mHealth

Momentum
Success
Potential
Challenges
Needs
Application

# mHealth for Development

## Mobile Communications for Health

UNITED NATIONS FOUNDATION

Vodafone Foundation

Challenges

# Health Challenges

> "57 countries have critical shortages in health care workers, with a total deficit of 2.4 million health professionals worldwide."

## Executive Summary

A brief review of health statistics in the developing world reveals a picture of unnecessary tragedy. According to the World Health Organization (WHO), an estimated 2.5 million people were newly infected with HIV in 2007; every minute, at least one woman dies from complications related to pregnancy or childbirth. And for every woman who dies in childbirth, around 20 more suffer injury, infection or disease—approximately 10 million each year. At the same time, communicable diseases such as malaria, yellow fever and cholera continue to claim lives due to preventable factors such as a lack of access to proper drugs and medical treatment.

The need for effective solutions in the health care arena is underscored by the 2008 Global Monitoring Report—the annual assessment of progress toward the Millennium Development Goals. While the report cited encouraging results in other areas (global poverty decreased, education and aid effectiveness increased), it revealed a lack of progress in crucial public health areas such as reducing communicable diseases and improving maternal health. A further concern for the future of global health is that, according to the WHO, 57 countries have critical shortages in health care workers, with a total deficit of 2.4 million health professionals worldwide.

The worldwide health challenges facing tens of millions of citizens, and especially children, present arguably the most significant barrier to global economic development. Fortunately new information and communication technologies (ICTs) are now available to help improve public health, with wireless communications being the most ubiquitous and widely accepted of these technologies within the developing world.

Within this context, delivering health care services via mobile communications—commonly referred to as mHealth—has emerged as a potentially revolutionary solution for a wide array of pressing health care and health care system needs. Mobile technology represents a high-reach, cost-efficient method for making health care more accessible, affordable and effective across the developing world. mHealth has the capacity to dramatically expand access to communications and to transmit voice and data at the precise time it is needed, which will empower health care workers to make improved diagnoses and provide citizens with access to health care where it is needed most.


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Potential

# Nascent with Tremendous Potential

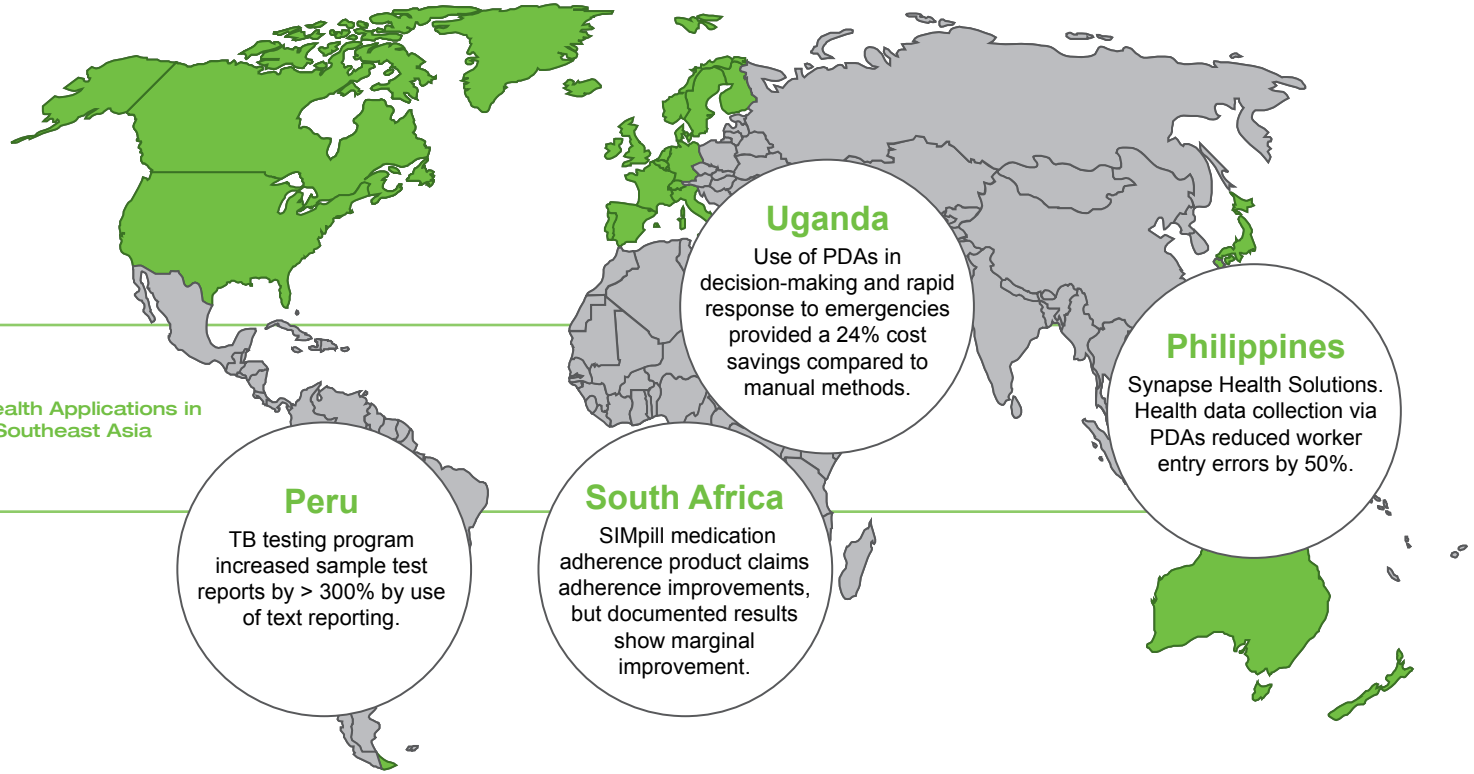
While there is no panacea to the complex and multi-faceted challenges of improving public health outcomes, mHealth—existing at the nexus of the health and technology domains—provides a singular opportunity to bring about significant improvements. With the adoption of wireless technology in the developing world having become nearly mainstream, mHealth has emerged as the most viable means of providing health care where it is needed the most. A full 64 percent of all mobile phone users are in the developing world, and it is estimated that by 2012, 50 percent of all individuals in remote areas of the world will have mobile phones. Eighty percent of the world's population now lives in an area with mobile phone coverage and the GSM Association (GSMA) expects that figure to rise to 85 percent by 2010.

mHealth is currently a nascent area with the majority of projects taking place on a pilot basis. However, given wireless technology's rapid adoption and its extensive geographic reach, mHealth has tremendous potential to scale and provide dramatically improved health outcomes. These improvements take place on two levels: first, the efficiency of health care provision is significantly improved, and second, the health services provided are more effective.

How precisely does mHealth make health care more effective? This benefit can be measured in two distinct but interrelated ways:

- Enabling improved access to health-related services, reducing the delay to patients receiving care.
- Enabling improved clinical outcomes, such as reduced infant mortality, longer life-spans and decreased contraction of diseases.

> **"64% of all mobile phone users are in the developing world."**



Examples of the Impact of mHealth Applications in Latin America, Africa and Southeast Asia

**Uganda**
Use of PDAs in decision-making and rapid response to emergencies provided a 24% cost savings compared to manual methods.

**Philippines**
Synapse Health Solutions. Health data collection via PDAs reduced worker entry errors by 50%.

**Peru**
TB testing program increased sample test reports by > 300% by use of text reporting.

**South Africa**
SIMpill medication adherence product claims adherence improvements, but documented results show marginal improvement.

## Impact of mHealth

While measuring clinical outcomes is more complex than measuring efficiency and generally requires a longer time frame, it is important to keep in mind that one of the benefits of mHealth is its ability to enable improvements on both levels simultaneously. For example, a five-year assessment of EpiHandy, a mobile health data collection and record access tool developed by the Centre for International Health at the University of Bergen in Norway, collected information on breastfeeding habits and child anthropometry in rural areas of eastern Uganda. Results comparing EpiHandy to data collected through similar paper-based health surveys found greatly reduced data entry errors, increased cost efficiency and general user acceptance of the new technology. A further example of mHealth providing both efficiency and effectiveness is the practice of using SMS text message alerts to remind patients to take their medications. Health care providers have found that "40% of hospital readmissions for heart failure happen because patients fail to take their medications properly."[1] In turn, a reduction in hospital admissions saves revenues for the health care provider. These cases demonstrate how improved patient outcomes and increased efficiency go hand-in-hand. Many of the initial outcome-oriented measurements of mHealth programs have documented increased efficiency, which leads to increased effectiveness. Finally, public health organizations are ultimately able to direct savings back into service programs.

[1]Source: E-Health Insider, Technology Review, Vodafone Policy Paper Series

> **"40% of hospital readmissions for heart failure happen because patients fail to take their medications properly."**

# Application Areas: Compelling, Viable & Scalable

mHealth applications show tremendous potential for addressing a wide range of public health issues such as HIV/AIDs treatment and prevention, improving maternal health care, tracking outbreaks of communicable diseases and ensuring children receive proper preventative care and vaccinations. These efforts are enabled by access to wireless technology, which in turn enables connectivity to health care information systems and remote experts. Key applications areas for mHealth are outlined in the table below.

| Application | Description | Project Examples |
|---|---|---|
| **Education & Awareness** | Primarily one-way communications to mobile subscribers via SMS/text messaging in support of public health and behavior change campaigns. | • Freedom HIV/AIDS<br>• Frontline SMS<br>• Mobile4Good<br>• UNICEF/Georgia |
| **Data, Health Record Access** | Applications designed to enter and access patient data on mobile phones, PDAs or laptop computers. In some projects, patients may also use mobiles to access their own records. | • Rwanda TRACnet<br>• Satellife PDA projects<br>• EpiHandy<br>• EpiSurveyor<br>• RESCUER |
| **Monitoring / Medication Compliance** | One-way or two-way communications with the patient to monitor health conditions, maintain care giver appointments or ensure strict medication regimen adherence. Some applications may also include inpatient and out-patient monitoring sensors for the monitoring of multiple conditions (such as diabetes, vital signs or cardiac). | • Cell-Life<br>• Virtual Health Pet<br>• SIMpill<br>• On-Cue |
| **Disease / Emergency Tracking** | Applications using mobile devices to send and receive data of disease incidence, outbreaks and geographic spread of public health emergencies, often used in association with GPS systems and back-end applications for visualization. | • InSTEDD<br>• Voxiva Health Watch<br>• AESSIMS |
| **Health / Administrative Systems** | Applications developed for "back office" or central health care IT systems allowing for access by and integration with mHealth applications. Such applications often tie into regional, national and global systems. | • The Africa Health Infoway |
| **Analysis, Diagnosis & Consultation** | Applications developed to provide support for diagnostic and treatment activities of remote care givers through Internet access to medical information databases or to medical staff. | • Peru Nacer<br>• Tele-Doc |

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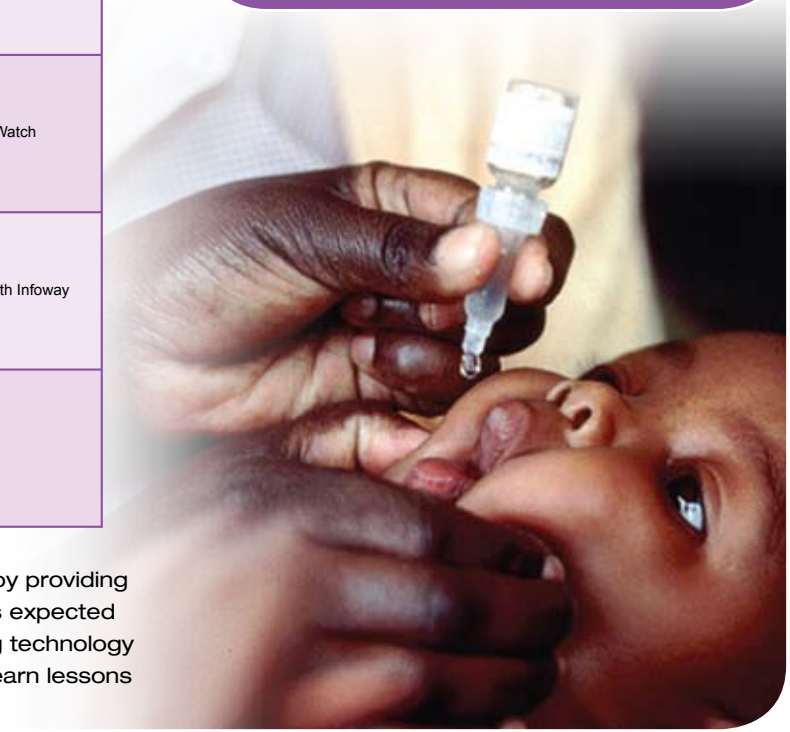

Projects have been launched in each of the application areas noted above, thereby providing improved health outcomes for the most vulnerable members of society. This list is expected to expand over the next several years as mHealth projects scale up, and enabling technology advances. Even considering this nascent stage of development, it is possible to learn lessons from the multitude of successful projects already underway.

## Education and awareness campaigns via SMS/text messaging

One-way SMS alerts can be deployed to provide citizens with critical information on health issues. The power of wireless technology is its ability to provide information at the precise time it is needed, and targeted to the correct population segment or individual who has signed up for the SMS alert service. This has the advantage of reaching populations in geographically isolated rural areas as well as in urban areas where the absence of health care workers and clinics can have negative health consequences.

Examples of programs using SMS alerts are currently being used to promote maternal health and encourage HIV/AIDS testing. Building upon the success of these pilots, programs are scaling to address communicable diseases such as tuberculosis, malaria, cholera and dengue; and other health related issues such as malnutrition, basic sanitation and drug abuse. By inducing health-promoting behavior, the programs currently in place have already made positive impacts. Even more encouraging is the potential of such programs to address a broad range of health issues in a cost-effective and scalable manner to alleviate health issues and prevent problems before they occur.


> **"One-way SMS alerts can be deployed to provide citizens with critical information on health issues."**

### AIDS Treatment

Cell-Life, a South African based social enterprise focused on using technology to serve the HIV/AIDS community, is currently working with the National AIDS Foundation in Uganda to encourage subscribers to undertake AIDS testing. A text message was sent to 15,000 Celtel subscribers encouraging them to go in for AIDS testing. Within one week of the public service campaign, there was a dramatic increase in the number of people having HIV/AIDS testing.[2]

The India-based Freedom HIV/AIDS program, a social initiative of ZMQ Software Systems, has reached out to millions of people in the world to raise HIV/AIDS awareness using mobile phone games. According to the program, "The solutions have catered to various target audiences like school children, youth, adults, women, corporate workers, cell phone users, sex workers, mobile workers and migrant labor.[3]

[2] http://www.cell-life.org/
[3] http://www.freedomhivaids.in/FreedomHivAids.htm

# Application Areas: Compelling, Viable & Scalable

## Data Collection

One of the most important areas of mHealth is data collection. Wireless technology plays a critical role in bridging the information gap regarding patient data in the developing world by enabling the collection of disease information and its analysis at the local, national, regional and global level. This allows public officials to gauge the effectiveness of health care programs, identify and rapidly respond to infectious disease outbreaks and adjust programs and policies accordingly.

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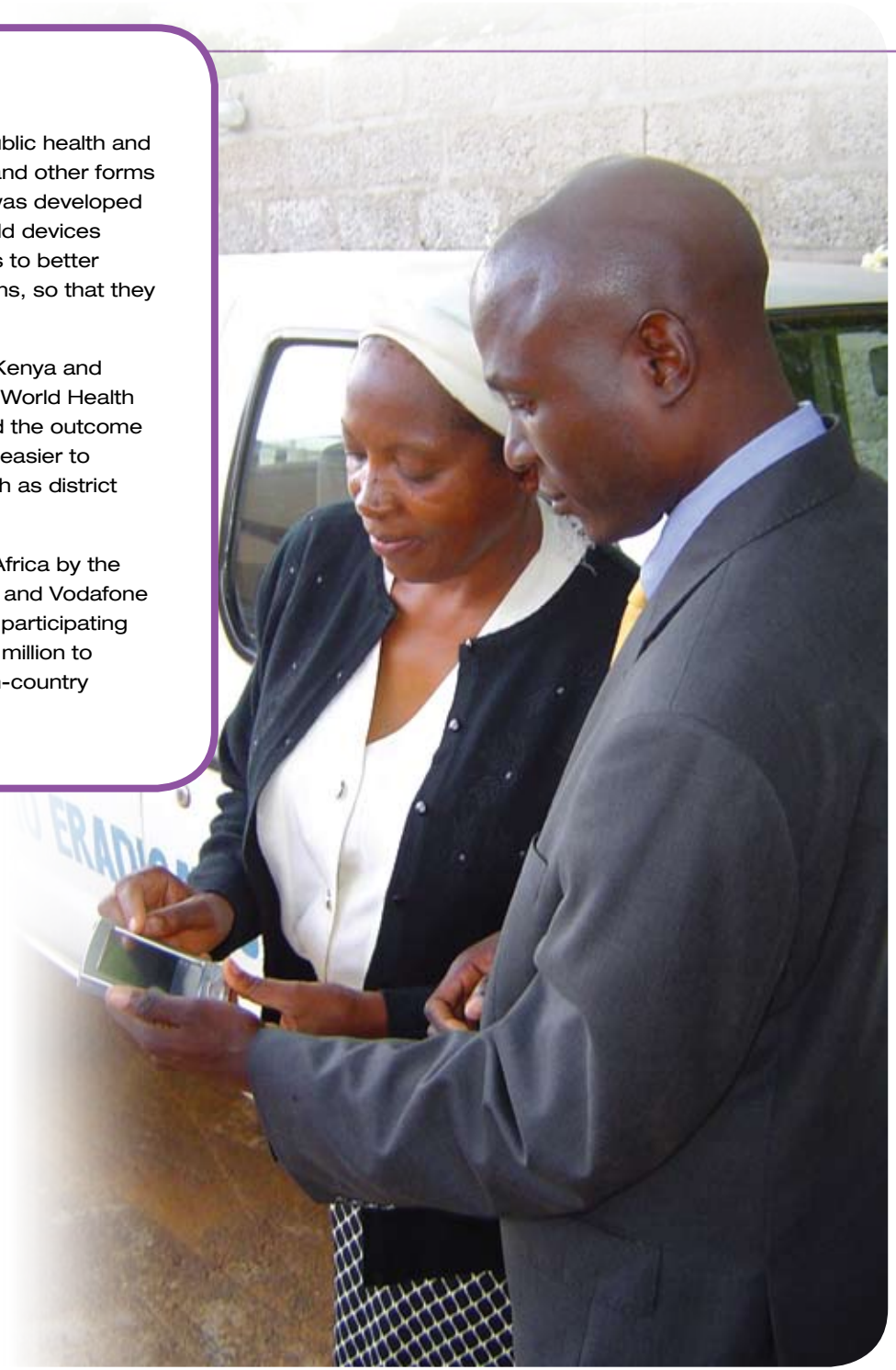
### EpiSurveyor

EpiSurveyor is a free and open-source software solution that enables public health and development professionals to easily create, share, and deploy surveys and other forms on mobile devices including PDAs and cell phones. EpiSurveyor, which was developed by the non-profit organization DataDyne, can be downloaded to handheld devices and used by workers in the field. The technology enables health workers to better understand and identify the strengths and shortcomings of their programs, so that they can actively work toward continuous improvement.

Successful pilot programs for the application were initially conducted in Kenya and Zambia, with trainings conducted by DataDyne, in collaboration with the World Health Organization and participating ministries of health. These pilots provided the outcome of improving the timeliness and availability of health care data, making it easier to strengthen preventative programs aimed at improving public health, such as district level health care programs involving immunizations against malaria.

EpiSurveyor will be rolled out in more than 20 countries in sub-Saharan Africa by the end of 2008. This rollout is supported by the United Nations Foundation and Vodafone Foundation Technology Partnership, the World Health Organization, and participating ministries of health. The Technology Partnership has committed over $2 million to develop this mHealth program. These funds provide direct support for in-country activities and for software development and support from DataDyne.



## Handhelds for Health

Technology can play a critical role in preventing large scale outbreaks of communicable diseases. Most outbreaks start in small clusters, and if detected and investigated early, their spread could be more easily prevented or controlled. Handhelds for Health, a social enterprise founded by Shashank and Isha Garg from India, is developing an open-source, disease surveillance system designed to detect and address disease outbreaks in a timely manner. Health workers will be equipped with mobile devices for the real-time collection, validation, and transmission of data to a server where resident experts can identify trends and make informed public health decisions.

Handhelds for Health will also use this system for surveillance of non-communicable diseases (NCDs) because with epidemiological transition and shift from communicable diseases to non-communicable diseases in developing countries like India, the increasing burden of NCDs will require better medical follow-up and data management for large community-based cohorts for longitudinal studies.

# Meeting Current & Future Public Health Needs

Needs

As developing countries tackle and make significant improvements in the so-called diseases of poverty, average income levels increase along with average life expectancy. As income levels rise, dietary habits change and health needs change. It is commonly agreed upon by health experts that within the next 15 years health care policy-makers and providers will be forced to turn their focus to prevention and early detection (rather than late-stage treatment) of non-communicable diseases and to the health needs of an aging population: orthopedics, mental disorders, cancer, and elder care.

> **"As health care needs rapidly evolve, wireless technology is also advancing in ways suitable to address health care challenges."**

| Current Health Care Picture | Global & Demographic Changes | Tomorrow's Health Care Picture |
|---|---|---|
| • Domestic violence.<br>• Lack of resources for family planning.<br>• Communicable diseases.<br>• Fake, tainted pharmaceuticals.<br>• Lack of immunizations.<br>• Lack of safe water sources.<br>• Household/workplace dangers—fire, accidents.<br>• Improper nutrition.<br>• Substance abuse, violence among school-aged children.<br>• Mental health: depression, suicide.<br>• Physical fitness, elder care.<br>• Care, chronic disease. | • GDP growth increases spending on healthcare.<br>• Traditional diseases controlled (TB, smallpox); new diseases appear (SARS, avian flu).<br>• Aging populations means increase in death from non-communicable causes.<br>• Declining birth rate, climbing life expectancy.<br>• Adoption of "developed country" behaviors. | • Shift from "late stage" treatments to prevention, early detection.<br>• Increased focus on elder care.<br>• Increased focus on health issues of elderly.<br>• Continued health worker shortages, distribution inequities. |

> **"According to the 2007 Global Monitoring Report, ICT adoption in most regions have kept pace with the MDG goals (with the exception of Africa.)"**

As health issues evolve, the growing field of mHealth is well positioned to address these challenges. The primary benefits of mHealth—the ability to scale, to bring communications to where it is most needed and to fill the gap left by shortages of health care workers—apply to all sectors of the developing world: urban and rural, impoverished, working poor and middle class alike.

Additionally, as health care needs rapidly evolve, wireless technology is also advancing in ways suitable to address health care challenges. Next generation networks, WiMAX, specialized and more intelligent wireless devices and the miniaturization of devices will enable mobile technology to tackle a wider range of health issues with more sophisticated solutions.

Although these advances will provide widespread benefits, the key issue for developing countries remains access to technology and closing the digital divide. According to the 2007 Global Monitoring Report, ICT adoption in most regions have kept pace with the MDG goals (with the exception of Africa). Gaining benefit from this adoption, however, depends upon the ability to address a number of critical success factors.

# Success Critical Success Factors

In order to move mHealth to a greater level of effectiveness, current efforts need to be brought to scale, their sustainability needs to be ensured and their health impacts must be measured. Four key considerations for the successful scale of mHealth programs:

- Creating the right "fit" between mHealth applications and health care needs. The technology solution must be designed with a user-centered approach in mind, and one that keeps the health care objectives and environment firmly in sight. When designing new solutions, technologists do well to speak to end users and discuss how they may potentially use mobile tools in fulfilling their daily functions.
- Using the simplest proven technology and implementation.
- Building upon growing intersection of eHealth and mHealth.
- Providing guidance and tools to ensure proper impact and success assessment.

# Gathering Momentum Momentum

Across governments, the health care sector, the private sector, multilateral organizations, foundations and NGOs, there is an increasing realization of the role to be played by mHealth in meeting the Millennium Development Goals.

In the Summer of 2008, a one-week conference on mHealth was held in Bellagio, Italy – part of a month-long series of workshops on eHealth organized by the Rockefeller Foundation.

The United Nations Foundation and Vodafone Foundation Partnership bought together mHealth experts who agreed to catalyze the momentum for mHealth and work towards building an alliance to address mHealth issues and development in the developing world.

Existing as it does at the intersection of technology and health care, mHealth provides a singular opportunity to extend the benefits of both domains to previously unreachable populations. In doing so, mHealth has the opportunity to powerfully contribute to a more sustainable and equitable development. By leveraging a powerful technology that is now accessible to vast portions of the world's global population, mHealth brings health care to those who previously did not have access. As wireless technology continues its pace of rapid adoption throughout the developing world, the impetus to take advantage of the technology's benefits in the health care arena is becoming stronger. Successful pilot projects are scaling up, while new projects are demonstrating positive results. As the multiple sectors involved in mHealth increase their activities, the benefits will continue to expand. All trends indicate that these cross-sectoral alliances using mHealth will continue to grow, furthering the momentum in using mHealth tools and applications to further progress toward meeting the UN Millennium Development Goals.

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mHealth

## The United Nations Foundation & Vodafone Foundation Technology Partnership

The United Nations Foundation and Vodafone Foundation Technology Partnership is a leading public-private alliance using strategic technology programs to strengthen the UN's humanitarian efforts worldwide. The Partnership has three core commitments: (1) to support the use of rapid response mobile telecommunications to aid disaster relief; (2) to develop health data systems that improve access to health data thereby helping to combat disease; and (3) to promote research and innovative initiatives using technology as an agent and tool for international development. Further information can be found at: www.unfoundation.org/vodafone.

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