

surveys
records
Emergency
Innovative outbreaks Treatment
Remote systems
reminders Awareness line mapping mobilization centers
disease information Communication support
care raising compliance Call telephone Decision
Doctor health monitoring help
issues Diagnostic time Mobile Real
Appointment Surveillance Emergencies Patient
consultation Community
Pushing the Frontier:
telemedicine

THE ROLE OF mHEALTH IN THE FIGHT AGAINST TUBERCULOSIS



Tuberculosis (TB) is curable and can be treated with drugs that cost as little as 25 Dollars. However, some three million people every year fail to access quality diagnosis and treatment. This in turn can cause the development of drug resistance and fuels further infection among family members, work colleagues, and members of the community. The TB epidemic still kills more people every year – almost a million and a half – than traffic accidents worldwide.

To bring about a step change in the fight against TB, we need new tools and simple, affordable innovations to better detect people suffering from it. We also have to make health services available to the people most vulnerable to contracting it. We believe that mobile phones can bring about such positive change. This paper showcases the **potential of mobile technologies for TB**, explores some outstanding applications, and seeks to catalyze the conversation about mobile health (mHealth) within the TB community.

Mobile health, or mHealth, is a component of eHealth. The WHO's Global Observatory for eHealth (GOe) defines mHealth or mobile health as medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices.

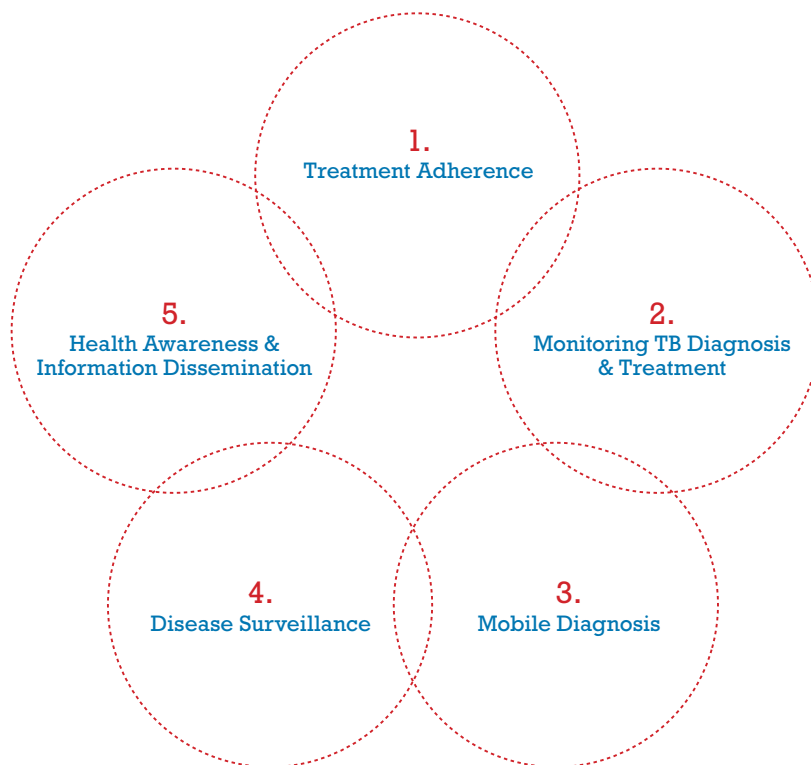
“The spread of mobile technology enables communities to voice their own needs and become change agents in creating a healthier and more sustainable future.”

TED TURNER, BUSINESSMAN, PHILANTHROPIST, AND CHAIRMAN
UN FOUNDATION (HOST OF THE MHEALTH ALLIANCE)

THE OPPORTUNITY:

MHEALTH AND TB

These days it can often appear as if ‘everyone’ is going mobile. However the potential of mHealth for TB remains relatively underexplored. To change this, we would like to highlight a few mobile solutions from the field, which represent low cost, easily implementable tools for tackling key issues that remain barriers in overcoming TB. In the five key areas below, we see mHealth already starting to have an impact on TB care and control.



Some of these highlighted mHealth applications rely on basic GSM services, the world's most dominant mobile phone standard. These GSM services are a standard collection of applications and features available to mobile phone subscribers all over the world, such as calls and (SMS) text services.

However, technology spreads quickly and widely, and an increasing number of mHealth projects necessitate additional functionality and access to the Internet. While a “feature” phone offers some limited additional functions over and above calls and text, a smartphone is built on a mobile computing platform and offers more advanced functionality and ability to run complex applications.

1. TREATMENT ADHERENCE

Taking TB medicines every day for at least six months can be annoying for patients and a challenge for health workers. Interrupted treatment on the other hand triggers drug resistance and prolonged illness. Mobile phones can provide a cheap and simple way to encourage patients to take their medication. A variety of projects already show that text (SMS) messages, or other reminders like automatic call-backs on your personal phone, can be used in a wide array of methods to communicate with patients, who are otherwise required to visit a TB clinic or to be monitored by a visiting health worker.

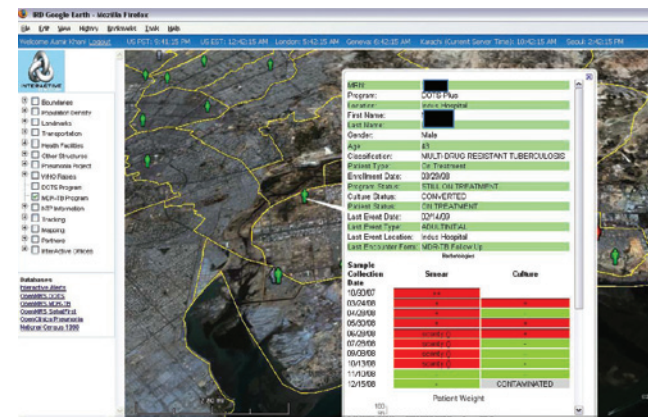
Combining reminders with incentives, which can be sent as phone credits or as cash via mobile banking, offers new opportunities to support people with TB to complete their treatment and to play an active role in their own health. The additional functionality of smartphones, such as touch screens with icon's guided menu options, or small supportive applications, or “apps”, can enable even illiterate people to utilise mobile phone based treatment support.

EXAMPLE: A team at the Indus Hospital in Pakistan was supported by a TB REACH grant from the Stop TB Partnership to use an integrated real time mobile phone enabled database. This catalyzed a novel TB treatment compliance and case holding scheme that worked by sending a monetary reward as incentive to the patient's or doctor's personal mobile phone. The "X-out-TB" technology is one element in this project. It uses strips, which reveal a code when exposed to the urine of patients who have taken TB medication. When texting these codes back to the hospital, patients are rewarded via a mobile money model in which cash can be collected or forwarded to other phone customers anywhere in the country. Another incentive scheme pays out to doctors that identify additional cases and support treatment adherence from TB patients throughout the necessary treatment cycle. This innovative scheme that leverages the expertise and technologies of each of its partners has led to a four-fold increase in case detection in the catchment area and pushed treatment adherence to over 90 percent – all of this at lower cost per case than the existing public health solution.

2. MONITORING TB DIAGNOSIS AND TREATMENT

High-burden TB areas often face limited human and technical resources. Paper-based systems are still common to monitor TB diagnosis and treatment, making the administrative system slow and labour-intensive. It also limits the ability of health workers to analyse the copious amounts of data generated. To address this, mHealth components have been developed that streamline the collection and monitoring of patient information using mobile phones. There are additional benefits: mobile-based data collection software has early warning systems that can now be activated to indicate faulty or missing entries. Projects exist that integrate Global Positioning System (GPS) enabled phones to monitor the location of where field workers enter patient data, ensuring that fraudulent data are not being entered from the field workers' homes. Other projects have sought ways to streamline the reporting system in laboratories – connecting lab technicians, lab directors, physicians, field workers and, ultimately, patients – via text (SMS) and mobile or web interfaces.

EXAMPLE: Health workers' malaria case-management practices often differ from national guidelines, threatening the outcomes of public health programs. In Kenya, one program assessed whether text-message reminders sent to health workers' mobile phones could improve and maintain their adherence to treatment guidelines for outpatient paediatric malaria. The trial showed that correct management of fixed-dose combination therapy improved by almost 24 per cent immediately after intervention, and these results kept up even six months later. As this case demonstrates – in resource-limited settings, public health programmes should consider use of text messaging to improve health workers' case-management practices.

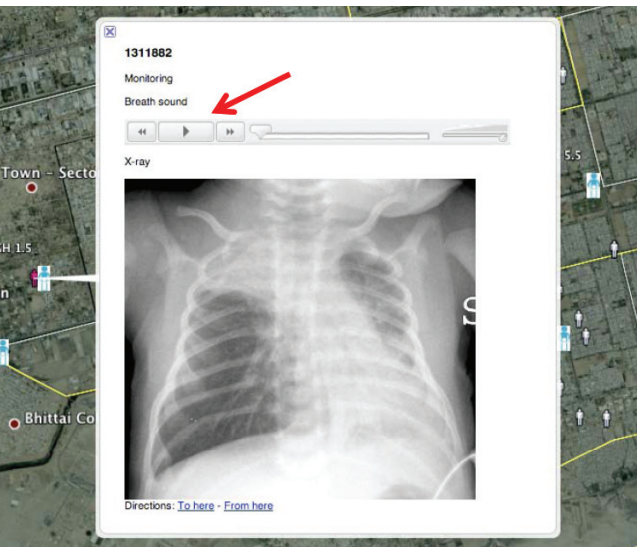


CLOSING THE INFORMATION DIVIDE:

A decade ago a major concern among international development policymakers was the information divide; it was said that the African continent had fewer telephone connections than the island of Manhattan. Now there are an estimated 430 million mobile phone subscriptions across Africa; this means around one for every two people living on the continent.

3. MOBILE DIAGNOSIS

Applications and accessory attachments can turn mobile phones into medical devices. This additional functionality of phones now makes diagnosis accessible in more geographic areas and outside health centres with laboratories. Such innovations are exciting developments for TB, where active case finding in vulnerable groups is necessary to stem the epidemic. This approach thrives in public-private partnerships, especially for the development or the roll out of such new tools.



EXAMPLE: In Vietnam, the Stop TB Partnership's TB REACH program supports CellScope, a project that mobilizes health workers at communal health posts to take pictures of sputum smear slides using camera-enabled phones. Images are sent to diagnostic hubs where they are analysed and results are sent back to the community health worker with minimal delay. This helps community health workers deliver their diagnosis while with the patient. As a result, someone living in a rural or remote area does not have to travel long distances to have her or his tests analysed and can instead receive diagnostic services in their hometown. Simple mobile phones that merely enable large file data transfer through data compression are also already used to relay digital x-ray pictures, taken from mobile containerized units that screen populations for TB, to central radiology hubs. This enables quick analysis of results without the need of specialists on site.

MOBILE WORLD TODAY:

Mobile phone networks cover 90% of the world's population, with 75% of mobile subscriptions held by nearly 80% of the population in low- and middle-income countries.

In a world of 7 billion people, there are already 6 billion mobile phone subscriptions held. In India, far more people have access to a cell phone than to a toilet.

Another example is a low-cost stethoscope, made of an eggcup that can be attached to mobile phones, which enables patients to monitor their heart. This is used for patients with a particular form of TB (tuberculous pericarditis) that leads to cardiac arrest. The onset of symptoms of this form of TB is insidious and can be detected through heart monitoring. The use of this mobile technology enables people to have their heart monitored remotely by specialists who can pick up early signs of deterioration.

4. DISEASE SURVEILLANCE

It is estimated that one third of all TB cases go undetected, resulting in over three million people each year who are not accessing the diagnosis and treatment they require to be cured. Therefore, disease surveillance efforts are a vital component of national TB programs. With the use of mobile phones, electronic data capture can potentially make it easier for health care personnel to collect and manage large volumes of data and shortens the time needed for analysis. This process streamlines the reporting of patient data to their respective national TB programmes. In addition, GPS allows real-time mapping of disease outbreaks to accelerate the response time among governments and health workers alike.

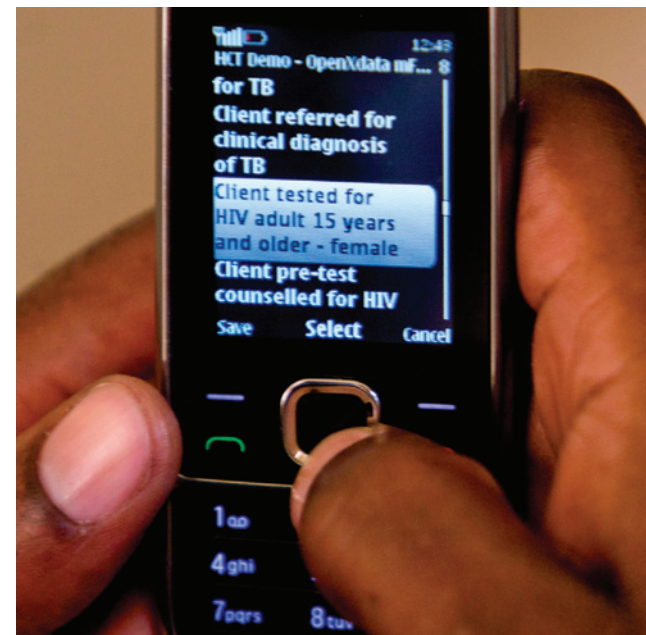
EXAMPLE: Alerta DISAMAR is a national disease monitoring system in Peru that allows users to transmit or access data through multiple technologies, including mobiles, to increase the reach of its disease surveillance activities and to dramatically reduce the time for remote notifications to reach the central level. Health care workers in the field can enter information into this system with numeric codes through dial tones and voice messages. The information is immediately transmitted to a central system where it is processed and stored and then alerts are sent via short message service to mobile phones or by email to personnel who can act immediately on potential outbreaks. Authorized users can access information through a web interface. The system, which has led to early outbreak identification and response, timely case management, and increased review of clinical procedures within reporting units, represents a fully functional, sustainable and cost-effective solution for real-time disease surveillance. The system has also been deployed in Ecuador, Colombia and Paraguay.

Several examples that include or specifically address TB surveillance through mobiles are also being piloted e.g. in Cameroon (improving Laboratory Data Management for drug resistant patient TB diagnosed in EXPAND – TB projects) and Pakistan (based on an open Medical Record System for multidrug resistant TB cases and alongside projects for childhood pneumonia and rabies surveillance).

5. HEALTH AWARENESS & INFORMATION DISSEMINATION

Mobile phones make ideal tools for the wide dissemination of information relating to TB prevention, diagnosis, and control. In some health fields, such as HIV/AIDS and maternal and newborn health, mobile phones are already commonly used. There are also many ways to inform communities and people-at-risk about TB, and to send health messages about when to seek care. In addition, reducing the stigma associated with the disease by way of information might increase the willingness of people to see a counsellor or accept treatment.

EXAMPLE: The Mobile Alliance for Maternal Action (MAMA) is providing culturally sensitive and adaptable health information messages to expectant mothers via mobile phone. They piloted this scheme in three countries where mobile phones are widely used and maternal and infant mortality is high, including Bangladesh, India, and South Africa. MAMA is partnering with local governments, mobile operators and non-government organizations in these countries to ensure that its efforts can be expanded or replicated to reach the most mothers possible. The program is also enhancing the capability of globally operating agencies that create and develop mobile health information programs for moms by documenting lessons learned and sharing information and adaptable message libraries. There are many parallels that can be applied to TB, including the development and open access to a library of proactive health messages to deliver via mobile phones and the goal of building a replicable programme.



THE ADVANCE OF MOBILE:

Mobile phones provide migrant and rural populations with access to information and communication opportunities that would otherwise be nearly impossible.

THE ROAD AHEAD

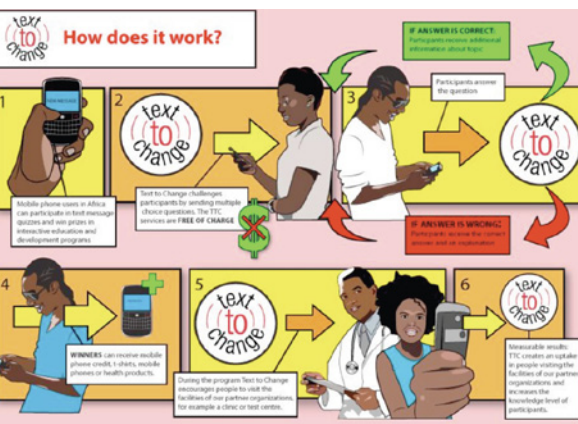
We have presented encouraging initiatives. However, mHealth is approaching a tipping point, and additional momentum is needed to transition to the next stage. There have been hundreds of projects piloted with a relatively limited reach, but the continued challenge is implementing effective approaches and applications to reach national scale. At this point, we would like to take a moment to highlight common lessons learned in this field.

In many of the existing projects, the **evidence base** that would enable decision-making and prioritization for further investment needs to be strengthened and expanded. For these projects to continue or advance to scale, it will be critical to know what works and what does not. Building this evidence base and thus the business case for mHealth will also be a key ingredient to maximize return on investment for early-stage initiatives and to inform funding decisions to scale up ideas that work. Rigorous monitoring and evaluation is needed to do this and to identify the key aspects neces-

sary for the success of a project. This is where partners and current funders can help, guide, and drive toward advancements in the mHealth field.

Today we see that **partnerships** have moved beyond a purely philanthropic approach to wide-ranging alliances of competence and interest. It has proven important to be inclusive while building these partnerships, and to account for all areas in which a partner may add value. There are many stakeholders in the mHealth ecosystem, from mobile network operators and pharmaceutical companies to governmental health ministries and healthcare providers. Each of them is able to provide greater benefit by working together instead of alone.

Another observation is that mHealth tools are not always clearly linked to **health systems' needs and priorities**, especially when technical developers design projects without closely partnering with national programs and with those who will eventually use the system. In order to scale many mHealth pilots, they must be integrated into the national plans and budgets that are eventually funded by governments and their external donors.



“We have more pilots in mHealth than there are in the US Air Force or Indian Air Force.”

PROF. K. GANAPATHY, PRESIDENT APOLLO
TELEMEDICINE NETWORKING FOUNDATION

The availability of **technology**, the policy environment, and literacy in health and technology vary widely across countries; an adaptation of technology to country realities is therefore vital. For example, if the challenge is illiteracy, incorporate audio messages; if the challenge is lack of uptake, use incentives; if the challenge is lack of capacity to use mobile devices, invest in training. Solutions that target the needs of the community and make the technology as simple as possible for the users have the best results.

Stop TB Partnership

The Stop TB Partnership is a unique international body with the power to align actors all over the world in the fight against TB. Together our nearly 1000 partners are a collective force that is transforming the fight against TB in more than 100 countries. The mission of the Partnership Secretariat, hosted by the World Health Organization in Geneva, is to serve every person who is vulnerable to TB and ensure that high-quality treatment is available to all who need it. As demonstrated in this document, mHealth solutions are proving to be a vital tool to achieve this.

Innovations will move forward only if knowledge and experience from the various actors engaged in mHealth for TB are gathered and disseminated. The Partnership is joining forces with the mHealth Alliance as a first step. The next step will be to co-ordinate projects and exchange experiences with implementers from other health areas that have experience in mHealth. We also need to link TB projects and those being conducted in the wider mHealth community by involving TB implementers in working groups and networks, so that experience flows both ways.

Through one of its initiatives, TB REACH, the Partnership funds projects that use cost-effective, innovative and ground-breaking approaches and activities to reach people who otherwise would not receive TB care. Some of the grantees have used mHealth tools and are featured in this report. These projects have already resulted in increasing the number of people receiving TB services at relatively low cost. These first successes are a good starting point to raise funds for additional projects employing mHealth tools.

For more information, visit

<http://www.stoptb.org> and

<http://www.stoptb.org/global/awards/tbreach/>

“As a technologist and an entrepreneur, I can attest to the potential of technology to transform communities and, indeed, entire societies.”

PROFESSOR MUHAMMAD YUNUS, FOUNDER, GRAMEEN BANK,
NOBEL PEACE PRIZE LAUREATE 2006



mHEALTH FOR PATIENTS

mHealth can enable patients to receive health information; access their health records; participate in remote, real-time monitoring; and take greater responsibility for their own health.



The mHealth Alliance champions the use of mobile technologies to improve health throughout the world. Working with diverse partners to integrate mHealth into multiple sectors, the Alliance serves as a convener for the mHealth community to overcome common challenges by sharing tools, knowl-

edge, experience, and lessons learned. The mHealth Alliance advocates for more and better quality research and evaluation to build the evidence base; seeks to build capacity among health and industry decision-makers, managers, and practitioners; promotes sustainable business models; and supports systems integration by advocating for standardization and interoperability of mHealth platforms. The mHealth Alliance also hosts HUB (Health Unbound), a global online community for resource sharing and collaborative solution generation.

The mHealth Alliance is hosted by the United Nations Foundation, and founded by the Rockefeller Foundation, Vodafone Foundation, and UN Foundation. The Alliance now also includes HP, the GSM Association, and Norad among its founding partners.



MOBILE TECHNOLOGY BEYOND HEALTH:

The use of mobiles for health can be integrated with other mobile services.

The use of mobile money can serve as a means of providing incentives or managing health insurance payments/reimbursements. The utility of a mobile phone's Global Positioning System enables pinpointing new cases and enables surveillance though mapping the location and spread of new cases.

For more information, visit

<http://www.mhealthalliance.org> and

<http://www.healthunbound.org/>.

JOIN THE CONVERSATION

Powered by the mHealth Alliance, Health Unbound (HUB) is the interactive network and online knowledge resource center for the mHealth community. One of the challenges in advancing mHealth is that many of the projects being implemented are isolated from one another, and are unable to share information and best practices. HUB overcomes this obstacle by enabling the mHealth community to exchange ideas, share projects and outcomes, and build connections among the dynamic mHealth community. The Stop TB Partnership works with the mHealth Alliance to enable the exchange of experiences in mHealth from the TB community and its own partners.

Through HUB, the mHealth Alliance brings together individuals from all disciplines of the mHealth community, from developers to doctors, to generate collective solutions and inspire new innovations that will transform health with technology. HUB is also where the mHealth Alliance offers a comprehensive database of mHealth technologies, programs, organizations and policies to promote collaboration of efforts and best practices from lessons learned.

Currently, there are already dozens of programs, organizations, and technologies related to TB in HUB's database. If you have an example – or want to explore what others are doing, join HUB to add to this database, start a discussion, share an idea, and learn more about mHealth and its potential to improve TB care around the world.

Join us at www.healthunbound.org. We look forward to hearing from you!

“If mobile phones aren’t part of your health strategy today, you need to revise your health strategy.”

MIKKEL VESTERGAARD FRANDSEN, CEO OF
VESTERGAARD FRANDSEN GROUP



mHEALTH FOR PUBLIC HEALTH:

Through mHealth, health services can be delivered more effectively and efficiently – by providing real-time information to the public and healthcare providers alike.
