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mHEALTH
COMPENDIUM
SPECIAL EDITION 2016:
REACHING SCALE

May 2016

This publication was produced for review by the United States Agency for International Development. It was prepared by the African Strategies for Health (ASH) project implemented by Management Sciences for Health (MSH).

mHEALTH COMPENDIUM

SPECIAL EDITION 2016: REACHING SCALE

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 project funded by the United States Agency for International Development (USAID) and implemented by Management Sciences for Health (MSH). ASH works to improve the health status of populations across Africa through identifying and advocating 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.

May 2016

This document was submitted by the African Strategies for Health project to the United States Agency for International Development under USAID Contract No. AID-OAA-C-II-0016.

Recommended Citation: Sherri Haas. May 2016. mHealth Compendium, Special Edition 2016: Reaching Scale. Arlington, VA: African Strategies for Health, Management Sciences for Health.

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Acknowledgements

This compendium was produced by the African Strategies for Health (ASH) project in collaboration with the US Agency for International Development's Africa Bureau (USAID/AFR). Funded by USAID/AFR, the overall objective of ASH is to contribute to improving 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 across the continent to USAID and other development partners to enhance decision-making regarding investments in health.

Sarah Konopka, JoAnn Paradis, Stephanie Rotolo, and Cindy Shiner contributed to the production of this document. Report design was by Erin Dowling Design. We extend our

thanks to USAID and, in particular, Ishrat Z. Husain from USAID's Africa Bureau, as well as Peggy D'Adamo from the Global Health Bureau, for their support and inputs.

Our gratitude goes to the organizations and individuals who took the time to share their knowledge and experiences by contributing the mHealth program profiles featured in this report. 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 worldwide 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

AEFI	adverse events following immunization	ITU	International Telecommunication Union
API	application programming interface	IVR	interactive voice response
ASH	African Strategies for Health	JICA	Japan International Cooperation Agency
BCC	behavior change communication	JSI	John Snow International, Inc.
BTRC	Bangladesh Telecommunications Regulatory Commission	KEMRI	Kenya Medical Research Institute
CBMNH	community-based maternal and neonatal health	mACM	Mobile Alert Communication Management
CDC	U.S. Centers for Disease Control and Prevention	MAMA	Mobile Alliance Maternal Action
CHW	community health worker	MCH	maternal and child health
CHMI	Center for Health Market Innovation	MCTS	Maternal and Child Tracking System
CSR	corporate social responsibility	MNCH	maternal, newborn, and child health
DFID	UK Department for International Development	MNO	mobile network operator
DHIS2	District Health Information Software 2	MOH	Ministry of Health
DOH	Department of Health	MOHFW	Ministry of Health and Family Welfare
DPAT	district product availability team	MOTECH	Mobile Technology for Community Health
DSRU	Disease Surveillance and Response Unit	MSH	Management Sciences for Health
EM	enhance management	NAC	National AIDS Council
EPT	efficient product transport	NGO	non-governmental organization
FAQ	frequency asked questions	NHM	National Health Mission
FHIR	Fast Healthcare Interoperability Resources	NPAT	national product availability team
HC	health center	OGAC	Office of the U.S. Global AIDS Coordinator
HIP	high-impact practice	PBF	performance-based financing
HIS	health information system	PRSP	premium rate service provider
HISP	Health Information Systems Program - SA	RMNCH+	A reproductive, maternal, newborn, child and adolescent health
HSA	health surveillance assistant	S4CCM	Supply Chains for Community Case Management Project
HRIO	health records information officer	SDG	Sustainable Development Goal
HRIS	human resources information system	SMS	short message service
iCCM	integrated community case management	SOP	standard operating procedure
ICT	information and communication technologies	TOT	training of trainers
IEC	information, education, and communication	USAID	United States Agency for International Development
ICT4D	information and communication technologies for development	USAID/AFR	United States Agency for International Development's Africa Bureau
IDSR	integrated disease surveillance and response	USSD	unstructured supplementary service data
IHSSP	Integrated Health Systems Strengthening Project	WASH	water, sanitation, and hygiene
IMCI	integrated management of childhood illnesses	WHO	World Health Organization
IT	information technology		

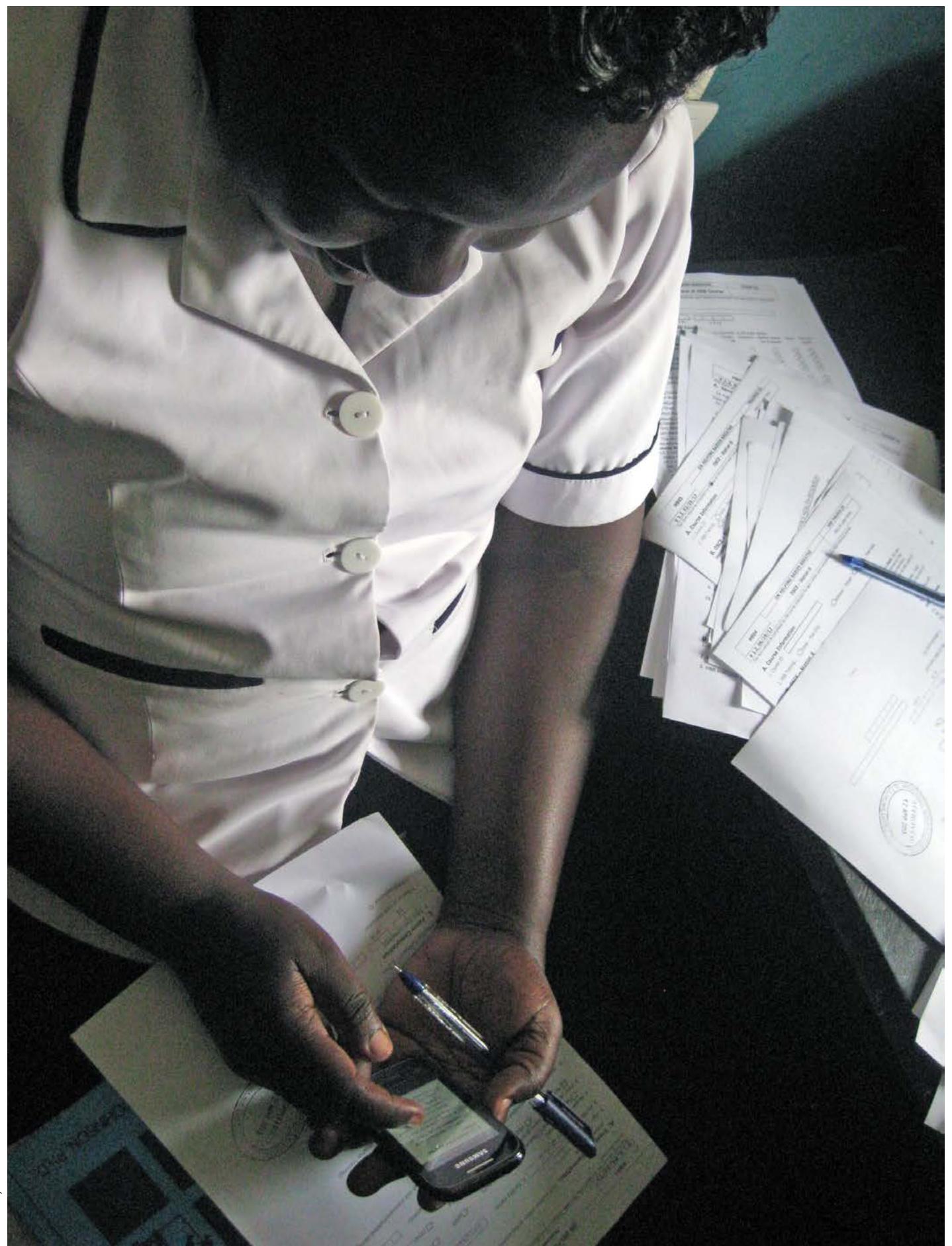


Photo by mHBB

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NOTE:

This special volume of the mHealth compendium features ten scale-up cases, offering project descriptions, publication references, and contact information for making further inquiries.

When using in a PDF format, resources and contacts can be accessed with a simple click on the email or website address appearing in both text and references.



Executive Summary

MHealth is the use of mobile and wireless technologies to support the achievement of health objectives. The rapid growth in access to mobile phones and networks in Africa has created opportunity for mHealth programs to positively impact the health of Africans. mHealth programs have the potential to contribute to innovative solutions to health system challenges including: (1) disparities in access to health services; (2) inadequacies of health infrastructure; (3) limited human resources for health; (4) cost to the individual of accessing health services; and (5) challenges in health financing.

The United States Agency for International Development's Africa Bureau project, African Strategies for Health (ASH) has produced five volumes of the mHealth Compendium to help USAID missions, governments, and health implementing organizations access information on a range of mHealth example programs. mHealth Compendium Volumes 1-5 document over 150 case studies of mHealth programs and applications being implemented mainly throughout Africa, but also in other regions of the world. The compendium volumes offer project descriptions, publication references, and contact information for making further inquiries.

mHealth Compendium Volumes 1-5 include two-page case studies of current or closed mHealth applications or programs with an introduction to the health area or problem; a description of the mHealth intervention; a snapshot of

important results or evaluation findings; lessons learned; and conclusion. In addition, each case study includes a summary of the geographic coverage, implementation partners, donor name(s) and contact(s), as well as contact information for the implementing partner. As the mHealth landscape has evolved and more programs and countries look to establish scaled, sustainable programs utilizing digital technology, the need for in-depth profiles of mHealth interventions or programs which have successfully grown in scale has grown. This *Special Edition 2016: Reaching Scale* was developed to provide greater detail on the development and experience of mHealth programs which have successfully grown in scale. The ten profiles featured in this volume were submitted by the programs. They were selected following a survey of current intervention status sent to previously featured programs, with an intention to select a range of intervention types, locations, and partner organizations. This list is not exhaustive of scaled mHealth programs.

Profiles of programs featured in the mHealth compendiums can also be accessed on ASH's online mHealth Database. The database facilitates a quick and targeted search for applications based on health area, application type, and location. The compendiums, database, and additional digital health resources can be downloaded at www.africanstrategies4health.org.

INTRODUCTION

Photo by Aponjon







What is mHealth?

MHealth is the use of mobile and wireless technologies to support the achievement of health objectives. mHealth can be utilized for a wide variety of purposes, including health promotion and disease prevention, health care delivery, training and supervision, electronic payments, and information systems. A 2009 global survey conducted by the World Health Organization (WHO) in 114 member states found that 83 percent of them were implementing mHealth services that fell into 14 distinct categories: health call centers, emergency toll-free telephone services, managing emergencies and disasters, mobile telemedicine, appointment

reminders, community mobilization and health promotion, treatment compliance, mobile patient records, information access, patient monitoring, health surveys and data collection, surveillance, health awareness-raising, and decision-support systems. The five volumes of the mHealth Compendium feature mHealth case studies representing each of these 14 categories. For the purposes of this compendium mHealth includes mobile phones, personal digital assistants (PDAs), tablets, mobile applications, and wireless medical devices.

The Rapidly Evolving mHealth Landscape

The mHealth landscape is consistently and increasingly evolving, growing out of the early stages of isolated and often short-lived pilots to a focus on scale, sustainability, interoperability, and integration of mHealth and eHealth interventions. According to GSMA's Mobile Economy 2016 report, there are over 7.6 billion mobile connections worldwide, representing 4.7 billion unique subscribers. With the rapid growth of mobile technology access, many believe that mHealth has the potential to transform the face of health service delivery across the globe by offering new means of when, where, how, and by whom health services are provided and accessed.

Evidence for mHealth

Although still limited, the amount of evidence around the effectiveness or efficacy of mHealth interventions is increasing. In recent years, there has been a significant upsurge in mHealth-focused health outcomes research—including several studies published in the Lancet—and reviews that aimed to synthesize the evidence. Additionally, the mHealthEvidence.org website, which was developed as a resource for cataloging, categorizing, and grading mHealth evidence, currently contains more than 7,500 sources from peer-reviewed and grey literature.

Standards for mHealth

One of the most promising aspects of mHealth is its potential for enhancing the smart integration of health services and the continuity of care across provider, place, and time by making information available at the right place and the right time. Strengthening patient management and health systems in this fashion can only be achieved if the various mHealth and HIS platforms have sufficient common ground to reliably exchange messages in a way that minimizes errors and misunderstandings. Known as interoperability, this ability of diverse systems and organizations to communicate and work together (interoperate) requires the establishment of and adherence to standards. Much like speaking a common language enables communication, using common standards for how data is structured and exchanged enables mHealth platforms and HIS to share data.

mHealth interventions are significantly more powerful when health sector actors make their information systems interoperable. Through close cooperation, governments, donors, and private health care providers can achieve interoperability by applying the same standards. These actions will maximize the power of mHealth as a tool for coordinating individual, patient-level services and public health programs.^{1,2}

Aponjon



Principles for Digital Development

The following set of principles are intended to serve as “living” guidelines to help development practitioners across sectors integrate established best practices in the use of information and communication technologies. The Principles for Digital Development were written by and for international development donors, multilateral organizations, and implementing partners to capture the most important lessons learned in the implementation of information and communications technology for development (ICT4D) projects, and are freely available for use by all.

These principles seek to serve as a set of guidelines that are meant to inform, but not dictate, the design and implementation of technology-enabled development programs. They have been endorsed by over 50 development donors, multilateral organizations, and implementing partners. *From Principle to Practice: Implementing the Principles for Digital Development*, released in February 2016, captures the experience, insights, questions, and recommendations of practitioners working in digital development. This report, as well as more information on the Principles for Digital Development can be found at digitalprinciples.org.

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 disabilities, 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 application programming interfaces (APIs) 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 and Security

- Assess and mitigate risks to the security of users and their data
- Consider the context and the 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-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





Other Key mHealth Tools and Resources

A number of tools, guidelines, and databases have been developed to disseminate information and best practices on mobile and digital health. The following list presents a short summary of a range of resources available, but should not be considered exhaustive.

mHealth Repositories

- **African Strategies for Health mHealth Database:** Compiles the more than 150 mHealth project and application profiles featured in the mHealth Compendium series into a single database. Information can be filtered by type of application, health area, and location. Profiles include intervention descriptions, important results or evaluation findings, lessons learned and contact information for both implementers and donors. (africanstrategies4health.org/mhealth-database.html)
- **Center for Health Market Innovation (CHMI):** Includes over 1,500 programs in a downloadable database of health innovations. Over 450 of the programs list mobile phone or tablet use as a program component. Results can be filtered by program type, health focus, country, target population, legal status, reported results, funders, and technology used. (healthmarketinnovations.org/programs)

- **GSMA mHealth Tracker:** This database captures and presents mHealth products and services around the globe. It tracks solutions in planning and deployment phases. (www.gsma.com/mobilefordevelopment/m4d-tracker/mhealth-deployment-tracker)
- **mHealth Evidence Database:** This database includes searchable peer-reviewed and grey literature on mHealth activities in developed and developing countries and is curated with sources proactively identified or included based on request. Material is classified using a harmonized taxonomy, scored using objective criteria, easily filtered, and searchable to facilitate the identification of evidence-based, high-impact mHealth practices. (www.mhealthevidence.org)
- **mHealth Knowledge:** This web repository, managed by K4Health, connects global health professionals to the people, products, and ideas needed to work effectively in mHealth. It connects users to mHealth resources including: applications and platforms, communities of practices, capacity building and learning opportunities, tools and guides, and sources of relevant news. (www.mhealthknowledge.org)

Guidelines, Toolkits, and Learning Resources

- **Global Digital Health Network:** Formerly the mHealth Working Group created in 2009 as a networking forum for members to share information, engage with the broader community, and provide leadership in digital health for global public health. (www.mhealth-workinggroup.org)
- **Integrating Mobiles into Development Projects:** This handbook is intended as a practical and actionable guide to help USAID staff and others 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)
- **Making the Journey from Cash to Electronic Payments:** A Toolkit for USAID Implementing Partners and Development Organizations: This toolkit was created for nongovernmental 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. (solutionscenter.nethope.org/programs/c2e-toolkit)
- **The MAPS Toolkit: mHealth Assessment and Planning for Scale:** A self-assessment and planning guide to help mHealth implementers successfully and sustainably scale-up their innovations. The toolkit assists mHealth project teams to critically assess their mHealth project as they move from piloting to planning their next steps for overcoming the challenges inherent in scaling up. (who.int/reproductivehealth/topics/mhealth/maps-toolkit/en/)
- **mHealth Basics: Introduction to Mobile Technology for Health:** A free, three-hour, self-paced eLearning course available on the USAID Global Health eLearning Center 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)
- **mHealth Field Guide for Newborn Health:** This guide explains how mHealth serves newborn health through referral and tracking of mothers and infants, decision support for community health workers (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)
- **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)
- **The mHealth Planning Guide:** Key Considerations for Integrating Mobile Technology into Health Programs: An interactive online guide intended for global health practitioners, program managers, and staff working to implement mHealth solutions in low-resource settings. (www.k4health.org/toolkits/mHealth-planning-implementation-guide)
- **National eHealth Strategy Toolkit:** Produced by the WHO and International Telecommunication Union to provide guidance to governments, ministries, and other stakeholders in how to develop and implement a national eHealth vision, action plan, and monitoring framework. (www.who.int/ehealth/publications/en/)
- **SDG ICT Playbook:** From Innovation to Impact: A resource for development organizations providing actionable information on leveraging ICT tools against the goals of the SDGs. It includes a portfolio of recommended technologies as well as insights on governance, partnerships, and strategies for affordable access. (solutionscenter.nethope.org/toolkit/view/sdg-ict-playbook-from-innovation-to-impact)

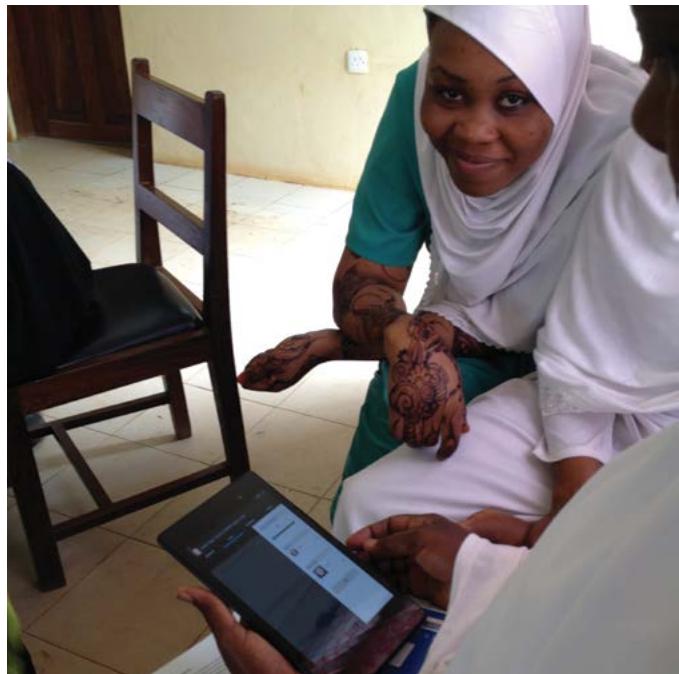


Photo by Julia Ruben, D-tree International



Photo by Lisa Hoashi / Mercy Corps

FEATURED CASES



Delivering health microinsurance at scale across Africa

POWERED BY MICROENSURE



A maternity nurse with a mother and her two newborn twins. Marangu Hospital, Moshi, Tanzania. Photo by David Dorey.

The Airtel/MicroEnsure partnership aimed to introduce millions of emerging consumers to their first health insurance products by offering simple cover, for free, aimed to establish trust through transparent, reliable operations. It then offered products for customers to increase options, creating a path to greater health insurance coverage.

Health insurance penetration in Africa remains under 3%, serving fewer than 3 million people, even though more than 400 private and nonprofit health insurance schemes operate across the continent, according to the Landscape of Microinsurance in Africa 2012. Moreover, these health insurance schemes on average are unsustainable, paying out more in claims than they attract in premiums.

By contrast, all other forms of insurance operating on the continent have less than half as many products active, yet in aggregate they serve 17 times the number of people.

The reasons for low penetration of health insurance are multifaceted, but a key issue has been the high expense of traditional health insurance, which keeps it out of the hands of the mass market. While public health insurance projects are underway in many markets, MicroEnsure decided to pursue a complimentary private solution with Airtel, a pan-African telecommunications company, in order to deliver a sustainable health product to the emerging customer.

The Airtel/MicroEnsure partnership aimed to introduce millions of emerging consumers to their first health insurance products by offering simple cover, for free. By introducing consumers to a basic health insurance product, MicroEnsure aimed to establish trust through transparent, reliable operations. It then offered intuitive up-sell products to allow customers to increase their coverage by paying for more cover for themselves and/or their families, which created a path to greater health insurance coverage.

About Airtel/MicroEnsure

MicroEnsure and Airtel launched their first simple health insurance product in Ghana in January 2014, and eventually launched in seven African markets. The product was relatively straightforward: Airtel would reward loyal customers (who registered for the product by dialing a shortcode) with free insurance as long as they spent a minimum amount of airtime (usually US\$2). The more customers spent with the telecom, the more free health insurance (and life and accident insurance as well) they could earn. Customers were educated as to how the product works via an unstructured supplementary service data (USSD) menu showing policy information and through monthly SMSs informing them the amount of insurance they had earned for the following month based on their airtime usage in the previous month.

The health insurance offered a simple benefit: qualifying customers received one month of hospital cash insurance—

a lump sum of up to US\$300 paid to them via mobile money if they spent three nights or more in any hospital across the nation, for any medical reason, with no exclusions. This wide-open claims model was designed to eliminate the fine print traditionally associated with insurance and to demonstrate a reliable product.

Furthermore, while it might seem naïve to a typical, developed-market health insurance consumer that a lump sum of \$50, for example, would be attractive, MicroEnsure knew from its 12 years of experience in the mass market that, when there is no health insurance available at all, even a small amount of health cover represented a massive improvement over the status quo, and provided a stair-step into health financing. In other words, \$50 of hospital cash is viewed by the mass market in Africa as an excellent cover, especially when the cover is accessible for free.

Due to SIM-card swapping and a low level of brand loyalty for many African telecoms, this product was designed to increase loyalty as well as revenue for the telecom, hence it paid the premiums to MicroEnsure and its partner insurance companies in various markets. The customer's airtime was not deducted but rather the cover was provided for free and paid by the telecom on the basis of the overall increase in value to the core business (airtime spent) from the portfolio of insured customers.

This business model therefore offered a win-win-win for the patient, distributor, and insurer alike. The patients received free and reliable means of mitigating their risk; the distributor received a product to grow revenue and loyalty; and the insurer saw millions more customers become policyholders on a financially viable basis—as premiums exceeded the cost of claims.

Program Design Process

MicroEnsure had previously delivered mobile insurance through a “freemium” strategy, with Tigo in Ghana and Tanzania (2010–2013). In its partnership with Airtel MicroEnsure focused product design efforts on bringing a simple, valuable health insurance product to the mass market through the mobile channel.

MicroEnsure found from its experience that a traditional health insurance model was unlikely to be sustainable. It could not build a panel of hospitals and clinics and still meet the telecom’s requirements to serve all of its customers across Africa within a year; nor could it operate a third-party payment scheme to health providers without experiencing the fraud that dooms many health insurance schemes.

When MicroEnsure looked into provider insurance fraud, it found that mutual distrust between providers and insurers is likely an unsolvable problem for now in Africa, where developed information technology (IT) systems are few and far between—doctors resent being paid less by an insurer than the service cost them to provide, and so they over-charge knowing the insurer will pay less; then, the insurer sees the overcharge and charges the provider with fraud. This vicious circle dooms many health insurance products in Africa.

MicroEnsure resolved, therefore, to use a hospital cash product, paying the patient directly instead of paying the provider. However, many other hospital cash schemes had experienced problems with fraud as well. MicroEnsure decided to work to limit fraud in three ways: 1) by providing the product for free, thereby reducing the claimant’s incentive to

Monthly Recharge	Life Cover	Hospital Cash Cover
This Month		
N 1000	N 100,000	N 10,000
N 5000	N 250,000	N 25,000
N 10000	N 500,000	N 50,000

Sample Nigerian promotion by Airtel

commit fraud; 2) by providing a small sum assured for most of the telecom’s customers (i.e. the lower spenders), reducing their motive for a large payday; and 3) by providing a lump sum benefit instead of a per-day benefit, thereby reducing the incentive for customers with genuine claims to overstate the size of their claim.

Once MicroEnsure had determined that hospital cash was the correct approach from the supply side, it had to identify whether there was demand for hospital cash insurance.

MicroEnsure’s research illustrated that nearly 30% of health-related expenditure in these markets is for costs other than the medical expenses themselves. These costs include transport, food, lost income, and other foregone expenses, such as children’s school fees. Furthermore, the research showed that customers who had never been insured did not expect a full indemnity product, as traditional health insurance operates; rather, if they received a \$50 payout from MicroEnsure, they perceived it to be valuable, as it was greater than \$0—the amount of insurance they had ever received before. With this knowledge, it appeared as though customers would value the product as designed.

Growth in Scale

MicroEnsure designs its products, systems, and distribution strategies for large-scale implementation. MicroEnsure launched with Airtel Ghana in January 2014, and grew the enrolled customer base to 1.2 million within its first year. Once the product had demonstrated success, other countries launched in quick succession:

- Airtel Burkina Faso launched in August 2014, reaching 231,000 within its first year.
- Airtel Nigeria launched in September 2014, reaching 1.02 million within its first year.
- Airtel Madagascar launched in December 2014, reaching 57,000 within its first year.
- Airtel Niger launched in December 2014, reaching 194,000 within its first year. Airtel Malawi launched in May 2015, reaching 163,000 by March 2016.

- Airtel Kenya launched in August 2015, reaching 173,000 by March 2016.

In aggregate, these products had enrolled 3.74 million customers into hospital cash insurance in seven countries by March 2016, a little over two years after the initial product launch.

MicroEnsure's board approved significant growth in its IT development and African regional team, as well as local teams to deliver the product on the ground. Despite these investments, by the end of the roll-out phase it was clear to MicroEnsure that it did not plan enough expenditure on technology—especially the process of integrating its systems with the local telecom. Experience showed that it should have planned for more cost in recruiting, training, and development.



Photo by Airtel



Evaluation and Results

The major objectives for the project concerned: scale of health microinsurance, financial sustainability, and creation of new market penetration by offering customers their first-ever health insurance policies.

As of March 2016, MicroEnsure had enrolled 3.74 million customers into hospital cash insurance in seven countries, a little over two years after launch. Airtel's continued expansion and the fact that no insurance companies dropped the product indicate overall financial success of the product.

MicroEnsure expects to break even on its investment in the

mobile insurance model in 2017. Customer surveys across its operating markets have indicated that for 86% of its customers, Airtel Insurance was their first insurance policy of any kind.

Unfortunately, there are no assessments of health outcomes, as MicroEnsure does not track patients beyond the submission of a claim, nor does it track any additional information about their health, including the cause of hospitalization. However, with a large-scale footprint, MicroEnsure expects to be able to have a much more significant impact on health outcomes, as it has built the customer base.

Lessons Learned in Program Implementation and Scaling

Low health insurance penetration is often assumed to be a function of low demand for insurance in general. MicroEnsure has found that low penetration of traditional insurance is more likely a function of: high cost, low trust, poor access, and product complexity. If these barriers can be overcome, enrollment numbers indicate that mass-market consumers are very eager to be protected from health risk.

MicroEnsure research shows that a simple health insurance benefit is perceived as better than having no health insurance at all; it is not necessary—or financially viable—for the uninsured customer to enroll in full health coverage from the start.

Furthermore, mobile channels offer important assets to enhance an mHealth service, but the telecom will only unleash those assets if they will directly benefit in their own core business growth; if this is not clear to them they will not lend their brand and footprint to the initiative.

MicroEnsure experienced several challenges during the rapid growth of the program. For example, due to Airtel's emphasis on rapid expansion across markets, MicroEnsure did not invest in client education and impact to the degree that it might have with a slower roll-out. This underinvestment led to lower uptake in some markets than initially expected,



and to fewer claims than expected as well. Additionally, the overhead and administrative cost as well as the day-to-day operational headaches of expanding in market after market often served as a distraction from the key program focus—to

drive value for the customer. MicroEnsure learned that in future multinational roll-outs, it should move more deliberately in order to ensure each project is performing according to best practice prior to the next product being rolled out.

Future Plans

MicroEnsure's main plans for Airtel Insurance are currently centered on transitioning from a free product to a product that customers pay for in order to make the product sustainable for the long term. The free product was successful in generating additional revenue and reducing customer churn for Airtel, but the company will not pay for free insurance in perpetuity. MicroEnsure has launched a prototype of a paid product in Ghana, which more than 100,000 people have purchased to date. It expects to roll out the lessons learned from the prototype to other Airtel markets throughout 2016.

MicroEnsure expects not expect that all Airtel Insurance products will remain live, as telecoms' priorities change; however, it expects 3-4 of the products to remain live, including in its largest markets of Ghana and Nigeria. By year-end 2017 it expects to have more than 2 million paying customers on Airtel Insurance overall. If it successfully converts a sufficient number of customers from free to paid products, MicroEnsure plans to seek to drive additional value through

higher-value products with greater health benefits. MicroEnsure is currently prototyping telemedicine and health education products in Kenya and is designing other mHealth solutions, which it expects to make available at scale near the end of 2016 and early 2017. ■

Snapshot: Airtel Insurance powered by MicroEnsure	
Geographic Coverage	Burkina Faso, Ghana, Kenya, Malawi, Madagascar, Niger, Nigeria
Implementation Dates	2014 to present
Implementation Partners	Microensure (product design, mobile implementation, insurance arrangement, field engagement, back office support) Airtel Africa (marketing and distribution) Various insurers (risk underwriting)
Donor(s)	N/A
Contact Information	Peter Gross, Marketing Director, MicroEnsure, peter.gross@microensure.com

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Photo by Aponjon

In Bangladesh, the power of health in every mother's hand

Aponjon (meaning “dear one(s)” in Bangla) aims to help to substantially reduce maternal and newborn deaths by improving health-seeking behaviors and preventive care among pregnant women, new mothers, and their families.

The Mobile Alliance Maternal Action (MAMA) program launched nationally in December 2012. A Bangladeshi social enterprise, Dnet, implements Aponjon in partnership with the Ministry of Health and Family Welfare (MOHFW) and with support from the US Agency for International Development.

Although under-five child mortality has decreased considerably in Bangladesh, neonatal mortality has decreased at a slower rate, with neonatal deaths a larger share of infant mortality. Greater progress was needed at that stage. Given that newborn survival and health are intrinsically linked with the health of women before conception, during pregnancy, and around the time of birth, and recognizing limitations in human resources for health, Aponjon developed as a mobile-based behavior change communication (BCC) program to increase health-seeking behavior at the household level and use of health facilities to prevent neonatal deaths.

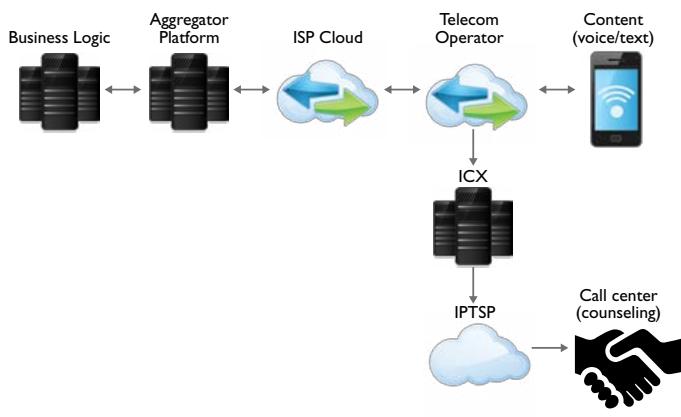
The service is designed for women between 6 and 42 weeks of pregnancy and mothers with a child under one year of age. It features critical health information and reminders based on gestational stage and age of baby in the form of text and voice messages. The messages also address “gatekeepers” such as the women’s partners, mothers, and mothers-in-law. In addition, Aponjon also launched a mobile application “Shogorbha” for pregnant women and redesigned its website as a host of web services.

About Aponjon

Globally, Aponjon is a unique mHealth initiative because it functions through all of the country’s telecom operators—six. About 81% of Aponjon users are from rural areas; 60% of women users have their own mobile phones. Technology stakeholders in the program include the telecom operators and value added services platform aggregator.

Aponjon has two major components: content (voice/text) and call center (counseling). The primary audience (expecting and new mothers) are delivered two messages, either by SMS or interactive voice response (IVR), a week while the secondary audience (partners, in-laws, parents, etc.) receive one, with each message costing about US.03 cents. The voice messages are a mix of direct messages and mini-skit messages, with local actors playing the roles of a doctor, pregnant woman, mother, and mother-in-law. Gatekeepers’ information reinforces messages provided to the mother and encourages family involvement in healthy decision-making around pregnancy, birth, and infant care.

Figure 1.
Aponjon has two major components:
content (voice/text) and call center (counseling).



All Aponjon content complies with the government's BCC guidelines. Content is identified, designed, and adapted based on ethnographic research; semi-structured content surveys; a review of national guidelines and international literature on maternal, newborn, and child health (MNCH); and an expert review by a panel of Bangladeshi physicians, researchers, and communications professionals. Followed by feedback from BabyCenter, the messages are approved by the Information, Education, and Communication (IEC) Committee of the MOHFW. The service is available in Bangla and two local dialects. Aponjon also offers a counseling line

to subscribers, serving as a direct channel to communicate with a doctor about health problems. Aponjon partners with the field forces of BRAC, Infolady (Dnet's program), MaMoni, Social Marketing Company, Smiling Sun, and several local nongovernmental organizations and agencies for customer acquisition. Customers can also register themselves, and provide information to ensure that the messages are in sync with the gestational stage or baby's age. Users are also able to select a preferred time of day for message delivery so that the message is received when it is most convenient.

Program Design Process

Dnet carried out extensive formative research from September 2011 through May 2012 before launching the service nationally. The research included 1,403 subscribers from five divisions, including 349 pregnant women (25%), 575 mothers of children under age one (41%), and 479 other household decision-makers (e.g. husbands, mothers-in-law) (34%). Areas of interest included: gender and mobile phone ownership; effective strategies for enrollment and promoting user awareness; acceptable cost models; user satisfaction of the content and tech platform; influence of content on MNCH-related health-seeking behaviors; and the involvement of family members in the service. Data collection included a pretest focus group, registration forms, deregistration data, payment status data, structured interviews, field observations, and phone surveys. The Johns Hopkins School of Public Health mHealth Initiative jointly produced a report with Dnet that examines and analyzes Dnet's formative research.

Aponjon conducts widespread bi-annual phone surveys. Apart from tracking health-seeking knowledge and practice indicators, the surveys query users if the service benefitted them and what could have been done better in terms of content and design of service delivery.

Aponjon received support from the Access to Information Program II (A2I-II) hosted by the Prime Minister's Office, which facilitated coordination among various government agencies for the program. Aponjon actively participates in the district health information system initiative of the Directorate General of Health Services-Management Information Services office and has already streamlined its system data landscape.

Another important public sector contribution comes from the Bangladesh Telecommunications Regulatory Commission (BTRC), which helped secure approvals for differential charging and approved the short code and Aponjon counseling line. Aponjon's partners in the private sector have also included Johnson & Johnson, Agora, Lal Teer, and Beximco which contributed through corporate social responsibility (CSR) funds and sponsorships and helped in brand propagation. Telecom operators also complied with the mode of differential charging and made it possible for Aponjon to reach people across the socioeconomic spectrum.

On the technical side, SSD-Tech provides the technical platform for service delivery with "MT charging," meaning clients are charged when messages are received. Synesis IT serves as the call center service provider that developed a customer relationship management system and a separate system for the counseling line.

Growth in Scale

After the national launch, Aponjon acquired 100,000 subscribers by July 2013. The subscriber base hit 750,000 in August 2014, 1 million in September 2014 and 1.5 million in December 2015. In addition to standard SMS and IVR, the service has made content available through a mobile application, "Shogorbha", for pregnant women. Aponjon aims to reach 2 million subscribers by September 2016 and launch newer products.

During its pilot phase, Aponjon served 1,403 subscribers in a few urban and rural areas across five divisions of Ban-

gladesh. A core research team had evaluated various aspects of the service before national roll-out. Community health workers from BRAC and USAID's MaMoni project assisted in enrolling most of the initial subscribers. Popular campaign strategies were executed in select urban locations and their contribution in the overall growth of subscription was reviewed. Using local leaders and spokespeople to increase awareness of Aponjon while also forging greater trust in the brand, building partnerships with more community-based organizations, including more detailed messages on nutrition, arranging for refresher trainings for call center agents

and initiating a ticketing system for better management of service issues by vendors are some major pilot phase outcomes that paved the way to a large-scale implementation.

Dnet uses innovative financing models, leveraging CSR funding at local and global levels, and providing the service for the poorest subscribers free of charge while charging the better-off users the full price. Dnet also uses advertising and sponsorship donations. Aponjon is financed primarily through support from development agencies (88%), namely USAID. The next largest portion of Aponjon's funding comes from local CSR (7%), followed by the Sponsor-a-Ma campaign (4%). Together, user fees and fees charged to com-

panies interested in using the messaging for advertising make up slightly less than 1% of Aponjon's funding.

Aponjon has faced some vital challenges in the process of scaling up its operations. Lack of funding for above-the-line campaigns crippled the program's ability to sustain its brand communication efforts. In spite of co-branding efforts with products of high rural market penetration, the program never overcame the need for launching above-the-line campaigns as the rate of self-registration was persistently low. Also, mostly due to the former, Aponjon had to heavily rely on customer acquisition led by community-based agencies that had to be paid more than some leading nongovernmental organizations.

Evaluation and Results

Aponjon conducts periodic surveys to understand the impact of the intervention and to gather feedback for further modification of the service. Annual sample surveys have been conducted since 2013 to understand how the service impacted users both in knowledge and practice, if at all. Reasons behind non-compliance with content instructions and the process of and barriers to behavioral changes are explored. Two sample surveys have been done so far, reaching 799 expecting and new mothers. These surveys revealed that about half (54%) of Aponjon users are first-time mothers, while 66% of them reported having been actively using some form of family planning. About 14% of users reported to have spaced previous births by at least 3 years. When users were asked about their level of satisfaction with Aponjon services, 91% indicated they were "satisfied" and 35% gave the services the highest possible rating.

Aponjon also conducted a content survey in 2013 to better understand user acceptability and comprehensibility of messages received. A total of 335 women and 88 gatekeepers were

interviewed. User feedback and preferences on message length, content type, message frequency, and usability were translated into actionable recommendations. Some of the major actions based on findings included the introduction of content in two major local dialects, incorporation of content specific to the rural version, and advanced messages on pregnancy care and home remedies.

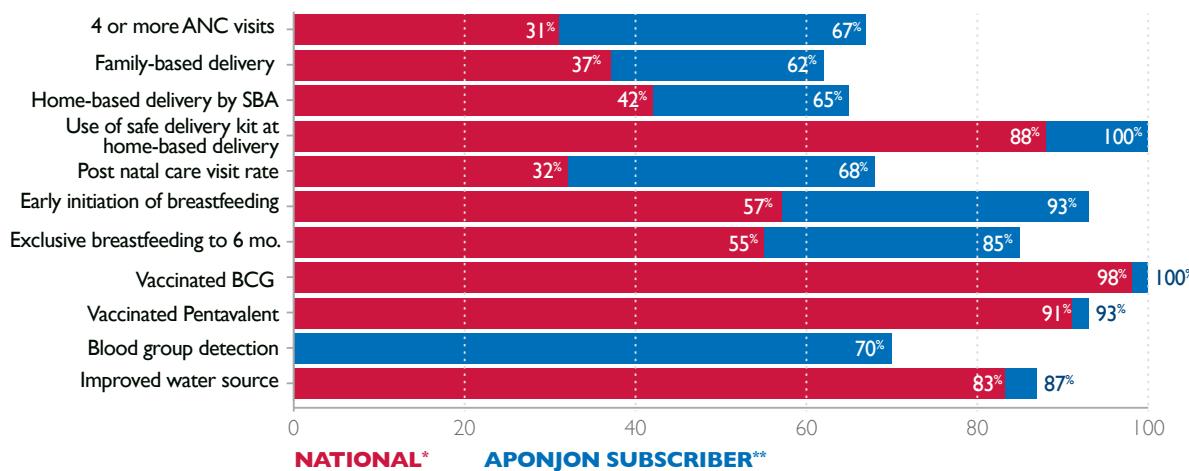
Aponjon performs regular bi-annual phone surveys to track the status of 11 health milestone indicators, including antenatal and postnatal care visits, exclusive breastfeeding, and BCG (TB) vaccination, and to gauge customer satisfaction and loyalty through net promoter scores. The outcomes of these health indicators are then compared to national level values (see Figure 2 below).

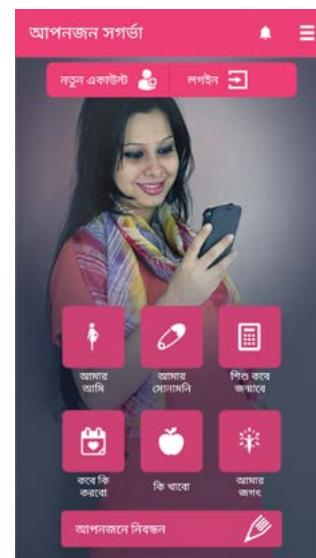
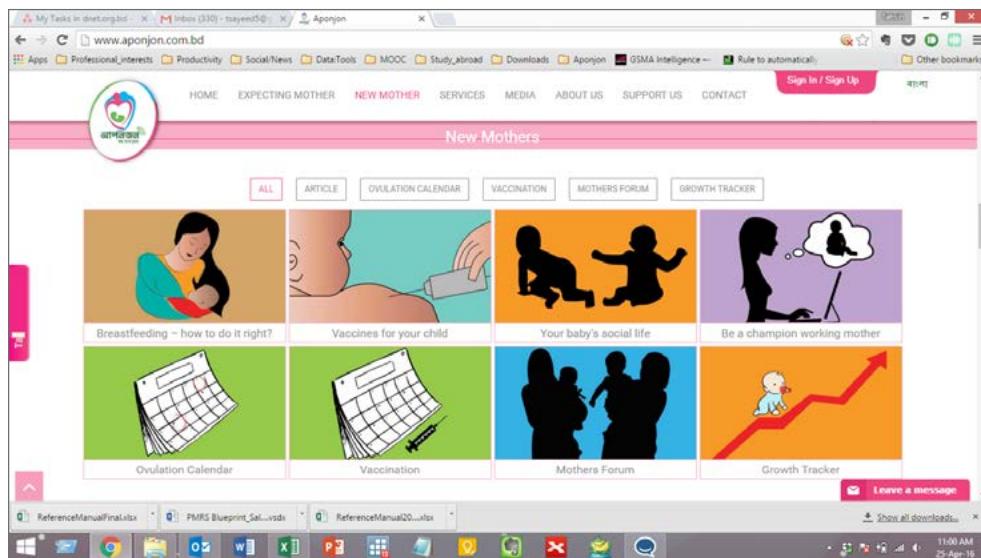
A third-party mixed methods evaluation of the program was conducted by the USAID-funded TRAction project. Results indicated that respondents who had used Aponjon for a

Figure 2.

Evaluation results for health-seeking behavioral indicators

(Sources: *National Data Source: BDHS 2014, WHO 2013, and Unicef 2012); **Aponjon subscriber phone survey VII, July 2015)





Images provided by Aponjon

minimum of six months, received at least three messages per month and carefully listened to most of the messages showed both increased knowledge and practice of maternal and newborn health care. Study recommendations included that the program should emphasize continued use of services for a longer duration, and to explore reasons for not receiving

ing or carefully listening to all messages. (Chowdhury, 2015) Other findings indicated that some non-eligible clients were registered by agents, and also that users demanded another service on early childhood development. Based on this research, Aponjon formed an in-house quality control unit and content for early childhood development is being developed.

Lessons Learned in Program Implementation and Scaling

One of the main challenges Aponjon faced was to gather all mobile network operators under one umbrella. Given that Grameen Phone was the only operator during the pilot, areas such as Chittagong—which had low Grameen Phone coverage—had much fewer subscribers. After a lengthy process of negotiation and technological integration with each operator, four operators were added before the national launch.

Receiving the right and disaggregated service delivery metrics from the technology platform vendor SSD-Tech posed another challenge for the program. Aponjon needed to be able to track message acceptability by content area and monitor fluctuations of deregistration by exposure to content.

Over the last two years, revenue from local CSR funds has decreased alarmingly as local companies are increasingly channeling their CSR funds through in-house charity foundations. This tendency has limited the program's ability to extend the service to ultra-poor families for free.

Aponjon devised a workaround, where possible, to each of the abovementioned obstacles. Soon after the pilot, the team built on the partnership with the BTRC and brought all six of the country's telecom operators (including the state-owned Teletalk) aboard. Dnet redesigned service metrics and ensured routine tracking of service delivery based on disaggregated measures. Lastly, the decline in CSR funding from local companies has been tackled with increased sponsorship and fundraising efforts globally. Prior to its dissolution in

December 2015, MAMA helped Aponjon broker instrumental partnerships with international donors and corporations such as Johnson & Johnson. Johnson & Johnson offered sponsorships covering the entire service package for over 5,000 mothers in fiscal year 2015-16.

Although the initial program delivery commitment was for 500,000 expecting women and pregnant mothers, Aponjon went on to cater to over 1.6 million subscribers to date. This is not only due to support from USAID but also because of partnerships across the public and private sectors that Aponjon has forged over the years. Furthermore, some major outgrowths from the initial structure of project deliverables are as follows:

- Aponjon's official website has been redesigned with the introduction of a diverse host of web services, including articles on food and medicine in pregnancy to breastfeeding practices, a growth tracker, event calendar, estimated due date calculator, ovulation calendar, and a social timeline called Mothers' Forum.
- Aponjon launched the first mobile app in the Bangla language with a range of comprehensive information for expecting mothers. Features include week-by-week gestational information, an expected due date calculator, event calendar, nutrition routine, weight chart, and kick-tracker.
- The Aponjon counseling line features 16 doctors/general physicians who are available with first-line medical counseling for registered subscribers.

Future Plans

Aponjon, based on a tested sustainability model approved by USAID, will transform into a for-profit business called Lifechord. All organizational formalities and legal paperwork have been completed. Initial capital for Lifechord includes program income from non-USAID funds, CSR funds, and Dnet's own investment. Lifechord will be able to explore radical cost-cutting and income-generation options beginning with the launch of Dnet's own technology platform in March 2016. This marks an important transition in the program; running the service from its own technology platform means greater control over service delivery metrics, stronger negotiation with mobile network operators as a content provider, as well as opportunities for generating revenue from diverse service innovations. This systemic changeover will translate into efficiency gains, broader developmental leeway, and fewer challenges to exploring new market segments and replicating in different contexts.

However, as an initially donor-funded program, one major roadblock to working out the current transition and sustainability plans is the limited opportunity to attract angel and impact investors, as investments arising from such initiatives cannot be declared as assets for LifeChord going forward. Therefore, Aponjon has been busy crafting its service portfolio with new developments paving a way to diverse revenue-generating activities.

Activities recently launched or in development include:

- **Aponjon Shoishob:** Weekly mobile content in the form of IVR/SMS. It will target parents of children aged 1–5 years and address issues pertaining to early childhood development.
- **Aponjon Koishor App:** Mobile application targeting adolescents aged 10–19 years and their parents. Features a counseling line and live web chat. Launched April 7, 2016.
- **Aponjon New Mother App:** A mobile application which will target mothers of children aged under one year. ■

Snapshot:Aponjon	
Geographic Coverage	Bangladesh
Implementation Dates	December 2012 to present
Implementation Partners	Dnet: a social enterprise that designs innovative products and service solutions for women, children, and youth in rural and urban settings to create social impact, and for institutions to enhance capacity and productivity. It runs Aponjon in partnership with USAID and the Government of Bangladesh.
Donor(s)	USAID
Contact Information	Tahsin Ifnoor Sayeed, M&E Specialist, Dnet, tahsin.ifnoor@dnet.org.bd

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Using mobile technology to improve community health supply chains in Malawi

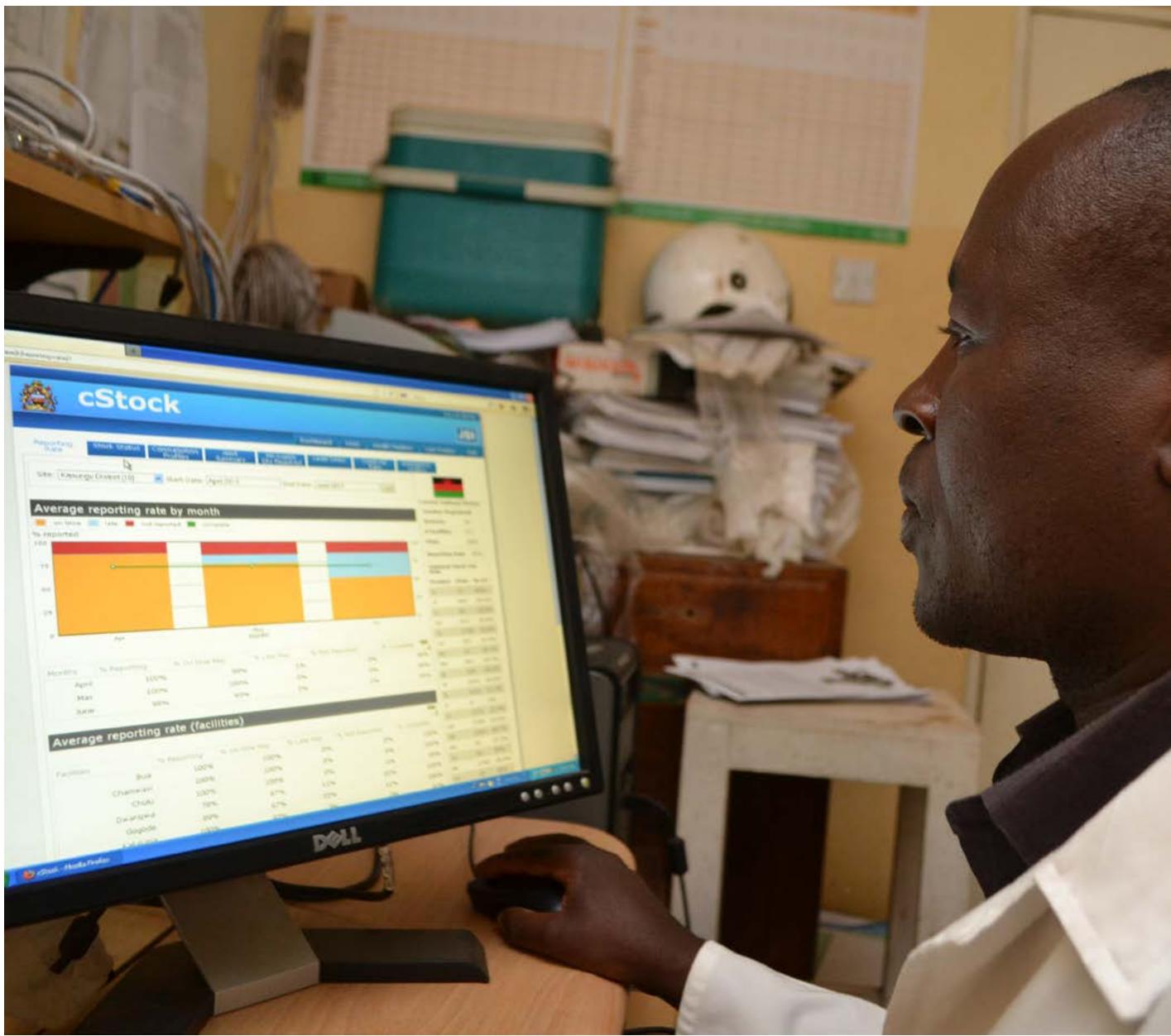


Photo by cStock

The combination of mobile technology, user-friendly dashboards, and quality-improvement teams have improved the reliability of supplies of life-saving commodities in community-based health programs.

In 2015, nearly 6 million children under the age of five died from treatable causes such as pneumonia, diarrhea, and malaria.¹ Integrated Community Case Management (iCCM) is one strategy for reducing childhood mortality by having community health workers (CHWs) trained to treat children under five close to home. However, investments in training CHWs to treat these children are often undermined by weak supply chains which are unable to consistently deliver medicines to CHWs.

The Supply Chains for Community Case Management Project's (S4CCM) goal was to find proven, simple, and affordable solutions for the supply chain challenges faced by CHWs in Malawi, Rwanda, and Ethiopia. iCCM was first introduced in Malawi in 2008. Two years later, John Snow International, Inc. (JSI)'s SC4CCM project conducted a baseline assessment that revealed poor medicine availability, with only 23% of CHWs having in stock the four key lifesaving medicines needed to treat all three targeted childhood illnesses on the day of the survey. A lack of visibility into stock levels at the community level and weak coordination and management practices used to respond to the needs of the CHWs were identified as the primary causes of the weak supply chain. However, the survey results also identified an opportunity, with 94% of CHWs owning simple mobile phones and 85% having network coverage at least some of the time.²

About cStock

In collaboration with Malawi's Ministry of Health (MOH), JSI designed the Enhanced Management (EM) approach. EM was developed to promote superior team performance practices and the use of data to inform decisions and improve supply chain performance to increase the availability of medicines for community health programs. The following three key components ensure the program's success:

1. **cStock:** The overall goal of cStock is to improve reporting and visibility of community health logistics data. It is a RapidSMS-based reporting and resupply system that facilitates timely data transmission and communication between the CHWs and the facility that supplies them with medicines. Using a streamlined, demand-based reporting and resupply process, stock data reported by the CHW triggers the re-order process, whereby cStock automatically calculates resupply quantities and transmits a request via SMS to supervisors at health facilities. The facilities then send

feedback to the CHW when the order is ready or if they are out of stock. Urgent matters, such as stock-outs or low stock levels, are communicated through SMS alerts.

2. **A user-friendly dashboard:** The web-based dashboard provides visibility of real-time CHW logistics data for district- and central-level managers. The system transforms two reported data elements into more than 10 supply chain indicators that are displayed on the dashboard as easy-to-use, relevant graphs and reports that facilitate rapid decision-making. These data can be used for coordination, planning, and identification of stock issues.
3. **District product availability teams (DPATs):** They complement cStock, building strong leadership and creating teams of CHWs that work together to support the goals of the intervention. They are comprised of district management, health center (HC) staff, and CHWs. DPATs have a common goal of improving

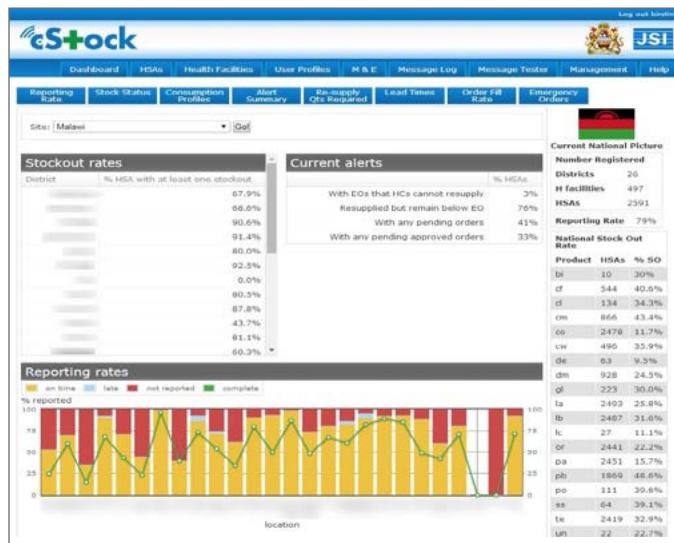
availability of essential medicines, and are designed to regularly use data provided by cStock to monitor community supply chain performance and address supply chain challenges. HC staff meet CHWs every month when they come to HCs for resupply; districts meet with CHW supervisors every quarter.

Program Design Process

Formative research, including quantitative and qualitative assessments, was conducted from May to June 2010 in 10 districts across Malawi's three geographical regions. Based on the results of the assessment, the project explored and consulted stakeholders on many different intervention options, focusing on transportation, motivation, and technology, and considered issues of affordability, scalability, and sustainability as criteria for selection. Two intervention packages were then designed and piloted over 18 months (see evaluation and results).

The design and development of cStock is based on a user-centered and iterative approach that combines the knowledge of supply chain experts with user experiences. The core principles of the design are to keep it simple; design with the end-user in mind; focus on feasibility, practicability, relevance, and usability; build ownership from all stakeholders throughout the process; and plan for scale and sustainability from the outset. The system was also designed to align and integrate into the current system by including workflows that streamlined existing procedures and practices, reducing workloads rather than increasing them.

Figure 1.
Sample cStock dashboard



All cStock users received a two-day training at the launch of the pilot. In addition, quarterly monitoring and implementation support were provided throughout the pilot period and feedback received was used to refine cStock and other accompanying tools and training.

In designing the system and workflows, consideration was given to ensure that key stakeholders have access to the data they need, and in a format that is easily accessed and interpreted. User inputs during the initial design phase were limited mainly to defining the workflows in terms of the recipients, content, timing, and format of the messages. The initial design of the dashboard was rudimentary, with limited time invested, and included only the basic supply chain metrics identified by the supply chain experts. The decision to begin with a simple dashboard was based on users' lack of experience with receiving, visualizing, and acting upon real-time supply chain data. After the users gained experience in using online reports, and a better understanding of how they could use logistics data to measure and monitor supply chain performance, the project engaged the users for input on the dashboard design.

Monitoring data were also used to design some targeted intervention-support activities, including sending group SMS messages to users on common data entry errors and conducting extra training sessions for HC staff on how to run effective meetings. Throughout the pilot, monitoring data were also shared with stakeholders, including MOH central staff and implementing partners, to get their input and ideas on addressing challenges.

Growth in Scale

The scale-up approach was defined by four primary strategies over two years (2013–2014). Strategies included gaining MOH endorsement, maintaining close engagement and coordination with partners, creating a dedicated cStock task-force, and developing a national product availability team. In this way, the necessary political will, buy-in, continuous engagement, and ownership was in place to maximize the potential for sustainability over time.

- MOH endorsement:** The MOH initially endorsed scale-up of cStock (but not DPATs) before the project had completed a full evaluation. The endorsement was triggered by enthusiasm for the unprecedented levels of access to community logistics data, positive



feedback from users, and high adoption of the system. After conclusion of the pilot, the evaluation data clearly showed that although supply chain performance improved with the implementation of cStock, performance was significantly better with the EM package that combined both cStock and the DPATs. Based on these findings, the MOH endorsed the full EM package.

- 2. Continued engagement and coordination with partners:** A vital part of planning for scale entailed the project's ongoing engagement and coordination with local partners, led by the MOH. This served to broaden ownership for the intervention and avoid duplication. As a result, multiple partners financed and supported the scale-up of cStock and DPATs to districts outside the original pilot districts. cStock, with DPATs, is now implemented and used in all of Malawi's districts. During the scale-up phase, partners financed and jointly

conducted the trainings with MOH, while the project provided technical support and quality control.

- 3. Creation of a taskforce:** An MOH-led taskforce that includes key stakeholders was set up to monitor the progress of the scale-up, assist in resource mobilization, and contribute to the development of a five-year transition plan. The plan outlined a structured and deliberate process on how to sustain cStock and DPATs for the next five years and build capacity within the MOH to take full ownership of the system so that EM becomes a core business practice of the health system.
- 4. Development of the National Product Availability Team:** The MOH also established a National Product Availability Team (NPAT) to manage the EM approach. This team meets to review data on performance and provide leadership and support as needed to ensure all districts can realize the full benefits of the EM approach.

Evaluation and Results

The project tested two different intervention packages: EM (cStock plus DPATs) and Efficient Product Transport (EPT) (cStock plus bicycle maintenance) over 18 months (2011–2013). Each package was tested in three districts, and four districts from the baseline assessment were used as a comparison group. The monitoring and evaluation strategy included three large mixed-method evaluations, one at baseline (2010), a second after the testing phase (midline—2013), and a third after the scale-up phase (endline—2014).

The midline evaluation compared the effectiveness of the two intervention groups (EM and EPT) in reducing stock-outs

and strengthening key supply chain processes. The evaluation compared results from baseline to midline and compared each intervention group with the non-intervention comparison group. cStock proved to be feasible and acceptable in all six districts; however, combining cStock with DPATs (three districts) resulted in significantly better supply chain performance and supply reliability.³⁻⁵

- Data visibility improved from baseline in all districts where cStock was implemented, but improved more significantly in EM districts: Results showed average CHW reporting rates of 94% in EM districts and 79% in EPT

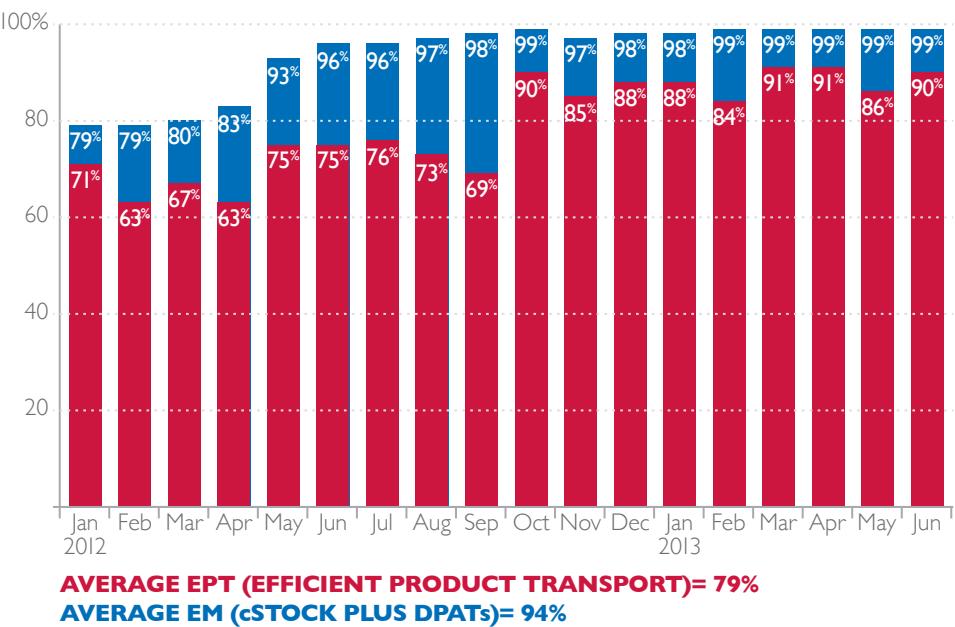


Figure 2.
Mean reporting rates to cStock by HSAs, on all commodities in EM (n=393) and EPT (n=253) districts, January 2012–June 2013

districts over the testing period (January 2012–June 2013). At baseline, only 43% of CHWs interviewed reported that they submit some kind of logistics report (see Figure 2 above).

- Supply reliability was found to be significantly higher in EM districts compared to EPT districts. Supply reliability was defined as the mean percent CHW stock-out rates by product over 18 months (January 2012–June 2013). Stock-outs for all products ranged between 5–7% in the EM group and between 10–21% in the EPT group. These differences were statistically significant at the p=0.000 level for all products (Figure 2).

The endline evaluation assessed scale, sustainability, and institutionalization. The evaluation consisted of qualitative case studies and quantitative analysis of cStock data in two original districts and two new districts. The results proved that cStock is easily scaled and provides a simple process for reporting on and resupplying community-level products in a systematic way. In addition, the benefits (coordination, communication, and collaboration) and challenges (transport, resources, and time) of the DPATs were quickly realized in the new districts and highlighted the importance of intense implementation support at the initial stages.⁶

Lessons Learned in Program Implementation and Scaling

The overarching lesson from this research is that mobile health strategies in isolation cannot create a reliable and robust public health supply chain. However, if these strategies are implemented as part of broader supply chain system strengthening activities that address the larger system constraints, mHealth solutions can be game changing. Other implementation challenges during development, deployment, and scale-up ranged from issues related to setting up the technology to the question of government readiness to assume ownership of the system after the initial implementing project ends.

Setting up a mobile information technology system: The two mobile network operators (MNOs) initially charged commercial rates for SMS messages. Recognizing the difficulties that the MOH would have in sustaining these costs without continued donor support, the project engaged in intensive advocacy efforts with both MNOs, urging them to provide

reduced rates as part of their corporate social responsibility to the health sector. The efforts proved successful, with one MNO providing a three-year waiver for SMS costs and the other reducing SMS costs by 40% and only charging for incoming messages.

Achieving broader ownership beyond a few champions: Turnover of district champions, staff who were the primary trainers and leaders for the EM approach at the district level, resulted in some loss of momentum for the uptake of cStock and for conducting DPAT meetings. It is important to plan for new staff training to ensure continuity and quality of intervention implementation. Training should also build a sense of ownership and develop champions. For instance, finding opportunities for district staff to attend larger meetings where they can proudly present their successes at a national level or across districts can motivate champions. To mitigate staff turnover effects, trainings during the scale-

up phase included more district-level staff and all program coordinators whose programs extend to the community level were included as DPAT members.

Developing MOH readiness for system maintenance and data storage / server hosting: Building capacity within the MOH to manage the cStock system has taken time and resources. The capacity to host the data in the private sector is still emerging. Therefore, the decision was made to outsource data storage and software maintenance to US-based companies. While outsourcing is the appropriate choice at present, in-country capacity for hosting and maintenance should be revisited as the program scales.

Future Plans

While most innovation projects strive to move from pilot to practice, achieving goals of scale-up and sustainability are often a challenge. Over the project period EM achieved full scale and began the journey toward being integrated as an organizational practice. Following the close of the SC4CCM project in 2015, JSI placed a secondee in the MOH for 12 months to transfer skills in managing cStock and the DPATs. The secondee worked closely with MOH staff to fully establish the NPAT and institutionalize national support for the innovation. cStock is now being funded through the Global

Fund grant, and MOH staff have taken full responsibility for all system administration for cStock and support for the DPATs. JSI no longer has staff dedicated to cStock and only provides ad hoc support to the MOH as needed. cStock continues to operate at full scale and is integrated into existing structures and processes for the CHWs. ■

Snapshot: cStock	
Geographic Coverage	Malawi
Implementation Dates	2011 to present
Implementation Partners	Malawi Ministry of Health (MOH)(implementing) JSI (design, pilot, and scale-up) Dimagi (software developers) Save the Children (scale-up) World Health Organization (scale-up)
Donor(s)	Bill & Melinda Gates Foundation (pilot) mHealth Alliance International Working Group Grant (sustainability) USAID/President's Malaria Initiative Global Fund
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Improving the quality of child health care in Malawi at the primary level through decision-support tools



Hotensia Dzuwa, HSA, Mlangali Health Centre, Dedza

Integrated Community Case Management is used in hard-to-reach areas to complement facility-based services. In this project, health surveillance assistants use a mobile application to assist in providing health services to children under five years.

Malawi is among the nine low-income countries that reduced their under-five mortality rate by 60% or more between 1990 and 2011. Despite this progress, many children continue to die from conditions that are easily preventable and treatable.

-A large proportion of children in Malawi are still at increased risk of mortality due to common childhood infections. The leading causes of under-five mortality in Malawi are malaria (13%), AIDS (13%), pneumonia (11%), diarrhea (7%), and neonatal conditions (31%). The Ministry of Health (MOH) and its partners have been scaling up a package of high-impact interventions to reduce under-five child mortality since 2007 under the Accelerated Child Survival and Development strategy. These efforts have included integrated Community Case Management (iCCM) in hard-to-reach areas to complement fixed or scheduled facility-based services. D-tree International is the partner providing mHealth solutions to support the implementation of iCCM to improve the quality of care provided to children under five.

About iCCM

In this project, health surveillance assistants (HSAs), a cadre of community health workers, use a mobile application to assist them in providing health services to under-five children (2-59 months) in line with the MOH-approved iCCM protocol. The iCCM mobile application is a Mangologic application which runs on an Android platform.

The components of the mobile application strengthen the ability of HSAs to deliver effective and efficient care. These components are synergistic in providing a comprehensive array of tools and a supportive supervisory framework for the HSA.

The first component of the iCCM application captures all the elements of the village register used by the HSA. The application supports HSAs to make the appropriate decisions on treatment. HSAs are also enabled to accurately report on their work in a timely manner. The iCCM mobile application therefore enforces adherence to clinical protocols and iCCM holistically.

The second component links the iCCM application to the logistics management system to improve the availability of needed drugs to the rural clinics where HSAs see patients. This work has been coordinated with the MOH cStock program to improve its use in tracking drug inventories. D-tree developed a simple user interface within the application for the health workers to use to report stock levels, which is then submitted to cStock via structured SMS.

The third component of this project is the supervisory tool for those who are managing and supervising HSAs. The tool is based on the new paper-based routine supervision checklist developed by the MOH and Save the Children. It focuses on key performance indicators for the HSAs. The tool facilitates both collection and interpretation of data and also has a dashboard so users can see the status of the work being done by HSAs; it will also provide information for project-related decision-making.

Program Design Process

The algorithm for the application was developed using the MOH's approved iCCM protocol. After the development and design of the application, D-tree trained six HSAs from Ntchisi District to use the application in their respective village clinics. The six HSAs were engaged to solicit feedback about the functionality, relevance, and user friendliness of the application to refine it. The refinement process took two months. The district health management team and Integrated Management of Childhood Illnesses (IMCI) Unit were then informed and permission was granted to roll out the application to all HSAs conducting iCCM in the district. D-tree trained MOH officials to train the HSAs. MOH officials were used as trainers with the objective of ensuring sustainability, support, and easy management of mobile application use. To keep the MOH and other relevant stakeholders informed about the progress of the implementation, presentations on the application functionality and roll-out were made during IMCI technical working group meetings, which are hosted by the MOH and attended by partners such as the Malaria Control Program, Central Monitoring and Evaluation Department in the Ministry of Education, Save the Children,

UNICEF, Support for Service Delivery Integration, and the World Health Organization.

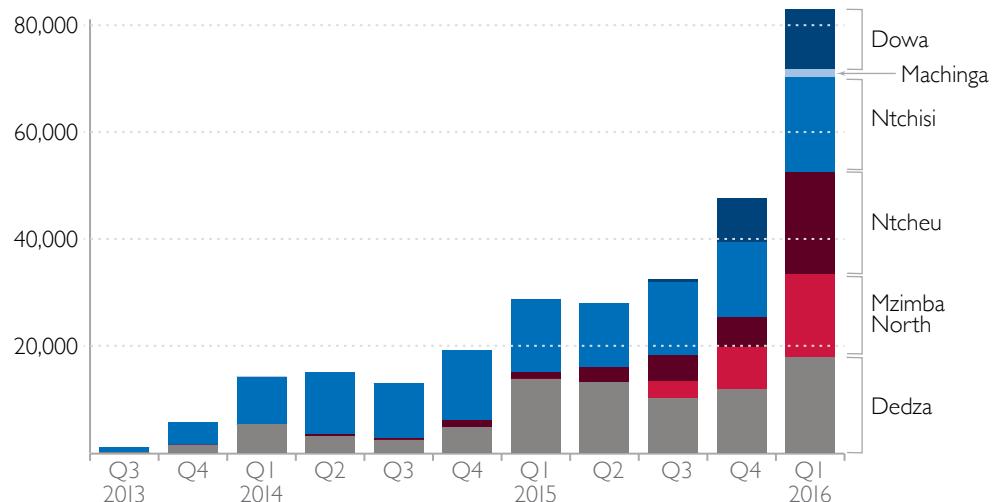
D-tree employs a number of avenues to solicit feedback to improve the application. D-tree has set up a chat group on Whatsapp which serves as a community of practice among the HSAs in their respective health facilities to share information on the usage and difficulties they may be facing. HSA supervisors also have a chat group on Whatsapp where they share ideas and give feedback on the use of the application. There is a dedicated helpline, which is available to all HSAs to call during working hours. D-tree interacts with IMCI experts who have the mandate from MOH to make changes to the protocols and to give feedback which is incorporated into the application. As part of project implementation, there are scheduled review meetings at the district and health facility levels where HSA supervisors and HSAs review progress and give feedback on use of the application. When feedback has been incorporated into the application, a new version is created and deployed remotely to the users. Users are informed through their respective chat forums and/or through SMS about the changes.

Growth in Scale

After initial development and refinement, the iCCM mHealth application was rolled out in Ntchisi District with about 20 HSAs in 2013. By December 2014, 138 HSAs and 15 HSA supervisors in Ntchisi District had been trained. The

application was expanded to HSAs in Dedza and Ntcheu districts in 2014 and in Mzimba North District in 2015. By February 2016, 128 HSAs and 33 HSA supervisors in Dedza, 116 HSAs in Mzimba North, and 133 HSAs and 38

Figure 1.
Total number of children seen





Flackson Chibwato, HSA, Chinguluwe Health Centre, Ntchisi

supervisors in Ntcheu had been trained to use the iCCM and supervisory applications. The HSAs have dedicated two to three days a week to running the village clinics. However, they see children who come to the village clinic even outside the dedicated days. On average, 75% of the HSAs are consistently using the mHealth application when assessing and treating children at the village clinics.

HSAs are responsible for a number of health services, including family planning; community case management; community-based maternal and neonatal health (CBMNH); nutrition; and water, sanitation, and hygiene (WASH).

D-tree plans to integrate as many services as possible into one

application to support the work of the HSAs. The current iCCM application was integrated with CBMNH protocols to have an integrated CCM/CBMNH application. This application was rolled out to 350 HSAs in Dowa District and 166 HSAs in Machinga District in 2015. In total, the program has trained and equipped 1,031 HSAs and 84 HSA supervisors since 2013. The total number of clients seen as of March 2016 is 307,762 (see Figure 1).

During 2016, D-tree will also add a family planning component to the application and add coverage to at least one more district.

Evaluation and Results

D-tree International carried out an evaluation to determine the clinical effectiveness of the electronic CCM. A mixed approach was used to collect both quantitative and qualitative data. The results showed higher scores in assessment, identification of danger signs referrals (diagnosis), treatment, and counseling. These are the key elements in the management of illnesses in children under-five.

Adherence to assessment using the eCCM app was 100% compared to 91% for those using paper. With the phone application, all questions are asked and recorded before going on to the next phase to encourage the HSA to go through the complete assessment. Paper users correctly identified 60% of the danger signs compared to 100% of the phone users. Treatment of cases with no danger signs was higher in the paper users (79%) compared to the phone users (74%). While the phone provides the recommended treatment, the actual

treatment given depends on the availability of the drugs and supplies recommended. Sixty percent of cases were referred appropriately in the intervention (phone) group while 48% of the cases were referred correctly in the control (paper) group. Counseling and treatment advice were seen to be higher among the phone users (93%) than the paper users (87%).

From the HSA and caregiver interviews, considerable positive feeling and feedback were recorded. HSAs felt more confident in using the iCCM application. They also felt that there was a reduction in the frequency of visits by the same children as compared to before, which they attributed to the comprehensiveness of the assessment and care given to the child when using the phone. HSAs expressed knowledge gain in using the application from the prompts and advice as well as counseling messages they get from the phone. HSAs also expressed improved follow-up rates for cases. However, they

were concerned with the double entry of data as they use both the phone and paper registers.

Quotes from the district health team and HSAs include:

"It is better to use the phone than the paper, because the phone has everything you need to do CCM."—District IMCI coordinator

"The phone enables me to conduct a comprehensive assessment of the child. The phone makes a diagnosis for me, so it makes my work easier, unlike before where I had to make sense of the symptoms to make a diagnosis."—Daniel Mandevu, Bembeke Health Centre, Dedza

Lessons Learned in Program Implementation and Scaling

- **It takes effort to train and generate stakeholder interest in using data** arising from the implementation of a mHealth application; simply building program dashboards is not enough. We have now worked to ensure that the results from each district's activities are reviewed and presented at the quarterly program meetings. For instance, based on the usage levels from Dowa District in 2016, D-tree was able to establish that the HSAs faced acute drug shortages and therefore were unable to operate the village clinics at full scale. This was brought to the attention of the IMCI unit, which sent a team to try to resolve the situation.
- **The involvement of communities in managing the phones is critical to their sustainability.** There have been occasions when an HSA's phone was stolen and later returned by another community member, as they saw this as a tool that belonged to the community and not just an individual. This is because after the application training, the HSAs sensitize the communities that they will now be using the phone to assess and treat the children. The community then sees the phone as a tool for running the village clinic.
- **The implementation of the mHealth system is not a panacea to fix all the problems of the health system.** It is and should be part of an integrated system to improve health care and outcomes. Specific to the iCCM system, when there are drug stock-outs, the HSAs tend to close the village clinics, so a mobile tool will only have limited effectiveness. Therefore, continued supervisory support is needed for both eCCM and non-mobile sites to help the HSAs feel confident to still see sick children even if they lack medication, as they should be able to successfully diagnose them and identify those who need home care and those who need to be urgently referred.
- **When scaling up, it is important to have clear and sustainable follow-up and support processes in place.** It is more helpful to avoid creating parallel structures and instead use existing structures to provide the support.
- In order to enhance coordination efforts between programs at the MOH and to support the use of data for decision-making, **D-tree placed a team member at the IMCI unit** to serve as mHealth coordinator.
- Although the mHealth application does not yet directly connect into the District Health Information Software 2 (DHIS2), the **monthly reporting feature** has shown to be useful as the districts using the mobile application have shown improved reporting rates into DHIS2. In the Central West Zone, for example, the mobile districts showed 100% reporting rates for the last 5 months with 89% reporting on time as compared to a 77% reporting rate and 53% on time in the non-mobile districts.

Future Plans

D-tree plans to develop a supervisory application for the integrated CCM/CBMNH application, which will allow the HSA supervisors to monitor the performance of their HSAs from a mobile device. As the program has grown, we have seen the need to engage HSA supervisors as well as assistant environmental health officers as a way of extending the ability of the program to identify HSAs who are struggling and to resolve common issues. In addition, the supervisory application will improve interaction between the HSAs and their supervisors through remotely checking the HSAs' performance. Currently, physical supervisions to check HSAs' performance are irregular due to financial constraints in the MOH.

With the continuous support to improve quality of care, the next step for D-tree is to integrate family planning into the existing CCM/CBMNH application. This is another key component of the work of the HSAs and was identified as a priority following discussions with the MOH. With the addition of family planning, the application will now serve to support most of the functions the HSAs perform. The integration of applications is in line with the MOH strategic plan where standalone services are being integrated to ensure a holistic approach to health care given to clients whose health needs span across multiple services.



Two HSAs doing a role play at a CCM mHealth app training in Ntcheu

D-tree, in collaboration with other partners, is working with the MOH to put systems in place that will enable interoperability of both systems to allow data from the mobile application to be sent to DHIS2. Currently, the health information system (HIS) policy has been approved and standard operating procedures (SOPs) are being developed. The SOPs will determine the process of interoperability.

While there is strong support from the MOH for continued use of the application and scale-up, the current funding streams end in 2016 and 2017, presenting a challenge for the future. This is an issue the MOH faces in other programs as well, as donors are directing funding through development partners rather than through the MOH, limiting the government's ability to fund their priorities. ■

Snapshot: iCCM	
Geographic Coverage	Malawi Districts: Dedza, Mzimba North, Ntcheu, Ntchisi, Dowa, and Machinga
Implementation Dates	July 2012–March 2017
Implementation Partners	D-tree International (project design and implementation support) ThingsPrime (solutions architect) Ministry of Health (implementer) Save the Children (project partner) Support for Service Delivery Integration (project partner)
Donor(s)	Barr Foundation Save the Children (Malawi) Support for Service Delivery Integration
Contact Information	Steve Ollis, Chief Operating Officer, D-tree International, sollis@d-tree.org

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KILKARI, MOBILE ACADEMY, & MOBILE KUNJI



Photo by BBC Media Action

Scaling up free mobile health education to 1 million community health workers and 10 million women in partnership with the Government of India

India's maternal and infant mortality rates remain above the Sustainable Development Goal targets. The Government of India is making considerable investments in this area and various innovative approaches and initiatives are evolving to bolster these efforts. Leveraging mobile phone technology (mHealth) to change people's health-seeking behavior is key among them.

In 2012, BBC Media Action, as a part of the Bill & Melinda Gates Foundation-funded Ananya program, designed, developed, and rolled out three mHealth services to increase the uptake of life-saving preventative maternal and child health behaviors by pregnant women, mothers of children up to two years old, and rural families in Bihar State. Ananya is a collaboration between the Gates Foundation and the Government of Bihar to dramatically reduce maternal and infant mortality in the state.

- *Kilkari (a baby's gurgle) is an outbound service that delivers weekly, time-appropriate audio messages about pregnancy, childbirth, and childcare directly to families' mobile phones from the second trimester of pregnancy until the child is one year old.*
- *Mobile Academy is an IVR training course designed to refresh CHWs' knowledge of simple steps families can take to improve the health of mothers and babies, and to improve their ability to clearly communicate them.*
- *Mobile Kunji is a free audio-visual job aid that brings together an interactive voice response (IVR) mobile service with a printed deck of cards with important health messages. It is designed to improve engagement between community health workers (CHWs) and families, thus leading to healthier behavior by new and expecting mothers.*

Given the success of these services, on 15 January 2016 the Government of India launched Kilkari and Mobile Academy nationally to train one million health workers and help nearly 10 million new & expecting mothers make healthier choices.

About Kilkari, Mobile Academy, and Mobile Kunji

Kilkari, Mobile Academy, and Mobile Kunji all use IVR technology that is already being used by the commercial mobile industry to make audio content available to any mobile phone across India. No new handsets, software, or technical skills are required for target groups to use the project's services, allowing accessibility at scale from the outset. A robust, open source mobile health platform called Mobile Technology for Community Health (MOTECH) powers all three services.

At the national level, both Mobile Academy and Kilkari have been integrated with the government's Maternal and Child Tracking System (MCTS). Currently 1.3 million pregnant women and mothers across six states who have registered mobile numbers on MCTS are automatically subscribed so that they begin receiving weekly calls. Similarly, only CHWs, who are registered in MCTS can dial into Mobile Academy and access the four-hour training course. They dial a 12-digit for access; bookmarking technology allows them to return to the exact location in the course whenever they like.

Program Design Process

When the three services were first being designed for rollout in Bihar, the goal was to create mHealth services that are scalable across the state and eventually across the country. Bihar alone has a population of 108 million people, including 27 million women of childbearing age, and over 80% of the population is rural with limited access to traditional media (TV and radio). However, 83% of women have access to mobile phones, but most of these are low-end basic phones. The aim was to use low-end technology for high-end gains, sustainably scale the solutions for millions of people, and create services that did not require smartphones, software, or technical skills to use.

The solution was found through Kilkari, Mobile Academy, and Mobile Kunji. All services are handset agnostic and employ easy-to-use familiar IVR technology. Mobile Academy empowers CHWs to access affordable standardized training content on their own terms; Kilkari delivers time-sensitive audio messages directly to the mobile phones of families; and Mobile Kunji gets around the challenge of delivering audio and visual content without distributing expensive hardware.

BBC Media Action began by researching its audiences: CHWs, pregnant women, and mothers of young children and their families. It conducted a landscaping study to understand their mobile ownership and usage patterns and

began to conceptualize and design the services. This involved technological design and development, checking health content, and conducting several rounds of user-testing and content pretesting.

A user-centric design approach was employed during development involving feedback and inputs from CHWs. Mobile Kunji, Mobile Academy, and Kilkari (user interface and content) went through four rounds of rigorous user-testing and pretesting with CHWs and families to assess comprehension, usability, and perceived value. The services were modified based on the results of each round of user-testing and then tested again until satisfactory results were achieved.

BBC Media Action collaborated with the Ministry of Health and Family Welfare (MOHFW), the National Health System Resource Centre, and National Health Missions (NHMs) in the states and experts in the field of reproductive, maternal, newborn, child, and adolescent health (RMNCH+A) to compile the technical health content for all three services. Before services were launched, the technical health content went through a rigorous vetting and approval process at MOHFW. This ensured that health content was aligned with national guidelines. In addition, a plan for periodically updating content was developed to ensure that it remains accurate and relevant to the audiences.

Growth in Scale

The rollout and scale-up of the three services in individual states has involved working with the MOHFW at the national level, the NHMs at the national and state level, and an alliance of donors (Gates Foundation, USAID, Barr Foundation, and UK Department for International Development (UKAid)).

In May 2012, BBC Media Action launched Mobile Academy and Mobile Kunji in Bihar as part of the Ananya program. In August 2013, BBC Media Action then launched Kilkari in Bihar under the same program. In 2014, Mobile Academy and Mobile Kunji were launched in Odisha with funding from UKAid and the state government, and in 2015, with funding from the Gates Foundation and the state government, the two services (Mobile Kunji and Mobile Academy) were launched in Uttar Pradesh.

In 2014, the MOHFW expressed interest in rolling out Mobile Academy and Kilkari nationally. At that time, BBC Media Action and the Gates Foundation began working with MOHFW to take the services to scale. The national launch of Mobile Academy and Kilkari by the MOHFW took place

in January 2016. The services will be rolled-out in three phases to train 1 million community health workers and help nearly 10 million new and expecting mothers make healthier choices and lead longer, healthier lives. In phase one of the national scale-up, Kilkari was rolled out in six Empowered Action Group states (Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, Uttar Pradesh) and Mobile Academy was rolled out in Jharkhand, Madhya Pradesh, Rajasthan, and Uttarakhand. In phase two, the two services will be scaled to an additional three states (planned for 2017); in phase three, the services will be scaled across the country (planned for 2018 onwards). In 2015, the Barr Foundation and USAID joined the national scale-up effort. BBC Media Action has worked in partnership with the Grameen Foundation since 2011 to scale MOTECH to power the services. MOTECH continues to be the engine for the national deployment. BBC Media Action, in partnership with state governments, is also scaling Mobile Kunji in Bihar, Odisha, and Uttar Pradesh, and rollout is planned in Jharkhand later in 2016.



Mobile Kunji (left) and Mobile Academy (right)

Evaluation and Results

Kilkari is being rolled out in six states currently to reach approximately one million families, with a goal to rapidly scale to reach 10 million families a year. Mobile Academy is now being rolled out to 432,000 health workers in Bihar, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, and Uttar Pradesh. The MOHFW plans to scale Mobile Academy to reach nearly a million health workers over the next three years. Mobile Kunji is being rolled out on a state-by-state basis to more than 282,000 CHWs in Bihar, Odisha, and Uttar Pradesh, with plans to scale to Jharkhand soon.

The results of a usage and engagement study, commissioned by BBC Media Action and carried out by the Indian Market Research Bureau in Bihar in 2014, indicate that exposure to Mobile Kunji is positively associated with: significant increases in the knowledge, confidence, and credibility of CHWs; positive significant difference in the quality of CHWs' interactions with new and expecting mothers; positive significant difference in levels of knowledge of life-saving preventative health behaviors among new and expecting mothers; and positive significant difference in adoption of life-saving preventative health behaviors by new and expecting mothers. A limited evaluation of Mobile Academy was also carried out as part of the usage and engagement study. It showed that Mobile Academy had a positive impact on the knowledge and confidence of CHWs, improved their standing in the community, and resulted in recognition from their peers.

Mobile usage data provides real-time information about Kilkari usage patterns by beneficiaries as well as CHWs' progress through Mobile Academy and which Mobile Kunji

content has been played to families (in what volume and with what frequency). Tracking these indicators over time provides key insights that enable on-ground project staff and government officials to make timely decisions about implementation and planning.

Indicators to monitor the usage of Mobile Academy include the uptake of the service by CHWs—this includes the number of unique users, the minutes consumed, progression and competition by CHWs in the four-hour course. This data can be aggregated for each block (smallest administrative unit in a state), district, and state. Project staff and government officials at these levels can monitor this data and use it to support and encourage CHWs in low-performing blocks to complete the course and help them if they have run into difficulties.

The indicators to assess the uptake of Kilkari include the number of users called by the service, the number of successful calls, minutes of content heard. The data generated can be aggregated, analyzed, and used by project and government staff to understand why the duration of messages listened to in one block, district, or state is lower than another.

Indicators for Mobile Kunji include the number of CHWs using the service, how many minutes heard, and specific health information accessed. This data can be used by project and government staff to understand why CHWs are not discussing a particular behavior. Based on this information, field staff can provide additional support in the form of training or mentoring.

Lessons Learned in Program Implementation and Scaling

- **Demonstrate sustained adoption at scale, as well as health impact.** One of the biggest challenges that state and national governments face is in scaling mHealth solutions beyond pilot stage. It is necessary to plan for growth early to figure out the significant financial, technical, operational, and legal challenges involved in scaling.
 - **Take the path of least resistance.** Modify the approach to reduce government procurement challenges. In India, as in many other countries, the government must first go through a procurement process to adopt a technology, product, or service. This can be a time consuming process. To help avert delays, BBC Media Action set up a toll free centralized long code platform, where shortcodes and integration with multiple operators' billing systems were not required, and government only needed to contract one operator via a standard competitive process.
 - **To generate wider interest, demonstrate demand for services not just from users, but from state governments.** The national government's interest in BBC Media Action's services grew after it scaled beyond Bihar. The launch in Odisha with support from UKAid and the state government in February 2014, and further program growth in other states drew attention at the national level.
 - **Be prepared to cope with the challenges of scaling and supporting open source software.** Open source software is used to power Kilkari, Mobile Academy, and Mobile Kunji because by investing in an open source mobile health platform, the financial hurdles that the government faces in adopting the system are limited.
- Essentially, it reduced the total cost of government ownership. However, when deciding to use open source software, it is critical for the development community to acknowledge the risk in using open source technology. Firstly, open source software may be created by organizations that might not have the capacity required to support the software to industry standard service level agreements after launch at scale. In addition, although open source technology can be adoptable by anyone, in many cases the people who know best how to fix or further develop an application are those who built it.
- **Localize content, test that it works, and keep technical information relevant and up-to-date.** Understand who the target audience is and ensure that content is relevant, understandable, and engaging. It's vital that the technical health content is reviewed periodically and updated as required. It's best to set up a process that ensures that key stakeholders review and update content periodically.
 - **Content licensing protects quality.** BBC Media Action is licensing its mobile health content, developed with funding from the Gates Foundation, DFID, and the Barr Foundation, to the government of India at no cost. However, the content is not open source—it cannot be downloadable by anyone under a Creative Commons license. BBC Media Action licenses its health content—usually royalty free—on a case-by-case basis to ensure that it remains factually accurate, complies with government policies and guidelines, is used in the context it was designed for, and is being used with the consent of the people featured.

Future Plans

National launch of Mobile Academy and Kilkari by the national government took place in January 2016. The services will be rolled-out in three phases, adding states in phase one and two during 2016 and 2017 dependent on feedback from users and successful adoption of the services in the phase one states. In 2018, there are plans to begin scaling the two services to the rest of the country, reaching a total of 1 million CHWs and 10 million pregnant women and mothers of children under one year of age. BBC Media Action, in partnership with state governments, is also scaling Mobile Kunji in Bihar, Odisha, and Uttar Pradesh, and rollout is planned in Jharkhand later in 2016.

The Gates Foundation's investment has covered the cost of scaling the software for the two services (including

MOTECH) so it can handle calls to and from 35 states, and to support software for a period of three years (through December 2018). Support from USAID and the Gates Foundation contributes to the national scale-up effort over the next two and a half years. Further investment is required for developing different language versions of the two services, to carry out monitoring and evaluation of the project, and to document the five-year learning journey from research and development to national scale-up. BBC Media Action is currently working to design impact-evaluation studies and a cost-benefit analysis of all three services to assess the value of delivering free health education to millions of beneficiaries and health workers. ■



Snapshot: Kilkari, Mobile Academy, Mobile Kunji

Geographic Coverage	India Mobile Kunji: Bihar, Odisha, Uttar Pradesh Mobile Academy: Bihar, Odisha, Uttar Pradesh, Rajasthan, Madhya Pradesh, Jharkhand, and Uttarakhand Kilkari: Odisha, Uttar Pradesh, Rajasthan, Madhya Pradesh, Jharkhand, and Uttarakhand
Implementation Dates	May 2012 to present: Mobile Kunji and Mobile Academy May 2013 to present: Kilkari
Implementation Partners	BBC Media Action (implementing organization) Pathfinder Intl. (Dec 2010-Mar 2016) (implementation partner) Grameen Foundation; OnMobile; Onion Development Technologies; IMIMobile; GSMA (technology partners) Government of India Ministry of Health & Family Welfare, State National Health Missions (partners)
Donor(s)	Bill & Melinda Gates Foundation; USAID; Barr Foundation; UKAid
Contact Information	Sara Chamberlain, Director, Digital, BBC Media Action, India sara.chamberlain@in.bbcmediaaction.org

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Connecting ministries of health with frontline health workers via SMS

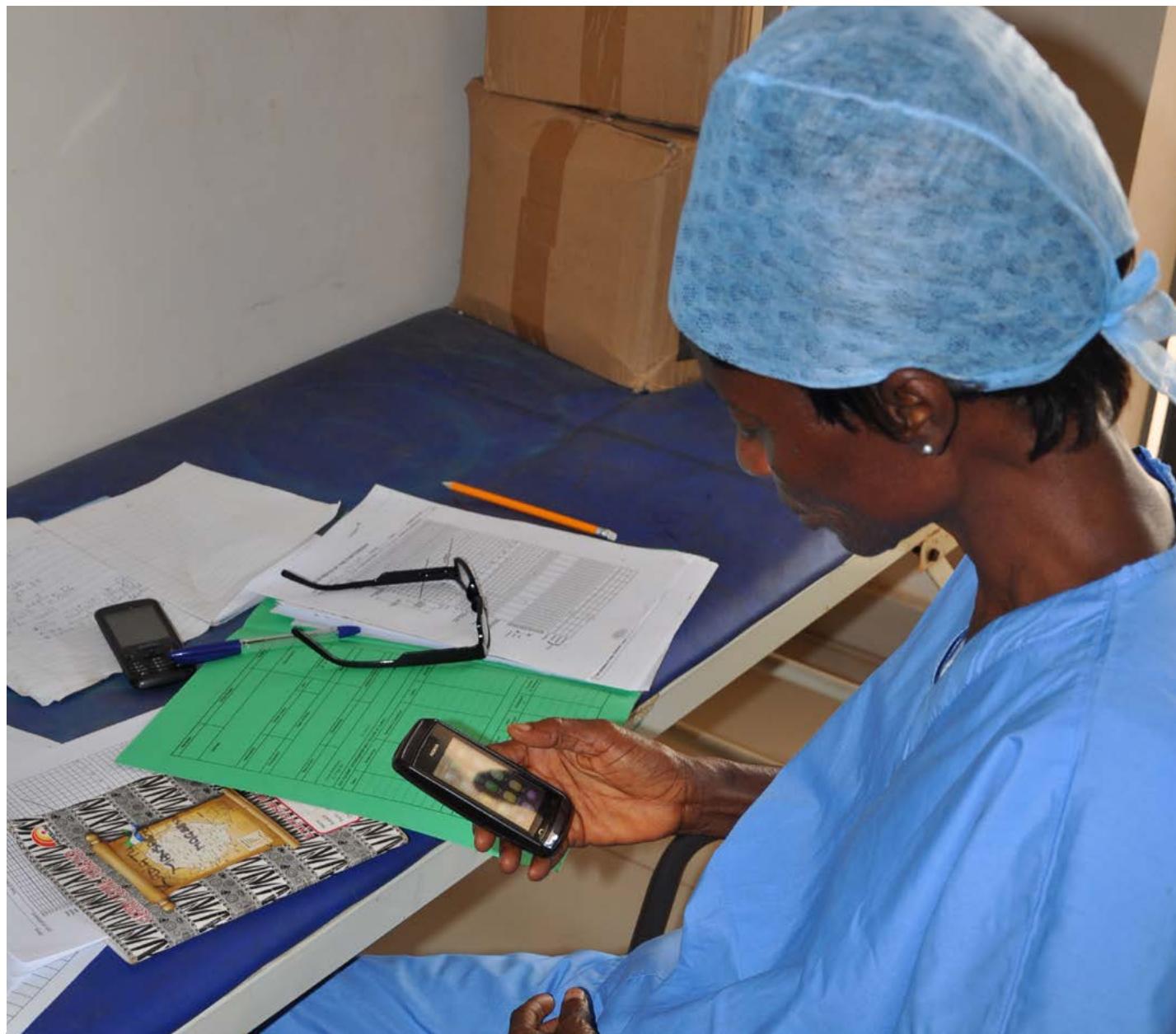


Photo by Emily Nicholson for IntraHealth International

MHero is a two-way, mobile phone-based communication platform that uses basic text messaging, or SMS, to connect ministries of health and health workers. mHero operates on simple talk-and-text mobile devices—no smartphone or tablet required.

MHero is not a new technology. It's a way to connect data from existing health information systems (HIS) to allow targeted, real-time communication. mHero brings together components of a country's HIS using open international interoperability standards for health information exchange. Health officials can use mHero to:

- communicate critical messages to health workers during a crisis;
- target messages to health workers based on cadre, location, or skill set;
- collect critical information that supports resilient health systems, including stock levels, routine formal and informal indicators, one-time assessments, and validation of health worker and facility data; and
- support surveillance systems for real-time reporting on active cases and potential outbreaks and to reinforce health workers' skills—part of a country's solution for Integrated Disease Surveillance and Response (IDSR).

Harnessing the principles for digital development—guidelines that can help development practitioners integrate established best practices into technology-enabled programs—IntraHealth International and UNICEF created mHero in August 2014 to support health sector communication during the Ebola outbreak in Liberia.¹ mHero is currently being scaled up in Liberia, piloted in Guinea and Sierra Leone, and deployed in Mali and Senegal as part of the Global Health Security Agenda to support IDSR use cases.

About mHero

MHero combines iHRIS, an open source human resources information system (HRIS) developed by IntraHealth, and RapidPro, UNICEF's SMS platform that allows users to create SMS messages in a "workflow" through a website. mHero supports one-time messages to health workers or two-way communication between health workers and the ministry of health. Health workers can initiate messages themselves by sending a standardized SMS to the mHero phone number.

The technology behind mHero includes interoperability with other systems, such as DHIS2, through OpenHIE, an architecture that supports mHero as HIS expands and evolves. Using these open source systems, ministries of health are able to efficiently leverage health information technologies, many of which they have already invested in scaling to improve their own HIS.

What makes mHero work at national scale is rigorous adoption of open international standards for health information data exchange. These include the Care Services Discovery (CSD), Mobile Alert Communication Management (mACM), and HL7 Fast Healthcare Interoperability Resources (FHIR) standards for sharing health worker and health facility data and to provide standards-based communication protocols for health workers. The open source and open standards approach means that the mHero platform is not tied to any specific piece of software and allows ministries of health to readily integrate mHero into their HIS.

A variety of tools support the mHero platform.² These include video tutorials on operating the platform; operations and management tools to support implementation; and a wiki to guide developers and program implementers setting up their own instances of the platform.^{3,4}

Program Design Process

The mHero platform is designed by facilitating interoperability of existing HIS. Linking iHRIS and RapidPro via an interlinked health worker registry, information on health workers (including cadre, facility, location), as well as their mobile numbers, are pulled from iHRIS and attached to the workflow developed in RapidPro. mHero was also created to be interoperable with District Health Information Software 2 (DHIS2) and interlinked facility registries to ensure standardized facility data are part of the mHero platform. Security, access control, and data synchronization services are provided through the OpenHIM software.

mHero's initial development was supported by UNICEF, the US Agency for International Development (USAID) through the K4Health Project, and Johnson & Johnson. The design process engaged a number of partners, including Jembi Health Systems, Thoughtworks, USAID, and others. An intentional multistakeholder approach was undertaken in the development and implementation of mHero to include as much collaboration as possible to ensure the platform aligned with other digital efforts to reach health workers, especially during the Ebola response. These stakeholders have expanded to include the World Health Organization, MEASURE Evaluation, Jhpiego, Management Sciences for Health, mPowering Frontline Health Workers, eHealth Af-

rica, Johns Hopkins Center for Communication Programs, International Medical Corps, Dimagi, the Clinton Health Access Initiative and many others.

The most important stakeholder, however, is the ministry of health in the country in which mHero is implemented. mHero is fully integrated into and operated directly by the ministry. The ministry decides which use cases to prioritize and which health workers to target with messages, and develops and sends the workflows. IntraHealth works with the ministries and partners in the respective countries to align mHero with national policies and strategies so the platform can be utilized to support the existing (or future) HIS and to respond to priority health needs.

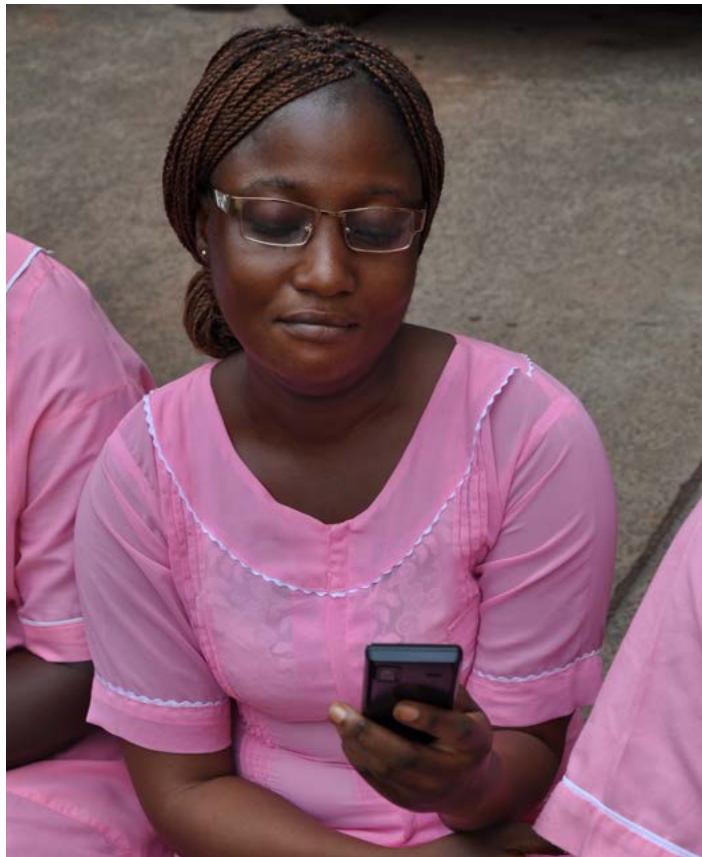
IntraHealth and UNICEF are building the capacity of mHero implementers at ministries of health in Liberia, Sierra Leone, and Guinea. This includes collaboration to strategically integrate mHero into existing data collection and reporting structures, training in RapidPro to create workflows and in operation of the platform through iHRIS, establishing interoperability between RapidPro and iHRIS, and developing standard operating procedures and other critical management processes to integrate mHero into the existing HIS framework.⁵

Growth in Scale

The first mHero use cases were developed to help Liberia's Ministry of Health and Social Welfare determine the location of health workers during the Ebola response and which facilities were open. After a successful pilot in four facilities in four counties, the mHero team at the ministry began raising awareness of the platform among county-level stakeholders.

Interest in the system grew as officials realized the platform's accessibility and flexibility, allowing for new use cases to be developed. These included collecting information about mental health services, conducting an assessment of anthropometric nutrition tools, alerting new staff to their payroll IDs, and collecting information from health workers on their level of family planning training, commodities supply, and service provision.⁶ To date, 22 distinct use cases have reached over 5,000 health workers throughout the country. The ministry is now engaging external partners in the development and sending of use cases, demonstrating its role in leading health worker communications in Liberia.

The success of mHero in Liberia can be attributed to the ministry mHero team's ownership of the platform and commitment to ensuring mHero is aligned with Liberia's HIS and that the platform is successful in responding to the ministry's information and communication needs. As mHero scaled in Liberia, ministries in Guinea and Sierra Leone began planning implementations. Officials from the three countries met through iHRIS and mHero trainings to share experiences developing and deploying the platform, including integration into ministry and HIS structures and best practices for strategic development of meaningful use cases. As of March 2016, the ministry in Sierra Leone had planned its use cases and was close to piloting the platform. Efforts to build a sustainable base for mHero in Guinea are gaining momentum as the ministry develops its HIS strategic plan. USAID has supported scale-up of mHero in the three countries through the Ebola Grand Challenge Innovation Grant through the Global Health Bureau.



In Mali, IntraHealth is working with the Ministry of Health to develop and deploy mHero in both SMS and interactive voice response (IVR) formats to support the surveillance system, including enhancements in real-time reporting and

reinforcement of health workers' skill sets during the surveillance process. In Senegal, the Ministry of Health is deploying a version of mHero across its health regions.

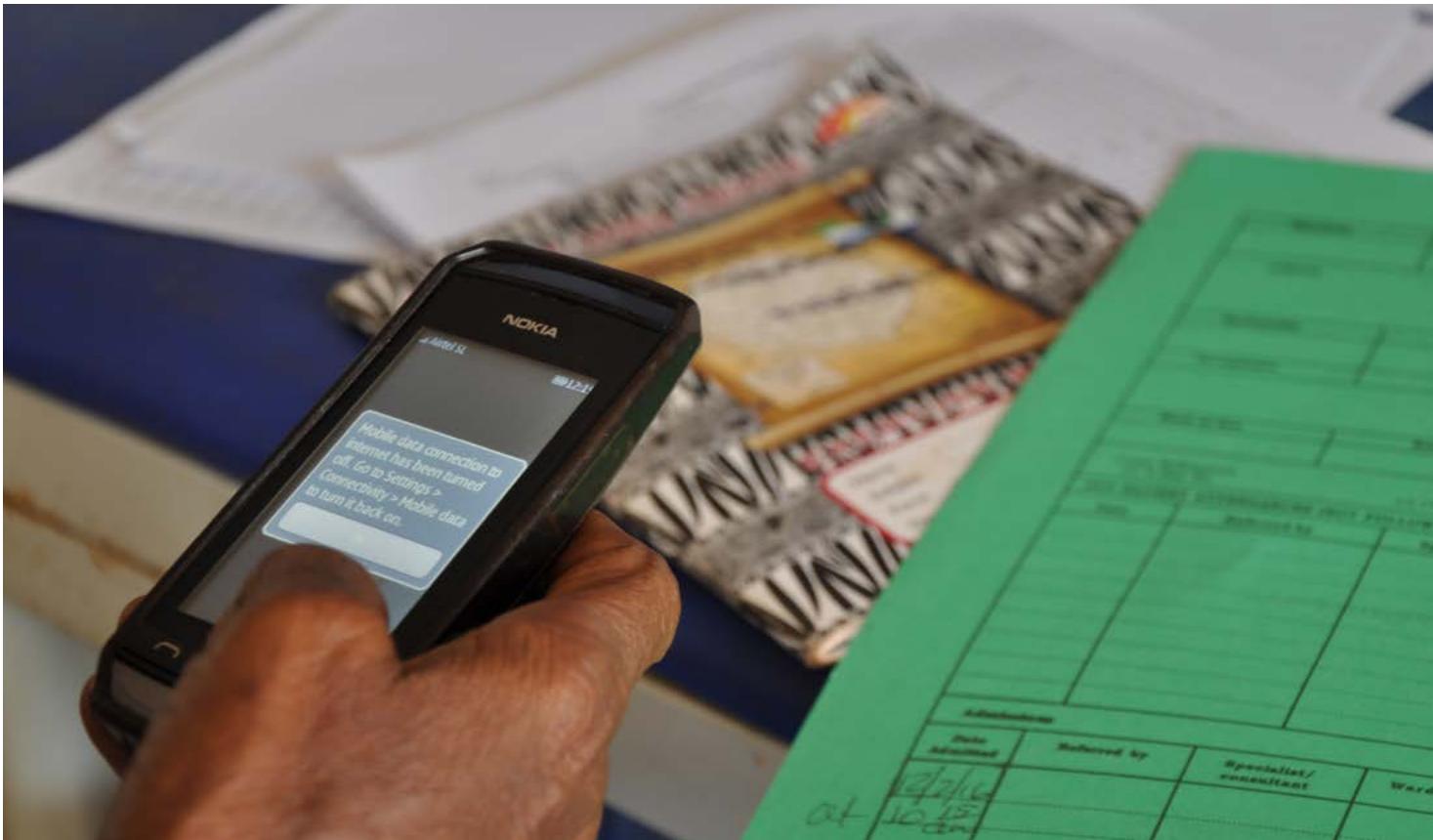
Evaluation and Results

In November 2015, one year after the initial pilot, a baseline assessment was conducted in Liberia to measure frontline health workers' awareness of, use of, and attitudes toward mHero. Ten-question phone surveys were administered to 266 randomly selected recipients who fit the definition of a frontline health worker. A randomly selected subsample of 20 health workers responded to an extended survey. This survey featured additional queries that elicited more detailed information about respondents' phone use, including mobile technologies such game playing, accessing social media, and taking online courses. The extended survey also probed participants' phone use patterns, such as preferred times for receiving and responding to text messages.

Overall, survey findings at baseline proved very preliminary due to a lack of awareness of mHero among respondents. Out of the 266 respondents, only 7.9% of the health workers had heard of mHero, and even fewer knew that mHero was

associated with Liberia's Ministry of Health and Social Welfare. The largest factor contributing to awareness of mHero was exposure, as 81% of those who knew of the platform had received an SMS sent via mHero. Health workers identified various factors motivating them to respond to these messages, with the most frequent reason being that they had been told about mHero prior to receiving the text. Responses to the extended survey indicate that health workers almost universally bring their phones to work each day, and more use their phones for connecting to social media than they do for playing games or taking courses. Health workers report receiving a wide variety of health-related texts each month of varying origin.

An endline assessment using the same questions will be conducted in Liberia in July 2016 toward the end of the USAID Ebola Grand Challenge Project.



Lessons Learned in Program Implementation and Scaling

A number of key insights and lessons learned have emerged since mHero's initial pilot in late 2014. These include:

- **Ministry of health leadership and ownership:** mHero's success depends on the ministry stakeholders who utilize and implement the platform. It can take time to build a sense of ownership, to identify the strategic "home" for mHero within the ministry, and to integrate mHero into the HIS architecture.
- **Awareness-raising with health workers:** To encourage their active engagement, health workers need to know that mHero messages are legitimately from the ministry and that their responses are important for decision-making. Flyers, brochures, and other communication tools can help spread the word.
- **Infrastructure:** mHero's functionality depends on a number of infrastructure components, including adequate software and hardware to operate the platform and mobile network service throughout the country. Inadequate infrastructure has delayed mHero implementation, in some cases more so than expected, but IntraHealth is

working with other implementing partners to improve infrastructure in Liberia, Guinea, and Sierra Leone.

The needed infrastructural investments are not extreme and can support other subsystems of an HIS and basic operations of the ministry. This includes basic Internet connection, procuring laptops for ministry staff, and provision of servers and backup servers for data and ensuring security of mHero and iHRIS data. Working with other partners and donors to ensure a strategic approach to infrastructure improvement is important, especially during an emergency response when coordination of investments is challenging.

- **Implementation capacity:** Though mHero harnesses existing technology, the processes for implementing mHero are new. Ensuring ongoing capacity-building for mHero team members to not only facilitate the interoperability of the systems but also establish procedures that fit within their local context is important, as is building capacity to manage and use data. Through ongoing training and mentorship, both from a distance and through short-term technical assistance, IntraHealth

continues to work with mHero teams in the respective ministries to foster skills-building in systems operations and data use. Staff turnover and non-mHero work demands have posed challenges, thus an organizational development approach must be taken in capacity-building efforts.

- **Engaging other external partners:** Many other donors and implementing partners have been operating in Liberia, Guinea, and Sierra Leone to support the Ebola response and rebuilding efforts, creating an additional but important layer of collaboration and commitment for mHero implementation to be successful.

Future Plans

The future of mHero focuses on thoughtful steps toward the full integration of the platform into ministry of health HIS plans and procedures, ensuring strategic use of the platform to support the needs of health workers and ministries, and raising awareness to encourage message response. Future trainings on both iHRIS and mHero have been planned, as well as workshops on the strategic use of data to inform programmatic and policy decisions. Discussions about interoperability are underway to ensure mHero can directly support other HIS subsystems. Pilot messages will be initiated in Sierra Leone, Guinea, and Liberia in the coming months, demonstrating full regional scale of the platform. In addition, the Liberia ministry is interested in decentralizing use of mHero so that county human resource officers can use it to communicate with health workers in facilities.

Other future plans to expand the capability of the mHero platform include the following:

- Providing mHero functionality at the level of the Inter-linked Health Worker Registry, rather than iHRIS, for countries or programs that do not use iHRIS
- Tighter integration with DHIS2 for routine data collection as well as alerts and reminders to support the routine data-collection process

- Streamlined integration for communication with a health facility's point of contact
- Integration with other communication platforms as alternatives to RapidPro (e.g., CommCare) for countries that are comfortable with their existing platform
- Expanded analytics capabilities ■

Snapshot: mHero

Geographic Coverage	Guinea, Liberia, Mali, Senegal, Sierra Leone, Tanzania
Implementation Dates	November 2014 to present
Implementation Partners	IntraHealth (co-founder of platform); UNICEF (co-founder of platform) mHero is implemented by Ministries of Health
Donor(s)	USAID Johnson & Johnson UNICEF Global Innovation Centre UNICEF Liberia
Contact Information	Amanda Puckett BenDor, Technical Advisor, IntraHealth, apuckett@intrahealth.org

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Promoting maternal and child health in South Africa through mobile health messaging and feedback on services received



Photo by MomConnect

The MomConnect technical solution has a number of linked elements that enable pregnant women to receive information about their own health and also that of their infants. Women can both ask for more information and supply feedback to improve the quality of health care.

In 2014, the South African Minister of Health, Dr. Aaron Motsoaledi, launched an initiative (MomConnect) to use mHealth technology as part of a suite of interventions, such as increased access to contraception and improved coverage of breastfeeding, to address the relatively high maternal mortality ratio (MMR) and child mortality rate in South Africa. The Medical Research Council estimated the MMR in the country at 155 deaths per 100,000 live births in 2013. South Africa's Sustainable Development Goal (SDG) for MMR is 70 deaths or less per 100,000 live births by 2030. Similarly, the child mortality rate of 39 deaths per 1,000 births in 2014 has an SDG target of 25 or less deaths per 1,000 by 2030.

MHealth projects in a number of countries have successfully used mobile phone technologies to enhance interventions which have been shown to improve maternal and child health (MCH) outcomes. In South Africa, virtually every pregnant woman has either her own mobile phone or access to one. Because of this virtual universal access, MomConnect was introduced.

MomConnect aims to improve both the demand for MCH services, through providing pregnant women with information via messages, and the supply side through impacting on quality via user feedback.

About MomConnect

The MomConnect technical solution has a number of linked elements that enable pregnant women to receive information about their own health and also that of their infants. They also enable interaction with a helpdesk. Women can ask for more information and give feedback to provide impetus for the supply side of the health system to improve the quality of care.

Women who think they are pregnant subscribe to Mom- Connect using a free of charge unstructured supplementary service data (USSD) number on their phones (*134*550#). This number works on all mobile networks in South Africa. They initially receive messages encouraging them to register their pregnancy at an antenatal clinic.

Women attending the antenatal clinics are registered into a central database. Based on the estimated gestational age of the fetus, stage-based messages are sent to the pregnant woman. Similar messages linked to the age of the infant are sent after delivery. Variables linked to the identification of the women and the facilities allow MomConnect to link

with other national information systems under development. The women can choose one of the 11 official languages for messages.

There are 150 messages in the full suite. These include hard health messages that address hypertension, HIV, and immunization for the baby. There are also softer messages about the growth of the baby and importance of bonding. These messages continue until the infant is one year old.

Several components allow women to give feedback to the helpdesk located in the national Department of Health (DOH). These include: frequently asked questions (FAQs); a five-question service quality rating survey the day after women register their pregnancy; and a compliments and complaints system which the women can use at any time.

MomConnect sends information via a national health information exchange to a central database in the DOH, where it can be linked with other information in the DOH.

Program Design Process

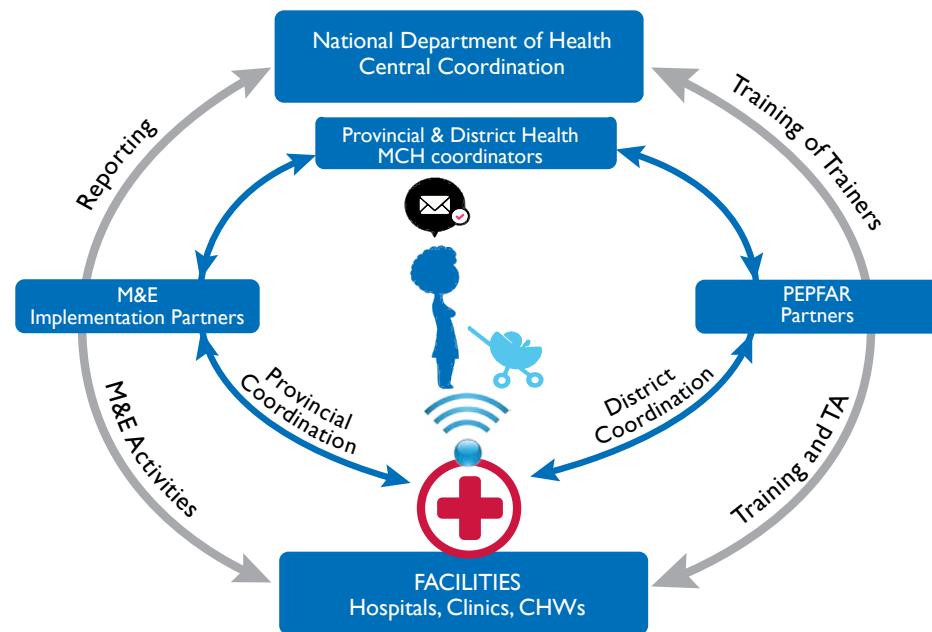
Between 2008 and 2013, a number of small-scale pilot mHealth projects were started in South Africa, many of these dealing with maternal health. After reviewing these projects, the DOH set up a task team to design a national mHealth program to register all pregnant women and send them messages.

The team was made up of DOH staff as well as people with expertise in various aspects of mHealth, including those with links to mobile network operators; expertise in the back-end of data systems, databases, and information interoperability; prior experience of sending mHealth messages; and links to the international mHealth community. The DOH gave leadership and ownership to MomConnect, which enjoyed considerable political support as a ministerial flagship project.

While the team developed the technical aspects of MomConnect, the political mandate was to make it a nationally scaled-up project to be implemented throughout South Africa. In addition, the political mandate was to incorporate a feedback mechanism so that the voices of pregnant women could be heard loudly and clearly.

Because the task team was chaired by a senior manager of the DOH, national managers are consulted in all aspects of the project to ensure that it aligns fully with the overall direction of the DOH. For example, a message set was initially developed by the task team. Several managers in the DOH then reviewed all of the messages to ensure that they were fully aligned with DOH policies and guidelines.

Figure 1.
Scale-up model for MomConnect

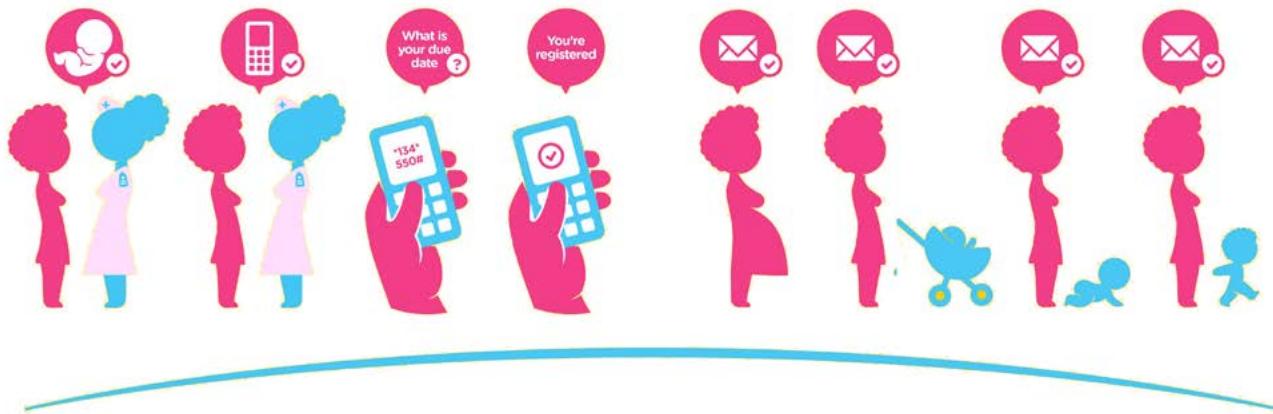


The feedback mechanism has a number of discrete components.

- **FAQ service:** Pregnant women, who are registered for the service, are able to ask question via SMS. The MomConnect helpdesk, with a professional nurse in charge, responds by giving standard approved answers or directs the women to a clinic for further assistance.
- **Service Rating:** The day after registering her pregnancy on MomConnect, the pregnant woman is sent an SMS which prompts her to complete a free survey. This survey covers friendliness of staff, patient privacy, facility cleanliness, and waiting times. A single follow-up message is also sent if women do not complete the survey.
- **Compliments and Complaints:** Women are able to send a complaint or compliment via a free SMS. These are logged at the helpdesk. Each of the 52 health districts in South Africa has a focal person in charge of MCH. After sorting the complaints into the relevant health district, based on the clinic where the complaint arose, these are sent to focal persons. They are expected to act on these and give feedback to the helpdesk within 10 days. If no action is taken the complaint is escalated to the provincial health management.

Growth in Scale

There are about 4,000 public sector facilities in South Africa, so implementing the MomConnect technical solution on a national scale required partnerships and a considerable



amount of coordination. The scale-up approach is shown in Figure 1.

The DOH provides overall leadership and coordination of MomConnect. A project manager was appointed, reporting to the senior manager in the DOH responsible for MCH. The project manager, based in the DOH, coordinates all MomConnect activities and acts as the central point of responsibility.

MomConnect was rolled out in a high-profile campaign across South Africa in 2014. This followed a visit by the Minister of Health to each of South Africa's nine provinces where he gave a presentation on MCH in South Africa and the potential impact of MomConnect.

To register, pregnant women go to one of the country's 4,000 health facilities and receive assistance from health care workers who have been trained in the registration process. Follow-

ing the announcement campaign by the Minister, each of the district support partners funded by the President's Emergency Plan for AIDS Relief were trained to support the facilities in the districts in which they work. This enabled wide-scale training (2–3 hours) on how MomConnect works and how to register pregnant women.

Between August 2014 and February 2015, over 30,000 health care workers were trained to register women on MomConnect. Nearly all (95%) of public sector facilities have registered women on MomConnect. However, the numbers of registrations are still not optimal. Operational research has identified that lack of connectivity and timeouts as two major constraints. Also, in some places the registration processes could be streamlined. New methods have been designed to overcome these difficulties and retraining of health workers that take these factors into account has begun.

Evaluation and Results

As of March 2016, over 34,000 health workers have been trained to register pregnant women in the system. They work in 95% of all government health facilities in the country. During the first year and a half of MomConnect they registered 663,513 women. This represents nearly half of all the pregnant women attending antenatal care.

More than six times as many compliments (4,924) were received compared to complaints (788) since the launch of MomConnect in August 2014. The compliments give positive feedback on MomConnect generally, as well as on particular facilities or staff. The complaints fall into three main categories: health systems issues (e.g. lack of drugs and vaccines); health services issues (e.g. long waiting times), or those related to individual health workers (e.g. rude treatment).

In July 2015, a telephone survey was conducted with 10,000 registered users of MomConnect. There was a response rate of approximately 20% (1,980 respondents).

Of the respondents to this survey, over:

- 98% (1,962) felt that MomConnect messages had helped them.
- 80% (1,611) had shared the messages with friends or their partners.
- 80% (1,606) reported that the messages helped them to remember their clinic visits.
- 75% (1,531) reported that the messages had helped them feel more prepared for childbirth and delivery.
- 70% (1,414) actually wanted more messages than the 100-plus they already receive during their pregnancy and the first year of the child's life.

An overall impact assessment interviewing women before and after getting messages has been developed. It has received ethics approval from the University of Stellenbosch and the US Centers for Disease Control and Prevention (CDC) and is awaiting final approval from the Office of the U.S. Global AIDS Coordinator (OGAC). This will be conducted in May and June 2016.

Service ratings were submitted by 30% of all women registered on MomConnect since March 2015 when a reminder to complete the survey was introduced. The MomConnect clients' satisfaction with the friendliness and helpfulness of the staff varied between 85 and 88%, and was the highest of all the categories rated for the period January to December

2015. Client satisfaction with facility cleanliness and respect of privacy received a satisfaction rate between 74 and 85% for cleanliness and 82 and 85% for privacy. The clients were least satisfied with waiting time length which ranged between 71 and 76% satisfaction.

Lessons Learned in Program Implementation and Scaling

The most important lesson is that to ensure scalability and sustainability there has to be political support and leadership. Because MomConnect is championed by the Minister of Health, it is automatically given endorsement by many stakeholders, who would otherwise not give their active support, including managers in the national and provincial DOHs. Having a senior manager in the DOH responsible for leading the implementation also gives MomConnect the necessary authority to attract support from a range of stakeholders.

Another key lesson is the importance of partnerships and harnessing capacity and skills from all stakeholders. MHealth is a burgeoning field and no one party has all the knowledge and experience to implement complex projects at scale. Much of the success of MomConnect has been the ability to integrate and harness the skills and contributions from a number of players. This has been done by having an inclusive task team, as the key advisory body for the project, meet regularly to discuss implementation and augmentation of MomConnect. The team has brought continuity to implementation and ensured that the program has been oriented around its initial plans. Also, MomConnect has had a transparent process from the outset and welcomed contributions from all stakeholders.

As MomConnect is the first mHealth project of national scale in South Africa it has had to break new ground all

along the implementation chain. This requires a management structure that is flexible and able to make quick decisions to respond to the various needs of different stakeholders, including donors, mobile network operators, and other interest groups, such as the private sector, which want to be included in MomConnect activities.

MomConnect is constantly monitored, and opportunities for improvement are continually assessed. These include monitoring of costs, and the project is continuing to assess more economical ways of providing certain services. New alternatives, such as instant messaging, are being explored to reduce the costs related to messaging. Local innovations are adopted for national scale-up. For example, one province introduced a sticker which is placed on the outside of the woman's antenatal folder. This bright sticker indicates that the woman is registered on MomConnect and serves a dual purpose: other women are stimulated to get a sticker, and health workers immediately have another chance to motivate the women without stickers to register on MomConnect.

One of the challenges to MomConnect is paradoxically due to its success. A number of stakeholders want to use this success for their own areas of interest. For example, a number of researchers want to add particular messages in which they are interested.

Future Plans

This work serves as an important foundation that can be built upon to reach new audiences. Processes are in place to extend MomConnect to provide additional support to HIV-positive mothers and partners and to lengthen the period of messaging until children reach age five. MomConnect is also being extended to the private sector, as there is anecdotal evidence that many women first book with private general practitioners but then deliver in public health facilities. These efforts will strengthen the continuum of care between reproductive, maternal, newborn, child, and youth health, while facilitating the development of high-quality, accountable health services.

In addition, new technology approaches, such as using instant messaging services, are being explored. This is expected to give

opportunities to both reduce costs and improve the service by expanding the content available for women.

MomConnect has a component (NurseConnect) aimed at supporting and empowering frontline nurses with mHealth messaging and information so that they are better equipped to give high-quality MCH service. NurseConnect has been piloted and will be rolled out nationally by August 2016.

One long-term challenge is the cost of information transfer, in particular SMS costs. The mobile network operators are being asked to zero-rate these costs as a public good and at the same time alternatives to cheaper forms of data transfer are being explored. ■

Snapshot: MomConnect	
Geographic Coverage	South Africa
Implementation Dates	August 2014 to present
Implementation Partners	National & Provincial Departments of Health Praekelt Foundation; Health Information Systems Program/SA MEASURE Evaluation mHealthEnabled Universities of Stellenbosch and Western Cape
Donor(s)	USAID Johnson & Johnson Elma Philanthropies Discovery foundation
Contact Information	Dr.Yogan Pillay Deputy Director-General HIV/AIDS, TB & MCHW, pillary@health.gov.za

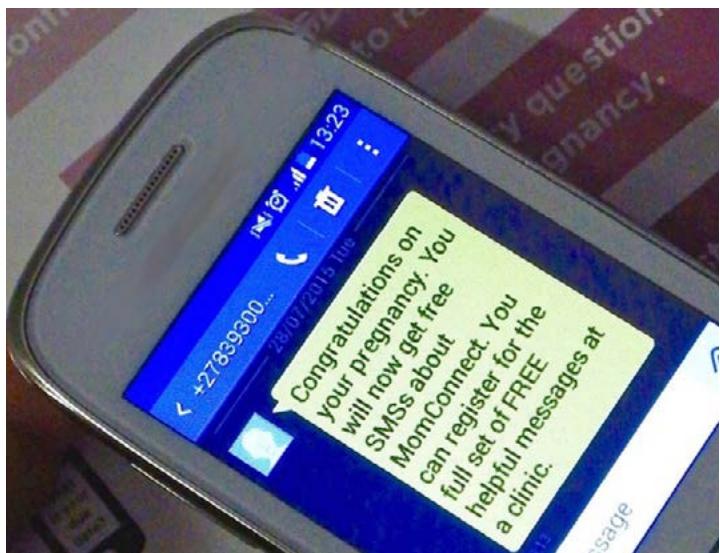


Photo by MomConnect

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Enhancing event-based disease surveillance and response efforts in Kenya through SMS reporting and web portal dashboards

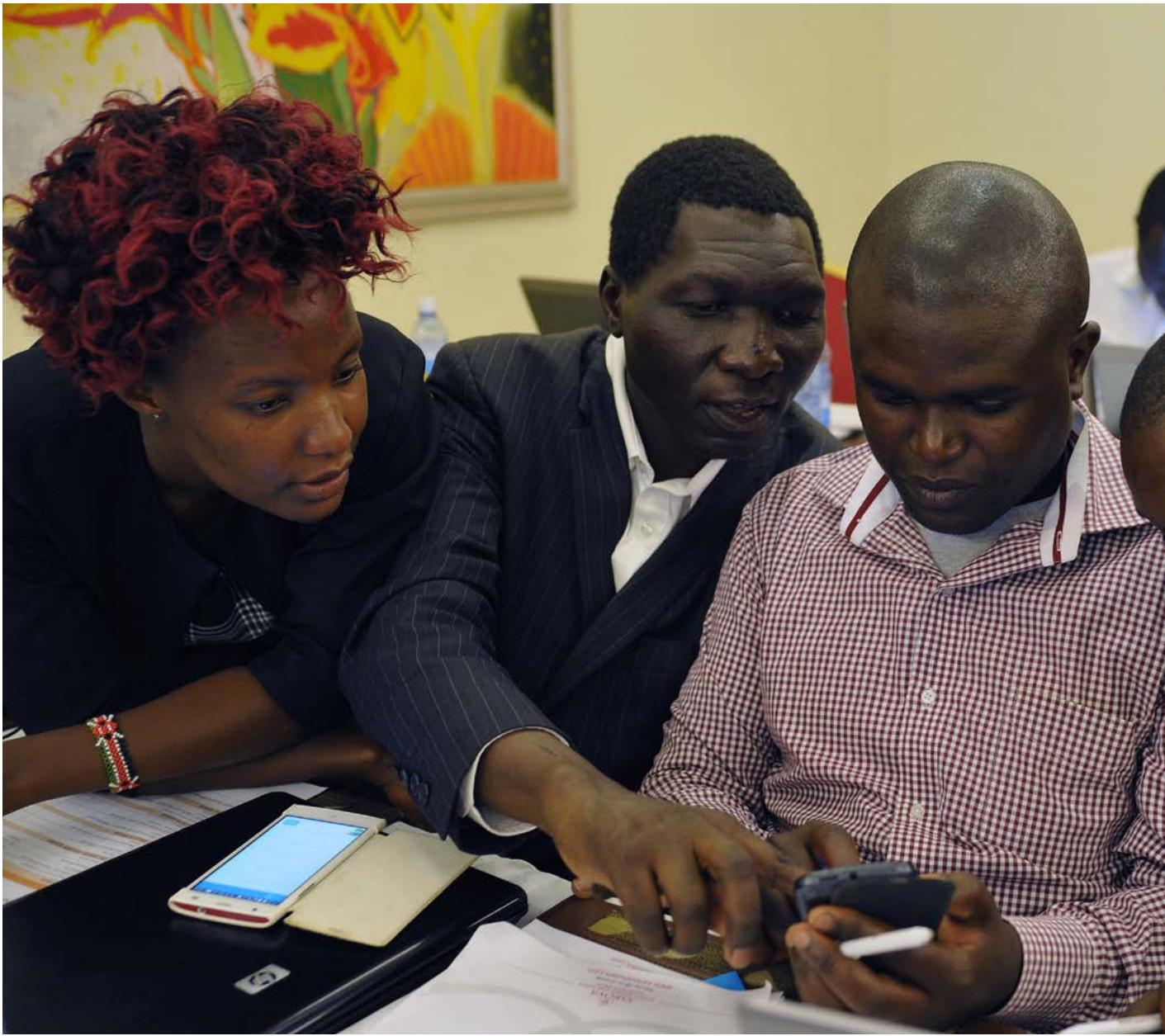


Photo by Takeshi Kuno

Mobile SMS-based disease outbreak alert system (mSOS) enhanced timely notification—and the technology can be used to enhance disease surveillance in resource-limited settings.

Disease outbreaks pose serious public health risks worldwide as seen in the recent SARS, Ebola, and Zika epidemics. Resource-limited settings lack strong disease surveillance mechanisms to quickly detect, diagnose, and contain outbreaks.¹ This hinders a nation's ability to fully comply with the World Health Organization (WHO)'s International Health Regulations (IHR 2005) and the Integrated Disease Surveillance and Response (IDSR) strategies.²⁻⁴

In Kenya, as in other African countries, paper-based reports or ad hoc information from the health facilities reach the authorities at the national and sub-national levels late, which in turn limits abilities to respond in a timely manner to control the outbreaks.⁴ To overcome these challenges, the Ministry of Health (MOH) and the Japan International Cooperation Agency, Japan Agency for Medical Research and Development, Science and Technology Research Partnership for Sustainable Development (JICA-AMED SATREPS) project piloted the mSOS (mobile SMS-based disease outbreak alert system) in 2012–2014.⁵⁻⁷

A randomized controlled trial was implemented, which showed that mSOS enhanced timely notification and that the technology can be used to enhance disease surveillance in resource-limited settings.^{8,9} Based on recommendations from the stakeholders, a technical working group was formed at MOH, and the system is currently undertaking a series of modifications before a nation-wide rollout.¹⁰⁻¹³

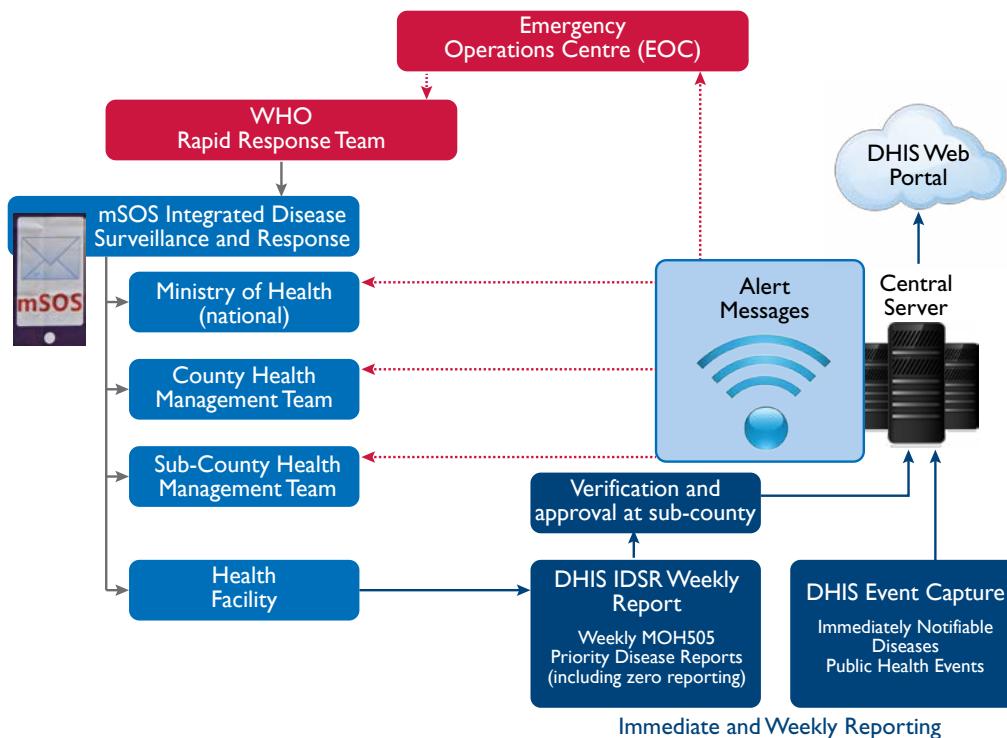
About mSOS

Mobile SMS-based disease outbreak alert system (mSOS) is a formatted text-message system that allows real-time communication between health facility workers and disease surveillance coordinators at the sub-county, county, and national levels in line with the IDSR guidelines.⁵⁻⁷

At the time of the pilot, the IDSR guidelines recommended health facility workers completing and submitting paper-based forms to the sub-county-level disease surveillance coordinators, and sub-county-level disease surveillance coordinators electronically transmitting information to higher-level managers at the county and national-levels. Sub-county disease surveillance coordinators are the first-level responders to the reporting facilities. mSOS tried to eliminate redundancies of data entry at multiple levels, and to make information-sharing instant at all levels.⁴ The system consists of two components: text messaging function, and web portal (see Figure 1, next page).

1. **mSOS (text messaging):** The text messaging function allows health facility workers to input formatted text messaging with patient-level information of suspected disease outbreaks. A text message is immediately sent to relevant health authorities at the national and sub-national levels with information on the place, time, and details of a patient with suspected disease that needs to be reported within 24 hours.
2. **mSOS web portal (dashboard):** mSOS web portal displays a dashboard with patient-level information, bar graphs with cumulative incidents, and hot spot maps indicating the health facilities that reported the cases. The relevant authorities at the national and sub-national levels can also enter the time and details of actions taken on the notifications sent.

Figure 1.
Structure of the mSOS Integrated Disease Surveillance and Response Mobile System



Twelve diseases and conditions were picked for the pilot from the immediately notifiable diseases list in IDSR. The list included adverse events following immunization (AEFI), anthrax, cholera, dengue fever, Guinea worm, measles, neonatal tetanus, plague, Rift Valley fever, viral hemorrhagic fever, yellow fever, and any public health event of concern (e.g,

infectious, zoonotic, foodborne, chemical, radio nuclear, or caused by an unknown condition). The pilot was implemented in two counties: Busia and Kajiado. Busia County borders Uganda by the Victoria Lake basin with 7 sub-counties, and Kajiado County borders Tanzania with 5 sub-counties.⁸⁻¹⁴

Program Design Process

The design process took 1 year: 6 months in conceptualization, 3 months in programming, and 3 months in beta testing. The implementation period was 6 months.

- 1. Conceptualization:** mSOS was conceptualized in mid- to late-2012. The JICA expert conducted informal interviews with MOH employees and workers in health facilities to objectively understand the practice and implementation of IDSR guidelines and bottlenecks of disease surveillance activities on the ground.
- 2. Technical working group:** A technical working group was formed at the MOH Disease Surveillance and Response Unit (DSRU), and mSOS was developed in early 2013. The technical working group consisted of the head of DSRU, managers in charge of national disease surveillance and data management, the JICA expert, and experts from the WHO and Kenya Medical Research Institute (KEMRI). Minutes were written and

circulated to all members.

- 3. Contracting:** Strathmore University Faculty of information technology (IT) was identified as the institution to perform programming for mSOS because of past experience working with the MOH. One of the servers at the MOH was identified to host mSOS. Due to strict regulations by the Kenyan telecommunication authorities, a contract for a toll-free number was signed with a premium rate service provider (PRSP) and not directly with a telecommunication company.
- 4. Programming:** Several students at Strathmore University Faculty of IT undertook mSOS programming as part of their internship. Students and their supervisor regularly attended the technical working group meetings to understand user requirements, and presented progress in the technical working group meetings.

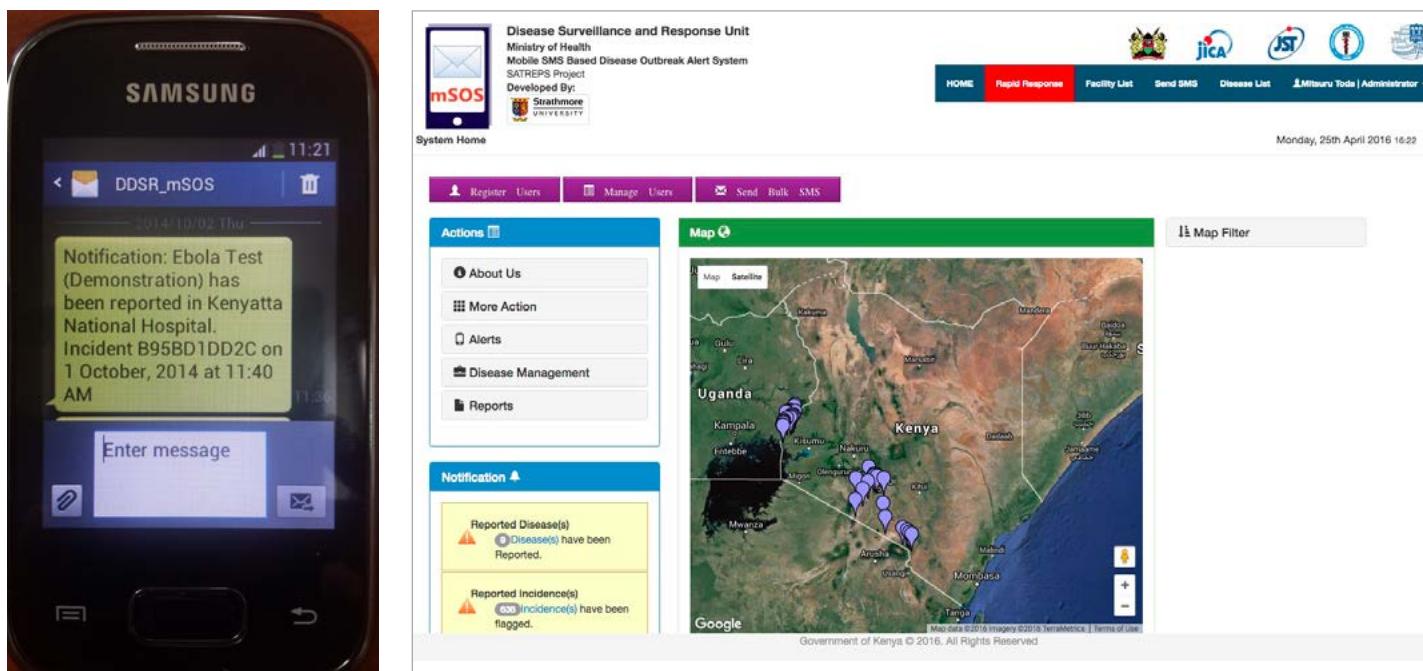
- 5. Stabilizing the system:** After repeated prototyping of the system, mSOS was pretested in a few health facilities in Nairobi in early 2013, and several bugs and issues with power outages were identified. A tracking system was programmed in order to monitor downtime, and redundant backup was created.
- 6. Pilot implementation:** mSOS pilot was implemented for 6 months, October 2013–April 2014. A 1-day training or refresher course for IDSR guidelines and a 1-day training on mSOS was conducted in September and October 2013 for 67 health facility in-charges in Busia and Kajiado counties. All 12 sub-county disease surveillance coordinators were also trained on how to troubleshoot and use the mSOS web portal.

Growth in Scale

After the implementation of the pilot, and before the results were analyzed, DSRU recommended mSOS to be modified as mSOS Ebola.¹⁵⁻¹⁷

- 1. mSOS Ebola (text messaging):** When a patient suspected of having Ebola was identified by the Ebola Rapid Response Team, patient-level information was sent through formatted text-messaging using mSOS Ebola. The messages with the detailed information on the time, place, and nature of the suspected patient case were delivered to senior management at DSRU and a few policy decision-makers at the MOH. An alert message was also sent to the designated KEMRI laboratory workers.
- 2. mSOS Ebola (web portal):** Patient-level information on the suspected cases, response action conducted, and laboratory confirmation were displayed on the password-protected web portal dashboard.

- 3. mSOS Ebola (KEMRI Laboratory module):** Results on the laboratory confirmation of the patient serum samples were updated using the mSOS Ebola web portal, and text messages were automatically delivered to senior management at DSRU and a few policy decision-makers at the MOH. After mSOS Ebola was implemented, the mSOS stakeholders' meeting was held to disseminate the preliminary results of the pilot.
- 4. mSOS pilot dissemination:** At the stakeholders' meeting, mSOS was very well received. Health workers appreciated the ease of use of the system and rapid feedback from their managers through mSOS.¹¹⁻¹² Health managers especially appreciated the real-time information sharing. The system was unanimously recommended for integration into the national health information and management system, specifically to the open-source District Health Information Software 2 (DHIS2) platform.¹⁸



Sample mSOS alert messaging (left) and web portal dashboard (right)

- 5. Buy-in from the MOH:** Due to the overwhelming recommendations at the stakeholders' meeting on the ability of mSOS to quickly adapt to the needs on the ground (as seen by mSOS Ebola), the scale-up of mSOS was included in the Cabinet Secretary's Performance Contract 2015/16, a contract between the MOH Cabinet Secretary and the President of Kenya.¹⁹
- 6. Technical working group for scale-up efforts:** A technical working group coordinated by DSRU includes multiple units within the MOH, such as the Health Information System; Information, Communication, Technology; eHealth; Zoonotic Disease; and Disaster Response units. It also includes multiple international partners, such as the WHO [SIKIWIS], Centers for Disease Control and Prevention (CDC) [mHealth Kenya, I-TECH], JICA [JICA-AMED SATREPS project], and United States Agency for International Development (USAID) [AfyaInfo project].¹³
- 7. Establishment of mSOS/IDSR Weekly Mobile Reporting System:** A new enhanced version of the mSOS pilot, mSOS/IDSR Weekly Mobile Reporting System was developed through the technical working group in late 2015. This new system combines event-based and indicator-based disease surveillance information. Once a suspected disease outbreak or public health event is detected at the health facility level, information is sent through the system to a central server at the MOH. The central server then sends alert messages to multiple officers responsible for outbreak and disaster response. The list of diseases and conditions is expanded to not only suspected disease outbreaks of immediate concern, such as cholera and measles, but also public health events (event-based) and routine disease information (indicator-based), including diseases such as malaria.²⁰

Evaluation and Results

As part of the cluster randomized controlled trial to test the effectiveness of the system, the research study included quantitative and qualitative assessments of the current IDSR guidelines implementation, and the impact of mSOS implementation.²¹

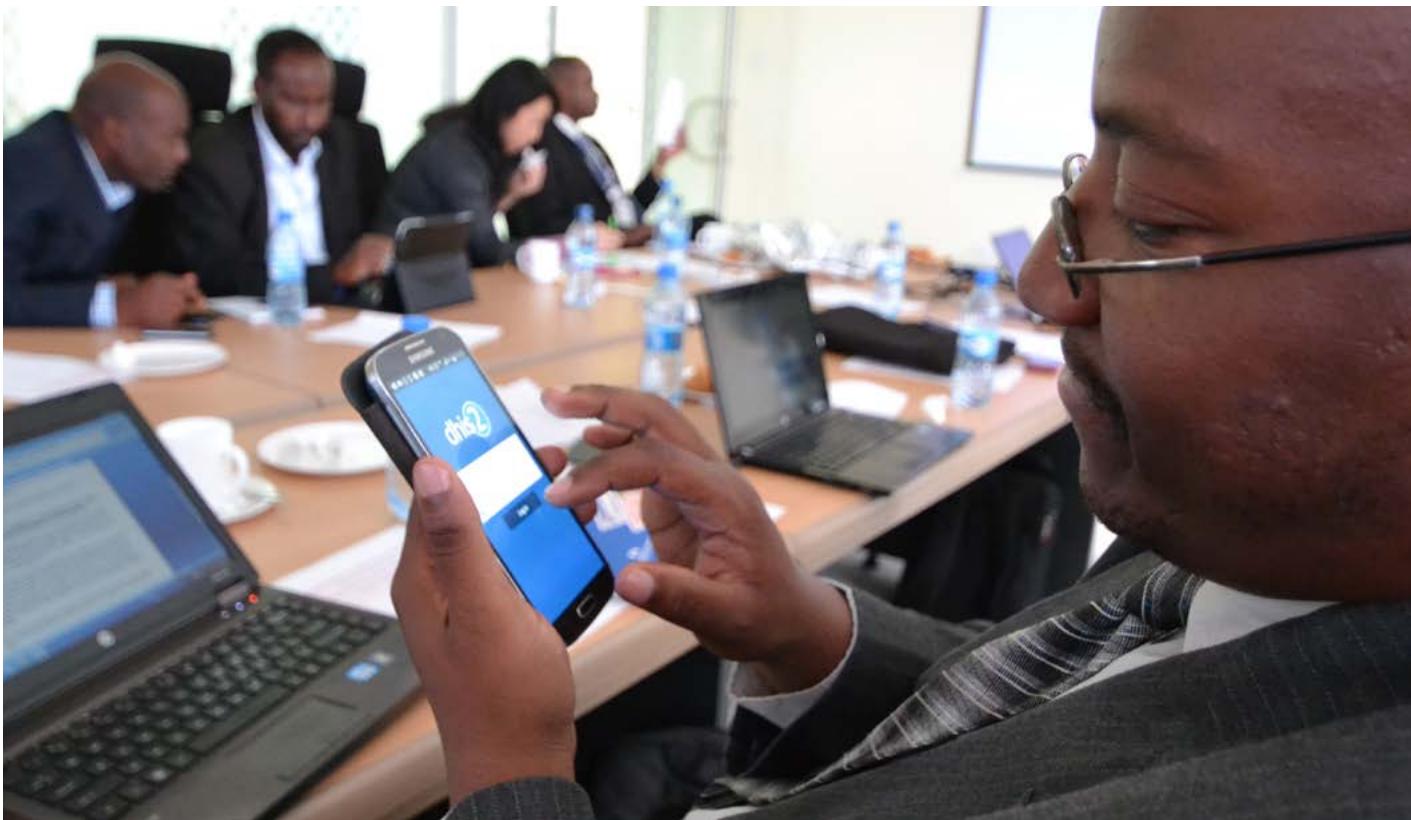
A baseline assessment was conducted in June 2013, including retrospective data for the six-months before the intervention (December 2012–May 2013), reviewing all information from outpatient, inpatient, and maternal and child health registers for the 12 diseases and conditions selected for the study. In addition, in-depth interviews with health facility in-charges and sub-county disease surveillance coordinators were completed. A post-intervention survey, including documents review, and in-depth interviews with health facility in-charges and sub-county disease surveillance coordinators were completed in May 2014. In addition, a focus group discussion was conducted at the national level.

A total of 153 health facilities were assessed for eligibility, and 142 completed the baseline survey in the selected 12 sub-counties in Busia and Kajiado counties. Health facilities included public, private, faith-based, and non-governmental organization-owned facilities at all levels of care. A total of 135 health facilities attended the IDSR training and the randomization was conducted during the IDSR training by

stratifying health facilities by sub-counties and randomly selecting intervention facilities from each stratum by a 1:1 ratio. Sixty-eight facilities were in the control group and 67 were in the intervention group. A total of 65 health facilities in the control group and 66 health facilities in the intervention group were assessed during the follow-up survey.

The quantitative analysis included examining the reporting rates comparing paper-based and mSOS reports. A retrospective review at the baseline survey showed that 36 cases (17 cases in the control group and 19 cases in the intervention group) required immediate notification. Only one paper-based report in the control group was completed. During the post-intervention survey, we found that 130 cases in the intervention group and 39 cases in the control group required immediate notification. One paper-based report in the control group was completed, and 25 cases were reported through mSOS in the intervention group. The results showed that the health facilities that used mSOS achieved more timely notifications than those that did not (+16.7%). The results of the evaluation were published in *Emerging Infectious Diseases* in April 2016.⁸

Analyses are currently ongoing for qualitative data collected during field interviews and focus group discussions.



Lessons Learned in Program Implementation and Scaling

Lessons learned from mSOS pilot implementation were that timing, leadership, and feedback are important components of the implementation success.

1. **Timing:** mSOS was conceptualized, piloted, and disseminated during a time when the MOH was exploring ways to move from paper-based reporting to electronic reporting. It was also a time when various outbreaks occurred within Kenya and around the world, most notably Ebola in West Africa. At the same time, mobile phone penetration skyrocketed within the country, even in hard-to-reach areas. Compliance with IHR 2005 was also a task that the MOH needed to address. Overall, there was an increased awareness and willingness of the ministry to look at a mobile phone solution that could enhance disease surveillance and compliance with IHR 2005. The scale-up was also suggested at a time when the MOH is addressing a number of related efforts including: trying to integrate all information systems within DHIS2, preparing an electronic nationwide master facility list, conducting a review of event-based surveillance, proposing mobile phone-based indicator surveillance, holding various taskforce meetings for national outbreaks, and construction of an Emergency Operation Centre at the MOH. mSOS was able to leverage these timings to not

only pilot the system, but also to tie into current disease surveillance efforts within Kenya's MOH.

2. **Leadership:** Strong leadership by the DSRU, which promoted buy-in from the national government, county governments, and international partners, lead to mSOS being recommended for scale-up and integration into the national health information and management system. DSRU included mSOS in its work plans, and staff members from the unit helped support the system. DSRU also worked with the Health Information Systems (HIS), ICT, and eHealth units and their partners to assure that the maintenance could be conducted within the ministry through DHIS2. This in turn would help mSOS be a sustainable system.
3. **Feedback:** Inclusion of the opinions from all aspects, such as the end-user, programmers, and health managers were an important component of the development and implementation of mSOS pilot. Repeated pretesting and informal feedback from users helped mitigate system abruptness and solve bugs in a timely manner. In addition, engagements with various stakeholders through the technical working group helped mSOS be programmed and evolve as a flexible tool to offer local solutions to local problems. The large stakeholder meeting and users' feedback helped move mSOS into the next stage.



Future Plans

The MOH envisions that real-time reporting and response through the mSOS/IDSR Weekly Mobile Reporting System will reduce lag time for notification and response to outbreaks and disasters, and minimize morbidity and mortality in Kenya. The system will continue to improve as the MOH rolls it out to all levels, including all 47 counties, all sub-counties, and the 7,500 health facilities across the nation.

- Stakeholders meeting:** A stakeholders meeting was held in December 2015 and pretesting was completed with the relevant MOH units and international partners.
- Training:** In early 2016, national-level officers in the MOH attended a training of trainers (TOT) workshop. Since February 2016, a series of TOT workshops including county and sub-county disease surveillance coordinators (DSCs) and health records information officers (HRIOS) have been ongoing by the MOH with funding support from international partners. The training materials, including manuals and slides, were drafted and printed. As of April 2016, approximately 350 national, county, and sub-county DSCs and HRIOS were trained in half of the regions in Kenya.¹³ A launch ceremony is scheduled in 2016 after TOT is completed at the national, county, and sub-county levels.
- Expansion of modes:** The system would be modified to smartphone- and feature phone-based applications so that health workers could use their personal phones to report.
- Emergency Operation Centre:** The system will be linked to the national Emergency Operation Centre for 24/7 analysis of information and prompt response action

to notifications that need further investigation. The system will serve as an early warning mechanism, whereby analysis on trends could inform potential outbreaks and mitigate morbidity and mortality in the nation.

- Expansion of users:** In the future, the system will be expanded to the community level and to the public where suspected cases can be reported and filtered automatically by the system.
- Paperless reporting:** Once the system is rolled out to the whole nation, it may also replace the current paper-based reporting guidelines in the future. ■

Snapshot: mSOS

Geographic Coverage	Kenya Pilot: 67 health facilities Scale-up: 7,500 health facilities
Implementation Dates	2013 to present
Implementation Partners	Ministry of Health (multiple units), Kenya SATREPS Project Japan International Cooperation Agency (JICA) Japan Agency for Medical Research and Development (AMED) Strathmore University Faculty of Information Technology
Donor(s)	World Health Organization Centers for Disease Control USAID JICA AMED
Contact Information	Dr. Daniel Langat, Disease Surveillance and Response Unit, Ministry of Health, Kenya, langat4@yahoo.com

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RapidSMS Rwanda



Photo by Todd Shapera

Tracking the first 1000 days of life, preventing unnecessary mother and newborn deaths

The overarching goal in instituting RapidSMS was to make each pregnancy “everyone’s business.” RapidSMS aims to ensure that no woman dies due to pregnancy or delivery and to have all 30 districts record zero preventable maternal deaths.

Between 2000 and 2015, Rwanda achieved some of the world’s highest average annual reductions in both the maternal mortality ratio and under-five mortality rate. Rwanda Demographic and Health Survey data show that the maternal mortality ratio fell from one of the world’s highest in 2005 at 750 deaths per 100,000 live births down to 210 in 2014, and the under-five mortality rate declined by two-thirds during the same period. 1,2

Rwanda’s 45,000 volunteer community health workers (CHWs) have been major contributors to this success. Each of the country’s 15,000 villages has three CHWs who provide a broad range of preventive, promotional, and curative services. Starting in 2009, the Rwanda Ministry of Health (MOH), together with UNICEF, Management Sciences for Health (MSH), and other partners, initiated an mHealth system with CHWs called RapidSMS, which has become a key intervention in promoting maternal and neonatal health.

The overarching goal in instituting RapidSMS was to make each pregnancy “everyone’s business.” RapidSMS aims to ensure that no woman dies due to pregnancy or delivery and to have all 30 districts record zero preventable maternal deaths. This system has since been extended to enable CHWs to monitor and report on a wider array of health events involving pregnant women and children for the critical window of 1,000 days – from the first signs of pregnancy through the age of two years – when risk of death is highest.

About RapidSMS

RapidSMS is a mobile phone-based technology being used throughout Rwanda to improve community maternal and child health. This tool helps CHWs track women’s antenatal care visits, identify women at risk, refer them to health facilities, and improve communication with the facilities in the event of an emergency. The system also requires CHWs to regularly reach out to families at the household level and send simple text messages to the MOH reporting significant events occurring during a woman’s pregnancy, delivery, and the first year after the infant’s birth. Once received at the central level, these messages are stored in a web-enabled database and used to inform the ministry’s strategic planning, technical supervision, monitoring and evaluation, and resource coordination. For certain messages sent by CHWs, the system raises an alert and provides immediate feedback with guidance to the CHWs about specific actions to take. It can also be used for widespread distribution of messages

related to specific behavior change communications campaigns or health threats that CHWs should be aware of in their community.

The RapidSMS system enables CHWs to rapidly communicate with other levels of the health system, promotes routine contacts between CHWs and at-risk populations in their communities, and enables supervisors at the health center level and above to monitor CHWs’ performance. It has a very simple message format and works with basic mobile phones. Plasticized instruction cards serve as quick reference guides that make it very easy for CHWs to send messages for each type of alert. Since their simple mobile phones lack the capacity to store all of the guidelines for health service delivery and use of the RapidSMS system, these A4 cards list the codes for each event and give examples of how to compose the different type of SMSs CHWs may need to send. Each message contains the National ID number of the mother

Figure 1.
RapidSMS Rwanda sample
registration code format

RapidSMS®				Republic of Rwanda Ministry of Health	
Register Yourself				You only need to do this once! Remember to re-register if you move!	
REG	324576834571245	324	RW	Biyogo	
Start with REG	National ID	Clinic ID	Language (RW, FR, EN)	Village Name	
Report Pregnancy Register only AFTER it is confirmed!					
PRE	624576811417124	21.02.2010	FE	HO	80.2kg
Start with PRE	Mother's National ID	Date of Last Menses Period	Risk Codes	Location Code	Mother's Weight
Report Maternal Risks / Deaths During Check Ups, report risks and mother's weight					
RISK	624576811417124	FE CI	HO	71.2kg	
Start with RISK	Mother's National ID	Risk Codes	Location Code	Mother's Weight	
Report Birth					
BIR	624576811417124	01 CI	BO	CL	3.3kg 5.5cm
Start with BIR	Mother's National ID	Child Num	Risk Sex	Location Code	Child Weight MUAC
Report Child Health / Death					
CHI	624576811417124	01	28.02.2010	V1 FE	3.3kg 5.4cm
Start with CHI	Mother's National ID	Child Num	Child Date Of Birth	Vaccine Risk Code	Child Weight MUAC

so that they can be linked together and allow for tracking the history of individual pregnant women.

The slightest evidence of warning signs, as itemized in the list of codes, should prompt the CHWs to not only refer the woman for care but also accompany the mother to a facility, reducing a potentially life-threatening delay in receipt of care.

Program Design Process

With technical and financial support from UNICEF, RapidSMS was first piloted by the MOH in Musanze District in 2009. The application follows national and international guidelines for care and was intended to address three delays which can cause maternal death, namely in seeking care, reaching care, and in effective intervention. The logic of the program is to have 100% registration, following up on identified risk cases, ensuring assisted deliveries, and using emergency alerts when appropriate.

After demonstrating positive results in the pilot district (highlighted below), the MOH began a national roll-out of the system in June 2010. The USAID-funded Integrated Health Systems Strengthening Project (IHSSP), managed by MSH, helped the ministry to develop a roll-out plan and

budget, design a training curriculum, and train over 1,000 community health supervisors who then trained over 45,000 CHWs, many with no experience in the use of mobile phones. Through IHSSP, USAID also procured and distributed phones to 10,000 of the CHWs in 30 districts and provided the first series of plasticized instruction cards for the CHWs to prepare and send messages through the system.

When the system was initially set up, it had a fairly basic interface that enabled staff at the health center level and above to monitor the logs of messages received, but only provided limited decision support. Significant effort went into designing compelling graphic interfaces that calculated indicators and helped these staff more easily navigate their way through the system.

Growth in Scale

The system was introduced in 2009 by the MOH's Community Health Desk with UNICEF support in Musanze, one of Rwanda's 30 districts. By May 2010, one year after initiating the RapidSMS system, prenatal care visits in Musanze District had increased by 25%, home deliveries had dropped by 54%, health facility deliveries rose by 26%, and under-five mortality had declined by 48%.

Based on this success, the MOH, through its eHealth technical working group and the Community Health Desk, strongly urged other partners to participate in a national roll-out of RapidSMS. USAID provided funding for 10,000 phones, the Bill & Melinda Gates Foundation provided another 5,000 (through the Phones for Health project), and the MOH purchased the remainder. MSH, which had recently introduced a new computerized community health

information system (SISCom) nationwide, helped the MOH develop a roll-out plan, budget, curriculum, and schedule of training of trainer sessions to be implemented across the country. The initiative also benefited from support from the highest levels of government, with Her Excellency Mrs. Jeannette Kagame, First Lady of the Republic of Rwanda, participating in the ceremony to hand out the first 10,000 phones. Other partners working at the district level, including HealthBuilders, focused on reinforcing the use of the system through supervision and the creation of dashboards that enabled health center staff to monitor the coverage of the different services provided by their CHWs.

In November 2012, the first RapidSMS retreat took place where the group expanded RapidSMS from one module that tracked the pregnancy cycle (version 1) to version 2 which

consists of six modules: the pregnancy cycle, post-delivery period, newborn care, deadly childhood diseases (pneumonia, diarrhea, and malaria), nutrition, and children living with disabilities (cleft palate/cleft lip). The latter was later dropped to avoid overloading CHWs with multiple program activities.

The system currently receives approximately 12,000 messages a day (average since January 2016) from CHWs. The MOH is interested in using the system for other data-collection needs, including immediate reporting of maternal deaths from hospitals.

Evaluation and Results

Rwanda has achieved impressive progress in reducing maternal and child mortality between 2010 and 2015. While a key intervention implemented by the MOH, RapidSMS was one of a number of initiatives in the health system over this period of time, making it challenging to attribute specific improvements in maternal and child health to the mHealth program alone.

An impact evaluation of a separate program, Rwanda's CHW performance-based financing (PBF) program, implemented from 2012-2014 tested several different approaches to incentivizing high-impact services at the community level. The study looked at both the demand and supply sides of service delivery. The study found relatively little impact from the CHW performance incentives for a variety of reasons: performance was calculated at the CHW cooperative level (there is one cooperative per health center catchment area), and all CHWs received the same amount within a cooperative, regardless of their individual efforts. Realizing that

SMS messages are sent to a toll-free number—using a short code—so there is no cost to the CHWs to use the system. The MOH pays the SMS charges. Initially, this project was linked with Phones for Health, which included a public-private partnership with MTN and Voxiva, so the SIM cards and server hosting were provided for free, and SMS messages were charged at a discounted rate. When that initiative was discontinued in 2014, the server was relocated to Rwanda's state-of-the-art National Data Center.

RapidSMS provided a source of data on the activities of each CHW, the Community Health Desk saw an opportunity to address this by using the RapidSMS data to calculate specific indicators of individual performance and split the cooperative's PBF funds to reward CHWs in the top performance quintiles with a greater share of the funds.

This new approach, utilizing individual-level RapidSMS data, is still in the process of nationwide implementation. Now health centers are aware of the number of pregnant women in their community, CHWs can easily communicate with health centers during emergencies, and patients needing urgent care can receive ambulance transportation to health facilities. The system helps to ensure that CHWs in the community maintain regular face-to-face contact at the household level with all pregnant women and infants. This keeps the CHWs accountable to the people they serve, as the data are triangulated with information on expected pregnancies and births that are collected at the health facilities.

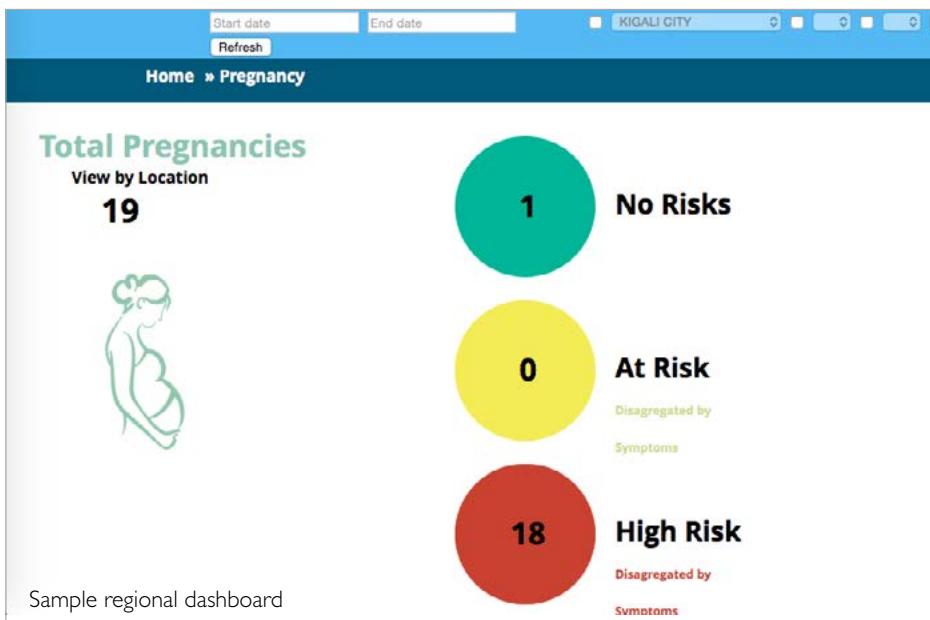
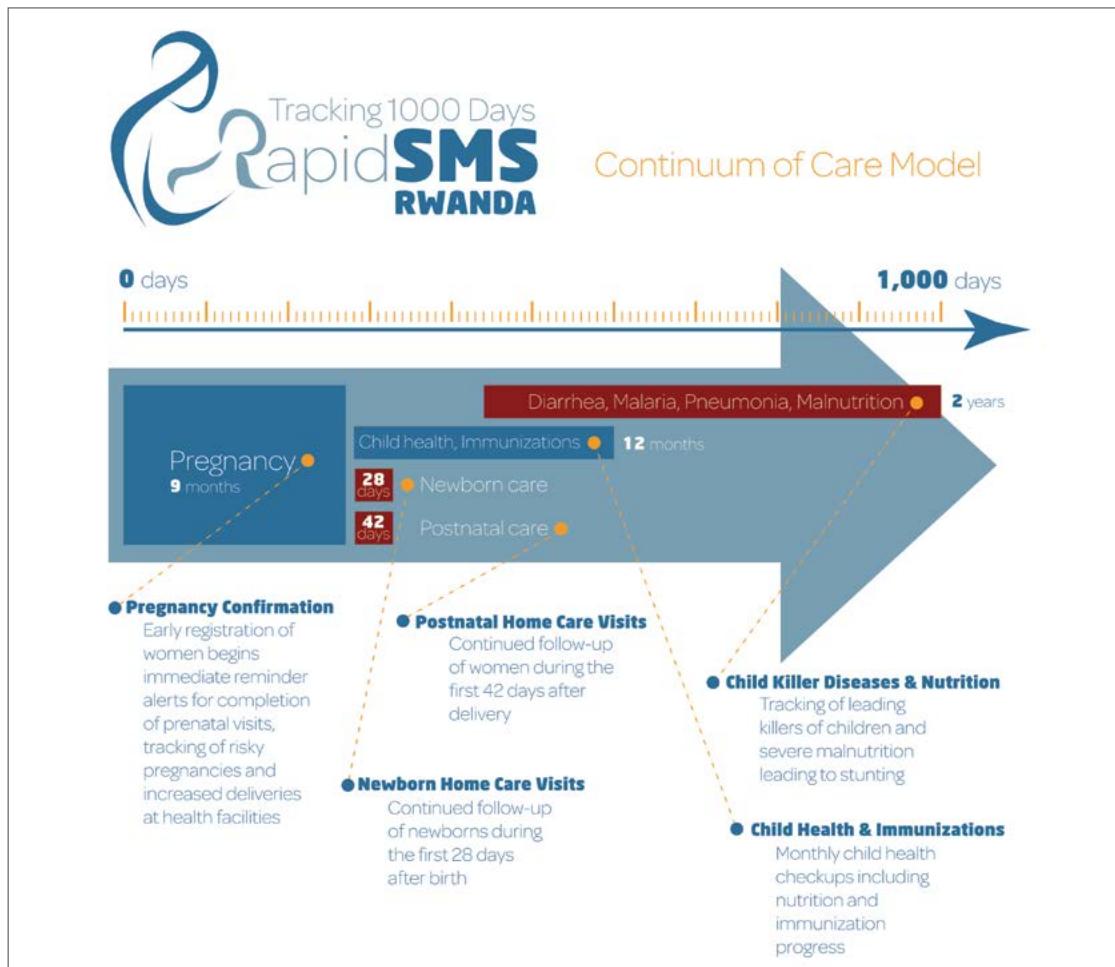


Figure 2.
RapidSMS Rwanda Continuum of Care Model



Lessons Learned in Program Implementation and Scaling

The initial implementation plan for the RapidSMS program did not account for the challenges of charging phones in a village setting without convenient access to electricity, nor the malfunctioning of nearly one-quarter of the phone chargers during the first year of national roll-out. Some solar chargers were purchased but have not been available in sufficient quantities. In most cases, the CHW cooperatives replaced chargers by using their own funds.

A discounted SMS rate had been negotiated for the program, however, after several years; the negotiated cost per message was actually higher than the market price, which had decreased over time. Organizations need to ensure that the contract with their mobile network provider enables them to index their discount on the actual rates.

Other key challenges encountered included the following:

- Misunderstanding by CHWs of case definitions for RapidSMS indicators
- Difficulties in using mobile phones due to English language barriers and lack of knowledge of how to use the text message capabilities of their phones
- Limited use of RapidSMS data by local leaders and medical personnel (doctors and nurses)
- Lack of full coverage of all pregnant women reported by CHWs using RapidSMS, especially in urban areas
- Lack of printed registers for recording RapidSMS messages for better follow-up
- Insufficient funding for supervisors to follow up with CHWs on RapidSMS activities

Future Plans

RapidSMS Rwanda is currently operating at national scale. The system is used by over 45,000 CHWs and their supervisors in 475 health centers, and provides information for decision-making at the national level as well. Part of the platform is being upgraded to RapidPro, an open source platform released in 2014 which features easier-to-configure data visualization. As part of Rwanda's Health Enterprise Architecture initiative, the MOH worked with many partners (including Jembi Health Systems, Regenstrief, and InSTEDD) to integrate RapidSMS data into a national shared health record repository and to generate alerts to CHWs immediately after registering a pregnant women with known pregnancy-related risk factors. While this has not been rolled out nationally, it was a proof of concept that sets the stage for a range of interoperability scenarios that can improve referral and continuity of care at the community level.

Additional ongoing and future plans for the program, and the partner organization, include:

- Continue work to improve interoperability between RapidSMS and other data management systems used within the country. In particular, interoperability with the PBF system in District Health Information Software 2 (DHIS2) is planned to allow for payment of performance incentives. Connection with the electronic medical records system's shared health record would allow for CHWs to be alerted to pre-existing conditions

in pregnant women that need to be handled carefully (e.g. HIV+) (MSH)

- Connect the program with a mobile money system to pay CHW performance incentives directly through their phones based on metrics calculated using data reported through RapidSMS (MSH)
- Continue to support the use of the RapidSMS data by health center and district-level staff through training and supervision to monitor the performance of their CHWs and triangulate with the health center data on antenatal care, deliveries, and treatment for malaria, pneumonia, and diarrhea (UNICEF). This will address many challenges such as clarifying case and indicator definitions, learning how to use phones more effectively, and reinforcing the importance of routine use of the system.
- Strengthen the RapidSMS coordination mechanism through monthly and quarterly national-level meetings, including annual reviews of the system and tools and technical validation meetings (UNICEF)
- Consolidate SMS, USSD, and other high-volume communications contracts within the MOH and Rwanda Biomedical Center to negotiate better terms for RapidSMS communications charges with the local mobile phone companies (MOH)



Snapshot: RapidSMS Rwanda

Geographic Coverage	Rwanda
Implementation Dates	2009–2011 (pilot) 2012 to present (scale-up)
Implementation Partners	Ministry of Health (coordination, funding, and project management) UNICEF (funding, technical assistance) MSH (technical assistance for systems, interoperability)
Donor(s)	USAID UNICEF
Contact Information	Randy Wilson, Team Lead: Research, M&E and KM, Rwanda Health Systems Strengthening Project, rwilson@msh.org

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Ending adolescent AIDS through mobile-based counselling and polling



Photo by UNICEF / Zambia / Maseka / 2016

U-Report has been used as a focused mHealth application, specifically providing real-time mobile counselling and conducting coordinated polls on AIDS among adolescents and young people.

Despite incredible progress over the last decade in placing people on HIV treatment and preventing mother-to-child HIV transmission, adolescents aged 10–19 have been largely left behind in the global AIDS response. Adolescents are the only age group for which AIDS-related deaths have not decreased—in fact they have tripled since 2000.¹ AIDS is the leading cause of death for adolescents in Africa, and the second globally.² Every hour 26 new HIV infections occur among older adolescents (aged 15–19), 40% of which happen outside sub-Saharan Africa.³ Moreover, risk is high among this age group due to their very limited knowledge about HIV. In sub-Saharan Africa, 70% of boys and girls (15–19) have low comprehensive knowledge on how to protect themselves and access services.⁴

To address this critical gap in HIV/AIDS response, and with youth being the greatest users of mobile devices globally, UNICEF decided to invest in innovative solutions that can achieve quick wins in service-delivery, while creating real, long-lasting change for adolescents. One such innovation is U-Report, a general mobile-enabled youth engagement platform. U-Report has been used as a focused mHealth application, specifically providing real-time mobile counselling and conducting coordinated polls on AIDS among adolescents and young people. Objectives of the program are to: improve access to sexual reproductive health (SRH) knowledge; increase utilization of HIV prevention services; and better understand perceptions on HIV-related issues in order to contribute to reducing new HIV infections among adolescents and youth.

About U-Report

Mobile Powered by RapidPro—UNICEF’s open-source software platform for international development—U-Report is a user-centered tool that empowers young people to speak out on various issues that they care about in their community, encourage citizen-led response, and magnify voices locally, nationally, and globally to create positive change. The platform is interoperable with various technology platforms, allowing U-Reporters to communicate with other young people and communities via SMS, Twitter, App, Facebook Messenger, and Telegram depending on country context. First launched in Uganda in 2011, there are currently over 2 million U-Reporters, operating in 23 countries: Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chile, Democratic Republic of Congo, Guinea, Indonesia, Ireland, Liberia, Mali, Mexico, Mozambique, Nigeria, Pakistan, Senegal, Sierra Leone, Swaziland, Uganda, Ukraine, Zambia, and Zimbabwe.

Young people are targeted to join U-Report through local nongovernmental organizations (NGOs), youth groups, and faith-based organizations. Traditional media campaigns are also used to advertise the service and encourage young people to sign up. By sending the text message, “join,” to a toll-free number and answering a few registration questions (e.g. age, gender, region within a country in which they reside), any young person with a mobile phone can become a volunteer “U-reporter” in their country. Weekly poll campaigns are conducted on a wide range of issues, including poverty, bullying, Ebola, and gender equality.

While U-Report is designed as a multithematic social messaging tool, some countries, like Zambia, have chosen to optimize on the tool’s large user base and real-time analytics. The program is utilized in a targeted approach to achieve HIV outcomes among adolescents and young people, partic-

ularly to: increase knowledge on HIV and SRH; generate demand for and increase uptake of HIV testing and counselling (HTC) and related health services, and better understand barriers to HIV-prevention services.

UNICEF, in partnership with Zambia's National AIDS Council (NAC), launched U-Report Zambia during the

2012 World AIDS' Day. It currently has a national reach of over 98,000 subscribers, 65% of whom are adolescents (10–19 years) and young adults (20–24 years). U-Report, as an SMS-based intervention, provides confidential, free-of-charge, and real-time counselling services on HIV and SRH to adolescents and youths.

Program Design Process

U-Report Zambia is built on the foundation of its Uganda counterpart, where the platform was first implemented. It was further developed through a participatory, consultative process including a design workshop that involved young people and program experts from NAC, the ministries of health, education, youth and sports, and local NGOs, representatives from mobile companies, and information technology and software developers. Throughout design and implementation, the opinions of adolescents and young people from both urban and rural areas were continuously sought, either in person or via U-Report to shape and improve the platform's programming and content, so that messages are locally adapted to the language and tone of its young users.

The mHealth application of U-Report Zambia has two components: Knowledge Bank and Poll/Campaign. Knowledge Bank is a dynamic repository of up-to-date information on HIV and SRH, which over time has expanded to other related issues, such as gender-based violence. SMS-counsellors use this resource to provide correct and consistent information to U-Reporters. The weekly Poll/Campaign module obtains and gauges the opinions of adolescents and young adults on HIV issues, and promotes national events to create awareness, promote positive behavior change and increase utilization of services (e.g. national HIV testing day). Survey results are disaggregated, analyzed, and displayed on its website in real-time, and integrated in key decision-maker meet-

ings. The results inform policy dialogue and programmatic decisions, and establish a baseline on knowledge, access, and utilization of high-impact HIV prevention services.

UNICEF provides technical leadership and manages the systems' operations (e.g. Poll/Campaign module, and reporting and analytics), and NAC acts as U-Report's primary champion and country-wide coordinator of various partners, ensuring that the program aligns with national HIV guidelines and plans. UNICEF negotiated discounted bulk SMS rates with all three mobile phone operators in Zambia—namely Airtel, MTN, and Zamtel, offering SMS service to U-Reporters at no cost.

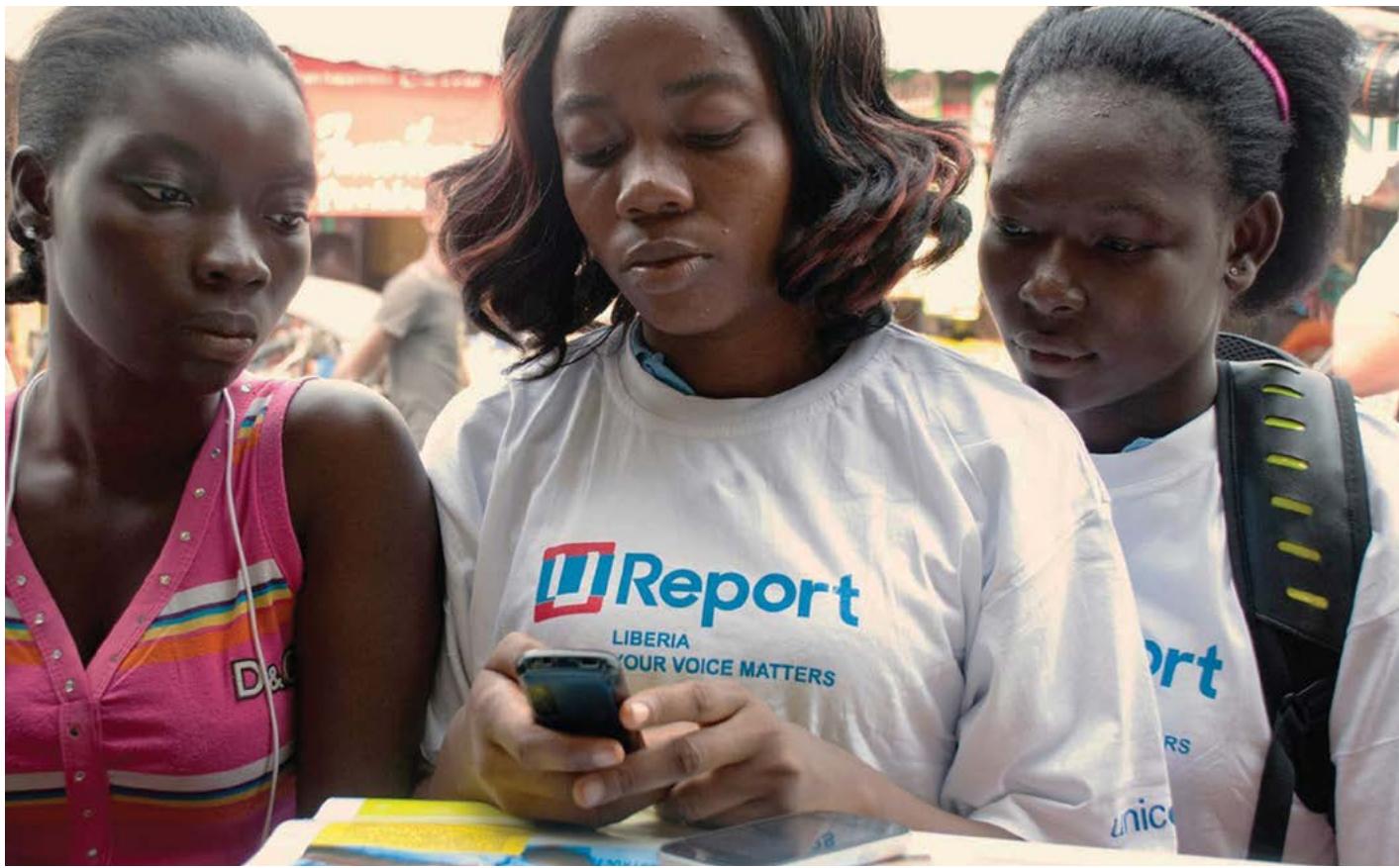
To implement the mHealth counselling component of U-Report, UNICEF entered into a partnership with CHAMP, a local NGO, which already managed the national "990" voice counselling service. CHAMP provides counsellors, manages the Knowledge Bank module, and conducts the day-to-day operations of the "878" SMS-based U-Report counselling service. Integrating and ensuring interoperability of the phone and SMS services, while challenging, is crucial to the program's goals as it both streamlines operations, and gives young people options to better access HIV counselling and information. The two-way SMS communication between young people allows for anonymity, while a voice conversation allows for more in-depth conversation when necessary.

Growth in Scale

In less than five years, U-Report's membership has rapidly grown to over 2 million users worldwide, going live in 23 countries, with 11 in the pipeline. In addition to its country roll-outs, U-Report has a global roll-out (U-Report Global), which enables adolescents and young people from all over the world to voice issues that affect them through Facebook Messenger, Twitter, Telegram, and App, regardless if they have a national U-Report. U-Report's digital reach has expanded to over 40 countries in both developing and developed countries.

U-Report collaborates and builds relationships with multiple stakeholders, who want to work on a common program-

matic issue/s in their country to ensure local ownership and long-term investment, while achieving the three U-Report global strategic goals: "scale, engage, and change." U-Report is based on the theory that the strength of its voice is in its numbers. Using transferable technology developed in the South, UNICEF is able to launch in a new country within 8-12 weeks, working towards the objective to create an international community of young people. To ensure sustainability, UNICEF also works with telecommunication providers to make U-Report a free platform within interoperable technologies.



U-Report's advantage is that not only is it a multiplatform technology, but it is also a multithematic platform that goes beyond mHealth per se. U-Report can focus on a specific outcome area (e.g. HIV/AIDS) or population group (e.g. adolescent girls and boys) like in the case of Zambia, but it can also concurrently tackle a broad range of issues that is most press-

ing to young people. While HIV and health are important issues, they are often the least of concerns among the youth, so it's important to have a flexible platform. U-Report's holistic approach constantly engages adolescents to discuss issues that affect them today, while giving them access to health information and HIV services they need the most.

Evaluation and Results

Of the over 98,000 Zambian U-Reporters who have voluntarily signed up, about 62% have asked questions—through both poll-based solicited and unsolicited messages—with the counsellors.⁵ Most respondents are aged 10–24 years (65% of users), male (60%), and located around the urban areas (55%). The average monthly traffic for 2016 ranges between 8,000 and 10,000 SMS messages, 90% of which, if addressed to counsellors, are responded to within a two-hour window. By capitalizing on the growing use of mobile phones and through reliable and correct information from the counsellors, U-Report Zambia contributed to increasing access to and improving comprehensive HIV knowledge among adolescents and young people. While it's crucial to promote and reinforce information through multiple channels, U-Report added value by disseminating information in real-time to a targeted and particularly vulnerable population at a relatively low cost.

Through a 10-day U-Report campaign on HTC, a package of SMS messages designed to trigger a two-way interactive SMS counselling session, was delivered to all registered Zambian U-Reporters in Lusaka and Chongwe districts. SMS counsellors addressed questions and referred U-Reporters to the nearest HTC site in their location. The evaluation analyzed HTC uptake among U-Reporters at baseline, and measured the increase in uptake two weeks after the campaign.⁶ Out of the 1,139 U-Reporters (10–24 years) who claimed that they have not tested for HIV in the past 12 months, 18% reported going for HTC during the SMS campaign, most (62%) of them adolescents (15–19 years). In a short period of time, the U-Report SMS campaign was able to generate 1 additional HIV test for every 5 young people who had not tested for HIV in the previous 12 months. While the results are promising, the methodology relies on self-reported data on HTC uptake, and it would be important to conduct future studies that allow such claims to be verified by health facilities.



Photo by UNICEF / Zambia / Maselka / 2016

Zambian U-Reporter Beatrice Phiri (right) speaks to a youth about HIV and AIDS information received on U-Report.

U-Report conducted a polling initiative focused on better understanding barriers to HIV prevention in Zambia among adolescents and on generating user feedback and solutions for more youth-friendly health services. The main barrier to HTC, according to analysis of a sample of 15,228 U-Reporters aged 10–24 years, was fear of a positive test.⁷ Lack of awareness of the importance of HTC was highest among younger adolescents. Older adolescents and youth proposed to increase tailored HTC campaigns, while younger ado-

cents prioritized the use of incentives and campaigns targeting parents. While all age groups suggested to make condoms more widely available, older adolescents and youth preferred confidential condom distribution centers managed by other young people. These findings were presented by adolescents themselves at the Third National HIV&AIDS Prevention Convention—a national-level forum on HIV, which allowed young people to meaningfully participate in policy and program design on HIV and health in their country.

Lessons Learned in Program Implementation and Scaling

Voluntary medical male circumcision (VMMC) decreases the chance of men acquiring HIV by 60%.⁸ Accordingly, U-Report Zambia launched an SMS campaign on VMMC as part of an impact evaluation, conducted by IDinsight and funded by the International Initiative for Impact Evaluation.⁹ The randomized controlled trial, with a sample of 2,312 male U-Report subscribers (aged 15–30) in urban Lusaka and peri-urban Chongwe districts, examined the effects of SMS-based interventions on circumcision uptake. In a span of five months, participants received 21 SMSs, providing VMMC information, encouraging them to go for circumcision, and engaging them in SMS counselling via U-Report. The evaluation found that the SMS campaign did not have evidence of impact on uptake of circumcision within six months. However, the U-Report campaign showed significant information-seeking behavior on VMMC and spurred high levels of engagement with SMS counsellors. While SMS interventions and counsellor access alone may not lead to increased circumcision uptake, policy-makers and program implementers should consider integrating low-cost SMS

promotion as part of a broader range of behavior change interventions.

U-Report is committed to providing free access for the user anywhere in the world, making negotiations with mobile network operators (MNOs) crucial. Negotiations on packages with MNOs vary from country to country. One lesson learned is to work closely with the operators at the onset, and bring them in as part of the U-Report program. In U-Report Zambia, the counselling component has an annual fixed cost of over US\$200,000 covered by the Global Fund to Fight AIDS, Tuberculosis, and Malaria over the next three years. This price provides a dual SMS and voice service 24/7, with counsellors working out of a call center. However, this expense can be further reduced with more cost-effective solutions, such as using a telecommuting model (i.e. counsellors work remotely) and automated counselling systems. The lower the cost, the more scalable and sustainable an innovative solution is in the long-term.

Future Plans

During World AIDS Day 2015, more than nine countries engaged over 1.3 million U-Reporters to participate in a multicountry dialogue on HIV/AIDS related issues. The coordinated poll gauged young people's perceptions on common themes, such as testing, treatment, knowledge on prevention and transmission, and stigma around HIV/AIDS. While its results should not be taken as statistically accurate, as a crowdsourcing tool U-Report can complement ongoing processes and interventions. In 2016, U-Report will conduct a series of questionnaires on HIV throughout the year to amplify the voices of adolescents and young people worldwide, with quantitative and qualitative responses feeding into UNICEF's biennial "Stocktaking Report on Children and AIDS." This initiative will give adolescents an opportunity to recommend solutions, influence decision-makers and government leaders during the 21st International AIDS Conference (AIDS 2016) in Durban, South Africa, and actively participate in shaping the future of HIV programming in UNICEF.

In the pipeline, UNICEF's priority is to expand mHealth applications of U-Report linked to HIV services and programmatic results. Several countries are working on linking U-Report to help improve antiretroviral treatment adherence, promote condom use, increase HIV testing, and supplement country assessments on adolescents and HIV data. Nigeria and Zimbabwe have started adopting the Zambian model of providing real-time counselling via U-Report. Zambia is looking into optimizing its SMS counselling through artificial intelligence. Currently in the testing phase, the automated version uses machine learning algorithms that pick out key words from messages, sort them into categories,

and send standard responses, with the goal to provide faster and more accurate counselling services.

Beyond mHealth, U-Report is looking to further diversify channels over which young people can communicate. Smartphone apps for iOS and Android are being released this year, with the ability to send and receive rich media. This feature will enable U-Reporters to share their experiences and stories in their own voices, and connect with others. U-Report is also launching a web-based registration, which could be applied during a humanitarian crisis and/or a health emergency response. ■

Snapshot: U-Report	
Geographic Coverage	U-Report is live in 23 countries: Brazil, Burkina Faso, Burundi, Cameroon, Central African Republic, Chile, Democratic Republic of Congo, Guinea, Indonesia, Ireland, Liberia, Mali, Mexico, Mozambique, Nigeria, Pakistan, Senegal, Sierra Leone, Swaziland, Uganda, Ukraine, Zambia, and Zimbabwe. U-Report Global (ureport.in/) has a digital reach in an additional 28 countries.
Implementation Dates	2011 to present
Zambia Partners	UNICEF National AIDS Council (leadership and coordination) Christian Health Association of Zambia (management oversight of counseling service activity funds) CHAMP (management of the national "990" voice counseling service and operations of the "878" SMS counseling service, promotion activities)
Zambia Implementation Donors	Global Fund Mobile phone operators (i.e., Airtel, MTN, Zamtel) provide SMS services at discounted rates
Contact Information	James Powell, U-Report Global Coordinator UNICEF, jpowell@unicef.org

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6. "Zambia U-Report: Innovative demand creation for HIV testing and counselling using mobile phones." Abstract was written by authors from UNICEF Zambia, CHAMP, National AIDS Council (NAC), and UNICEF Eastern and Southern Africa Regional Office.
7. "Using real-time SMS to understand barriers to HIV prevention services among adolescents in Zambia: Lessons learned and implications for adolescent health programming." Abstract was written by authors from UNICEF Zambia, University of Zambia, National AIDS Council (NAC), CHAMP, and UNICEF Eastern and Southern Africa Regional Office.
8. Bailey, RC, et al. Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet*, 2007, 369:643–656.
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Ed Owles, Worldview



ANNEX

Case Studies from Previous Volumes

VOLUME 1.

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

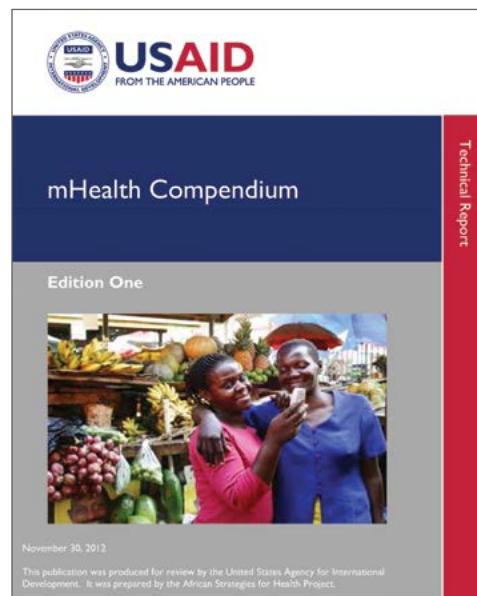
- Changamka Maternal Health Smartcard
- Mobile Finance to Reimburse Sexual and Reproductive Vouchers

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 Adherence Solution
- Supportive Supervision (SS) for TB in Nigeria
- The Malawi K4Health Mobile Learning Pilot



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VOLUME 2.

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

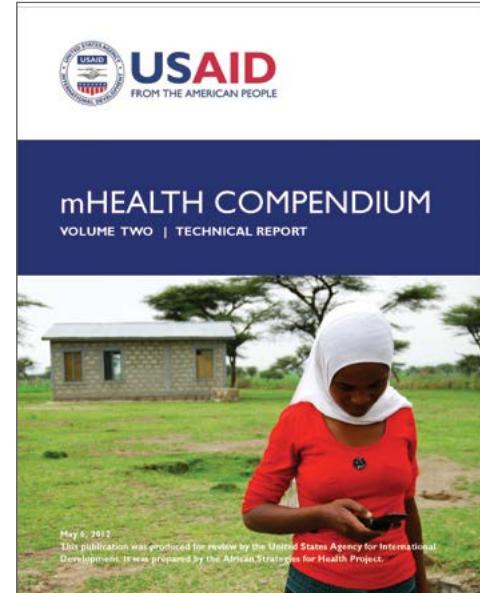
Heartfile Health Financing - an mHealth enabled innovation in health social protection
Jamii Smart | KimMNCHip—referrals, mSavings and eVouchers
Tanzania National eVoucher Scheme
transportMYpatient: Facilitating access to treatment for obstetric fistulae

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



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VOLUME 3.

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

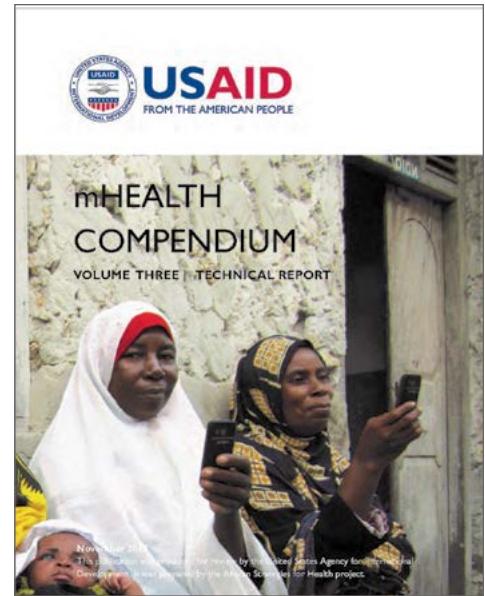
Interactive Alerts
mHealth for Safe Delivered: Ezy Pesa mobile banking services
Pona na Tigo Bima

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



VOLUME 4.

BEHAVIOR CHANGE COMMUNICATION (BCC)

Ananya

Empowering and Mobilizing People Living with HIV/AIDS
mCenas!

Mobile Information for Maternal Health
No-Yawa

DATA COLLECTION

Community Led Total Sanitation Mobile Surveillance

GIS Mapping of Health Facilities

Ma Sante

Mobile HIV & Malaria Diagnosis and Reporting System

mSOS

mSpray

mWater

Participatory Monitoring and Evaluation (PartMe)

Reduction of Maternal Mortality Through ICT

FINANCE

The Mobile Health Research Lab: Mobile Wallet

LOGISTICS

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

SERVICE DELIVERY

Better Health for Afghan Mothers and Children

Chipatala cha pa Foni (Health Center by Phone)

eCompliance

Emergency Triage Assessment and Treatment (ETAT)

Engage TB

Grand Challenge Exploration Phase 1 Project

inSCALE

IVR mLearning Platform in Senegal

Malaria Community Surveillance for Elimination

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

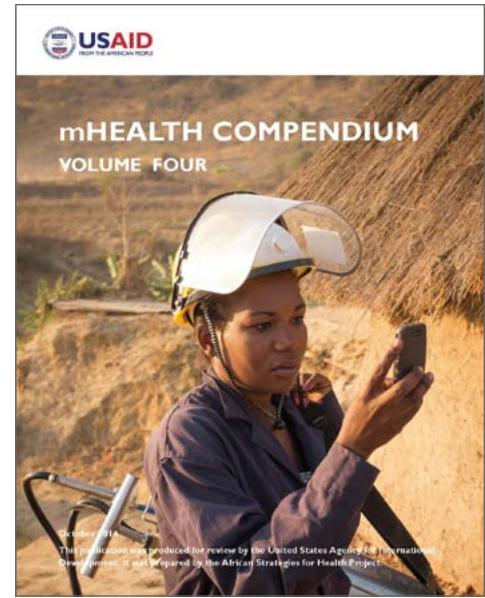
Mobile Phones for Improved Access to Safe Water (M4W)

Mobilise!

Peek Vision

The Referral Exchange System (SIJARIEMAS)

The Safe Delivery App



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VOLUME 5.

BEHAVIOR CHANGE COMMUNICATION (BCC)

Hesperian HealthWiki
EbolaTxt
Project Khuluma
U-Report: Fighting Diseases Across Borders
Alive & Thrive
Projecting Health
iDEA: Interactive Distance Education Application
MomConnect

DATA COLLECTION

MP3Youth
PMI Africa Indoor Residual Spraying (AIRS)
Hang-Up and Track
CRS Senegal mHealth Pilot
SEDA Automated Health Data Exchange System
OpenSRP: Open Smart Register Platform
SMS for Life: Sightsavers
mHBB

FINANCE

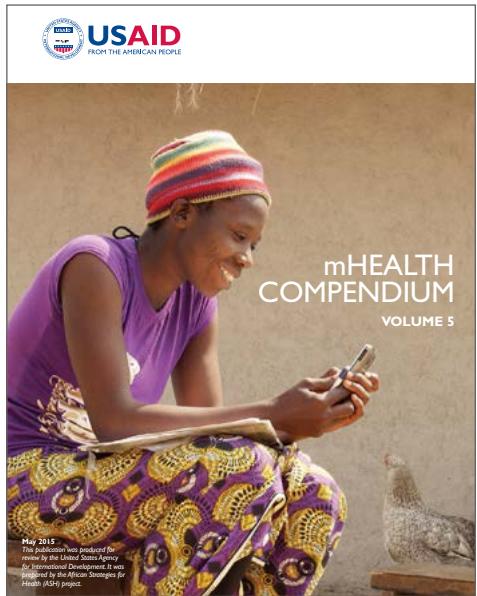
Accredited Drug Dispensing Outlet
mHealth for Safer Deliveries
Heartfile Health Financing
M4Change + mCCT
Airtel Insurance with MicroEnsure

LOGISTICS

Informed Push Model
mHealth for iCCM
IQSMS International Quality SMS
eLMIS Bangladesh
DrugStoc
cStock Supply Chains for Community Case Management

SERVICE DELIVERY

OppiaMobile
mCare Enhancing Neonatal Survival in Rural South Asia
mTIKKA
HELP: Health Enablement and Learning Platform
ETAT
mHealth for Community-Based Family Planning Services
ePartogram
mHero
Mobile App for Management of HIV in Pregnancy
Maternal and Child Health Integrated Program, Kenya
ASHA-LINKS
CommCare Mobile Job Aid for Sahiyas
MobyApp
CycleTel Family Advice & CycleTel Humsafar



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Photo by David Dorey

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