aimed to improve maternal, neonatal, and child survival. BHAMC reached 36,200 children under five years old and 45,250 women of reproductive age in 74 villages across four districts of Herat Province. An important component of the strategy was utilizing community health workers (CHWs) and community leaders to strengthen linkages of households and communities to health facilities and skilled providers; to improve health behavior; and to provide basic lifesaving care within the home and community using Home Based Life Saving Skills (HBLSS).

The pilot study focused on CHWs using the HBLSS modules on a mobile phone instead of standard paper materials to facilitate counseling and referrals as part of the comprehensive maternal and newborn care approach. The intervention was introduced into ten remote villages (five intervention villages and five comparison villages), in Karukh District. A total of 10 CHWs working in male-female teams to make home visits culturally acceptable (one pair per intervention village) received phones loaded with airtime and an application to facilitate counselling and referrals.

About Better Health for Afghan Mothers and Children

World Vision worked with the software consultancy firm Dimagi to adapt its software application CommCare™ and develop two counseling modules for CHWs based on HBLSS—one for antenatal care and one for postnatal care. The modules were created in Dari, the local language, in visual and audio formats. The project also set up a database at the BHAMC office and at World Vision headquarters to access the data in real time.

During home visits, CHWs used the application to facilitate discussions about maternal and newborn health issues. After consultations with the women, CHWs uploaded information about the pregnancy to the phones for recordkeeping, reporting and follow up. When a woman went into labor, the CHWs made a referral call to link the woman's family with a skilled provider in the nearest facility.

HEALTH-RELATED OUTCOMES AT ENDLINE, BY STUDY GROUP (%)

Outcome	Intervention (n=103)	Comparison (n=103)
Any ANC visit*	**73**	**53**
2 or more ANC visits	50	45
4 or more ANC visits	18	17
Received iron supplements	64	50
Developed a birth plan*	**76**	**63**
Saved money	50	44
Arranged transport	27	22
Coordinated with health facility*	**17**	**5**
Delivered in facility (assisted by doctor, nurse, or midwife)	58	47
Knows 2 or more pregnancy danger signs*	**71**	**58**
Knows 2 or more newborn danger signs	95	95
Had a postnatal visit	39	39
Initiated breastfeeding within 1 hour of birth	81	72
Any CHW visit	54	51
2 or more CHW visits	43	49

* Differences between intervention and comparison groups were statistically significant at $P < .05$.

Evaluation and Results

The study, cleared by Institutional Review Board, used a pretest/posttest design with baseline (2010) and endline (2012) household surveys, in the ten designated sites. All intervention and comparison areas were part of the comprehensive maternal and newborn care approach. Both surveys had a total sample size of 206 mothers of children aged 0 to 23 months (103 each from intervention and comparison sites). In addition, focus group discussions were conducted in February 2013 with seven CHWs and eight Shura (village health committee) members from the intervention area. Data were analyzed to observe changes that could be associated with using CommCare™ with HBLSS. Heightened security challenges resulted in study limitations including implementation delays, small sample sizes, and a limited follow-up period.

Key findings included the following:

- Using mobile phones with the HBLSS application by CHWs, improved women's health knowledge and use of health services.
- As a job aid, mobile technology spurred interest among women to learn from CHWs, facilitated counseling, and enhanced CHWs' credibility among clients
- As a communication tool, use of mobile phones helped coordinate referrals to health facilities and delivery of medical supplies.

After 20 months of implementation, more mothers in the intervention group developed a birth plan than mothers in the comparison group (76 percent vs. 63 percent); to have had at least one antenatal care (ANC) visit (73 percent vs. 53 percent); and to know at least two danger signs during pregnancy (71percent vs. 58 percent) (see table). In addition, more mothers in the intervention group had a CHW coordinate referral to a facility than mothers in the comparison group (17 percent vs. 5 percent). A larger proportion of mothers in the intervention group delivered in a facility than mothers in the comparison group (58 percent vs. 47 percent), but the sample size was too small to detect statistical significance.

Lessons Learned

- Expanding the project to a larger number of CHWs will require careful documentation of the design and process of training and supervision of CHWs, including costs
- Harmonizing CommCare™ data with the district-level health information system is another consideration for further expansion of the model
- Similar studies with larger sample sizes and that include cost analysis should be conducted to build more evidence on the value of using mobile technology in community health promotion strategies, especially in post-conflict settings
- CHWs in Afghanistan operate primarily in closely-knit pairs of one male and one female (typically a husband and wife pair, but also as a brother and sister, or man and aunt pair); men tend to be more literate and more experienced with cell phones, while women, typically not formally employed, have more time to devote to CHW tasks and provide the majority of pregnancy and newborn-related care

Conclusion

Using mobile health technology to enhance communication within a family-focused, maternal and newborn health care approach is a promising strategy for addressing geographical and cultural barriers that impede access to basic health care services in post-conflict settings. Findings from this pilot study demonstrate that equipping CHWs with a low-cost (two USD per month), locally customized mobile application for counseling and referrals is feasible, affordable and highly acceptable among rural Afghan women and that it improves their health knowledge and behavior.

Geographic Coverage: Herat Province, Afghanistan

Implementation Partners: World Vision, Inc.; Bhakthar Development Network; Afghanistan Ministry of Public Health

Funder: USAID

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See References on page 89.

Chipatala cha pa Foni (Health Center by Phone)

Linking community members with the health system to improve reproductive, maternal, newborn and child health outcomes in Malawi

SERVICE DELIVERY

Implementation date: 2013

In Malawi, a woman has a one in 34 chance of dying during childbirth[1] while 71 children die for every 1,000 live births[2]. Knowing where to go for care and when to seek care are integral to reducing maternal and child mortality rates. To this end, VillageReach and the Malawi Ministry of Health (MOH) operate Chipatala cha pa Foni (CCPF) or Health Center by Phone, an mHealth innovation designed to increase access to timely and appropriate maternal, newborn and child health (MNCH) information, advice and care.

CCPF's goal is to improve health outcomes through increased uptake of home and facility based care practices among women of reproductive age, pregnant women, and caregivers of young children. CCPF is designed to encourage appropriate utilization of the health system, save patient time and transportation costs, and provide women and caregivers with greater control and opportunity to interact with the health system without having to travel long distances to a health facility.

A variety of demand generation and community mobilization strategies have been employed to spread awareness of CCPF. During the pilot, community volunteers were chosen in each village and given a low-cost phone to provide those without personal phones access to the service. In addition, CCPF is promoted through community outreach events, health workers and print media. The initiative is currently implemented in four districts in Malawi and serves a population of over 300,000 women and young children.

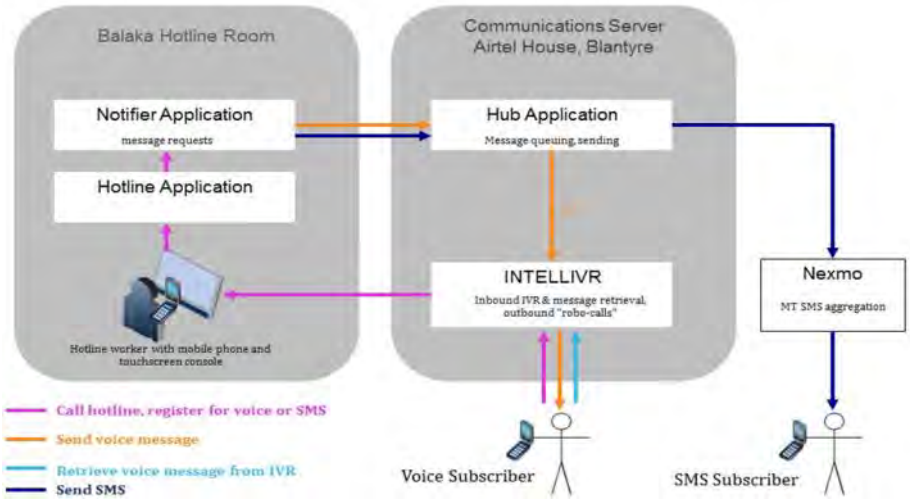
About Chipatala Cha Pa Foni

CCPF has two main components. A toll-free hotline provides clients with information and advice on reproductive, maternal and child health issues and refers callers displaying "danger signs" for further care at a village clinic, health center or hospital. Secondly, a "tips and reminders" mobile messaging service provides regular text or voice messages on reproductive, maternal, and newborn health topics. Messages are tailored to the client's week of pregnancy or a child's age.

The CCPF technology solution has four main applications that sit on two different servers: the hotline server and communications server. The hotline server manages the client data from the hotline application (developed by Baobob Health Trust) and a notification application (developed by VillageReach). The communications server manages a Hub application (developed by VillageReach) and IVR (developed by Yo! Uganda).

Evaluation and Results

In 2013, the Invest in Knowledge Initiative, an independent research firm, performed a comprehensive external evaluation on the CCPF pilot project. The mixed method evaluation included a baseline and endline survey in both implementation and comparison districts. Data showed that there were significant improvements among CCPF users for the following indicators:



- Increased use of antenatal care within the first trimester
- Increased use of a bed net during pregnancy and for children under five
- Early initiation of breastfeeding
- Increased knowledge of healthy behaviors in pregnancy, including drinking more water and minimizing strenuous lifting
- Increased knowledge that some traditional medicines can be harmful in pregnancy
- Increased knowledge of maternal health services including number of recommended antenatal visits

In addition, CCPF users were highly satisfied with the service, citing the ability to access the service from home (saving time and money traveling to the health center) and respectful treatment from hotline workers as major benefits of using CCPF.

Furthermore, over 75 percent of CCPF's calls are typically resolved without needing a referral. Therefore, the program reduces undue burden on the health system by encouraging uptake of appropriate home-based care.

Lessons Learned

- Working with partners supports scale-up; VillageReach has worked with partners to create cost-sharing agreements, utilize existing programs to implement CCPF in new areas, and to generate demand for the service
- Government engagement is critical; VillageReach and the MOH have a strong partnership achieved through engaging the MOH in content development, encouraging MOH officials to visit the CCPF call center, soliciting and incorporating MOH feedback on implementation, and receiving endorsement from the Reproductive Health Unit
- The rigorous evaluation of the pilot has helped garner support for expanding CCPF to new districts, as well as contributed to the global evidence base for mHealth
- Using community volunteers equipped with phones can help increase access and generate demand for mHealth services in areas with low phone ownership; however, adequate ongoing resources need to be allocated to maintain phones and volunteer motivation in order for the strategy to remain effective over time

Conclusion

CCPF leads to significant improvement in MNCH indicators among its users while reducing undue burden on the health system. Expansion to four more districts by 2016 could lead to a greater impact by the initiative in Malawi. VillageReach is actively working with the MOH and other partners to expand CCPF nationally.

Geographic Coverage: Four districts in Malawi

Implementation Partners: VillageReach, Malawi Ministry of Health, Baobab Health Trust, Concern Worldwide Malawi, Clinton Health Access Initiative (CHAI), Support for Service Delivery Integration, Presidential Initiative on Safe Motherhood, Airtel

Funder: WHO's Innovation Working Group/UN Foundation; Concern Worldwide's Innovations for Maternal, Newborn and Child Health

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See References on page 89.

eCompliance

Ensuring high-quality delivery of health care among tuberculosis patients in resource-constrained settings

SERVICE DELIVERY

Implementation date: Cambodia (December 2013), Dominican Republic (November 2013), India (December 2010), Kenya (August 2014) & Uganda (July 2012)

Tuberculosis (TB) has been declared a health emergency by the World Health Organization (WHO). Over nine million people are newly infected with TB and 1.4 million die annually[1]. Incomplete TB treatment has led to an alarming rise in multi-drug resistant TB (MDR-TB), a man-made epidemic. It is estimated that 3.7 percent of all newly infected individuals in the world have MDR-TB[2]. In 2015, it is estimated that USD 2 billion will be required for the diagnosis and treatment of MDR-TB. MDR-TB, if not fully treated, leads to the dreaded XDR-TB (Extremely Drug-Resistant TB), causing greater suffering and economic loss.

Operation ASHA, an international non-governmental organization working to combat TB, is using an innovative solution called eCompliance, a combination of Operation ASHA's comprehensive model and a high leverage, low-cost biometric technology. The application assists with monitoring every dose taken by TB patients. The intervention aims to minimize development of multi-drug resistance, because MDR-TB treatment is often left incomplete due to long duration and debilitating side effects. The technology supports the directly observed therapy (DOTS) model, which is an essential part of TB treatment programs.

About eCompliance

eCompliance, is a portable biometric identification system capable of identifying patients by their unique fingerprint and compiling patient adherence data. The system is operated by Community Health Workers (CHW). During patient enrollment, their fingerprints are saved in the system and subsequently, every time the patient consumes a dose observed by the CHW, the patient provides their fingerprint. This provides indisputable proof that the CHW observed the patient taking the medication.

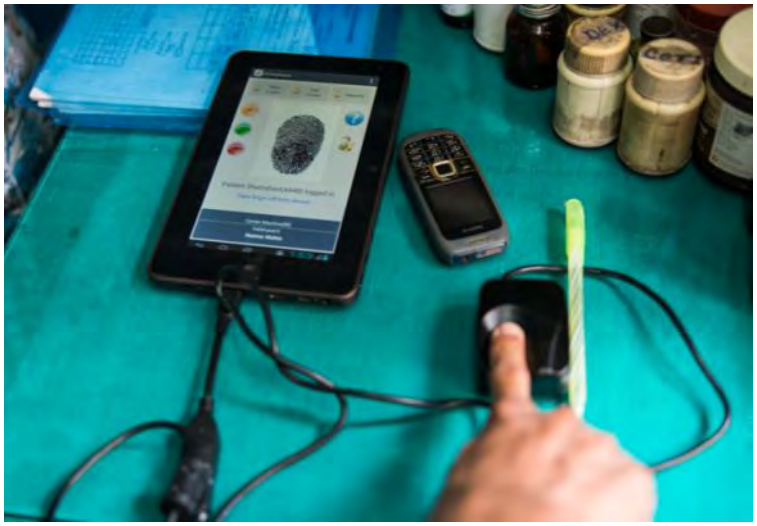
When a patient misses a scheduled dose, the system sends the CHW a text message. The CHW has to do the required follow-up in the next 48 hours in the patient's home, and again take a fingerprint before giving the medicine and reemphasizing the importance of adherence. This prevents any dose from being missed as well as prevents tampering with the system to obtain extra incentives.

The eCompliance system is highly interactive and easy to use even for semi-illiterate health workers. eCompliance is linked to an Electronic Medical System (EMR), which allows automatic generation of all reports, improves transparency and reliability, increases productivity and eliminates human error.

eCompliance technology has been customized to suit the local requirements of the dosage regimen for the country. For example – In rural Uganda, Columbia University's Earth Institute adapted the Operation ASHA strategy for a rural African setting. In that context, patients no longer go to the clinic while on TB treatment, but rather a community health worker goes to the patient's home with an eCompliance system to observe the patient taking the drugs and record the drug intake.

Evaluation and Results

eCompliance has achieved tremendous success, having raised the "Treatment Success Rate' to 86.9 percent, (from 32 percent), as noted by a WHO consultant in 2011, in Chhattisgarh state of India. The application has been used to enroll nearly 9,800 TB patients and clocked over half a million transactions on over 170 machines in India & Cambodia. The application has successfully reduced treatment default rates from as high as 36 percent to as low as 1.5 percent, thus minimizing the risk of MDR-TB. In 2011 in Ruhiira, Uganda, there were 52 TB cases diagnosed and placed on treatment and eight patients died. The eCompliance system was implemented in July 2012; since then, 31 patients have been enrolled in the system, and have been lost to follow-up or died[3]. The eCompliance initiative comes at a cost of $3 per patient, which is more than offset by increased productivity of CHWs and office staff so it does not add to the per patient cost.



Lessons Learned

- The implementation of a good quality DOTS program is the first priority for TB control in the country
- As the price of technology falls, technological and biometric approaches towards TB control are viable even in poor areas; The current DOTS program allows opportunities to apply novel technological solutions, which have shown significant results in preventing MDR-TB
- An automatic follow-up procedure reduces the response time to defaulting patients and focuses counseling on first-time and repeat missed dose patients

Conclusion

eCompliance is a solution that enhances and improves upon the DOTS model. The system has been able to verify that patients were present for treatment by enhancing observation with biometric identification. It provides a method to quickly respond to missed doses by patients with up-to-date attendance information. eCompliance is a low cost, high impact, high visibility, scalable and replicable technology.

Geographic Coverage: Cambodia, Dominican Republic, India, Kenya, Uganda

Implementation Partners: Operation ASHA, RNTCP (India), CENAT (Cambodia), Uganda, Kenya (Columbia University), Dominican Republic (Clínica de Familia)

Funder: USAID, Columbia University

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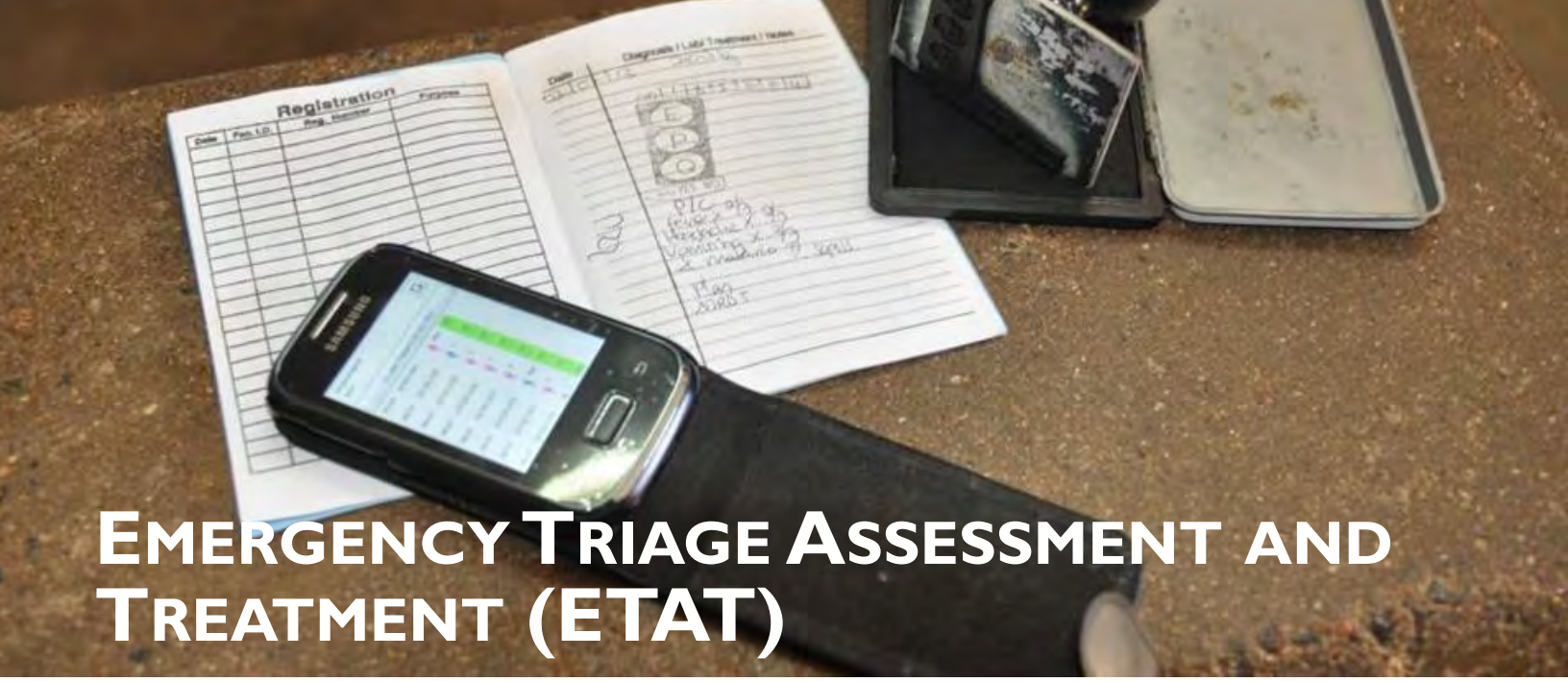
See References on page 89.



Emergency Triage Assessment and Treatment (ETAT)

Decision support tools to triage children in outpatient departments in Malawi

SERVICE DELIVERY

Implementation date: July 2012 to September 2014

Despite major breakthroughs in high and middle income countries, meningitis remains a huge problem in Africa and especially in Malawi. There is an exceptionally high fatality rate and the young are especially at risk. An aggressive infection, meningitis can kill within hours of the first symptoms. Recognizing the disease early-on can mean the difference between life and death and improve outcomes for survivors, who are often left with life-altering conditions (e.g. deafness, brain damage).

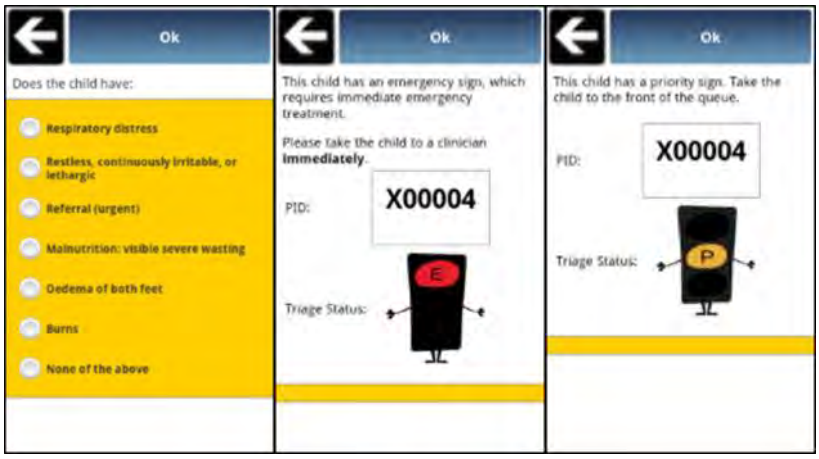
More than half the babies and children who get meningitis in Malawi will die from the illness, while others are left with serious disabilities. Formative research carried out by Malawi-Liverpool-Wellcome Trust (MLW) in the second biggest city, Blantyre, showed limited knowledge about the symptoms of the disease among health professionals and the public. Meningitis Research Foundation's solution is Action Meningitis, a project which focuses on the faster identification of sick children by using mobile phone technology (mHealth) and educating health care workers and the public to the dangers.

About ETAT

Long lines to see the health care workers are very common in many health facilities in Malawi, and the delay in navigating these queues can be the difference between full recovery and death. Action Meningitis has introduced the concept of Emergency Triage Assessment and Treatment (ETAT), at Queen Elizabeth Central Hospital (QECH) in Blantyre, and at five peri-urban health centers in Blantyre. The name of the initiative is 'Chipatala Robots', drawing from the local use of the word robot, meaning traffic light. Health Surveillance Assistants (HSAs) and nurses are trained on the ETAT protocol to rank sick children in the queue as E(mergency), P(riority) or Q(ueue). Children as 'E' are taken straight to a clinician, those classified as 'P' are taken to the front of the queue and those classified as 'Q' wait their turn in the queue.

D-tree International and partners have worked together to introduce the ETAT system into urban health centers using mobile phone technology to track referrals to QECH. Health workers were provided a half-day orientation on the use of the device and application and then moved into a half-day on the job training in their respective outpatient department, with follow-up visits then performed by Action Meningitis and D-tree staff.

Using mobile phone technology (mHealth) application, HSAs scan through the queues at the health centers assessing each child's for the level of acuity and identifying children who need immediate assessment. The tool tracks a child from assessment in the queue, assessment by the clinician and, if applicable, through arrival at the hospital. Since inception, over 200,000 cases have been triaged using this system, with 90 HSAs in seven health facilities trained on it use.



Evaluation and Results

An evaluation was conducted in five peri-urban health centers in Blantyre, between December 2012 and May 2013. Close to over 41,000 cases were observed, during peak traffic times throughout the week. The existing system in place was simply a first-come, first-served model. Pre- and post-patient journey modelling with health staff from each clinic identified waiting times to be noticeably shorter post intervention with the most significant time differences reported in the waiting bay and consultation room.

The triage intervention reduced the mean waiting times between arrival at the clinic and consultation from 74 minutes to 34 minutes for any child attending the clinics. There was a significant difference ($p<0.05$) indicating a noteworthy drop in the average time spent waiting post-intervention. Data captured through the phones also indicated shorter waiting times between triage and consultation for emergency cases (28 minutes), priority cases (45 minutes) and non-urgent cases (59 minutes).

Analysis is ongoing comparing the agreement between the HSA's assessment and that of the clinician. This will allow us to demonstrate the accuracy of the assessment made by the triage system and the mHealth tool.

Lessons Learned

- Health center staff reported that the system had a positive change in separating under-five monitoring visits from those in need of clinical assistance
- Patient guardians perceived the Chipatala Robot system intervention positively
- The intervention contributed to improved recognition of severe illness amongst both health workers and patient's guardians; Most of the health facilities reported that very few deaths occurred on the queues while patients were waiting to be seen by clinicians

Conclusion

This study has shown that mHealth technologies have the potential to improve primary level services with high patient numbers and overburdened staff, one step in the right direction to helping improve early recognition and response to severe illness in children in Malawi. The tools can be effectively deployed even in a busy clinical setting such as an urban hospital's outpatient department and proved to dramatically reduce the time to access care for the sickest children who are most at risk.

Geographic Coverage: Blantyre, Malawi

Implementation Partners: D-tree International, Meningitis Research Foundation, Malawi Liverpool Wellcome Trust

Funder: Action Meningitis (an initiative of the Meningitis Research Foundation principally funded by the Scottish Government and Deutsche Bank)

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Engage TB

Providing a tool for self-screening for tuberculosis in Tanzania

SERVICE DELIVERY

Implementation date: June 2014

With funding from Bristol-Myers Squibb Foundation, Pathfinder International (PI) in collaboration with the Tanzanian Ministry of Health and Social Welfare (MoHSW) through the National Tuberculosis and Leprosy Program (NTLP) and the Kinondoni Municipal Council are working jointly to intensify activities to "Stop TB" at the community level. This initiative is done through Pathfinder International's new project called ENGAGE TB.

About Engage TB

Tuberculosis (TB) is an airborne disease associated with overcrowding and poverty. Kinondoni Municipality is densely populated municipality in Dar es Salaam, with over 1.2 million inhabitants. It is estimated that over 4,000 people contracted TB in Kinondoni Municipality in 2011. To address this health challenge, Pathfinder International contracted an SMS Aggregator (a company called Push Mobile) to develop a self-screening mobile application. The software enables the inhabitants of Kinondoni Municipality to do TB self-screening and access the basic health information related to TB via short messages (SMS) through their phones by sending a code word "TB" to a network neutral toll free short code (15077) free of charge. The application asks a series of questions, according to the WHO TB Screening Protocol including basic information such as the symptoms and signs of TB.

Apart from giving the client information, the mobile application also provides a list of health facilities that have the capability to conduct laboratory tests to confirm TB, using a web login can confirm if clients test TB positive through sputum testing into the system that were referred using the SMS service. Once a client has been confirmed as TB positive, the Lab Technicians will register the client back into the application and hence enable the client to receive reminders about Directly Observed Therapy (DOT) to help with adherence to TB medication for a period of six months.

Clients, who are TB Negative, will receive messages about behavior change to help them avoid the spread of TB and or being infected by TB.

In addition to these direct benefits, Pathfinder international is taking part in the global campaign of attaining the sixth Millennium Development Goal (MDG) through the provision of vital TB information..

Age Category	Overall	Completed	Referred	TB
Male clients				
Under Five	27	18	16	5
Above Five	207	166	118	20
Sub-Total	234	184	134	25
Female Clients				
Under Five	22	15	13	1
Above Five	196	147	107	11
Sub-Total	218	162	`120	12
Overall result	**346**	**254**		**37**

Evaluation and Results

Pathfinder began implementing ENGAGE-TB in June 2014. A total of 540 mobile respondents (inquiring about under-five and above five, males and females) have been registered into the systems, and a total of 254 were referred of which. Of these referrals, 37 respondents were diagnosed to be TB positive and have started treatment.

Lessons Learned

- Introduction of the TB Self-Screening mobile application has increased access to services by community members in the Kinondoni Municipality; the system is simple and easy to use and has been received well by community health workers, health facility workers and Municipal officials
- Shortage of health care workers in health facilities has increased the work load of laboratory staff and health facility staff in uploading the testing results of mobile users in the system
- The Engage TB Self-Screening Mobile application increased the work load of community health workers, District Staff and lab technicians and no incentives or additional motivation was provided to them, thus affecting project performance
- Integrating of TB Self -Screening mobile application and referral services into existing community structures, using the community health workers as ambassadors, enabled fast start-up and acceptance of the project into the community; This approach delivers TB Screening services directly to the households of clients thus ensuring access to TB screening services without barriers of direct and opportunity costs to the client

Conclusion

Engage TB project has been a learning process for Pathfinder, Kinondoni District Staff and community health workers in general. The introduction of an m-Health intervention to successful identifying the TB cases early through Self-Screening services and offer the required assistance to gain access to treatment and reduce TB cases and multi drug TB resistance in the communities is seen as a great and innovative way of achieving this goal by both the Ministry of Health and Social Welfare, The National Tuberculosis and Leprosy Program and the Kinondoni Health Management Team. Lack of funding for maintaining the Self Screening Mobile Application system as the project is coming to an end means the system will not be online again after end of project just a short time after launched.

Geographic Coverage: Kinondoni District, Dar Es Salaam in Tanzania

Implementation Partners: Pathfinder International, Ministry of Health and Social Welfare (MOHSW), National Tuberculosis And Leprosy Program (NTLP), Kinondoni Municipal Council and Push Mobile

Funder: Bristol-Myers Squibb Foundation

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Grand Challenge Exploration Phase I Project

Community health workers using mobile phones to improve maternal, newborn and child health outcomes in Mozambique

SERVICE DELIVERY

Implementation date: November 2010 to October 2012

As part of its growing mHealth program, World Vision implemented a Bill & Melinda Gates Foundation funded Grand Challenge Exploration (GCE) Phase I Project to complement the activities of Strengthening Communities through Integrated Programming (SCIP) Ogumaniha: an ongoing, community-based, multi-sectoral project to improve the health and livelihoods of children, women, and families funded by USAID Mozambique. SCIP empowers community health volunteers (CHVs) in mobilizing communities to increase access to maternal, newborn and child health (MNCH) services using the 2003 Home Based Life Saving Skills (HBLSS) methodology. HBLSS training takes place through community meetings using materials designed for low-literacy settings to recognize life-threatening problems in pregnant women and newborns.

About The Grand Challenge Exploration Phase I Project

The Grand Challenge Exploration Phase I Project in Mozambique utilized the Gates-funded MOTECH Suite (MTS), a sustainable, scalable, open source mobile solution which includes CommCareTM, a job-aid for mobile health workers. The GCE project took place in the Licuar and Namacata communities within the Nicoadala district where male and female CHVs were selected from within the SCIP project intervention areas to receive training. The CHVs had a minimum seven years of experience and an estimated 40 percent were functionally literate[1], many having limited formal education. They were not paid and did not receive direct incentives for participation.

Training sessions on the use of the Pregnancy and Postpartum Modules installed on mobile phones through CommCareTM were conducted. Training focused on basic operating skills and implementation of the CommCareTM program, as most selected CHVs had limited experience using phones.

The CHVs visited homes of pregnant women and newborns, each responsible for assisting at least 15 families in his/her community. The CHVs registered the information of any pregnant woman in their care using the CommCareTM program on the phone as early in the pregnancy as possible.

CHVs followed the prenatal and postpartum care algorithms with their clients, following text and/or audio prompts through non-urgent questions, reminders, and advice on ensuring safe pregnancy. In case of danger signs, the CHVs applied first aid procedures, contacted health facility personnel for clinical management support, and referred the

client to a health facility. The CHVs continued these follow-up visits to the pregnant woman until parturition, and then once within one week after delivery for postpartum care.

All data were transmitted from phones to the Project's database for collation and analysis. The Project Coordinator monitored data quality, assessed CHVs' work and made follow-up supervision visits. The data were used to inform any necessary adjustments in the implementation of the project.

Refresher trainings were conducted periodically to improve the skills of CHVs using CommCareTM and to gather input regarding advantages, challenges, and impacts of mobile phone use.

Evaluation and Results

The project was evaluated based on the analysis of CommCareTM data and interviews (written and verbal) with CHVs and project participants. Data from the CommCareTM application and health facility records were analyzed, primarily using Epi-Info version 3.5.3. Frequencies for all parameters measured were calculated, including clients who experienced one or more danger signs. Additionally, two CHV focus group discussions, with a total of 19 CHVs (79 percent), were conducted to gain understanding of the project, its interventions, successes, challenges, and lessons learned. The CHVs had the opportunity to provide feedback about the program and areas for improvement.

Initial results conclude that the use of the mobile phone modules improves the quality of services delivered by CHVs as demonstrated by danger sign identification and referral rates.

Key qualitative findings reported by CHVs included the following:

- Enhanced communication with health facility personnel through the use of the mobile phones
- Expedited referral process benefited women with both minor and significant complications
- Increased confidence of clients in CHVs provision of services because of the mobile technology
- Increased client trust in the CHVs because they are asking the same questions that are asked by hospital staff

Lessons Learned

- Allow time for users to become familiar with using phones; Consider providing reading glasses to users who may have trouble reading the phone screens
- Consider a solar charger as a power source for the phones; It is a cheaper, long-term solution
- Illiteracy needs to be accounted for—in this project an audio application was added to the module
- Make expectations of phone use clear upfront, and address misuse of phones
- Provide standardized materials in appropriate local languages so translators are not needed

Conclusion

The use of mobile phones by CHVs to follow-up with pregnant and postpartum women assists with identification, referral and expedited management of minor and major complications to health facilities in these communities, where literacy levels were not high. Mobile technology increased credibility of CHVs in the community and strengthened linkages with the formal health system.

Geographic Coverage: Nicoadala district in Zambezia Province, Mozambique

Implementation Partners: World Vision, Inc.

Funder: Bill & Melinda Gates Foundation

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[1]High illiteracy rates are ubiquitous among community resources living in rural areas of the developing world. This might constitute one of the most important barriers to address in improving their skills and resolution capacity.

Eleni Capsaskis, Malaria Consortium

Innovations at Scale for Community Access and Lasting Effects (inSCALE)

A community health worker decision support system in Mozambique

SERVICE DELIVERY

Implementation date: June 2013

Since 2010, approximately 1,950 community health workers (CHWs) in Mozambique have been deployed to improve access to basic health care in remote areas of the country, focusing primarily on maternal, newborn and child health (MNCH). Locally known as Agentes Polivalentes Elementares (APEs), these trained community members conduct extensive health promotion and education activities. They work in the case management of malaria for patients of all ages, and pneumonia and diarrhea in children under five. APEs also refer pregnant women, newborns and children with danger signs to the nearest health facility.

In order to improve the quality of care provided by APEs and scale-up the program nation-wide, Malaria Consortium, Dimagi, Inhambane provincial health directorate, the Mozambique Ministry of Health (MOH) and other partners have worked to address key challenges through the five-year inSCALE implementation research project. A randomized control trial conducted by the project studied the effects of mHealth applications on CHW motivation, supervision and performance, and ultimately coverage of appropriate treatment for children with diarrhea, pneumonia and malaria.

About inSCALE

Malaria Consortium's Innovations at Scale for Community Access and Lasting Effects (inSCALE) project is responsible for Mozambique's largest mHealth deployment to date and provides an opportunity to explore the potential impact of technology solutions on child care services delivered through a national health system. The two main features include the APE CommCare support tool and the CommCare HQ web-based, real-time dashboard for program planners.

Through the use of images and audio, the inSCALE APE CommCare application walks APEs through the consultation steps to assess, classify, treat and refer patients. The decision support tool includes a checklist of mild and severe signs and provides treatment guidance. In addition, APEs can use a built-in and simplified respiratory timer to detect pneumonia symptoms. Individual patient data is stored on the phone and, once a network connection has been established, is sent to a server, along with weekly aggregated case data and drug stock levels. Each APE also receives a monthly automated credit allowance to call peers and supervisors for additional support.

CommCare HQ incorporates Active Data Management capabilities which allow facility and district-based supervisors to receive weekly and monthly summary reports on diagnosis, treatment and follow-up of patients, along with recommendations on needed actions. They can assess each APE's performance using custom competency checklists and provide constructive feedback over the phone or during monthly supervision meetings. APEs and health facility-level supervisors also receive monthly motivational SMS messages.

All data is stored on a web-based server that provides real-time information on each individual case, epidemiological data, and drug stock indicators. Stakeholders at the provincial and district-level statistics bureau use the CommCare HQ reporting dashboard to access and analyze the data.

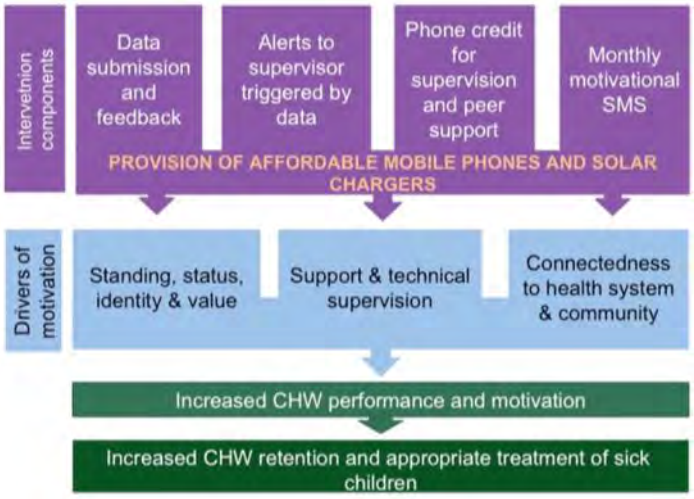

Figure 1: Conceptual framework for the inSCALE APE CommCare intervention package

Evaluation and Results

While the process evaluation is currently ongoing, preliminary results have been collected. Since implementation, 132 APEs (out of almost 300 deployed in the whole province), 47 facility-based supervisors, and six district APE coordinators in the six selected districts have been using the inSCALE CommCare application. Quantitative results reveal that 60 percent of APEs have received one or more calls from their supervisor in the last 30 days, while 80 percent have called their supervisor for help or support in the last 30 days. About 70 percent of APEs state they always use CommCare in their work and that it helps them to remember what symptoms to look for. The three most preferred aspects of the tool are the job aid for newborns, children and pregnant women, the improved respiratory rate timer, and treatment and dosing instructions.

Initial qualitative findings show the application contributes to enhancing the community recognition of the APEs, leading to increased legitimacy and motivation of APEs. Health facility supervisors find weekly reports of drug stock data useful for providing access to continuous and accurate medicine use and for addressing commodity gaps. Real-time data also allows for quick identification of active and non-active APEs, the number of diagnosed and treated cases, and the number of referred cases, disaggregated by cause.

Lessons Learned

- The APE consultation and decision support system was developed based on already existing and well-tested paper-based job aids and is fully aligned with MOH diagnostic and treatment protocols for community-based care, thus allowing a smooth transition from paper-based manuals to a phone-based tool
- System-generated reports follow the MOH standard reporting templates and utilize the national rubric for comprehensive case management to ensure that supervisors can link them back to their paper-based system
- A user-centered design was critical to development and involved MOH staff and APEs in every step; User feedback was obtained through interviews and APE observation during patient visits and throughout the iteration process
- The "training of trainers" approach was key to generating project ownership and sustainability; Malaria Consortium trained health cadres at various levels of the provincial health system who then trained APEs and supervisors in their respective catchment areas
- Additional Android phone introductory sessions and an AppLocker application helped APEs learn the necessary technical literacy levels for efficient phone usage while avoiding overuse of other data-heavy applications

Conclusion

The inSCALE APE CommCare App is already addressing some of the key challenges faced by the APEs and their supervisors through strengthening their relationship, enabling APEs to conduct high quality work, and connecting them with the communities they serve. The application has the potential to incorporate additional job aids and tools for the management of a wider range of diseases. It can also become a valuable tool to strengthen health systems and improve quality of care through community-based delivery systems by utilizing epidemiological data for improved forecasting and supply distribution, and for providing information to the MOH and Provinces to support their decisions about targeted interventions and approaches.

Geographic Coverage: Six districts in Inhambane province, Southern Mozambique

Implementation Partners: Malaria Consortium, Dimagi, Inhambane provincial health directorate, Mozambique Ministry of Health, London School of Hygiene & Tropical Medicine, University College of London

Funder: Bill & Melinda Gates Foundation

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See References on page 89.

IVR for mLearning Platform

Delivering refresher trainings to health care providers in Senegal

SERVICE DELIVERY

Implementation date: 2013

In-service training reinforces and updates health care providers' knowledge, but it is often expensive and requires providers to leave their posts[1]. When health workers are away from their posts for training, there may be no one else to deliver health services in their place. Most mHealth applications to train health workers require smartphones or digital tablets and Internet connectivity[2,3,4,5] or use short message service (SMS) text systems to provide training, guidance, and updates[6,7,8].

The IntraHealth International-led CapacityPlus Project developed, deployed and assessed an innovative mLearning system that used a combination of Interactive Voice Response (IVR) and SMS text-messaging to deliver refresher training to family planning providers in Senegal, focusing on management of contraceptive side effects and counseling to dispel misconceptions. The course was aligned with Senegal's national policies and international guidelines[9,10,11]; it used a spaced education approach, where content is spaced and repeated over time[12,13,14].

About IVR for mLearning

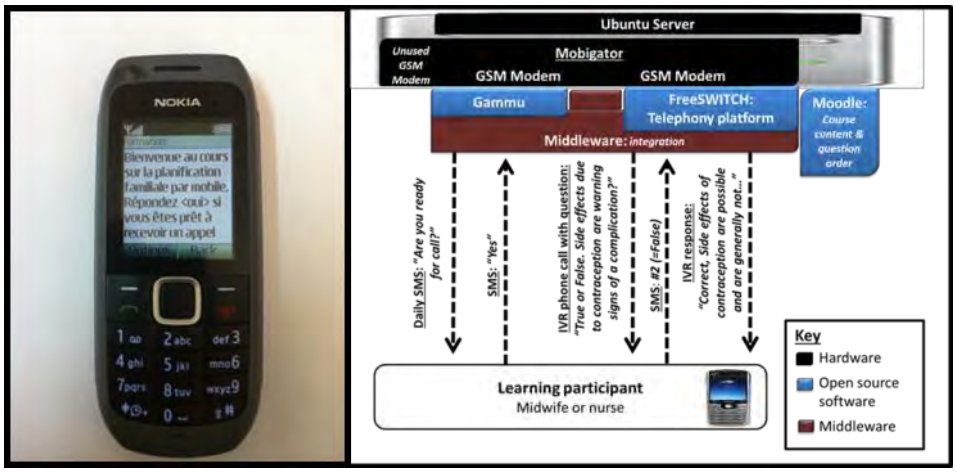
The Project used IVR technology—possible with any type of phone—to deliver information via audio recordings and allow users to provide feedback by pressing a number key. The mLearning system allows for the delivery of more robust information than SMS text but does not require Internet connectivity.[15,16] The system used a set of custom scripts ("middleware") that manage interactions between open source IVR software tools and learning solutions, including Gammu, FreeSwitch, and Moodle. The project prioritized open source technologies because of their low cost and ability to easily undergo local adaptation.

The application was piloted among 20 midwives, nurses, nursing assistants, and health agents, chosen in coordination with the Ministry of Health, in two districts in the Thiès region of Senegal.

The training content (in the form of 20 multiple-choice questions and accompanying detailed explanations on family planning) was delivered to the trainee's mobile phone and was compatible with all basic phone models. Whenever the trainee was available and ready—even if hours or days after the initial reminder—they texted the mLearning system to prompt a call. Trainees then responded to audio-recorded questions using their phone keypad. The system indicated whether the answer was correct or incorrect and provided a detailed explanation via audio recording. The same questions and explanations were delivered a second time to the trainees until all questions were answered correctly twice.

Evaluation and Results

To assess acceptability, trained data collectors visited trainees at their health posts within five weeks of course completion to administer a post-training survey about participants' opinions and experiences. To assess changes in knowledge, participants completed a written test—comprised of 20 multiple-choice and true/false questions—at an orientation to the system (pre-test), at the same time as the post-training survey (post-test), and again during a supervision visit 10 months after the training. The pilot application was carried out among a limited number of participants to allow for careful assessment and modifications before larger-scale implementation.



Participants reported that the overall experience of using a mobile phone to complete in-service training was either good (35 percent) or very good (65 percent). Participants greatly appreciated the convenience and flexibility of the mLearning system: 60 percent liked the ability to determine the course's pace and 55 percent liked being able to access the course when convenient. The largest criticism (35 percent) was poor network reception.

Overall, participants' knowledge of contraceptive side effects and misconceptions was relatively high at baseline and significantly increased ($p < 0.05$) from an average of 12.6 correct questions (out of 20) before the training to 16 out of 20 after the training. There was a slight decline in average knowledge scores ten months after the post-test (14.8 out of 20), but the gains in knowledge were still significantly higher than before the training ($p < 0.05$).

Lessons Learned

- An IVR and SMS mLearning system is appropriate, feasible, acceptable, and associated with sustained gains in knowledge
- Trainees accessed IVR most frequently during non-regular working hours and the average call duration was 13 minutes, suggesting that the training did not disrupt health workers' service delivery schedules
- Providing pertinent written materials and incorporating different interactive exercises enhances learners' experiences
- Sufficient time is necessary to pre-paid and post-paid (or contract) mobile phone mechanisms before starting course delivery

Conclusion

The IVR mLearning platform using a spaced education approach has the potential to be an effective, efficient, and low-cost means of providing refresher training and/or updates on National health guidelines, policies, and protocols (see panel). The pilot experience provides compelling evidence that the mLearning system could be scaled up to other training topics and geographic areas in Senegal and beyond.

Geographic Coverage: Two districts in Thiès region, Senegal

Implementation Partners: IntraHealth International (implementers), in coordination with the national, regional, and district Ministry of Health

Funder: USAID-Washington through the CapacityPlus project

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See References on page 89.

Malaria Community Surveillance for Elimination

Leveraging mobile phones and community health workers for malaria surveillance in Zambia

SERVICE DELIVERY

Implementation date: February 2012

Zambia has set the forward-looking goal of malaria elimination, targeting select areas before expanding efforts nation-wide. This is a very ambitious goal given the landlocked country has varied malaria risk with areas of the north possessing a very high malaria burden with more than 24 percent of children infected and the central and southern regions with far less malaria. Akros and partners developed a surveillance system that leverages community health workers (CHWs) and mobile phones to increase access to malaria testing and treatment services, provides high-resolution data and maps that illustrate hotspots, and reveals areas nearing the goal of malaria elimination.

About Malaria Community Surveillance for Elimination

There was a need to go further beyond the facility-level in diagnosing and treating malaria if Zambia is to be successful in eliminating the disease. Malaria services need to be extended to the community level, especially in the rural areas of Zambia, where these services are difficult to access. People living in these communities often have to travel long distances to access malaria services and treatment. In acknowledging this critical need, Akros and partners developed a community-level malaria surveillance system, which relies on tireless efforts of community health workers (CHWs). The CHWs were trained to diagnose and treat malaria and report these data to the central DHIS2 (District Health Information System) through java-enabled feature phones. Dashboards and feedback loops have been developed and implemented, also leveraging mHealth technologies, to ensure district and community counterparts understand and utilize data in their resource allocation and decision-making. The district dashboards created within DHIS2 provide graphs and maps showing different types of information including reporting rates, commodity stocks and malaria burden indicators, by clinic and on a monthly basis. This allows districts to monitor performance of clinics remotely and target areas that require on-site technical support or additional malaria response activities.

Evaluation and Results

This new system has revitalized malaria surveillance in eight districts of Zambia. Malaria-related data are now reported on a weekly and monthly basis by cell phone in the districts of Choma, Kalomo, Kazungula, Namwala, Pemba and Zimba in Southern Province as well as Itezhi tezhi and Mumbwa Districts in Central Province. Surveillance coverage has also been significantly improved from some 150 data points represented by health facilities to more than 1,500 data points now represented by CHWs tasked with providing services for malaria screening and treatment in their villages.

Data received provide a near real-time picture of the location of malaria hotspots as well the progress of areas towards the achievement of zero malaria cases (elimination). In the trenches of malaria elimination campaigns, the speedy, granular data provided through the community surveillance system are necessary to encourage political will and a continued push towards achievement of elimination.

Lessons Learned

- CHWs are the crucial workforce within this system; their involvement in this system is a source of pride; maintaining communication through feedback loops (via mobile phone and personal interaction) is essential
- Incentives such as providing prepaid air time vouchers for personal cell phones encourages strong reporting rates
- Keep it simple; long lists of indicators to collect are not a good choice for rural community surveillance systems
- Data must be extremely tangible and accessible to all stakeholders in order to actually be integrated into decision-making; DHIS2 dashboards have been an invaluable tool in that regard

Conclusion

As Zambia, and other countries embark on malaria elimination goals, the establishment of quality surveillance systems is crucial. Clinic-based systems are typically not enough in areas moving from the pre-elimination to elimination stages. Increasing access to care to ensure all malaria infections are identified and treated to prevent onward transmission is essential. Leveraging mHealth tools such as the use of mobile phones to capture and report data from the most rural of areas is possible and can be highly successful.

Geographic Coverage: Three provinces (four districts) in Zambia

Implementation Partners: Akros, MACEPA, Zambia Integrated Systems Strengthening (ZISSP)/ USAID, Isdell Flowers Cross-border Malaria Initiative

Funder: MACEPA, USAID, Isdell Flowers/ Zambian Anglican Council

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See References on page 89.

Mobile-based Early Detection and Prevention of Oral Cancer (mEPOC)

Mobile telemedicine model for early detection and prevention of oral cancer in India

SERVICE DELIVERY

Implementation date: June 2012

Oral cancer in India is mainly due to the widespread use of tobacco. Oral cancer is preceded by a pre-cancerous stage which is detectable by simple oral examination. Pre-cancerous lesions are asymptomatic, and often patients do not seek intervention during early stages of disease. Moreover, over 60 percent of patients present with advanced stage of disease.

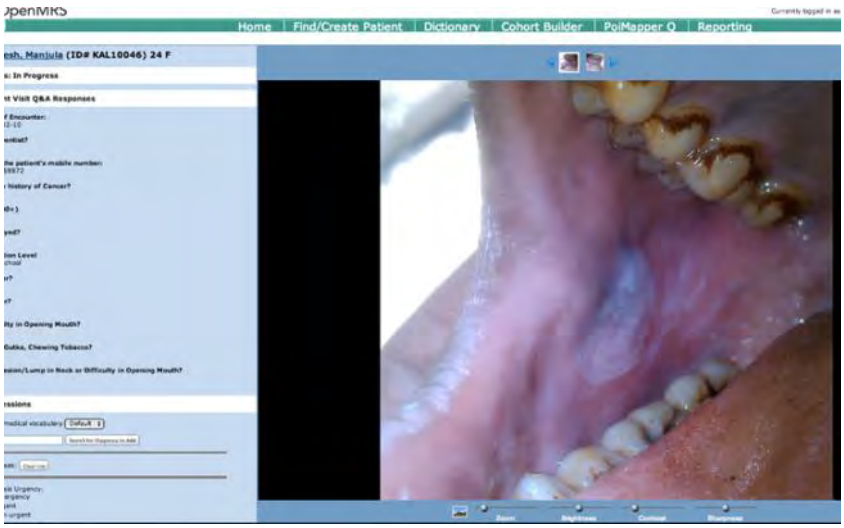
Delay in diagnosis is due to numerous factors. At the patient level, there is a limited knowledge of risk factors, low health literacy, and economics and social barriers in seeking health care. Providers have a limited knowledge of and training in screening and diagnosis, and sometimes offer inadequate services. Lastly, at the health systems level, there is a poor infrastructure and a weak system in place. These gaps present a critical opportunity for early diagnosis of oral cancer.

Evidence shows that direct visual examination of the oral cavity is a cost-effective method for oral cancer screening in resource-constrained settings. However, conventional oral cancer screening programs have several limitations, including poor patient follow-up after screening, lack of permanent portable record of medical data after screening, lack of record of visual and tactile examination data after screening, slow rates of information transfer, poor communication between primary provider and specialist, false positive referrals, and limited facilities for follow up and diagnosis. Therefore, Biocon Foundation and partners has developed a mobile telemedicine model to address some of these challenges of oral cancer screening programs for early detection of the disease. The basic principle of this model is to empower and assist primary care providers to enable early disease detection.

About mEPOC

The project used mobile phone applications, which incorporate clinical decision algorithms to assist community health workers (CHWs) and primary care providers to assess risk and diagnose oral cancer at an early stage. They can also communicate with the specialists through open Medical Record System (OpenMRS) and refer patients for treatment in a timely manner.

The Oral Cancer Screening (OCS) program is implemented with the help of mobile technology to reach out to individuals and reduce cost burden on the healthcare system. In order to implement the OCS program, Biocon first conducts a baseline survey using mobile technology to collect data. Information collected in the mobile phones is uploaded to open MRS on the Biocon server. A specialist in remote locations sends the recommendation through SMS. Lastly, the CHW informs the patient and completes the referral.



Evaluation and Results

The pilot study aimed to test the feasibility of using mobile technology to detect and prevent oral cancer.

The study was conducted in four nodal primary care centers representing different health delivery systems in rural and suburban areas in the state of Karnataka: a dental school, government public hospital, a rural private dental clinic and a non-profit community hospital. Opportunistic screening of individuals was performed in the dental school, government hospital and the rural dental practice, whereas, targeted screening of high-risk frontline health care workers did individuals in a community setting.

The oral cancer screening application on an Android based mobile phone was integrated with openMRS for portability and used by primary providers to collect data during screening. This application enabled capture of text and image data of oral lesions during the screening. The primary providers or health workers uploaded all data obtained during screening from the phone to open MRS, which could be accessed at a remote site by an oral medicine specialist. The specialist made recommendations for further follow-up or biopsy.

Compliance rate for follow-up, biopsy and definitive treatment at a cancer center was monitored through openMRS. A total of 1,680 individuals were examined, 1,440 through opportunistic screening in the dental clinic and dental school and 240 by front line community health workers.

Approximately 129/1,680 individuals were identified with oral lesions and recommended for further follow up or biopsy. Among those screened, 62 individuals (48 percent) followed up and underwent biopsy of oral lesions. Of those who underwent a biopsy, 54 patients (87 percent) had a positive result of a premalignant or malignant lesion, and the remaining eight patients were normal.

Our experience suggests that using mobile technology for a cancer-screening program in resource-constrained settings is feasible.

The total number of people screened in the population-based screening (3,179), camp model (626) and work place model (1,757) was 5,562.

Lessons Learned

- This application provided clinical decision support, which strengthens health care provider in proper screening and diagnosis of oral cancer
- Frontline health care providers can be utilized for early oral cancer detection program
- Electronic Data Capture is reliable modes to improve the compliance for follow up
- Intra-oral photographs serve as a good tool to create awareness and educate on importance self examination of the mouth

Conclusion

mHealth approach for oral cancer early detection is feasible. Using front line health care providers will be one of the best approaches to down stage oral cancer.

Geographic Coverage: South Karnataka and Bangalore, India

Implementation Partners: Biocon Foundation, Bangalore, KLE Institute of Dental Sciences, Bangalore, Axxonet System Technologies Pvt Ltd. Bangalore

Funder: Biocon Foundation

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See References on page 89.

Mobile Phones for Improved Access to Safe Water (M4W)

Strengthening monitoring and evaluation of water, sanitation and hygiene in Uganda

SERVICE DELIVERY

Implementation date: October 2011 to present

Mobile Phones for Improved Access to Water (M4W), is an initiative aimed at improving the functionality of rural drinking water sources and strengthening operations and support mechanisms. The project has been running from October 2011 across eight pilot districts in Uganda (Amuria, Arua, Kabarole, Kasese, Katakwi, Kyenjojo, Lira and Masindi Districts).

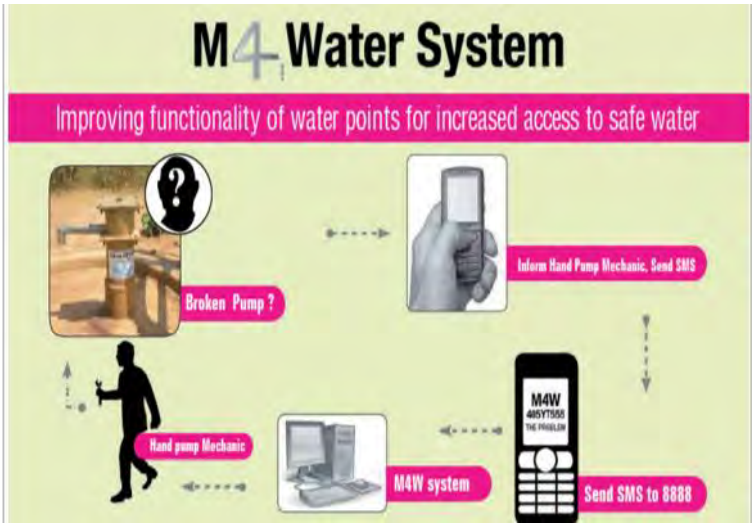
This collaborative initiative, implemented by The Netherlands Development Organization SNV, IRC/Triple-S, Makerere University, Water Aid Uganda and the Ministry of Water and Environment (MWE), has documented many successes including availing regular water sanitation and hygiene (WASH) monitoring data to the District Water Offices (DWOs). The Project has reduced the response time to fix non-functional water sources in participating districts, resulting in the community's increased access to and utilization of safer water sources.

Through M4W, a consumer can notify (via text) the system, which is hosted at DWO. The water source is fixed usually within a short period of time, depending on the vigilance of Water Source Committee (WSC) or the DWO. Overall, M4W is an information sharing and management system that ensures safer rural water sources remain functional.

About M4W

The M4W system, designed by Makerere University College of Information Science and Technology, uses multiple technology platforms (computers and mobile phones) and provides information to various stakeholders at sub-national and national levels. The District Water Management Information System (DWMIS), a module of the system, enables DWOs to monitor water points via internet. Data are accessible on the M4W website and through the M4W system, depending on the user. Information on functionality, location of the water sources and management are available through Google maps.

When reporting a problem, the user sends a text message to code '8888', providing the source identification number and type of problem. Once the system is notified, it generates an SMS which is automatically sent to the relevant Hand Pump Mechanic's (HPM) phone. Upon receiving the message, the HPM goes to the source in question to assess the magnitude of the fault. For minor faults, the HPM advises the WSC on



the necessary action. For major faults, the DWO is informed accordingly. Each fault attended to by the HPM is reported to the system and the user is also given feedback. In short, the system was designed to reduce the time taken to report and respond to faults on water sources.

Evaluation and Results

Improved response to Non-functional Water Sources: Maintenance of safer water sources has improved in the pilot districts. Participating HPMs were recruited and trained by the M4W stakeholders. Since M4W's initiation, approximately 1,561 messages have been received, of which 377 water sources have been fixed. This represents 24 percent of the water sources that have been repaired in all the eight pilot districts on basis of the messages received.

Cheaper Option for Acquisition of WASH Monitoring Data: The M4W system has provided an opportunity to use ICT to support monitoring of WASH sector activities, locally and nationally. A total of 9,278 water sources are currently being monitored under the M4W initiative. In 2011, the baseline data collected revealed that at least 19 percent of the water sources that existed in the pilot districts, had not been captured on the MWE database. Estimates reveal that it would cost an estimated $314,080 for national deployment of the system in all the 111 districts in the country together with an additional $46,080 for subsequent recurrent costs, annually. If implemented, the $314,080 budget would suffice for MWE to update the national data base periodically, compared to spending about $1million for the same purpose – a savings of over $650,000.

Lessons Learned

- Political support determines the success or failure of an initiative
- Use of existing local government structures was a core strength that contributed to results of the initiative; moreover, using existing enables scale-up across the country
- A collaborative initiative like M4W requires all involved stakeholders to fulfill their roles. i.e. water users have to continue paying for services, HPM are motivated in timely manner, DWO is responsive
- The M4W system would work better with a business model designed around it e.g. in a scenarios where private operators are responsible for maintenance and lose money when water is not flowing
- For the M4W system, communities must send messages on faulty water sources and they also must contribute money for operations and maintenance through their WSCs on regular (monthly) basis if the system is to work properly.

Conclusion

The M4W initiative is a real potential for improving response to non-functional drinking water sources in the rural areas of Uganda, therefore increasing access to safer rural water sources. The system uses the existing government structures at national and district level for collecting and reporting WASH related data. The system currently provides instant data which is useful for updating DWMIS and is also being considered for updating the national data base through the MIS.

Geographic Coverage: Eight Districts in Uganda (Amuria, Arua, Kabarole, Kasese, Katakwi, Kyenjojo, Lira and Masindi)

Implementation Partners: IRC International Water and Sanitation Centre, SNV Netherlands Development Organisation, Water Aid Uganda, Ministry of Water and Environment – Uganda, Makerere University College of Computing and Information Technology

Funder: African Transparency and Technology Initiative, SNV Uganda and WaterAid in Uganda

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See References on page 89.

Mobilise!

Mahantesh, Soukhya Project

Mobile technology provides support services for domestic violence prevention and response in India

SERVICE DELIVERY

Implementation date: February 2011 to January 2014

Domestic violence (DV) is highly prevalent in India and surfaces in a multitude of forms. Since the 'Nirbhaya' case surrounding the 2012 gang rape in Delhi, Indian-led efforts to prevent and respond to DV have been gaining unprecedented momentum. The Mobilise! Project builds on DV research and programmatic experiences in Bangalore and other parts of India. Documentation shows that women experiencing DV are likely to participate in and seek out health care services, but seldom approach DV support services directly. With considerable public and private investments in maternal and child health services, women's utilization of primary health care facilities in India has increased sharply in recent years. These health facilities offer a key entry point for DV prevention and response interventions. The Mobilise! Project examines health system-based interventions to address DV.

About Mobilise!

Jointly implemented by Dimagi, RTI International, St. John's Research Institute and other local partners in 30 health centers in Bangalore, the Mobilise! Project's primary goal is to apply mobile technology innovations towards strengthening services in response to and prevention of gender-based violence (GBV), particularly DV. A core aspect of this project is the implementation and evaluation of a primary health care system-led response to DV. Developing recommendations around mobile technology can support this response in a sustainable and scalable way in Bangalore and India at large. The mHealth tools developed under this project are built upon Dimagi's open source mobile technology platform, CommCare, which is specifically designed for supporting frontline service delivery in low-resource settings.

Mobilise! has developed four specific mHealth tools:

1. mTrainer: A mobile-facilitated participatory training program to build primary health care providers' knowledge and skills to address DV, using various applications including a checklist, polls and scenario-based games
2. mSoukhya: A tool to support primary health care providers in their identification of and response to women experiencing violence; mSoukhya includes an application that promotes providers' adherence to a DV adherence protocol, provides key messages to women, and supports documentation of service provision
3. mShakti: A tool for community outreach workers to raise awareness about DV and its adverse health impacts, as well as services available through the primary health care system

4. mSupervise: A tool for health care workers engaged in the supervision of the health systems' responses to DV

Additionally, a mobile-based survey tool using the CommCare platform has been developed to evaluate the impact of the health systems' intervention on providers' knowledge, attitudes and practices, as well as women's perceptions and use of DV-related services in the community.

Based on initial findings, the project has been awarded an additional $500,000 grant from USAID to scale-up the program. This involves creating standard GBV training mobile apps for primary health care providers, improving supervision and performance of mobile users, providing self-learning modules for mobile users, and building a GBV CommCare app library.

Evaluation and Results

A proof of concept (POC) study conducted in Bangalore showed that using CommCare as an mHealth tool is feasible, acceptable and potentially effective in supporting the implementation, monitoring, evaluation and scale-up of a health systems' response to DV. Specifically, the study found that the CommCare mHealth tools can be effective interventions in enhancing case management and the quality of care offered to women who have experienced DV. As part of the Mobilise! Project's scale-up activities, a more rigorous evaluation of the role of mHealth tools in promoting a response to DV is currently being implemented.

As part of the initial proof of concept, the intervention was conducted in 18 centers (nine each in intervention and control arms). The intervention arm involved 10 nursing staff using the CommCare app. In all, 38 cases were identified during the course of the year-long POC, of which 28 belonged to intervention sites and ten to the control. Most of the cases were identified in the immunization clinics. During general clinics, probing for injury marks also revealed violence. Cases were also identified in the field during door-to-door visits, with few women calling the Soukhya project counselors directly after attending the community outreach programs.

Lessons Learned

- Although mHealth tools are acceptable and feasible in the context of a public primary health care system, intensive advocacy is needed to promote broader adoption and sustained use
- Political commitment and administrative leadership are essential to ensure adoption, consistent and wide scale implementation, and sustained use of mHealth tools for DV response and prevention
- mHealth tools need to be developed and evaluated to disseminate prevention messages to women in the community served by primary health care centers

Conclusion

Initial results from the Mobilise! Project indicate that there is a role for mHealth tools in DV prevention and response initiatives. Development and testing of a menu of applications to promote the implementation, monitoring, supervision and scale-up of programs addressing DV is a priority in India. Furthermore, advocacy for greater political commitment and policy change to advance DV prevention and response are urgently needed in order to ensure that evidence-based mHealth tools are adopted and used in a sustainable fashion.

Geographic Coverage: Urban Bangalore, India

Implementation Partners: Dimagi Inc., RTI International, St John's Research Institute, Bruhat Bengaluru Mahanagara Palike (BBMP)

Funder: USAID

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See References on page 89.

Peek Vision

Delivering comprehensive affordable eye care in Kenya

SERVICE DELIVERY

Implementation date: January 2013 - March 2014

Ophthalmic health is an important public health issue particularly because eye-related morbidity can have major impacts on other aspects of social development, including quality of life and level of productivity, particularly in developing countries.

According to the World Health Organization, 285 million people worldwide are visually impaired and 39 million of these people are blind. However, 80 percent of blindness is avoidable. Moreover, a disproportionate 90 percent of blind people live in low-income countries and it is these areas of greatest need where patients do not have access to diagnostics or treatment.

During the planning and implementation of Africa's first eye cohort study (The Nakuru Eye Cohort) by the International Centre for Eye Health in Kenya, the need arose to make ophthalmic screening portable, bringing services to the patient. There was a clear need to use portable equipment while maintaining the rigorous standards of care for ophthalmic screening. The Portable Eye Examination Kit, known as Peek, is a smartphone-based system that carries out a full range of ophthalmic diagnostic tests in even the remotest of settings where clients are often unable to seek out screening and diagnostic services.

About Peek Vision

In low-income countries, more people have access to mobile phones than running water. Peek presents a solution to support eye care systems where those most in need are the least likely to access care. A team of ophthalmologists, developers and engineers have created a mobile app and clip -on hardware that transforms a low-cost Android smartphone into an eye examination and diagnostic suite, capable of running a range of tests, including visualization of the back of the eye. It is easy to use, affordable and portable. A health worker with minimal training can use Peek to gather detailed clinical information. Images are graded and patients diagnosed, either through an automated process, or via cascading of digital images to a network of experts around the world. Peek can diagnose blindness, visual impairment, cataracts, glaucoma, macular degeneration, diabetic retinopathy and other retinal and optic nerve diseases and crucial indicators of brain tumor and hemorrhage. The system stores contact information and GPS data for each patient. Google-map integration allows a novel way to follow-up and treat patients. More broadly, such technology allows coordination of services, to target mass treatment campaigns to the regions of greatest need.

Evaluation and Results

A large validation study was conducted comparing Peek alongside conventional reference standard equipment which was used on approximately 2,500 study participants as part of the Nakuru Eye Disease Cohort Study, in Kenya.

Close to 50 percent of participants in the follow up study (>1,000 participants) were examined using both Peek and standard screening exams. The results obtained from standard diagnostic equipment and Peek application and hardware are being compared to determine if Peek is as sensitive and specific as conventional eye examination equipment and the levels of agreement. Among the 1,000 participants, all have received some form of treatment. Some of the participants had sight improved-restored with surgery or glasses. Analysis is now ongoing with a target of publishing the results in a peer-reviewed journal in 2014.

Lessons Learned

- The portability of screening services allows a larger proportion of the population to be screened, reducing missed opportunities to address avoidable blindness, particularly among hard to reach populations
- The system has to be developed on the ground and in the local context with feedback from the population it will be serving
- Build communication channels for constructive feedback and improvement of mHealth tools
- mHealth does not work in isolation from the healthcare providers and recipients and therefore expectations must be appropriate

Conclusion

Peek has the potential to reduce avoidable blindness, particularly in low and middle-income countries. Based on results of the validation study in Kenya, there are opportunities to introduce utilization of Peek in other countries where there is great need. A strong evidence base is required for uptake and ongoing engagement with the existing health infrastructure to help strengthen, rather than replace models of delivering health care.

Geographic Coverage: Kenya

Implementation Partners: LSHTM, University of Strathclyde, NHS Glasgow Centre for Ophthalmic Research

Funder: The Queen Elizabeth Diamond Jubilee Trust

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The Queen Elizabeth Diamond Jubilee Trust | Dr. Andrew Cooper (andrew.cooper@qejubileetrust.org)

See References on page 89.

The Referral Exchange System (SIJARIEMAS)

Reducing obstetric and newborn emergencies through the use of information and communication technologies in Indonesia

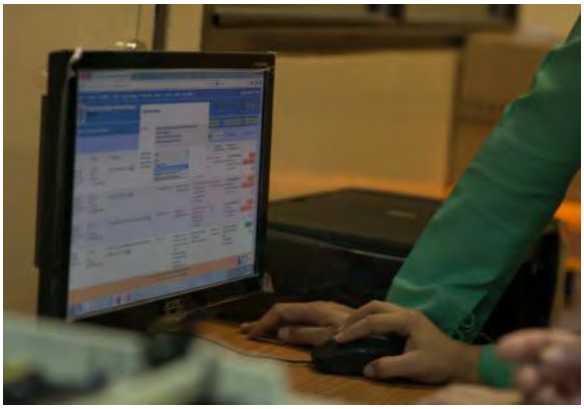
SERVICE DELIVERY

Implementation date: 2011 to 2016

Indonesia's maternal mortality rate (359 maternal deaths per 100,000 births) is one of the highest in South East Asia[1]. In the event of an obstetric or newborn emergency, an efficient patient referral system between health centers and hospitals can save lives. The current referral system in Indonesia has bottlenecks, delaying care for both pregnant women and newborns. Challenges include delays in patients seeking care, in patients being referred, and in providing adequate care to patients. Poor coordination and communication between facilities and health providers is a major factor that contributes to delays. In addition, most health facilities and hospitals are frequently ill-prepared to manage incoming emergencies, sometimes resulting in patients being referred to multiple hospitals before receiving treatment.

About SIJARIEMAS

The SIJARIEMAS system was developed to address those challenges by facilitating timely communication and improved coordination within an agreed upon referral network (public and private facilities and health providers). The system utilizes SMS, internet and phone calls to initiate and manage the referral process. Upon identifying an obstetric or newborn emergency, a health center-based midwife sends an SMS with patient data, vital-signs, diagnosis and pre-treatment information to the SIJARIEMAS system. The system automatically routes the information to the nearest hospital per the referral pathway pre-registered in the system. Upon receiving the notification, an alarm is activated in the hospital emergency room, maternity ward and/or newborn ward. Referral hospital staff assess whether they are able to handle the patient (based on diagnosis, bed availability, clinical equipment, etc.) and either accept, reject the referral. If accepted, the incoming referral notification is automatically forwarded to the emergency team so they will be prepared to receive incoming referral with specific complication/diagnosis. The midwife who initiated the referral, will then receive SMS confirmation about the destination hospital and the stabilization advice from specialist. If rejected, the system automatically routes the message to the next closest, pre-selected hospital. During the process, the midwife of the referred patient will receive guidance from specialist at the hospital on the stabilization treatment that is needed prior to transporting the patient. The midwife is kept up to date about the patient's referral status at receiving hospitals and is alerted via SMS with follow up guidance after the patient is discharged and sent to the facility where they have been referred.



The data collected through the system are being used to improve the hospital, health centers accountability, transparency as well as to encourage community participation. Through the system, the District Health Office (DHO) have access to monitor all referral cases and referral services in the district in real time as well as the director of hospital for their hospital only.

SIJARIEMAS was designed based on intensive care patients' needs assessment and engaging local stakeholders to map out the optimal referral pathway in any given district between health centers and hospital. There was also a critical need develop the standard operating procedures for the referral process. The software was developed using open source software.

Evaluation and Results

SIJARIEMAS has been deployed in six provinces and 23 districts in Indonesia. The system has networked over 13,000 health providers, 700 health facilities and has facilitated over 19,500 obstetric and newborn referral cases. Among all cases, 79 percent of cases are responded to within ten minutes.

Based on the testimonial from the users, the system gives certainty and self-confidence to the midwife who referred the case, as "tour the hospital" cases are minimized because the midwife receives an SMS confirmation from the destination hospital that ready to receive the patient. For the receiving hospital, the advance notification ensures they are prepared to receive the emergency referral patient. Lastly the DHO has more accurate referral data for analysis of the emergency referral system in real time.

SIJARIEMAS data show that the number of referral cases facilitated and the number of health providers and facilities registered in the referral system, is increasing. The adoption of the referral system by local stakeholders (DHO and Hospital) has gone beyond initial expectation. All districts and hospitals have been allocated funds (the local budget) to participate in the referral system.

Lessons Learned

- It is important to provide numbers of communication channels to accommodate different communication preference of midwives
- Increasing the number of health providers and facilitates linked into the system will increase the effectiveness of SIJARIEMAS
- There are constraints in using the technology such as mobile network signal and coverage, power outages and internet connectivity

Conclusion

Midterm Review of EMAS Program, indicates that the SIJARIEMAS has substantial acceptance, useful and feasible for districts and health facilities. The intervention is an important and effective driver of for the improvement of referrals in the district. Lastly SIJARIEMAS provides important source of data, from which analysis can be done to understand weaknesses and strengthen the referral system, greatly contributing to the reduction in obstetric or newborn emergencies.

Geographic Coverage: 23 districts in six provinces (North Sumatera, Banten, West Java, Central Java, East Java, South Sulawesi) in Indonesia

Implementation Partners: JHPIEGO (prime), RTI International, Save the Children, Muhammadiyah, Budi Kemuliaan

Funder: USAID

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See References on page 89.

The Safe Delivery App

Utilizing smartphones to improve the quality of emergency obstetric and newborn care in Ethiopia

SERVICE DELIVERY

Implementation date: 2014 to 2017

In 2013, more than 290,000 women died from pregnancy related causes globally and 42 percent of all under-5 deaths occurred in the neonatal period. In sub-Saharan Africa, which accounts for almost half of all maternal deaths, a woman faces a one in 39 lifetime risk of dying due to pregnancy or childbirth-related complications, in sharp contrast to one in 3,700 among women in developed countries. In addition, sub-Saharan Africa also has the highest neonatal mortality rate globally with 31 out of 1,000 babies dying within the first 27 days of life. Improving health workers' knowledge and skills managing emergency obstetric and neonatal care is essential to reducing maternal and perinatal deaths. However, most complications happen in the peripheral part of the health system, where health workers are difficult to reach through conventional training programs. As such, there is a huge unmet need to overcome the current outreach gap and find innovative, cost effective solutions to strengthen health worker skills and quality of care in developing countries.

About The Safe Delivery App

The Safe Delivery App was developed by the Maternity Foundation, in collaboration with University of Copenhagen. It is a smartphone application that aims to improve the quality of emergency obstetric and neonatal care. It is designed to train birth attendants in developing countries in the management of normal and complicated deliveries and to overcome conventional barriers such as reaching peripheral health facilities with quality training; training health workers with low literacy; low retention of skills.

The Safe Delivery App currently contains three animated clinical instruction films on manual removal of the placenta; postpartum hemorrhage; and neonatal resuscitation.

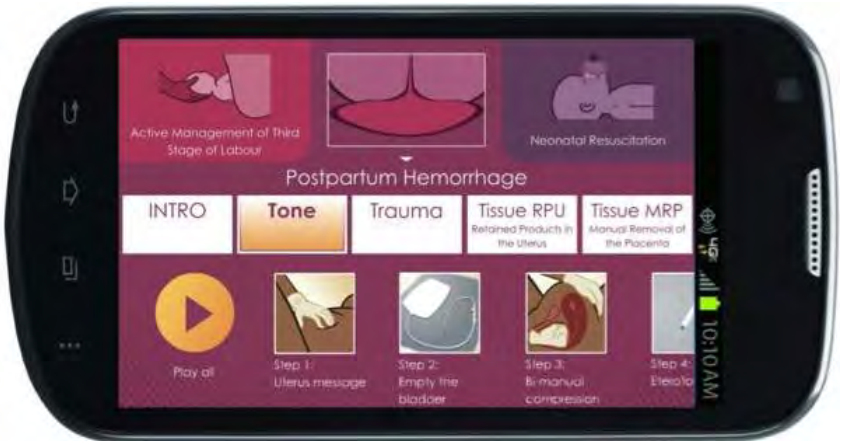
Additionally, the application features push messages with quiz questions spurring the health worker to use the application to update their knowledge and enables easy access to essential drug and equipment lists. The application can also be used as a reference tool during clinical work. The tool is useful in various scenarios such as preparation before attending a birth, a situation where a complication occurs or for debriefing and self-evaluation after a complication.

The application can be preinstalled on the phone and it is therefore not a requirement to have network connection or internet access with the phone.

Evaluation and Results

Cluster randomized control trials are being conducted in Ghana and Ethiopia to assess the effectiveness of the Safe Delivery App in increasing/improving health worker knowledge and skills, increasing successful neonatal resuscitations and reduced occurrence of postpartum hemorrhage.

The preliminary midterm results from the research study show a remarkable increase in the skill level of the health workers and midwives, who have been working with the Safe Delivery App for a six-month trial period. Although the results are preliminary at this point, they indicate that skill levels improve the most, where capacity building is needed the most: in the peripheral parts of the health system, which can be very challenging to reach through conventional training programs.



Furthermore, the Safe Delivery app has been very well received by both end-users and global health experts.

One health worker expresses the use of the app state: "If I have a problem, I can find exactly the procedure I need in the app - it is like LIVE for me. So this mobile app is like my new best friend, whom I will be working together with to serve my community" (Tadelu, Health extension worker in Gimbie, Ethiopia).

The final conclusions with results and final assessments will be ready by the beginning of 2015.

Lessons Learned

- End-user feedback about the tool have underscored the need for health workers to have easy-to-access and high-quality clinical instruction and tutorial material – especially in rural areas where refreshment trainings are scarce
- Mobile solutions such as the Safe Delivery App can strengthen access to essential MNCH care in low-resource settings
- As the tool communicates visually and in local language it overcomes low literacy and language barriers; Hereby it empowers health workers to improve their skills and knowledge

Conclusion

The Safe Delivery App overcomes the conventional outreach barriers of low literacy and reaching peripheral health facilities by being easily adaptable, communicating visually and in local languages. Thus, the Safe Delivery App overcomes the outreach barriers of conventional training programs in an innovative, cost-effective way and holds a huge, scalable potential.

Because of the promising midterm results, Maternity Foundation, University of Copenhagen and University of Southern Denmark are currently developing an additional five clinical instruction films, so that the Safe Delivery App will address all major life threatening MNCH-related complications. These films include Pregnancy Induced Hypertension/Pre-eclampsia; Post Abortion Care; Sepsis; Prolonged Labor; and Early Neonatal Management. The full app will be tested in an implementation study in 2015/2016 and then rolled out with key players in sub-Saharan Africa.

Geographic Coverage: Pilot test is being conducted in five districts in West Wollega Zone, Ethiopia: Gimbie, Homa, Haru, Nole, and Genji.

Implementation Partners: Maternity Foundation, University of Copenhagen, and University of Southern Denmark

Funder: Merck for Mothers' Global Giving Program

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See References on page 89.

ANNEXES

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Districts : Select
Target Area : 588_31
Date
View Target Area Stats
610 27
434 150
446 126
100%
66-99%
33-66%
1-33%
0%

ANNEX 1: Volumes One to Three Compendium Case Studies

mHEALTH COMPENDIUM EDITION ONE CASE STUDIES

BEHAVIOR CHANGE COMMUNICATION

Chakruok Interactive Radio Program
CycleTel™
iCycleBeads™ Smartphone Apps
La Ligne Verte Family Planning Hotline
Mobile 4 Reproductive Health (m4RH)
SMS and IVR to Improve Family Planning Services
Text Me! Flash Me! Call me!
Workplace-based SMS Awareness Campaign

DATA COLLECTION

Automating Data Collection for HIV Services
Child Status Index (CSI) Mobile App
EpiSurveyor/Magpi
Integrated Health Systems Strengthening Project – IHSSP: RapidSMS
JSI Early Warning System

FINANCE

Changamka Maternal Health Smartcard
Mobile Finance to Reimburse Sexual and Reproductive Vouchers

LOGISTICS

cStock
Delivery Team Topping Up System
Integrated Logistic System – ILSGateway
International Quality Short Message Services (IQSMS)
Mobile Product Authentication MPA
mTrac: Monitoring Essential Medicine Supply
Tupange SMS Community Tracking System

SERVICE DELIVERY

CommCare for Home-Based Care
Community IMCI (cIMCI)
eFamily Planning (e-FP)
eNutrition
Maternal Health (Antenatal and Postnatal Care)
mHealth for Safe Deliveries in Zanzibar
Mobiles for Quality Improvement (m4QI) – SHOPS Project
MOTECH Suite
Project Mwana – SMS for Early Infant Diagnosis of HIV
SIMpill® Medication Adherences Solution
Supportive Supervision (SS) for TB in Nigeria
The Malawi K4Health Mobile Learning Pilot

mHEALTH COMPENDIUM VOLUME TWO CASE STUDIES

BEHAVIOR CHANGE COMMUNICATION

CommCare for Antenatal Care Services in Nigeria
JustTested: SMS-Based Support and Information for HIV Testing and Counseling Clients
MAMA Bangladesh
MAMA South Africa
Tobacco Kills: Say No & Save Lives
Wazazi Nipendeni (Parents, Love Me): mHealth Initiative to Support Maternal Care in Tanzania

DATA COLLECTION

Community-based Health Promotion for Safe Motherhood using mHealth
DataWinners Platform
iHRIS and Mobile Reference Dictionary
iPhones for Malaria Indicator Survey
The Last 10 Kilometers: What it Takes to Improve Health Outcomes in Rural Ethiopia
Mobile Phone Microscopy for the diagnosis of Parasitic Worm Infections
OpenHDS

FINANCE

Heartfile Health Financing - an mHealth enabled innovation in health social protection
Jamii Smart | KimMNCHip—referrals, mSavings and eVouchers
Tanzania National eVoucher Scheme
transportMYpatient: Facilitating access to treatment for obstetric fistulae

LOGISTICS

Enat Messenger for Maternal Health in Ethiopia
Mobile Phone Survey Software for End-Use
mPedigree
mTRAC Stop Malaria Program (SMP)

SERVICE DELIVERY

AliveCor Heart Monitor - Mobile ECG
FioNet: Mobile Diagnostics Integrated with Cloud Information Services
GxAlert
MarieTXT: A Mobile Powered Management Information System
mCARE: Enhancing Neonatal Survival in Rural South Asia
txtAlert for Patient Reminders

mHEALTH COMPENDIUM VOLUME THREE CASE STUDIES

BEHAVIOR CHANGE COMMUNICATION

Heart Health Mobile

Mobile Integrated Resources for Aurat-Women (MIRA) Channel

NightWatch: Mobile

Wired Mothers

DATA COLLECTION

Child Profiling Survey

Global Trachoma Mapping Project

Malaria Control Program (MACEPA)

Real-Time Biosurveillance Program

ZiDi

FINANCE

Interactive Alerts

mHealth for Safe Delivered: Ezy Pesa mobile banking services

Pona na Tigo Bima

LOGISTICS

Fone Astra

Project Optimize: Albania

SMS for Life

SERVICE DELIVERY

ACT of Birth, Uganda

Baby Monitor

eNUT

Mobile Media Rich Interactive Guidelines

MobiUS Ultrasound

mSakhi

Pre-eclampsia Integrated Estimate of Risk (PIERS) on the Move

Sky Social Franchise Network

SMART

The First, Second and Third Volumes of the Compendium are available at www.africanstrategies4health.org/resources.

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No-Yawa

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