Pathfinder INTERNATIONAL

TECHNICAL BRIEF

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mHEALTH AS A TOOL FOR INTEGRATED SYSTEMS STRENGTHENING IN SEXUAL AND REPRODUCTIVE HEALTH PROGRAMMING

The growth in capacity and geographic reach of mobile technology has important implications for health and development. While mobile technology is commonly used to address health systems challenges, Pathfinder International is exploring the application of mobile technology to improve implementation for sexual and reproductive health and rights, necessarily moving beyond strictly health system interventions to navigate the social determinants of health at the community level. This publication discusses Pathfinder's experience integrating mHealth for this purpose, distilling lessons from our global efforts to apply mHealth for strengthened linkages between health systems and communities, placing particular emphasis on our implementation experience in Mozambique, Tanzania, Nigeria, and Haiti.

Background

Over the past several years, the technological capacity and reach of mobile technology has increased significantly. According to the International Telecommunications Union (ITU), in 2005, there were 2.2 billion mobile-cellular subscriptions worldwide—1.2 billion of these in the developing world.[1] By 2013, the ITU reported 6.6 billion mobile-cellular subscriptions. Over three-quarters of those subscriptions were in the developing world. Health and development experts have high hopes for mobile technologies—such as personal digital assistants, mobile telephones, and tablets—to support health programs (mHealth)† because they offer an unprecedented level of connectivity as well as cost-efficiency and security.[2] The landscape for mobile technologies in health has evolved from being dominated by feasibility and pilot studies, to controlled trials assessing outcomes, to designing mHealth projects for scale and incorporating mHealth into national policies and health management information systems.

Recognizing the range of uses for mHealth and the resulting need for relevant guidelines, a growing body of literature has developed to discuss how mobile technology should be applied for development purposes. Many of these discussions have emphasized the use of mHealth to catalyze health systems strengthening, or to support components of the health system.¥ For example, the WHO's Global eHealth Survey frames respondents' use of mHealth within health system goals relevant to the six pillars. The mHealth Alliance lists health systems strengthening as one of the three strategic objectives of leveraging mHealth for maternal, newborn, and child health.[3] Most notably for health interventions, representatives from UNICEF, WHO, and the Johns Hopkins University propose a vetted list of common mHealth applications (see page 3 for a detailed list) as a set of tools to be integrated within the health system to enhance the response to known health systems constraints or barriers. In addition to discussions around mHealth's ability to catalyze strengthening within the health system, discussions around how to use mHealth with and within the community are taking shape.

Pathfinder interventions seek to address health system and community dynamics that drive adverse sexual and reproductive health (SRH) outcomes through catalyzing community systems, strengthening health systems, and establishing functional mechanisms for the interaction and integration of the two. Within this context, Pathfinder applies mHealth as a supportive tool to facilitate the interactions between communities and health systems and for integrated systems strengthening.

Implementation Experience

With decades of experience implementing community-based health programs to advance sexual and reproductive health and rights (SRHR), particularly for vulnerable and marginalized populations, Pathfinder recognizes that positive health outcomes are stifled not only by weaknesses in the health system, but also by constraints at the community level—such as adverse gender norms, economic disparities, and political instability—which prevent community access to the health system. As an SRHR implementing organization, Pathfinder, through an integrated systems strengthening (ISS) approach, works with communities and health systems to strengthen their interaction. This is accomplished by: (1) working with community members to identify their unique SRH needs; (2) building community capacity to share those needs with the health system and hold it accountable to its mandate of serving the people; and (3) strengthening the health system so it can provide high-quality services that are responsive to the community's expressed needs. Because mHealth connects typically hard-to-reach populations (e.g., youth and women) to health systems and resources, it can be an effective tool for ISS, which requires meaningful engagement between the health system and the community. In this context, mHealth can be used not only as a catalyst for health systems strengthening, but also to promote integration—acting as a mechanism to enhance and facilitate communication between communities and health systems. As many organizations move beyond the confines of health systems strengthening to work within communities, further considerations for mHealth are required (such as how it can support communities or the linkages between a community and its health system).

Through applying mHealth to catalyze ISS in the implementation of SRHR programs, Pathfinder has learned valuable lessons on how linkages between communities and health systems can be strengthened, with particular considerations for meeting the needs of vulnerable populations. The section below discusses in detail implementation experience in Mozambique, Tanzania, Nigeria, and Haiti:

- **Mozambique, mCenas! *(September 2013 to June 2014):*** mHealth was applied to reach youth with timely, accurate, and impartial SRH information in order to drive youth to services provided by the health system.
- **Tanzania, Mobilizing Maternal Health *(October 2013 to September 2016):*** mHealth supports families, communities, and government health workers to increase antenatal care (ANC) attendance, improve individual knowledge of pregnancy-related care and support, and establish systems

† The World Health Organization (WHO) defines mHealth as mobile and wireless technologies to support the achievement of health objectives. ¥ Health system components, or pillars, per the WHO include: health service delivery, health workforce, health information systems, access to essential medicines, health systems financing, and leadership and governance (WHO, *Monitoring the building blocks of health systems: A handbook of indicators and their measurement strategies*, 2010).

PATHFINDER GLOBAL mHEALTH IMPLEMENTATION

Pathfinder has over five years of experience implementing mHealth projects in seven different countries. Across these projects, Pathfinder uses a variety of mobile tools including: mobile case management applications, data collection tools, geographic information system (GIS) mapping, mobile money, and short message service (SMS) platforms. The table below details Pathfinder's mHealth projects globally as they align with 12 common mHealth applications proposed by representatives from the WHO, UNICEF, and the Johns Hopkins University. This list of applications builds upon previous efforts by international organizations to define mHealth uses and has been vetted by mHealth stakeholders, researchers, and policymakers. For more information see* mHealth Innovations as Health System Strengthening Tools: 12 Common Applications and a Visual Framework.[4]

FIGURE 1: PATHFINDER GLOBAL mHEALTH IMPLEMENTATION BY PATHFINDER TECHNICAL AREA

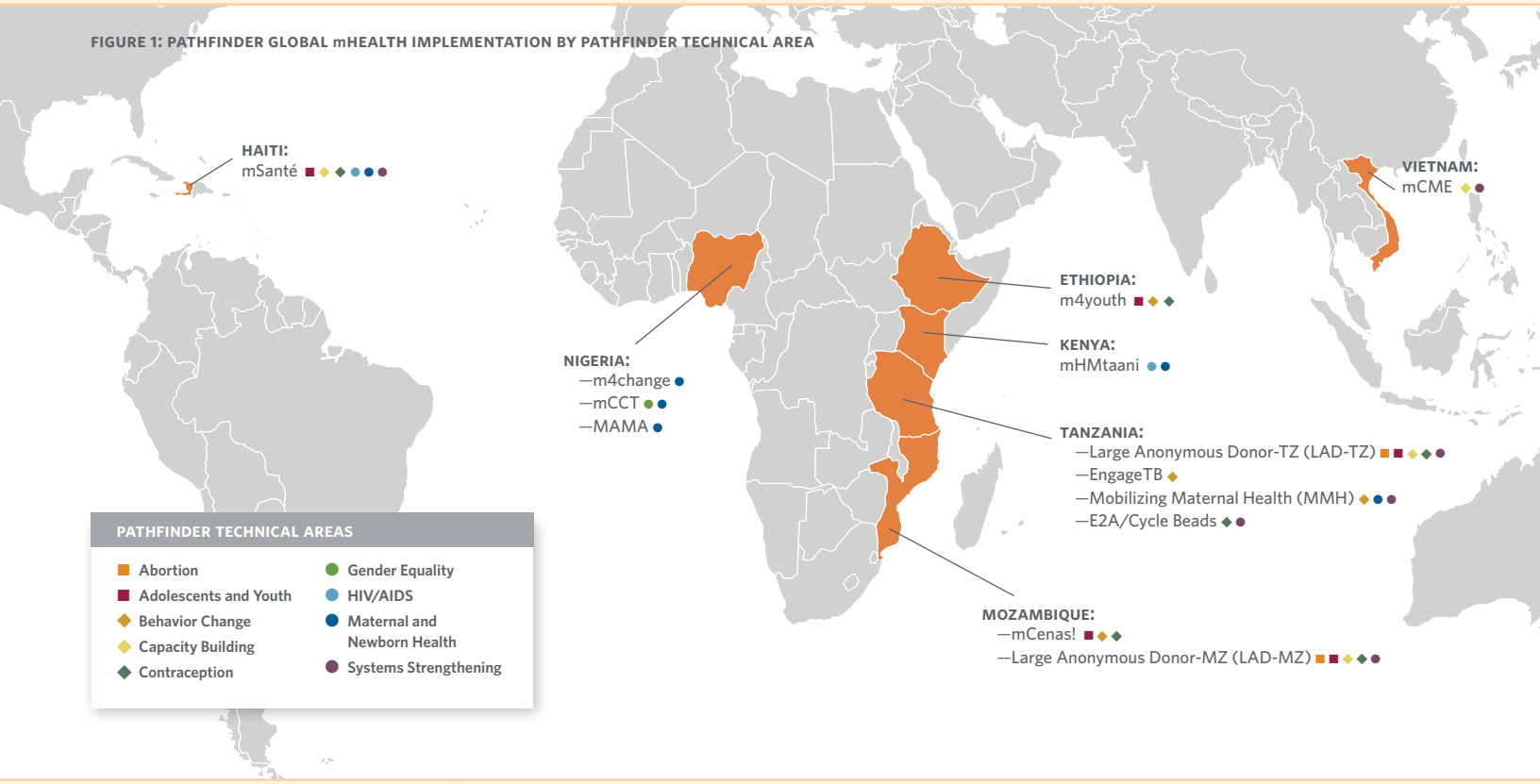


TABLE 1: PATHFINDER GLOBAL IMPLEMENTATION OF COMMON mHEALTH APPLICATIONS

	Client education and behavior change communication	Sensors and point-of-care diagnostics	Registries/ vital events tracking	Data collection and reporting	Electronic health records	Electronic decision support	Provider-to-provider communication	Provider workplanning and scheduling	Provider training and education	Human resource management	Supply chain management	Financial transactions and incentives
Ethiopia	✓											
Haiti	✓		✓	✚	✓	✚	✓	✚		✓		✓
Kenya	✓		✓	✚	✓	✚	✓	✚		✓		✓
Mozambique	✓		✓	✚	✓	✚	✓	✚		✓		✓
Nigeria	✓		✓	✓	✓	✚		✓				✚
Tanzania	✓		✓	✚	✓	✚	✓	✚		✓		✓
Viet Nam**									✓	✓		

✓ **mHealth activities that support health systems strengthening**

✚ **projects that engage mHealth at both the facility and community levels to support integrated systems strengthening** *(e.g., the use of a mobile-based decision support tool by a community health worker enables improved job performance but also provides accurate information to the community member, thus increasing his/her knowledge and awareness.)*

* Pathfinder mHealth projects include: m4youth (Ethiopia), mSanté (Haiti), mHMtaani (Kenya), mCenas!, Large Anonymous Donor (Mozambique), m4change, mCCT, MAMA (Nigeria), EngageTB, Mobilizing Maternal Health, Large Anonymous Donor, E2A/Cyclebeads (Tanzania), and mCME (Viet Nam). ** Pathfinder's mHealth project with Boston University School of Public Health in Viet Nam is part of a randomized controlled trial to determine what modality of SMS is most effective to communicate continuing medical education to physician assistants and therefore does not meet many of the above-listed applications.

for management of pregnancy-related complications and emergencies during birth and postpartum.

- **Nigeria, m4change and mCCT *(January 2014 to December 2015):*** mHealth supports local implementers to reduce barriers to skilled ANC and efficient delivery of financial incentives to women for antenatal and postnatal care.
- **Haiti, mSanté *(October 2013 to September 2016):*** mHealth is applied broadly across several components of the community and health systems as part of a comprehensive strategy to standardize care, strengthen referrals, and improve the health of the Haitian population.

Mozambique

Context

Approximately one-third of Mozambique's population is between the ages of 10 and 24. Like adults, youth face barriers to SRH, such as geographic barriers, financial barriers, and commodity stock-outs. Youth, however, face the additional challenge of having limited SRH knowledge and skills, as they are commonly left out of national and local health programming. Further, youth require services that meet their unique SRH needs. Only 8 percent of all women ages 15–19 use a modern method of contraception. By age 15, 5 percent of women have already given birth to a child.[5] Meanwhile, mobile cellular subscriptions are increasing in Mozambique, and most youth ages 15–24 are literate, presenting an opportunity to reach youth with SRH information through written communications.

Between 2010 and 2014, Pathfinder led the USAID-funded Extending Service Delivery-Family Planning Initiative to address Mozambique's unmet need for contraception by integrating family planning into the primary health care system. Simultaneous to efforts to strengthen the health system, and because youth have special SRH needs that were not being met, mCenas! was developed to increase youth's knowledge about contraception and address barriers to contraceptive access.

mCenas!

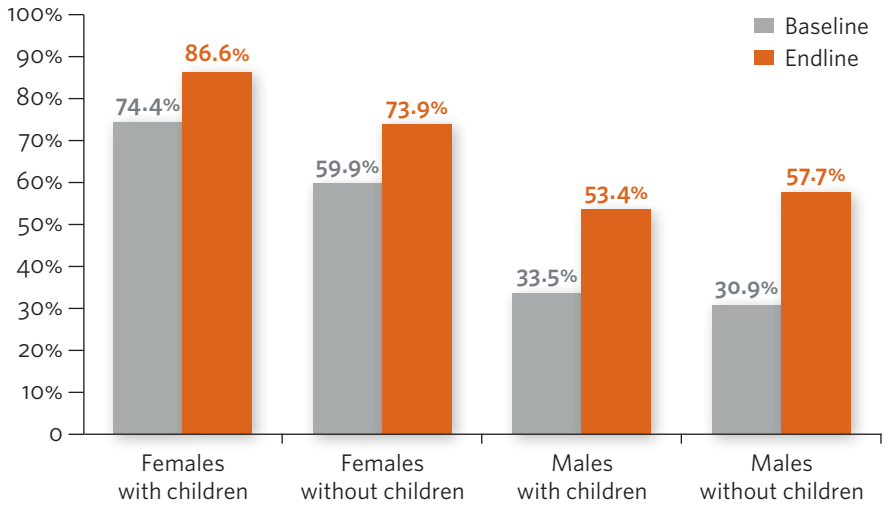
mCenas! is a mobile-based intervention to reach youth with SRH information tailored to their needs. mCenas! was implemented in Matola district of Maputo Province and Inhambane City district of Inhambane Province from September 2013 to June 2014. Role model stories were developed using a participatory approach in which Pathways to Change[§] (a theory-based game-like tool) was employed to support youth's own identification of barriers to and facilitators of behavior change in contraceptive uptake and continuation. The design of the mHealth application content was conducted by and for the target population, ensuring that content reflected and resonated with youth experiences in the country. Once data collection was complete, content for mCenas! was finalized in conjunction with a local script writer, who adapted content to local SMS slang. Stories were then delivered to youth in SMS installments over a two-month period. In addition to the role model stories, youth had access to an interactive SRH information menu and a link to Alo Vida—a Mozambican Ministry of Health hotline.

Over 2,000 youth were enrolled in mCenas! by activistas (peer educators) affiliated with community-based organizations at schools and community events between September

TABLE 2: MOZAMBIQUE HEALTH AND MOBILE LANDSCAPE

Health context	
Total unmet need	22.3%[6]
Population between ages 10 and 24	33%[7]
Contraceptive prevalence rate, women in union ages 15–19	5.9%[8]
mHealth context	
Mobile cellular subscriptions per 100 people	48[9]
Literacy rate, women ages 15–24	65.1%[10]
Literacy rate, men ages 15–24	78.5%[11]
Percent of women ages 15–19 reporting distance to facility as a barrier to care	48.7%[12]

FIGURE 2: KNOWLEDGE ABOUT CONTRACEPTION: MEDIUM-HIGH KNOWLEDGE OF THREE OR MORE CONTRACEPTIVE METHODS



[§] The game and handbook are available here: http://www.pathfinder.org/publications-tools/pathways-to-change-game.html.

2013 and February 2014. To be eligible for participation, individuals had to be between 15 and 24 years of age, own a cellphone, and have the ability to read SMS messages. Participants were separated into two groups, those with and those without children, ensuring youth received messages most relevant to their fertility life-stage. From January to July 2014, the USAID-funded Evidence to Action (E2A) project conducted an assessment to determine whether delivering contraception information via SMS was acceptable to Mozambican youth, and whether it could lead to improvement in their contraceptive knowledge, attitudes, and self-efficacy.[13] Findings reflect that SMS is indeed an acceptable method of delivering information on contraception. The majority of participants (56.8 percent of male youth without children, 57.6 percent of males with children, 73.3 percent of female youth without children, 67.7 percent of females with children) strongly agreed when asked if they felt comfortable sending and receiving SMS messages about SRH. Further, 10,541 requests for information from the SRH FAQ menu were made and 8,641 messages were received that the application was not programmed to register. Importantly, about half of the non-conforming messages were attempts to engage with the application or role-model characters through asking for advice or wishing to further engage with the system.

Findings also suggest that SMS can improve contraceptive knowledge. Among both men and women, there was an increase in medium to high knowledge about three or more contraceptive methods, and significant increases in intention to use and continue to use contraception in the year following the survey for both males without children who currently used contraception and for females without children who currently did not use contraception.

Finally, while male youth had high self-efficacy for contraceptive-related tasks—such as getting condoms or supporting partners to use contraception—there was no contraceptive-related task that female youth expressed confidence in their ability to accomplish. This finding suggests that, when working with vulnerable groups—such as women or youth—in behavior change, access to information alone may not be enough to incite change. While mobile tools establish an entry point for information access in these populations, counseling or interpersonal dialogue to reinforce information provided could ensure that lasting behavior change takes place.

Tanzania

Context

Despite considerable progress in reducing maternal, neonatal, and child mortality in recent years, Tanzania still has high maternal and child mortality rates. Most notable is the nation's low percentage of facility deliveries, which is lower still in Mwanza and Shinyanga regions, where 46 percent and 33 percent of deliveries happen in health facilities, respectively.[14] Preventing women from accessing appropriate care are: long distances between home and care, inadequate care at facilities, limited decision-making power, and low financial resources.[15] In Tanzania, Pathfinder uses mobile technology as a tool for a variety of SRH purposes. In the Mobilizing Maternal Health project specifically, mobile technology is used by the health system to address obstetric emergencies and increase institutional deliveries.

Mobilizing Maternal Health

The Mobilizing Maternal Health (MMH) project aims to reduce maternal mortality and morbidity through increasing facility-based deliveries and accurate referrals to appropriate facilities for emergency obstetric care. Reaching this goal requires building community knowledge about antenatal care, postnatal care, and pregnancy-related danger signs; strengthening communication between the community and the health system; and increasing the capacity of health facilities to meet the increased demand. To address this last point, project partners have provided basic and comprehensive emergency maternal obstetric and newborn care (BEmONC and CEmONC) training to providers in both Shinyanga and Mwanza and are building and expanding maternity waiting hostels, which adjoin hospitals. The mHealth component of MMH facilitates non-emergency and emergency referrals for pregnant women by organizing transportation for women with complicated or emergency pregnancies so they can deliver with skilled assistance at an appropriate facility, and by supporting community health workers (CHWs) in antenatal care counseling and referrals—thus increasing women's awareness of pregnancy-related danger signs and linkages to health facilities.

TABLE 3: TANZANIA HEALTH AND MOBILE LANDSCAPE

Health context	
Maternal mortality ratio (maternal deaths per 100,000 live births)	454[16]
Percent of health facility deliveries	50.2%[17]
Percent of women reporting lack of money as a barrier to health treatment	24.1%[18]
mHealth context	
Mobile cellular subscriptions per 100 people	55.7[19]
Literacy rate, women	72.2%[20]
Literacy rate, men	82.1%[21]
Percentage of women reporting distance to facility as a barrier to care	19.2%[22]

MOBILE REFERRAL SYSTEMS

Financial and geographic barriers often prevent women from accessing needed care at a facility. Mobile technology enables the non-emergency system to track women who are priorities for facility deliveries and reduces financial barriers to care. Mobile technology supports the emergency referral system with algorithms, stored information, and communication tools that allow for the coordination of free emergency transportation to appropriate health facilities for over 1,000 women who will experience obstetric emergencies.

Non-emergency referral system

In the non-emergency referral system, any woman who attends an ANC visit at a health facility and is identified as having a "high-risk" pregnancy (previous C-section, high blood pressure, more than five previous pregnancies, etc.) is given a referral by a health facility worker. A central dispatcher contacts each of the project-supported health facilities weekly to record the names and contact information of referred women. Local CHWs are then notified via SMS to conduct a home visit. In subsequent visits, CHWs determine whether women have been referred to specific maternal waiting hostels where they should present prior to their expected delivery date and are prompted by an MMH mobile application to brief the woman on what she should expect at the hostel. Once at the maternity waiting hostel, women are registered by a matron using a mobile application. Mobile technology is further leveraged to address the financial barriers to care. Upon arrival at the maternity waiting hostel, women receive a Vodacom SIM card so that they can receive mobile money through the mobile money platform, mPesa, as immediate reimbursement for transportation to and from the hostel.

Emergency transportation system

Call center dispatchers are equipped with an application, which, through a series of algorithms and stored location and contact information, enables dispatchers to coordinate people, transportation, and care providers so that a woman experiencing an obstetric emergency can be transported to an appropriate care facility at no financial cost to her. Call centers have been established at a referral hospital (one in each district) and are staffed 24 hours a day. Community members, family members, or pregnant women themselves can use a toll-free number, widely publicized throughout the project sites, to reach dispatchers at a call center.

Dispatchers' applications have a medical triage function and a transportation logistics function. Dispatchers determine—through a series of prompts, questions, and information in the application—whether there is an emergency, to which facility the woman should be referred, and which district ambulance or private taxi can transport the woman to the facility. All drivers registered in the mobile application have specific catchment areas and pre-negotiated prices for transportation. Once the woman has arrived at the facility, and the facility confirms her arrival with the call center, the dispatcher sends the driver a mobile money payment using mPesa.

Provider and client with mobile phone, Nigeria

PHOTO: Andrea Fletcher

COMMUNITY HEALTH WORKER APPLICATION

A custom-made mobile application-based job aid strengthens the counseling and referral capacity of CHWs as well as the SRH knowledge of the community. The MMH CHW application supports comprehensive antenatal, postnatal, and neonatal counseling for pregnant women and new mothers, in accordance with national guidelines. Depending on which type of visit they present for, the MMH CHW application prompts the CHW to counsel women in accordance with their gestational stage and birth preparedness needs. The application provides support for counseling on: nutrition, malaria, anemia and anemia management, HIV and AIDS, healthy timing and spacing of pregnancies, pregnancy danger signs, and promotion of ANC and facility-based deliveries. Thus, the application is designed to improve service quality for clients, who receive accurate and

standardized information, and ease of workflow for CHWs, who are aided by application algorithms and recorded health counseling information. The MMH project is in the process of training 125 CHWs in Shinyanga and 125 CHWs in Sengerema, to be completed by the end of 2015. These 250 CHWs are in turn expected to provide home visits to 30,000 pregnant women per year. Finally, the application informs CHW performance monitoring by the program and district government as data from each visit must be entered into the application itself. This data is viewable by CHW supervisors in real-time.

Though the MMH project prioritizes the use of mobile tools to increase facility-based deliveries and accurate referrals to appropriate facilities for emergency obstetric care, mobile technology is also used for communication between the facility and the community. Dispatchers are prompted by the application to follow up with facilities to understand if there is under- or over-triaging of cases by asking staff about the outcome of cases that are sent to facilities by dispatchers. In addition, dispatchers follow up with women who were not given emergency transportation to understand the outcome of their problems. The use of mobile tools to facilitate these interactions, in this case, provides a mechanism through which the health system and the community can strengthen their interactions.

In MMH, mobile technology is designed to address barriers to facility-based care faced by the community and strengthen service delivery in the community through improved counseling and referrals. Finally, it provides a foundation for engagement between the community and the health system to help the health system learn if it is indeed meeting the needs of the people it serves. Baseline surveys have provided data for measuring the performance of this complex system over the next three years.

Nigeria

Context

Nigeria has one of the highest maternal mortality ratios in the world. To recognize signs of high-risk pregnancies and to educate women and their families about safe pregnancy practices and healthy behaviors, the WHO recommends a minimum of four ANC visits during pregnancy.[23] In Nigeria, however, only 51 percent of women had 4 ANC visits for live births between 2008 and 2013.[24] Further, Nigeria has a shortage of skilled health professionals. Specifically, the shortage of skilled workers is felt at the primary health care level, to which community health extension workers (CHEWs) have been shifted to fill the gaps. Because CHEWs were intended to be based in the community, these CHEWs needed skills-strengthening related to antenatal and maternal health care.

In addition to shifting CHEWs to facilities to fill gaps in care, the Nigerian government aims to improve maternal health outcomes through the maternal and child health component of its Subsidy Reinvestment and Empowerment Programme (SURE-P MCH) by: (1) strengthening the health system through renovations, staff recruitment, and human resources planning at 1,250 health facilities, and (2) increasing the demand for health services by funding a conditional cash transfer (CCT) program to incentivize women to present for antenatal and postnatal care and to deliver at facilities. A paper-based system, however, is not only slow and burdensome (as it can take months for verification and money distribution), but it also makes payments to the women late. As a result, the incentive is no longer linked to a health behavior.

In 2012, Pathfinder partnered with the Nigerian government and Dimagi, Inc. to leverage mobile technology to first support CHEWs in facilities to provide ANC, and later to drive women to services by enhancing the ease of client tracking and the expediency and security of money transfer.

m4CHANGE

In m4change, a mobile-based intervention was implemented to support CHEWs to meet ANC needs of women in 20 primary health care facilities in Abuja federal capital territory and Nasarawa State. Between December 2012 and December 2013, 152 CHEWs were trained to use CommCare, a mobile-based decision support application. The application enabled CHEWs to register and track clients longitudinally, support health workers to conduct ANC services using decision support algorithms, and share data on a cloud server so that it can be aggregated for viewing by supervisors and the government and enables real-time decision making. The application is divided into four modules: client registration and collection of relevant medical history; client follow-up; lab/examination, which prompts the health care worker to record any maternal or fetal danger signs, hemoglobin levels, fetal heart rate, etc.; and health counseling.

TABLE 4:
NIGERIA HEALTH AND MOBILE LANDSCAPE

Health context	
Maternal mortality ratio (maternal deaths per 100,000 live births)	576[25]
Total fertility rate	5.5[26]
Nurses and midwives per 1,000 people	1.6[27]
Percent of respondents who attended 4 or more ANC visits	51.1%[28]
Percent of respondents who attended no ANC visits	33.9%[29]
mHealth context	
Mobile cellular subscriptions per 100 people	73.3[30]
Literacy rate, women	53.1%[31]
Literacy rate, men	75.2%[32]
Percent of women reporting distance to facility as a barrier to care	28.8%[33]

Using supervisor surveys, ANC client interviews, and a retrospective cost-effectiveness study, Pathfinder assessed whether using a mobile application to support ANC counseling and care improved ANC service quality and client satisfaction with services provided, and whether the mHealth intervention was cost effective. Findings suggest that the mobile application did improve quality of care and client satisfaction.[34] A quality score was developed consisting of 25 key elements essential to clinical and technical service provision and client education and counseling related to safe pregnancy and delivery. The overall quality score for technical care and client health counseling was originally 13.33 out of 25 possible points. At endline, the score had increased to 17.15. The technical score, composed of 12 different technical elements (e.g., did the CHEW provide an HIV test, measure client's blood pressure, or check the fetal heart rate?), increased from 7.77 to 8.44. Seven of the 12 technical elements showed statistically significant improvements. The health counseling score improved from 3.49 to 3.89 and 12 of the 13 health counseling elements showed statistically significant improvements. Client satisfaction with ANC services increased from 75 percent reporting satisfaction at baseline to 83 percent after the intervention. Finally, preliminary results from the cost-effectiveness study, suggest that, assuming all ANC interventions were met (tetanus toxoid vaccination during ANC, malaria prophylaxis during pregnancy, iron folate supplementation, blood glucose and blood pressure screening), 6.34 lives were saved and the incremental cost for each additional life saved was $7,722.93. (However, the study is not without limitations; most importantly, study results are based on a theoretical scenario in which there is complete coverage of all ANC interventions, which does not reflect the true coverage of these ANC interventions.) In m4change, mobile technology catalyzed improved service delivery. Because of the success of this project, the m4change application was used as a foundation and revised to address the challenges faced by the government's CCT program, while also providing a mechanism for engagement between the community and the health system.

mCCT

mCCT is designed to meet health system needs by enhancing the ease of client tracking, data collection, and the expedience and security of financial transfers, while also addressing the transactional challenges a woman faces in accessing ANC care. The cost of care and the cost of transportation to care often prevent a woman from seeking necessary SRH services. These costs manifest in the price associated with transportation and care, as well as in the time away from a job or in childcare required while a woman is away. To enhance the ease of client tracking, and the expedience and security of money transfer, mCCT is designed to register women eligible for the conditional cash transfer, track and verify their progress, and distribute payments via mobile money. In addition, an SMS campaign funded by Making all Voices Count, called Text2Speak, will elicit feedback from beneficiaries on the antenatal and postnatal care services they received, thus enabling a line of communication between the community and the health system.

Nigeria has several mobile network operators. To ensure that CHWs in SURE-P pilot sites have the ability to register, verify, and track a woman's eligibility and progress in the mobile application, Pathfinder worked with mobile aggregators to map mobile network operators with sufficient signal strength. These maps also serve beneficiaries who need to decide which SIM cards to use to receive CCT via mobile money. Further, negotiation with Nigerian banks was required to determine rates for distribution and cashing out mobile money, and to ensure that the mCCT application could communicate with the bank's mobile money application for the transfer of funds. Meeting the needs of the bank required several modifications to the mCCT platform. Finally, mCCT implementers needed to consider how women would receive mobile money payments (can they read, do they own SIM cards, and do they own handsets to read SIM cards from?), and what impact it might have on gender and power dynamics. In Nigeria, and globally, men have higher mobile ownership rates than women.[35] Anecdotally, to some Nigerian men, a woman's ownership of a mobile phone could indicate infidelity. Further, if women are to receive mobile money payments rather than physical cash, this could present an opportunity for conflict if a male partner expects physical cash. To address these concerns, educational opportunities for men and community leaders are being considered and a mobile telephony box has been set up at one of the SURE-P health facilities so women can check mobile money accounts by inserting their SIM cards in the telephony box. Thus far, 50 payments have been issued and there are 4 test sites.

Haiti

Context

Natural disasters, infectious disease outbreaks, and a fractured health system have negatively impacted Haiti's ability to meet Millennium Development Goals 4, 5, and 6. Further, distances to health facilities and mountainous terrain challenge some Haitians' abilities to reach an already limited health workforce. The Haitian Ministry of Health, the Ministère de Santé Publique et de la Population (MSPP), operates less than half of Haiti's health facilities—the majority of facilities are operated by private entities. The result is a disconnected community and a disparate amalgamation of data collection and reporting systems that are unable to communicate with one another, efficiently track clients, or report stock-outs across systems. In Haiti, mobile tools were integrated at different levels of the health system to improve linkages with the community.

Services de Santé de Qualité pour Haiti (SSQH) is a USAID-funded program that aims to support the MSPP in comprehensively improving the health of the Haitian population through strengthening the health system to more effectively provide the essential package of health services to the community. SSQH aims to accomplish this specifically through: increased utilization of the MSPP's essential package of services at the primary care and community levels, improved functionality of health referral networks, sustainable delivery of quality health services through institutionalization of key management practices at facility and community levels, and strengthened health department capacity to manage and monitor service delivery. Enhancing progress toward these objectives is mSanté, the mobile technology component of SSQH, which supports SSQH's goals through a CHW tool, a facility tool, integration of mobile money, and a design for national scale.

TABLE 5: HAITI HEALTH AND MOBILE LANDSCAPE

Health context	
Maternal mortality ratio (maternal deaths per 100,000 live births)	380[36]
Under-5 mortality rate (deaths per 1,000 live births)	73[37]
Deaths due to HIV and AIDS, per 100,000 population	72.9[38]
Physicians per 1,000 people	0.25[39]
Nurses and midwives per 1,000 people	0.11[40]
Population living in urban areas	56%[41]
mHealth context	
Mobile cellular subscriptions per 100 people	69.4[42]
Literacy rate, women	73.6%[43]
Literacy rate, men	74.7%[44]
Percent of DHS clusters in rural areas within 5 km of BEmONC facility	20%[45]

Community health worker home visit, Haiti

PHOTO: Maren Vespia

ASCP DECISION SUPPORT TOOL

The goal of the MSPP is to upgrade Haiti's community health workforce to Agents de Santé Communautaires Polyvalents (ASCPs), who, rather than working in just one health area, can provide services in multiple areas (maternal and newborn health, child health, family planning, infectious disease prevention, WASH, etc.). Further, tasks are shifted to ASCPs, to the extent permitted by MSPP, to ensure essential services are not only available at the health facility but also in the community. To support ASCPs with their increased responsibilities, Pathfinder and its technology partner, Dimagi, Inc., developed a mobile application to guide trained ASCPs through home visits for child health, family planning, and maternal health, and to efficiently collect relevant client data. If, during the home visit, a client reports symptoms of a sexually transmitted disease, desire for family planning, antenatal danger signs, postnatal maternal or child danger signs, or tuberculosis symptoms, the application prompts the ASCP to refer the client to a health facility. Because client data is stored in a server and is accessible at the facility, mHealth enhances continuity of care by referring a client to an appropriate facility and making client data available to that facility. In addition, if a referred client does not come to the health facility, mSanté allows institutional staff to track and recuperate the client. By the end of the project's first year, 1,734,446 clients were accessing services by project-supported facilities or ASCPs.

FACILITY TOOL

At the facility level, mobile technology is applied to ensure health system services meet the needs of the community as well as certain quality standards. The facility tool is designed to show service delivery and ASCP performance data so that supervisors can provide relevant feedback and mentoring to the ASCP workforce when needed. Further, because client data is loaded to a server and is accessible to the facility in real-time, the facility will be able to confirm that it can accept the referral. Once the client returns to the community, the facility will alert the ASCP so that s/he can follow up with the client, thus strengthening the referral network and ensuring continuity of care between the facility and the community.

Rolling out the ASCP and facility tools has not been without challenges. In areas where ASCPs were trained on mobile tool use before their supervisors were trained, the tool was not being used for data collection or decision support. It was necessary to understand who in the health system should be trained to use the mobile application first to ensure broad support and buy-in from local health workers. Further, a referral network of this magnitude is a significant challenge as it is necessary to determine, across the country, which person at which facility can accept or reject referrals for which type of care.

Despite challenges, in its first year of implementation, the SSQH project has surpassed its targets for: number of clients accessing services provided by project-supported facilities and ASCPs, percent of women who receive three or more ANC visits during pregnancy, and percent of departmental health authorities meeting to review data collected by mobile applications for monitoring and evaluation purposes. Further, the project has met its target for percent of births attended by a skilled doctor, nurse, or midwife, and reached 89 percent of its target for number of youth aged 15–25 accessing SRH services.

mSanté is unprecedented because of the myriad ways in which it leverages mobile applications for SSQH's four objectives, because it is designed to do this in combination with the use of mobile money (mobile technology is used not only to support ASCPs and facilities in interacting with the community but also to initiate payments to health workers with mobile money), and because it is designed for national scale. Pathfinder recently shared its mobile application with SSQH North, the project led in Haiti's four remaining departments, so ASCPs and facilities across the nation will provide the same care and counseling and will use the same systems to collect and report data. Further, by the end of SSQH, it is envisioned that mSanté will be linked to the national health information system.

As demonstrated by the design for SSQH, mobile technology offers an opportunity to take a standardized and higher quality of care to scale horizontally, or geographically, by providing job aids, performance monitoring tools, and referral mechanisms that allow for expedited communications and results.

Recommendations

Pathfinder's experience applying mHealth across different countries has yielded several recommendations for using mHealth as a tool to support solutions to complex community and health system interventions.

Use of mobile technology at the community level should be reinforced by human interaction and interpersonal dialogue to ensure a positive and lasting change in health outcomes.

Mobile technology has become an increasingly important tool in the public health toolkit and should be viewed as a means to an end, not an end in and of itself. Pathfinder found that in Haiti some ASCPs would play health counseling audio clips from their mobile phones for clients while engaging in conversations with people who were not clients. This indicated that further training to strengthen counseling and interpersonal skills was needed, as the audio clips should provide an opportunity for engagement and discussion. Further, the level of engagement of youth with the mCenas! intervention suggested that community members, and youth in particular, want more interaction with SRH information sources. When used well, mobile phones can open multiple avenues for interaction between different levels of the health system and the community, particularly the marginalized or vulnerable.

mHealth should be part of a larger service delivery program rather than a standalone intervention.

Advancing sexual and reproductive health and rights requires working in behavior and norm change, which is a complex task. As experience from Mozambique suggests, mobile technology alone cannot address complex systemic issues such as a woman's self-efficacy to seek contraception or perform contraception-related tasks. For this reason, Pathfinder integrates mHealth activities within larger programs to ensure that other barriers to health care access, such as adverse gender dynamics, are addressed.

Incorporate gender equity and power dynamics to ensure evidence-based and rights-oriented application design.

Globally, women are 14 percent less likely than men to own a mobile phone, and have

Three boys testing phones, Mozambique

PHOTO: Jaime Jacobson

cited cost and technical literacy as barriers to ownership and use.[46] Further, while youth are often thought of as early adopters of mobile technology, they may not have access to the technology due to illiteracy or lack of financial resources and decision-making power. When designing a mobile-based intervention for the community, it is important to understand who uses mobile tools, how they access and use them, and how their introduction might impact gender or power dynamics. Such considerations in the design of mHealth applications can help to ensure that the intervention modality is appropriate for the target population and that already vulnerable populations are not further marginalized.

Understand the context, specifically the mobile infrastructure, of implementation.

As demonstrated by mCCT, implementing mobile technology as a health system strengthening tool requires working with many different stakeholders—governments, mobile network operators, and banks—and requires understanding the role each stakeholder plays and how it will interface with mobile technology. For a beneficial partnership between multiple private and public entities, implementers and technology partners must understand the expectations stakeholders have of the technology being designed and the constraints that existing technologies may present early in the design process.

Design for local ownership and sustainability.

In order for mHealth interventions to be brought to national scale, there must be local support for and ownership of the intervention. Pathfinder works with local NGOs, community-based organizations, and governments to advance SRHR. When designing mHealth projects, models and tools are needed to allow local implementing partners to more effectively manage their SRH services and workforce. This may include policies for introducing mobile technology, training for adopting and managing data dashboards and supervision tools, and building partnerships between local stakeholders. Experience in Haiti led Pathfinder to develop a model for building local capacity and ownership to sustain mHealth interventions. This approach will be applied to NGO-based mHealth trainings in Haiti and in other countries, such as Tanzania.

Conclusion

As more and more interventions embrace the complexity of working across sectors and within communities, more global dialogue is needed about how to best apply mHealth to foster implementation effectiveness and impact for the communities we seek to serve. Several years into applying mHealth to this end, critical lessons have emerged. Mobile tools are effective and acceptable mechanisms through which marginalized and vulnerable populations, such as women and youth, can be reached. However, as suggested, implementers must understand the gender equity and power dynamics relevant to interventions and prioritize assurance that mobile tools will not deepen imbalances. Further, when implementing mHealth interventions, it is important to support organizational capacity and to design for local ownership if the outcome desired is sustainable change.

Mobile technology is not a silver bullet. However, it enhances approaches that we, as a development community, know work: it expands the reach of the health system, strengthens the capacity of community workers, enables supervision of health workers in hard-to-reach communities, and provides a mechanism for engagement between the community and the health system. As more people become connected via mobile technology and as it continues to advance and evolve, we hope that the dialogue about how best to leverage this technology will continue.

ENDNOTES

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ABOUT PATHFINDER'S PROJECTS

MOZAMBIQUE

The Extending Service Delivery-Family Planning Initiative (2010–2014) was a USAID-funded program operating in four of Mozambique's provinces (Cabo Delgado, Gaza, Inhambane, and Maputo), working with health facilities, communities, and partners to integrate family planning into primary care services.

TANZANIA

In collaboration with Touch Foundation and D-Tree International and supported by Vodafone Foundation, SWISSRE, and USAID, Mobilizing Maternal Health (2013–2016) aims to address and avert the delays to care that lead to adverse maternal health outcomes. Mobilizing Maternal Health operates in Tanzania's Mwanza and Shinyanga regions.

NIGERIA

m4change (2012-2013), supported by the Pathfinding Fund and the UN Foundation, equips community health extension workers with mobile-based decision support to improve quality ANC services. mCCT (2014—2016), supported by the Innovation Working Group and the UN Foundation, aims to support the Nigerian government's conditional cash transfer scheme to increase ANC uptake by using mobile technology to track beneficiaries and replace cash-based disbursements with mobile money transfers.

HAITI

Funded by USAID and alongside Haiti's Ministry of Health and local NGOs, Services de Santé de Qualité pour Haiti (2013–2016) is designed to sustainably strengthen Haiti's health services in 6 of Haiti's 10 departments.

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COVER: Community health worker using mobile phone with mother and child, Tanzania PHOTO: Sala Lewis