Introduction


Credit: DataDyne

Mounting interest in the field of mHealth—the provision of health-related services via mobile communications—can be traced to the evolution of several interrelated trends. In many parts of the world, epidemics and a shortage of healthcare workers continue to present grave challenges for governments and health providers. Yet in these same places, the explosive growth of mobile communications over the past decade offers a new hope for the promotion of quality healthcare. Among those who had previously been left behind by the 'digital divide,' billions now have access to reliable technology.

There is a growing body of evidence that demonstrates the potential of mobile communications to radically improve healthcare services—even in some of the most remote and resource-poor environments. This report examines issues at the heart of the rapidly evolving intersection of mobile phones and healthcare. It helps the reader to understand mHealth's scope and implementation across developing regions, the health needs to which mHealth can be applied, and the mHealth applications that promise the greatest impact on heath care initiatives. It also examines building blocks required to make mHealth more widely available through sustainable implementations. Finally, it calls for concerted action to help realize mHealth's full potential.

The report is organized into the following sections:

1 Identifying the potential of mobile phones to improve health in the developing world
2 Defining mHealth within the context of eHealth
3 Meeting health needs through a broad array of mHealth applications
4 Examining the impacts of mHealth projects
5 Assessing mHealth and future health needs in developing countries
6 Identifying the building blocks for sustainable and scalable mHealth programs
7 Understanding the incentives for multiple players: mHealth value chains
8 A call for action
9 Looking forward
10 Compendium of mHealth projects

Though the mHealth field is still in its early stages, it has already begun to transform health delivery. Projects throughout the developing world are demonstrating concrete benefits, including:

- Increased access to healthcare and health-related information, particularly for hard-to-reach populations
- Improved ability to diagnose and track diseases
- Timelier, more actionable public health information
- Expanded access to ongoing medical education and training for health workers

Due in large part to the successes of pioneering mHealth programs, activity in the field is rapidly gaining momentum. In 2008 alone, over a dozen new mHealth applications have been implemented or are in the trial stage. These include:

- InSTEDD, a US-based non-governmental organization (NGO) that provides technology solutions for humanitarian and disease support, opened a development center in Cambodia where mHealth-based disease and surveillance solutions are being designed for the Southeast Asian region.
- The Canadian development agency, IRDC, expanded support for a project providing nurses in the Caribbean with portable digital assistants (PDAs) to empower improved diagnosis and decision making.
- The United Nations Foundation and Vodafone Foundation Technology Partnership, together with the World Health Organization (WHO), a specialized agency of the United Nations (UN), announced plans to expand their mobile data-gathering program to more than 20 countries in sub-Saharan Africa.

This report profiles more than 50 mHealth projects taking place in the developing world. The long-term goal is that such programs will make healthcare more effective, and have a demonstrable and significant positive impact on clinical outcomes such as reduced infant mortality, longer life spans, and decreased contraction of disease.

Experts across the field, and interviewed as part of this report, assert that there is an unprecedented opportunity at hand to fulfill mHealth's promise. **To accelerate this momentum and fully unleash the potential of mHealth applications, dynamic multi-sector collaboration between groups as diverse as governments, multilateral organizations, and the private sector is needed.** Joint action should be directed toward the creation of a global mHealth infrastructure that lays out common standards and guidelines, and serves as a repository for shared resources and best practices. This is the best approach for scaling mHealth solutions and maximizing the field's capacity to serve a vital development imperative. ■

"Right now, we are at an inflection point in terms of acceptance. Whether it turns out to be the peak of inflated expectation or the trough of disillusionment will depend on whether governments make the link between telecommunication policy and health, and the extent to which donors encourage transparency in sourcing and the participation of local entrepreneurs. Ultimately, the take-up of mobile communications in the health sector isn't really about technology at all."

—Greg Elphinston,
Director Community Involvement, Nokia

Credit: DataDyne

Potential of Mobile Phones to Improve Health in the Developing World

As the first decade of the 21st century draws to a close, leaders in many developing countries can point with pride to tremendous strides in their efforts to improve the lives of their citizens. In many parts of the world, citizens in emerging economies have begun to taste the fruits of higher incomes and greater access to tools that promise to increase their quality of life and that of their children. Yet formidable obstacles remain. Health challenges present arguably the most significant barrier to sustainable global development. Disease and the lack of adequate preventative care take a significant toll on both developing populations, measurable in disability-adjusted life years (DALYs), and economies. Despite the broad economic advances of this decade, the 2008 UN report on progress toward meeting the Millennium Development Goals (MDGs) indicates continuing dire conditions in crucial public health areas. For example:[1]

- A child born in a developing country is over 33 times more likely to die within the first five years of life than a child born in an industrialized country, even though the leading causes of deaths (pneumonia, diarrhea, malaria, and measles) are preventable through basic services and vaccinations.
- Every minute, at least one woman dies from complications related to pregnancy or childbirth. And for every woman who dies in childbirth, approximately 20 more suffer injury, infection, or disease—nearly 10 million each year.
- An estimated 2.5 million people were newly infected with HIV in 2007.
- Communicable, and entirely avoidable, diseases such as tuberculosis (TB) and malaria continue to claim lives due to preventable factors such as lack of access to proper drugs and medical treatment. By current estimates, meeting the target MDG of halving the TB prevalence rate by 2015 is unlikely.

[1] United Nations, *The Millennium Development Goals Report 2008* (New York: United Nations, 2008).

Health-Related Millennium Development Goals

MDG 4. Reduce child mortality: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate.

MDG 5. Improve maternal health: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio.

MDG 6. Combat HIV/AIDS, malaria, and other diseases: Have halted by 2015 and begun to reverse the spread of HIV/AIDS; have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.

The ability of developing countries to overcome these serious health challenges is hindered by several core obstacles, among them a global shortage of healthcare workers. According to the WHO, among 57 countries, mostly in the developing world, there is a critical shortfall in healthcare workers, representing a total deficit of 2.4 million healthcare workers worldwide.[2] This human resources constraint intensifies the already increasing pressure on developing-world health systems. Not only must they cope with the burden of containing the spread of communicable diseases associated with extreme poverty, they must also contend with the growing incidence of chronic diseases, such as diabetes and heart disease, an effect of new-found (relative) affluence. Governments, businesses, NGOs, foundations, and multilateral organizations all recognize the importance of leveraging new tools and solutions to address these distinct but interrelated health challenges.

The Promise of Mobile Technologies for Health

Mobile communication offers an effective means of bringing healthcare services to developing-country citizens. With low-cost handsets and the penetration of mobile phone networks globally, tens of millions of citizens that never had regular access to a fixed-line telephone or computer now use mobile devices as daily tools for communication and data transfer. A full 64% of all mobile phone users can now be found in the developing world.[3] Furthermore, estimates show that by 2012, half of all individuals in remote areas of the world will have mobile phones. This growing ubiquity of mobile phones is a central element in the promise of mobile technologies for health.

Figure 1 illustrates that developing world citizens have plentiful access to mobile phones, even while other technologies and health infrastructure are scarce. This explosion of mobile phone usage has the potential to improve health service delivery on a massive scale. For example, mobile technology can support increasingly inclusive health systems by enabling health workers to provide real-time health information and diagnoses in rural and marginalized areas where health services are often scarce or absent altogether. ■

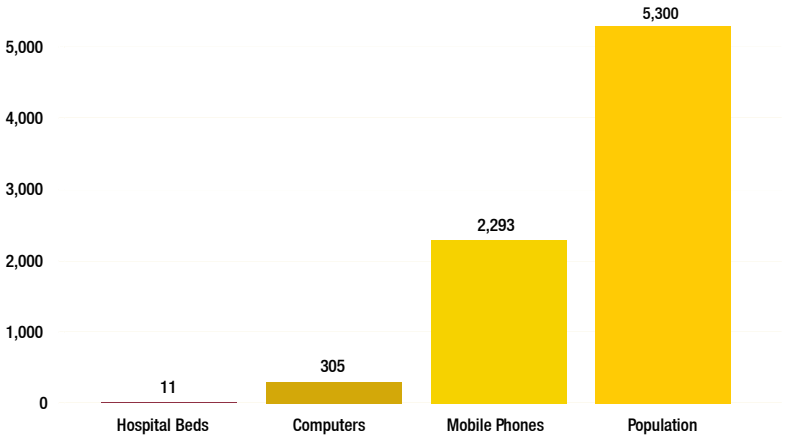

Figure 1. Technology and health-related statistics for developing countries (millions).[4]

Mobile phones reach further into developing countries than other technology and health infrastructures.

[2] World Health Organization, *The World Health Report 2006 - Working Together for Health* (Geneva: WHO, 2006).
[3] United Nations Department of Economic and Social Affairs, Division for Public Administration and Development Management, *Compendium of ICT Applications on Electronic Government - Volume 1. Mobile Applications on Health and Learning* (New York: United Nations, 2007).
[4] Vital Wave Consulting, Business Monitor International (BMI), International Telecommunications Union, World Bank's World Development Indicators, and the United Nations.

Credit: Praekelt Foundation

Defining mHealth Within the Context of eHealth

In recent years, mHealth has emerged as an important subsegment of the field of electronic health (eHealth). While there is no widely agreed-to definition for these fields, the public health community has coalesced around these working definitions:

- eHealth: Using information and communication technology (ICT)—such as computers, mobile phones, and satellite communications—for health services and information.
- mHealth: Using mobile communications—such as PDAs and mobile phones—for health services and information.

mHealth and eHealth are inextricably linked—both are used to improve health outcomes and their technologies work in conjunction. For example, many eHealth initiatives involve digitizing patient records and creating an electronic 'backbone' that ideally will standardize access to patient data within a national system. mHealth programs can serve as the access point for entering patient data into national health information systems, and as remote information tools that provide information to healthcare clinics, home providers, and health workers in the field. While there are many stand-alone mHealth programs, it is important to note the opportunity mHealth presents for strengthening broader eHealth initiatives. ■

"mHealth involves using wireless technologies such as Bluetooth, GSM/GPRS/3G, WiFi, WiMAX, and so on to transmit and enable various eHealth data contents and services. Usually these are accessed by the health worker through devices such as mobile phones, smart phones, PDAs, laptops and tablet PCs."

—Dr. Adesina Iluyemi, PhD Candidate, University of Portsmouth, UK

"With eHealth and mHealth, an ecosystem approach is recommended. Many of the basic applications and devices exist and are in use, but now we need to make them talk to each other in a way that yields strategic benefits."

—Dr. Patricia Mechael, mHealth and Telemedicine Advisor to the Millennium Villages Project at the Earth Institute at Columbia University