



Credit: DataDyne

## Meeting Health Needs Through a Broad Array of Applications

A growing number of developing countries are using mobile technology to address health needs. The mHealth field is remarkably dynamic, and the range of applications being designed is constantly expanding. The key applications for mHealth in developing countries are:

- Education and awareness
- Remote data collection
- Remote monitoring
- Communication and training for healthcare workers
- Disease and epidemic outbreak tracking
- Diagnostic and treatment support

This report details 51 mHealth programs, either currently operating or slated for implementation in the near future, that are taking place in 26 different developing countries. mHealth programs are more prevalent in some countries than others for reasons that have not yet been assessed by the academic literature. In particular, India, South Africa, Uganda, Peru, and Rwanda stand out for their level of mHealth activity. As the case studies examined in this report reveal, mHealth programs are gaining strong support across regions, as well as sectors as diverse as governments, technology providers and academia. Figure 2 shows the geographic and application area breakdown of these mHealth projects.

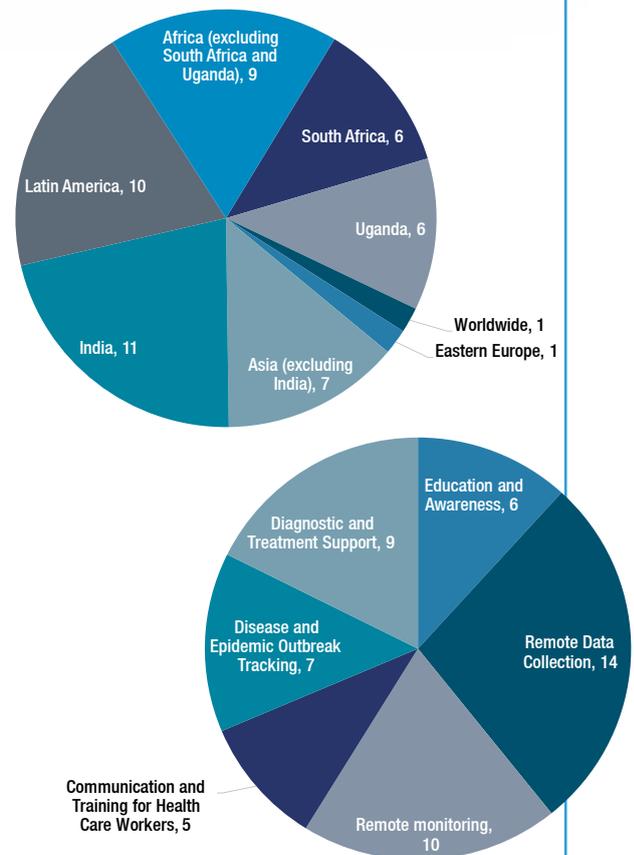


Figure 2. Distribution of mHealth programs by location and application area.



Figure 3. Distribution of mHealth programs by location and application area.

Figure 3 provides another view of the distribution of mHealth programs both geographically and by application area.

The following section describes the major mHealth applications in developing countries and provides examples of projects where the application has been put into action.

## Education and Awareness

Popularized by teenagers in western countries and Japan who wanted a low-cost means of communicating with friends, short message service (SMS) messages now offer a cost-effective, efficient, and scalable method of providing outreach services for a wide array of health issues. In education and awareness applications, SMS messages are sent directly to users' phones to offer information about testing and treatment methods, availability of health services, and disease management. **Formal studies and anecdotal evidence demonstrate that SMS alerts have a measurable impact on and a greater ability to influence behavior than radio and television campaigns.** SMS alerts provide the further advantage of being relatively unobtrusive, offering recipients confidentiality in environments where disease (especially HIV/AIDS) is often taboo. In the developing world, SMS alerts have proven particularly effective in targeting hard-to-reach populations and rural areas, where the absence of clinics, lack of healthcare workers, and limited access to health-related information all too often prevent people from making informed decisions about their health.

SMS message campaigns can be set up either as one-way alerts or interactive tools used for health-related education and communication. For example, a citizen may sign up to take a survey, delivered via SMS message, quizzing them on their knowledge about HIV/AIDS and the location of the nearest testing center. Depending upon their responses, information regarding where and how to receive a free test will be transmitted. This interactive model has been deployed in several countries (e.g., India, South Africa, and Uganda) to promote AIDS education and testing and provide information about other communicable diseases (such as TB), as well as to promote maternal health and educate youth about reproductive health.

## Education and Awareness

*Project Masiluleke* and *Text to Change* use SMS message campaigns to provide HIV/AIDS education in South Africa and Uganda, respectively. Project Masiluleke takes advantage of the 120 spare characters on free 'please call me' SMS messages to provide HIV/AIDS education and awareness, while Text to Change employs an SMS-based quiz to test users' HIV/AIDS knowledge and encourage testing and counseling.

While other communication mediums, such as radio, television, voice-based information hotlines, and even interactive websites can be employed in the service of education about public health issues, SMS stands out as having several advantages over each of these: cost-effectiveness, scalability, convenience, broad reach, and widespread popularity in the developing world.

By promoting health-conscious behavior, the mHealth education and awareness programs currently in place have already had positive impacts. The ubiquity and low cost of SMS messages hold the potential to shift the paradigm for health education by communicating with people in an accessible, engaging manner that both respects their privacy and gives them the tools to make informed choices.

## Remote Data Collection

Data collection is another crucial component of public health programs. Policymakers and health providers at the national, district, and community level need accurate data in order to gauge the effectiveness of existing policies and programs and to shape new ones. In the developing world, collecting field information is particularly important since many segments of the population are rarely able to visit a hospital, even in the case of severe illness. Gathering data where patients live is vital, and information should ideally be updated and accessible on a real-time basis. The data collection process is more efficient and reliable if conducted via smartphones, PDAs, or mobile phones rather than paper-based surveys that must be submitted in person and manually entered into the central health database.

Data collection programs have been deployed in multiple developing world countries, mainly as pilot projects. The most successful programs are scaling up and beginning to be deployed in multiple countries or regions. **These initiatives are closing the information gap that currently exists for patient data in the developing world, enabling public officials to gauge the effectiveness of healthcare programs, allocate resources more efficiently, and adjust programs and policies accordingly.**

## Remote Data Collection

Hundreds of health workers have used PDAs provided by the *Ugandan Health Information Network* to collect health data in the field. Not only has this solution resulted in significant cost savings—25% in the first six months—but health workers report increased job satisfaction due to the greater efficiency and flexibility provided by the technology.



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## Remote Monitoring

One of the areas most uniquely suited to grow in tandem with mobile technology is the remote monitoring of patients. Remote monitoring opens new possibilities for treating patients in an outpatient setting, a crucial capability in developing countries where access to hospital beds and clinics is limited. This group of applications consists of one- or two-way communications to monitor health conditions, maintain caregiver appointments, or ensure medication regimen adherence. Some applications may also include inpatient and out-patient sensors for monitoring multiple conditions.

Evidence shows that strict adherence to a medication regime is essential for effective treatment of a variety of health conditions, from AIDS to diabetes. In addition, **monitoring patients at home for chronic conditions dramatically improves survival rates.** Remote monitoring applications are being implemented on a relatively limited basis in developing countries, but they are gaining traction in the developed world, particularly for chronic diseases. As the benefits of these applications are documented in the developed world and funding models evolve in developing countries, remote monitoring is expected to become widespread and significantly improve health outcomes for a wide range of communicable and chronic diseases.

### Remote Monitoring

TB patients in Thailand were given mobile phones so that healthcare workers (themselves former TB patients) could call these patients on a daily basis to remind them to take their medication. Medicine compliance rates reached 90% due to the introduction of this remote monitoring application.

## Communication and Training for Healthcare Workers

In the Primary Healthcare Nursing Promotion Program, the National School for Nurses in Coban, Guatemala used an innovative combination of mobile phones, landline phones, and tele-writers to train nurses in this rainforest community.

## Communication and Training for Healthcare Workers

An acute shortage of healthcare workers is a major challenge facing developing country health sectors. Training new cadres of health professionals and empowering current workers in order to increase job satisfaction and reduce attrition are essential to meeting human capital needs. **Connecting health workers with sources of information via mobile technology is a strong basis for empowerment, as it provides the support they need to perform their functions effectively and self-sufficiently.**<sup>5</sup>

There is also a pressing need to improve communication among different health units to facilitate more efficient patient care. Due to the dearth of landline phones and Internet-enabled computers, it is not uncommon, for example, for a patient to be sent to the regional hospital by the local clinic, only to find that there is no bed available. Mobile phones can help bridge these communications gaps that in the health context can often mean the difference between lives lost and lives saved.

## Disease and Epidemic Outbreak Tracking

Outbreaks of communicable diseases often begin in pockets, and, when left undetected, can develop into epidemics. Recent instances of such devastating outbreaks abound, from cholera and TB to dengue fever and Severe Acute Respiratory Syndrome (SARS). **Deployment of mobile devices, with their ability to quickly capture and transmit data on disease incidence, can be decisive in the prevention and containment of outbreaks.**

Disease and epidemic outbreak tracking mHealth applications are being used in Peru, Rwanda, and India as an early warning system, allowing public health officials to monitor the spread of infectious diseases. Prior to the adoption of mobile networks, public health officials relied upon written, satellite, and radio communication for such emergency tracking. The migration of this function to mobile systems is simultaneously improving data quality and lowering costs.

## Disease and Epidemic Outbreak Tracking

Incidents of Japanese Encephalitis were tracked real-time in Andhra Pradesh, India, via a combination of mobile phones and web-based technologies. The government used the information to better prioritize vaccinations based on evidence of clusters of outbreaks.

<sup>5</sup> Iluyemi, A. and J.S. Briggs. *Access and Connectivity for Community Based Health Workers in Developing Countries: Employing Wireless Technologies*, Med-e-Tel 2008 Conference, Luxembourg.

## Diagnostics and Treatment Support

Diagnostics and treatment support are vitally important in healthcare—misdiagnosis or the inability to diagnose a condition could have serious, even fatal, ramifications. mHealth applications in this area are designed to provide diagnosis and treatment advice to remote healthcare workers through wireless access to medical information databases or medical staff. **With mHealth-enabled diagnostics and treatment support, patients are able to receive treatment in their villages and homes, averting the need for expensive hospital visits, which are beyond reach for many.**

Diagnostic and treatment applications use the phone as a point-of-care device. Health workers' phones are typically equipped with specialized tools, such as built-in software that leads the worker through a step-by-step diagnostic process. Once data are entered into the system (e.g., symptoms and an image of a patient's injury captured on the mobile phone), remote medical professionals can diagnose the illness and prescribe treatment. By eliminating the need for patient travel, these applications have the potential to dramatically increase access to care. ■

### Diagnostic and Treatment Support

Researchers from the University of Melbourne are creating diagnostic and analytical tools specifically for mobile phones for health workers in Mozambique. These tools include a built-in calculator for determining drug dosage and reference materials stored in the phone's memory.



Credit: UN Tim Mc Kulka