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Health on the move **Can mobile phones save lives?**

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Above Although only 32% of adult women in the rural state of Bihar, India own their own phone, 83% of women have access to one.

Introduction

We are currently witnessing an unprecedented global effort to improve the health of the world's poor. Financial resources are being poured into scientific advances, offering fresh hope for preventing and managing life-threatening diseases. Political will has coalesced around the Millennium Development Goals (MDGs). And rapid economic growth in even some of the poorest countries is lifting people out of poverty and improving health outcomes.

Despite all of this, the prospects for meeting the key MDGs of reducing maternal mortality by three quarters and reducing the deaths of children under five from preventable causes by two thirds remain extremely difficult in much of the developing world. Greater effort and further innovation are required.

This policy briefing focuses on how one of the greatest engines of innovation in the 21st century – the mobile phone – offers important opportunities for saving lives. The explosive growth of mobile telephony over the past decade has generated exciting new thinking around its potential to improve the uptake of health services and healthy behaviours. That potential is increasingly being transformed into practice, with encouraging results.

This policy briefing draws on BBC Media Action's direct experience in using mobile phones to improve health education in one of the poorest states of India. Bihar has among the highest rates of maternal and child mortality in the country, but also one of the most rapidly expanding mobile markets. The briefing shows how, in a region where mobile phones outnumber basic goods such as water taps and toilets, the former have emerged as a simple, high-impact solution for improving the survival chances of mothers and babies.

mHealth can be defined as the delivery of healthcare information and services via mobile communication

devices. This briefing identifies three aspects of mHealth that render it such a potentially robust healthcare tool:

- **Reach.** The first is its capacity to leverage existing – and quite basic – phones to provide life-saving information to people in difficult-to-reach, rural areas.
- **Design.** The second is its capacity to tailor both the delivery and content of that information to the needs of poor, illiterate and marginalised populations.
- **Scale.** The third is its capacity to operate at scale in a cost-effective, financially sustainable way.

Mobile telephony is not a panacea for all health challenges in the developing world. But there is enough experience – and the beginnings of an evidence base – to argue that mHealth deserves serious attention from any development actor seeking to improve global health.

This paper is organised as follows:

Part 1 examines the data on maternal and child health globally and in India.

Part 2 explores the role of mobile phones within the sphere of health communication, highlighting mHealth as an educational tool.

Part 3 provides a brief overview of BBC Media Action's mHealth work in Bihar, India.

Part 4 lays out the conceptual insights that work has yielded for reaching poor and marginalised populations.

Part 5 illustrates the integral role of scale in making such mHealth initiatives sustainable financially.

Part 6 reviews the state of the evidence on mHealth.

Part 7 draws conclusions arising from the analysis in parts 1–6.

PART I

Maternal and child health: the scale of the problem

The 2015 deadline for achieving the Millennium Development Goals (MDGs) is fast approaching.¹ For the health sector – where reducing child mortality and improving maternal health figure prominently on the agenda – the scale of that challenge is still considerable.

Over the past decade, the twin public health goals of reducing child mortality and improving maternal health have emerged as a real priority within the international development community. The HIV epidemic that swept sub-Saharan Africa and parts of Asia highlighted deadly consequences for women and children. In 2003, the pre-eminent health journal, *The Lancet*, drew attention to the 11 million children under the age of five who were dying from almost entirely preventable causes each year. Alongside these realities, new funding mechanisms emerged, such as the Partnership for Maternal, Newborn and Child Health and the Roll Back Malaria campaign. Efforts to improve global health also gained a number of high-profile advocates and philanthropists.

These investments have paid some dividends. Child mortality has been cut by more than a third since 1990, when there were 12 million deaths a year.² At the same time there has been a 47% drop in the number of women dying as a direct consequence of pregnancy and childbirth.³

And yet, there's still a long way to go. Some 7.6 million children still die annually from largely preventable causes.⁴ Every five minutes, three women die from complications related to pregnancy or childbirth, while 60 others will be left with debilitating injuries.⁵ The overwhelming majority of these deaths – some 99% – occur in the developing

world, more than half in sub-Saharan Africa, and one third in Southern Asia.⁶ Indeed, the lifetime chance of an African woman dying because of pregnancy-related causes is 100 times higher than that of a woman in a developed country.⁷

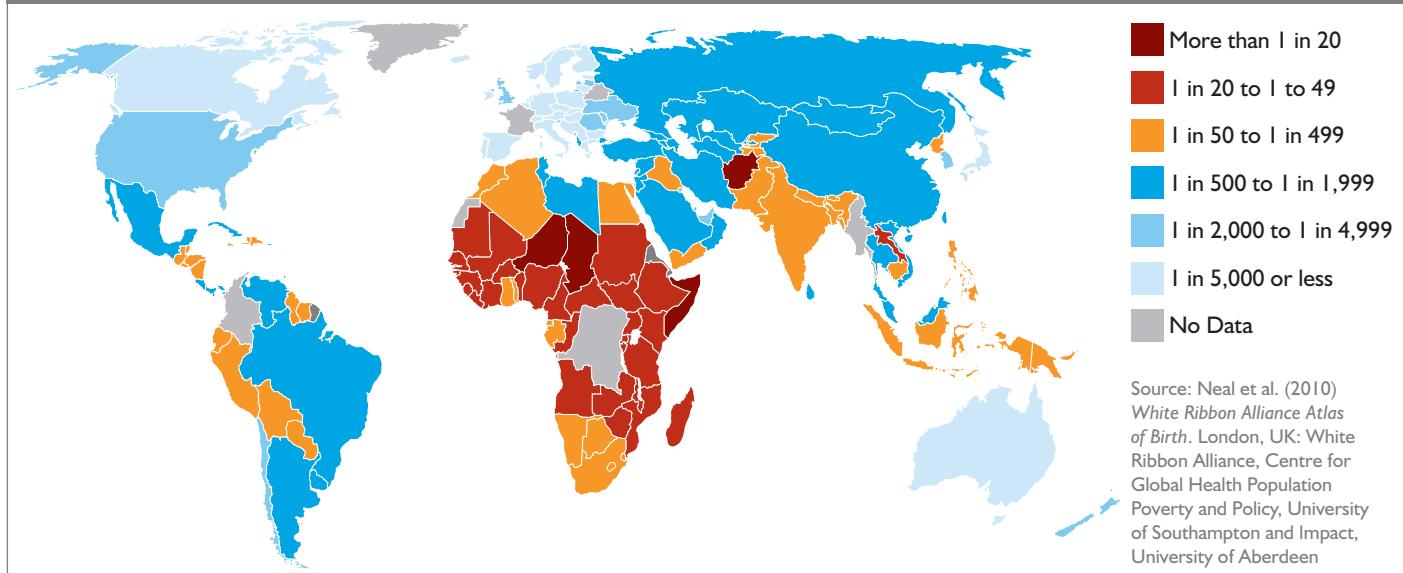
India, one of the fastest growing economies of the world, reflects the global challenge of securing maternal and young child health. On the one hand, the Indian government has made large health investments that have in turn saved lives. The maternal mortality ratio has fallen from around 600 per 100,000 live births in 1990 to just over 200 in 2010.⁸ Furthermore, some 53% of women now deliver with a skilled birth attendant, and vaccination coverage in children between 12 and 23 months is between 70% and 90%.⁹

On the other hand, the prevalence of stunted and underweight children as a result of malnutrition is still considerable in India. Around 48% of all children under the age of five are stunted, while 44% are underweight.¹⁰ With an average annual reduction in the child mortality rate of only 3% since 1990, India is not likely to meet this MDG.

In short, despite considerable effort within the international development community and developing country governments alike, the MDG objectives around improving maternal and child health still remain out of reach. Only nine out of the 75 countries that account for 95% of maternal and child deaths are on track to achieve the maternal health goal, while only 23 are on target to meet the child health goal.¹¹ The world is in need of bold new solutions in the health sphere if these ambitious targets are to be met.

Figure 1

Lifetime risk of maternal death



PART 2

What a difference a phone makes

The role of communication in saving lives

“I firmly believe in the power of information to change lives”

Below A young man and his mobile in the fishing port of Cox's Bazar, Bangladesh.

There are numerous, complex reasons why the vast majority of all global deaths of pregnant women, infants and children under five occur in the developing world.¹² Of course, poverty underlies many of these reasons, such as the insufficient number of skilled health workers, the lack of access to essential medicines and equipment, substandard living conditions and poor nutrition, to name but a few. Health-related behaviours and social norms – such as local customs around delivering babies at home without access to skilled birth attendants – also play a part.

The extent to which communication can help save lives depends inevitably on the complex interplay

among these myriad factors. Nevertheless, decades of research and practice have established a strong evidence base that communication has a major role to play in improving health.¹³ As Caroline Anstey, Managing Director of the World Bank Group, put it: “I firmly believe in the power of information to change lives.”¹⁴

Media and communication can help to achieve health outcomes by improving knowledge, shifting attitudes and social norms and increasing people’s confidence and motivation to act in the interests of their own health. They can also facilitate and stimulate public and interpersonal (one to one) discussion, which in turn can support the adoption of healthier behaviours and greater accountability around health service provision and policy making. (See box: Information, communication and health.)



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Information, communication and health

It is widely recognised that the availability of timely, accessible, accurate and relevant information plays a key role in shaping knowledge, which in turn is a driver of health-related change. Information also influences social norms and culture by increasing awareness about what other people are doing. And information can create demand for health products and services. The more trusted and credible a source of information is, and the more relevant and resonant it is made to its target audience, the greater its potential to influence behaviour.

In the context of maternal and child health, communication interventions can encourage people to adopt healthier behaviours, while reducing those that put health at risk.

For example, they can encourage people to seek ante-natal care from a skilled health worker, delay pregnancy to a healthy age and ensure a healthy interval between births. Basic, cost-effective, post-natal care practices such as immediate and exclusive breastfeeding and ensuring thermal care through wiping (not washing) a baby clean, wrapping it and encouraging skin-to-skin contact between baby and mother after birth can have a significant impact on saving newborn lives.¹⁵

Just one example is BBC Media Action's *Ghar Aagan* (House And Yard) weekly radio show in Nepal, which broadcast a real birth to influence health behaviours and social norms. Research showed that 77% of regular *Ghar Aagan* listeners knew the recommended number of ante-natal care visits (four), compared with 58% of non-listeners. Among regular listeners, the percent of women who actually had the recommended number of visits in 2012 was 74% in 2012 and only 52% among non-listeners.¹⁶

Communication can also help address social factors that are harmful to health. Informing and engaging women in the decisions they take about their health can help redress gender inequalities that affect health risks. Creating opportunities for people to engage in dialogue and debate also enables them to participate in decisions about health services within their community and hold leaders and service providers to account.¹⁷ The extent to


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which individuals discuss a behaviour with others is often closely correlated with the adoption of that behaviour.¹⁸

Most health communication initiatives deploy a range of different approaches to meet the health needs of people in a particular context. This may be through mass media such as radio and television, print media (pamphlets, posters, billboards), social media, community outreach (for instance, street theatre or events) and interpersonal communication (for example, between a health worker and a patient). A number of studies have suggested that combining mass media with interpersonal communication or other communication activities has a greater impact than any one intervention alone.¹⁹

“Information can create demand for health products and services**”**

Above BBC Media Action's radio show *Ghar Aagan* (House And Yard) broadcast a live birth on air from a Nepali maternity ward to influence health behaviour and social norms.



Above As part of the Ananya programme in Bihar, India, BBC Media Action has developed mHealth services to equip and train community health workers to communicate life-saving health information.

Mobile telephony has provided a fresh set of opportunities for those working to improve health outcomes in the developing world.²⁰ It is one of the fastest growing technologies in history; with around 6 billion mobile phone subscriptions (and counting), global mobile penetration stands at 86%.²¹ In the developing world, mobile penetration is only slightly lower, at 79% (ie, there are 79 active mobile subscriptions – or SIM cards – per 100 people). Africa has the world's lowest mobile penetration, but this is still 53.1%, compared with 1.4% for fixed line phones.

The simple fact that mobiles are increasingly ubiquitous in the poorest parts of the world has obvious health benefits. For instance, people can seek help in emergencies. Mobiles can also enable family members or others to keep in touch with those who are sick or vulnerable.

But mobiles have the potential for much more. As Ariel Pablos-Méndez, Assistant Administrator for Global Health at USAID, affirmed at a recent mHealth summit: “We believe cell phones and mobile health is more than

just information. It’s really changing behaviour, changing the way health systems operate.”²³

This potentially transformative role for mHealth is really taking hold within the international development community. Tim Wood, Director of Mobile Innovation at the Grameen Foundation, noted: “What’s exciting in the mHealth sector is that the untapped potential

of mobiles is now being seen by most of the large and respected development organisations.”²⁴

Educating populations and health workers

The scope of mHealth is almost as vast as the health sector itself. In the clinical realm, mobile phones are used to do everything from registering and managing patient data (such as pregnancies, vaccinations, ante-natal care visits and causes of deaths), to integrating medical records with payments, to remotely diagnosing health conditions and managing the supply of medicines.²⁵

This briefing will focus on the educational use of mobile phones, sometimes referred to as mHealth education or mHealthEd.²⁶ The main purpose of mHealth education targeting the general population is to increase access to information, raise people’s awareness, stimulate discussion and influence social norms, so that individuals and families can take more control of their own health. Examples include public health campaigns promoting condom use, timely and actionable measures for confronting disease outbreaks (such as avian flu) and demand creation for services such as vaccinations.²⁷

There are a number of mHealth initiatives that focus on maternal and child health education for families in developing countries. Many build on learning from BabyCenter, a service that reaches 14 million mothers in the United States every month with ‘stage-based’ information. The Mobile Midwife project in Ghana – developed by the Grameen Foundation in partnership

with BabyCenter – sends registered pregnant women messages linked to their stage of pregnancy. The Mobile Alliance for Maternal Action (MAMA) is scaling similar services in Bangladesh and South Africa.²⁹ In India, BBC Media Action is developing Kilkari, a service to provide subscribers with staged, weekly calls linked to pregnancy, birth and infant health. (See box: The Ananya programme.)

In order to build capacity for the delivery of information and services in rural areas, mHealth education content is increasingly being developed for community health workers. There is a real scale benefit to supporting front-line health workers, who can potentially serve numerous families over time. Save the Children estimates that 1 million additional community health workers are needed to help address a shortfall of 3.5 million health workers in 49 of the poorest countries.³⁰ In addition to plugging this gap, it's vital that the effectiveness of existing health professionals is increased. Examples of mHealth services designed to bolster this supply side of the equation include job-related aids that support community health workers' interactions with families, peer-to-peer networks that enable the rapid exchange of data and learning and mobile courses and quizzes that can be taken anytime, anywhere.

Like most mobile health innovations, offering health workers training opportunities via their mobile phones is intended to be both cost-effective and efficient. It replaces the need to travel – sometimes great distances – and to take time out of work in order to participate in classroom-based learning. A community health worker who received training from BBC Media Action's mobile service in Patna, India noted: "Before, if I had questions, I had to go on foot to the primary health centre. Now I can learn on mobile."³¹ Many mobile training courses also allow participants to get certified exam results immediately.³² Furthermore, job aids delivered via mobiles, such as audio recordings that community health workers can play to their clients, offer the benefit of controlling for the variability of health workers' skills by giving families the same quality of message every time.

But mobile job aids and training programmes have other professional benefits as well. Early evidence shows that such tools motivate health workers by increasing their job satisfaction, reducing staff attrition rates and elevating their status in the community.³³ As a community health worker in Begusari, India explained: "Ever since I started using [the job aid] Mobile Kunji during my visits with women and their families, the community's respect for me and what I do has grown. What's more, when I now walk into a village, people call me 'doctor didi' (sister) and ask me to give them information."³⁴

“When I now walk into a village, people call me ‘doctor didi’ (sister) and ask me to give them information”

In light of the dearth of adequately trained health workers in the developing world, it's hard to underestimate the value of mHealth education projects, especially of the training and support variety. As Jeffrey D Sachs, Director of The Earth Institute, put it: "Empowering community health workers can be a profound step change."³⁵

How 'low tech' can you go?

Mobile health is often described as a 'game-changing' technological platform. Unlike other mass communication platforms such as television and radio, mobiles can not only be used to provide information and enable people to interact with that information, but also to deliver services and strengthen health systems. In other words, mobile telephony can unite both the educational and clinical functions of mHealth in one device.

In so doing, mobiles have the revolutionary potential to integrate the 'supply' side of health systems (for example HIV diagnostics, vaccination registration and tuberculosis medication reminders) with the 'demand' side (such as promoting healthy behaviours and the uptake of health services among the population). Many donors and governments are therefore justifiably keen to invest in the provision of higher-tech handsets to health workers, such as feature phones or smartphones capable of hosting applications that can deliver clinical services and track patient data.

This sort of integrative mHealth model has the ability to transform health service delivery in the long term. But such projects are challenging to scale because they require considerable external resources to finance, and are complex to support and maintain. (See Part 5.)

In the rush to embrace the latest technological innovation, it's easy to overlook the fact that there is tremendous value and cost-effectiveness to be found in services that can make the most of the phones that families and community health workers already have, no matter how basic. This is particularly relevant for resource-poor contexts, among populations who may even lack the technical and language literacy needed for reading and sending text messages.

When it comes to developing new mHealth interventions, "there is a gold rush mentality," noted Dennis Gilhooley, Executive Director of the Digital Health Initiative. "We need to balance social and human needs with this rapid technological juggernaut."³⁶

The remainder of this policy briefing attempts to do precisely that.

“There is a gold rush mentality. We need to balance social and human needs with this rapid technological juggernaut”

PART 3

Bihar on the move: a case study

Right A basic handset held together with an elastic band and with numbers scraped off the keypad from repeated use.

The state of Bihar in northern India – poor, rural and populous – has some of the worst maternal and child mortality rates in the world.³⁷ With a population larger than that of Western Europe and limited infrastructure, reaching the state's 27 million women of child-bearing age is a daunting task. (See box: The Ananya programme.)

Eighty eight per cent of Bihar's 103 million people live in rural areas.³⁸ Many parts of the state are regularly flooded and much of rural Bihar has only two or three hours of electricity a day.

Pregnant women, in particular, have very limited mobility: they rarely leave the house and often have little or no role in making decisions related to their own health or bodies. Less than half of women in this state deliver their babies at a health facility.³⁹

Mass media provides only a limited opportunity to reach and engage priority populations in Bihar. Only 18% of women aged 15–45 watch TV and 11% listen to the radio.⁴⁰ It is therefore essential to reach the state's inhabitants not just through mass media, but also through face-to-face communication and community-level activities such as street theatre.



Figure 2



An existing network of some 200,000 community health workers helps provide access to people who might otherwise be difficult to reach.⁴¹ These health workers – about half of whom are tasked with making household visits – are often the only source of health information for families in rural locations with little media coverage.

But here, too, there are challenges. The average community health worker is a middle-aged woman with a basic education, a heavy caseload and inadequate training and materials. Her catchment area comprises approximately 1000 people, with an average of 56 women who are pregnant or have children under the age of two.

Enter mobile phones. Some 63% of adult men in rural Bihar own a mobile phone. Although only 32% of adult women in rural Bihar own their own phone, 83% of women have access to one. BBC Media Action research shows that all community health workers either own, or have access to, a mobile phone.

The majority of these phones are very basic, often second-hand, handsets.⁴² Some are even held together by string. But even these phones can be used to empower people with life-saving information.

The Ananya programme

Ananya (meaning ‘unique’ or ‘boundless’ in Sanskrit) is a programme funded by the Bill & Melinda Gates Foundation. The programme is in partnership with the state government of Bihar and 10 other implementing organisations, with funding totalling approximately \$122 million over five years (2010-2015). The programme aims to accelerate health outcomes linked to Millennium Development Goals 4, 5 and 6 (reducing child mortality, improving maternal health and reducing infectious diseases including HIV, malaria and tuberculosis).

BBC Media Action’s role in this programme is to communicate life-saving information and shape healthy behaviours that tackle the main causes of maternal, newborn and child deaths, such as safe delivery of babies, preventive post-natal care and nutrition. To do this, BBC Media Action has developed a comprehensive range of communication interventions, including mHealth services to equip and train community health workers who in turn communicate health information to nearly 7 million pregnant women and women with children under the age of two.⁴³ In early 2013, BBC Media Action will also launch a service that will provide timely health information directly to families via their mobile phones. All of these mobile services run on a mobile technology platform owned and supported by OnMobile and use an open-source software called ‘Motech,’ which has been customised for the Bihar programme in collaboration with the Grameen Foundation and Thoughtworks.⁴⁴ The GSMA Development Fund provided guidance and support during the initial design phase of the project.

The job aid – Mobile Kunji

Mobile Kunji – Kunji means a ‘guide’ or ‘key’ in Hindi – is an audio-visual job aid that community health workers can use during counselling sessions with rural families. It seeks to build support for healthy practices within families and communities. The job aid’s content aims to redress long-standing misconceptions and negative social norms around health-related maternal and child behaviours. For example, when mothers were asked why they didn’t follow advice to breastfeed exclusively for the first six months, many said: “People in my community will think I am keeping my child hungry if I only breastfeed.”

This job aid includes both an interactive voice response (IVR)-based mobile service and a printed deck of 40 illustrated cards on a ring, which communicate essential information on pregnancy and newborn health. The deck of cards is designed to be portable and durable.

Each card carries a unique, seven-digit number (‘short code’) that can be dialled on the community health worker’s mobile phone.

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Above A community health worker uses Mobile Kunji’s deck of cards while on a visit to a mother and her mother-in-law in Bihar, India.

The community health worker dials the short code and puts her phone on speaker mode so that both she and the family can hear the audio content, or simply hands the phone to the pregnant woman or mother to listen. The content, which is delivered in the authoritative yet sympathetic voice of a woman doctor character, is deliberately designed to be both engaging and conversational and to reinforce the health message illustrated on the card.

For example, one of the leading causes of maternal death is severe bleeding. One card encourages women to involve

their husbands in decisions around planning for birth so that families will identify their nearest hospital, make arrangements for emergency transportation, ensure that they have their health worker’s phone number handy and save money to cover costs in case of complications during labour and delivery.

Mobile Kunji is a toll-free service which can be accessed by any health worker in Bihar from any mobile handset, across five of the largest mobile networks in India. These operators account for approximately 80% of all mobile subscribers in Bihar.

The training course – Mobile Academy

Alongside Mobile Kunji, Mobile Academy works to expand and refresh community health workers’ knowledge of nine maternal and child health behaviours and to enhance their interpersonal communication skills. In light of the low wages community health workers earn, Mobile Academy is designed to be very inexpensive.

Once registered, community health workers can access the 190-minute course via a mobile short code. They can then complete the standardised course at their convenience, at a fraction of the cost of face-to-face training. Digital bookmarking technology enables users to return to where they left off and to complete the course as quickly or slowly as they like, spreading the total cost over 12 months if necessary. After completing the course, health workers with a pass score receive a printed certificate of completion from the government of Bihar.

The service for pregnant families – Kilkari

Kilkari, meaning ‘a child’s gurgle’ in Hindi, is an mHealth education service currently being developed for families with pregnant women and mothers of children under the age of one. The service will focus on prompting healthy behaviours and generating demand for health services. Once a family subscribes to the service, they will receive weekly phone calls about maternal and child health, linked to the stage of the woman’s pregnancy or their child’s age. Kilkari costs 1 rupee per message. If the family subscribes for 16 months, they will receive 64 messages at a total of 64 rupees or US\$1.18.

PART 4

Touching lives, not screens: Reach, design and scale

BBC Media Action's experience in Bihar offers unique insights into the potential of mobile telephony to provide life-saving information to those hardest to access – whether because of social class, gender, caste or location. Three elements of mHealth warrant particular scrutiny: reach, design and scale.

Reach: out with the new, in with the old

One of the main reasons the development community has focused on mobile phones as a tool for health innovation

“All I have to do is explain the information on the card and dial the number provided. I can answer all the questions the women have with ease and confidence”

Below A copycat Nokai phone owned by a community health worker in Bihar, India.

is their ubiquity. As noted earlier, mobile phones are now surfacing in places where mass media and even health facilities cannot be found.

But just because mobile phones are abundant in developing countries does not automatically render them useful. Their potential to promote healthy behaviour across large swathes of people hinges on the extent to which mHealth

programmes can leverage existing technology within target communities.

Most mobile phones found within low-income, rural populations tend to be extremely basic and old. In Bihar, even many of the mobiles owned by most community

health workers have black and white screens, no internet access and limited storage capacity. Health workers' handsets are often copycat brands (such as Nokla, Nokai and Simsung), which typically do not support local languages and are not known for their durability.

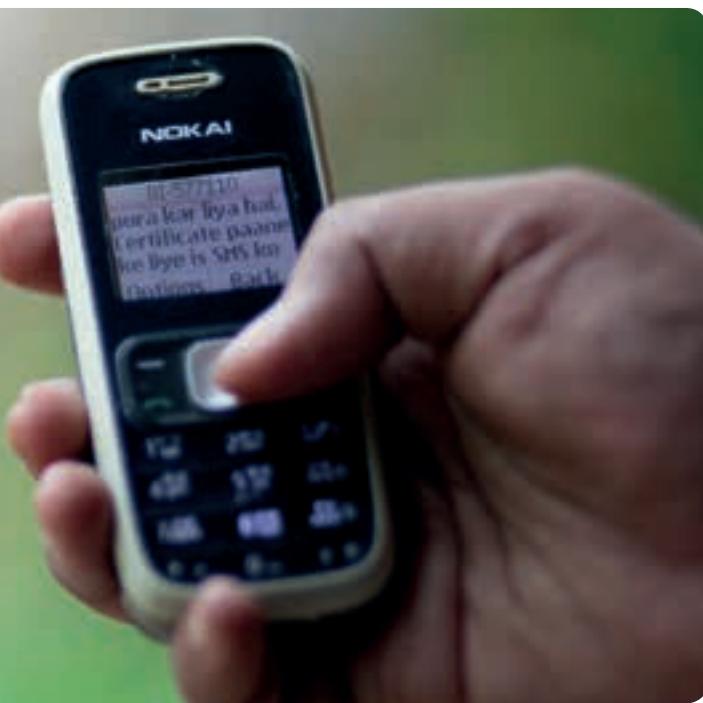
At first glance, the primitive nature of these phones might seem like a limitation. This is certainly true if the objective is to deliver comparatively sophisticated, mHealth clinical services, such as recording and tracking the provision of care to pregnant women and mothers or performing diagnostics remotely. Those kinds of services typically require pre-loaded software on a more advanced – and standardised – mobile handset. The procurement and distribution of new mobiles, with software already loaded on them, would therefore be essential to getting this sort of initiative off the ground in resource-poor settings.

In contrast, mHealth education services like Mobile Kunji and Mobile Academy (See box: The Ananya programme, above) have the luxury of being handset independent. In other words, because they don't require complex data capture of confidential medical information, these services can be obtained via phones without special software or internet access.

Making good use of simple, existing mobiles has four advantages for mHealth educational initiatives. First, these phones are user-friendly. Because the target group doesn't need to invest time in learning how to use a new device and/or software, they are instead freed up to focus on the actual content. Reba Rani, a community health worker in Bihar noted: "Now that I have Mobile Kunji, every time a woman asks me for information, I look at the index card of the Mobile Kunji deck of cards and choose an appropriate message. All I have to do is explain the information on the card and dial the number provided. I can answer all the questions the women have with ease and confidence."⁴⁵ (See box: The gender divide).

Second, the health benefits of being handset-neutral are also immediate. By designing mHealth education services that use phones that are already in the hands of the landless labourer, the mother-in-law, the pregnant woman, the health worker, these individuals can start getting information they can act on instantly. No time-consuming phone distribution scheme. Just life-saving information, now.

Third, employing existing handsets also requires less up-front capital investment. The Bihar programme is again instructive in this regard. When BBC Media Action was



The gender divide

"Within the digital divide, there is also a gender divide."⁴⁶

In many parts of the developing world, access to mobile phones is still the preserve of men. Women are 21% less likely to own a mobile phone than men: 37% of women in low- and middle-income countries own mobile phones, compared to 48% of men.⁴⁷ And ownership is not

the only impediment. Women often have to ask for permission from male members of the household to use mobile phones and may be monitored when they do so.

An ethnographic research study by BBC Media Action in Bihar, India illustrates how understanding the gender divide in mobile ownership and use guides programme design decisions. The study found that among those families who owned mobile phones – even those living in extended family, mud-hut dwellings with only three hours of electricity per day – the majority of households had two phones. One of these phones – typically the newer one – accompanied the males, many of whom were landless labourers, when they went out to work. The second and older handset was usually left at home.

All women interviewed had access to this household phone, even though it was constantly on the

GMB AKASH/PANOS



Above A slum dweller in Dhaka, Bangladesh talks on her mobile phone.

move – sometimes it was in the hands of the wife, other times with the nephew, sister-in-law or uncle. Unlike the primary 'male' phone, this household phone did not usually have a cash balance on it with which to make phone calls. Instead, its main purpose was to receive calls from the primary phone.

The Kilkari service (see box: The Ananya programme),

is designed for families that include pregnant women and mothers. The content is ostensibly aimed at women. However, it is only the man's phone that has the necessary credit to receive a message from the subscription-based service. So the content has to be targeted at the whole family, in a way that prompts men to share information with their wives. This is why, for example, calls reach the man in the evening when he is more likely to be at home, increasing the chances that he will share the message's content with his wife.

Mobile telephony also has huge potential to empower female community health workers. Services like Mobile Kunji and Mobile Academy enable these workers to acquire both knowledge and skills. This results in elevating their status in the community, as they are increasingly seen as respected and knowledgeable professionals, whose advice is backed by the 'doctor in their pocket'.⁴⁹

first considering its technological options for community health workers, the design team anticipated creating audio-visual content for community health workers to be stored on their mobile phones. The idea was to use inexpensive, yet sophisticated, Indian brand phones to project content on to the walls of huts, shops and clinics so as to facilitate learning.

But the team soon realised that the retail cost of procuring phones with this sort of technology for all 200,000 community health workers involved could be up to an additional US\$8 million – more than four times the entire mHealth budget for the project.⁵⁰ And that didn't include the cost of installing the content on the phones,

testing it, and distributing, maintaining and replacing lost, stolen or broken phones. In contrast, making content that was accessible to phones that community health workers already possessed circumvented the need to invest in new handsets, let alone replace them.

Fourth, by creating services that can be used by anyone who has access to a phone and can dial a number, an mHealth education project can be launched at scale from the get-go. In contrast, services that hinge on standardised telephones cannot easily support a large-scale roll-out precisely because the software only works on a limited number of handsets. (See discussion of scale in Part 5.)

“It’s like saying, if you can transport someone to a hospital on a bicycle where there is no ambulance, it’s better than not getting there at all”

In sum, basic phones may not be capable of supporting fancy software applications and delivering video content, but they are certainly better than nothing. As Joanna Rubinstein, Assistant Director of the Earth Institute for International Programs, put it: “It’s like saying, if you can transport someone to a hospital on a bicycle where there is no ambulance, it’s better than not getting there at all.”⁵¹

None of this is meant to downplay the vital role that handset-dependent services play in the clinical mHealth space. Electronic medical records, remote diagnostics and supply chain management all entail efficiencies, increased coverage and life-saving services. It is only to note that delivering such supply-side services requires – at a minimum – a standardised feature phone. But the additional time and resources required to bring clinical services to scale will also have a huge pay-off in the longer run.

Hitting home: of users and usability

mHealth education can thus maximise reach when the phone in the hands of health workers and families is abundant, affordable and easy-to-use.

But to have maximum impact – to get life-saving information where it needs to be – mHealth programmes also need to communicate in a way that can be readily grasped by the very poorest segments of the population.

To borrow from the jargon in vogue within some development circles, how does one reach the ‘base of the pyramid’?

BBC Media Action’s work in Bihar suggests that the answer lies in carefully grounding both the programme’s delivery mechanism and its content in local realities. And that, in turn, hinges on carefully executed demographic, social and cultural research.

Speakeasy: interactive voice response (IVR)

Many of us assume that the word ‘simple’ in the context of mobile technology means texting. Short message system (SMS) or texting has been used effectively to reach people with essential health information, largely in Africa and Latin America.⁵² But what if the population you wish to target can’t read?

Literacy isn’t the only obstacle facing those most at risk of ill health due to poverty and marginalisation. Many languages in the developing world, particularly in Asia, are not in Roman script, whereas most mobile phones in circulation in those countries only support Roman (English), Arabic or Chinese scripts. When targeting

users in resource-poor settings – even those who may be literate – mHealth planners can’t assume that these users will be able to read or type in their language on their phone.

Technical literacy is also relevant here. In developing Mobile Kunji and Mobile Academy, BBC Media Action conducted user-testing research in the villages of Bihar. The goal was to assess the most appropriate way to communicate with the rural families living there, as well as with the community health workers who serve them.

Research showed that because most households had only possessed their mobile phones for a very short time, 91% were only able to use the phone for making and receiving calls.⁵³ Even a basic skill like dialling a phone number on a keypad was something that rural women in Bihar were only just learning to do. Although the ability to press numbers is increasing, low literacy levels and the fact that handsets don’t usually have the Hindi script enabled (ie switched on) meant that SMS usage remained nearly non-existent.

mHealth projects often target community health workers with the expectation that these individuals have an ability to learn new skills easily. But the skills associated with using mobile phones aren’t necessarily intuitive. In many countries, community health workers are mature adults in their 30s and 40s, who may not be natural early adopters of new technologies. Even literate community health workers in Bihar did not know how to open a text message and only 9% of those who took part in the user testing had ever sent an SMS.

Given the lack of literacy and technical capacity of the general population and community health workers in Bihar, BBC Media Action identified IVR as the most appropriate technology for the target population. IVR is a relatively well-established technology that is used around the world to provide automated voice services to telephone callers.⁵⁴

IVR is well-suited to a population with the demographic features of Bihar. First, because it can be accessed by making a phone call, IVR audio content can be heard from any phone. Second, IVR does not require literacy and only entails very limited technical skills (the ability to dial a number and to press numbers on the phone in response to audio instructions). In many cases, poor, rural mobile phone users are already being exposed to IVR through their mobile network operators, whether via automated customer care lines or when ‘topping up’ their mobile phones with pre-paid credit.

That said, complex IVR menus with multiple options can confuse users. For Mobile Kunji, this challenge was avoided by doing away with IVR menus altogether. Instead, community health workers simply dialled

short codes to listen directly to the appropriate audio content.

So, for example, the Mobile Kunji card on family planning indicates the number 5771154. The health worker dials this number and immediately hears a recorded message on family planning. No menus, no choices. Just straight to the message on the subject of that particular card. The card reinforces the subject with an illustration and a list of the key messages in the audio recording.

IVR can thus serve as a simple, widespread solution to the needs of illiterate, poor populations in many developing countries by providing access to audio content via a simple phone call from any mobile phone. As Anne Nelson of the Columbia School of International and Public Affairs put it: “In development work, it’s critical to apply technology to local needs and infrastructure as they exist now, not just as they may evolve in the distant future. BBC Media Action’s killer app is the phone call.”

Going local

Even if content is delivered via the most appropriate technology, if that content doesn’t resonate, it’s likely to remain on the virtual shelf. “It’s not about the technology. The key to success is content,” says Cherie Blair, Founder of the Cherie Blair Foundation for Women.⁵⁵

To make a difference, mHealth interventions need to be carefully grounded in the social, cultural and demographic realities of target populations. “Researching what the barriers to behaviour change are and understanding which of these barriers are most critical... is a major pay-off,” noted Usha Kiran Tarigopula of the Bill & Melinda Gates Foundation.⁵⁶

It’s common in public health circles to assume that health training manuals or messages from health campaigns automatically resonate across different regions. From this perspective, translation and adaptation to a mobile format is all that’s needed for mHealth education to succeed. But this view dramatically underestimates the importance of localising content to address unique barriers and facilitators to behaviour change.⁵⁷ For example, the generations-old practice of delivering a baby at home may not be adequately addressed merely by promoting the generic benefits of delivering in a health facility. The facilitating factors – and obstacles – are likely to vary from community to community.

Furthermore, many community health workers hail from the very communities they serve. As a result, they may have the same socio-cultural biases concerning health behaviours that the general public have.

A nuanced, culturally rich understanding is thus vital for behaviour change communication that targets both the

“BBC Media Action’s killer app is the phone call”



general public and health workers. BBC Media Action’s research about its Kilkari service illustrates this challenge vividly. Considerable effort went into designing content that could be understood by the target group in rural Bihar. But as noted above, pre-testing research found that the comprehension levels of even the most basic concepts were often well below what experts anticipated.

A huge challenge was finding mHealth message vocabulary that could be understood by the majority of the target audience, some of whom speak dialects and languages other than Hindi. This was the case for both basic health terms like ‘safe delivery’ and ‘tablet’, as well as the language used in subscription prompts such as ‘mobile service’, ‘choose’ and ‘confirm’. Surprisingly, the poorest segment of the population did not even understand the word *swasth*, which means ‘health’ in Hindi and is used in most government-run health campaigns.

BBC Media Action’s research further found that the central bottleneck was not just one of translation, but of conceptualisation. In communities where ambulances had never existed, for example, the concept of emergency transportation was not easily grasped.

The amount of information provided also affects comprehension. Illiterate women, in particular, complained that there was too much information provided in phone calls conveying health advice, obscuring the main points. Comprehension was much better among men, perhaps because of their wider exposure to standardised Hindi outside the home, through movies, soap operas and locally televised sport matches. In general, this study found that the more

Above Mobile Kunji comprises a deck of 40 cards and audio content accessed via a mobile phone.

“Researching what the barriers to behaviour change are and understanding which of these barriers are most critical... is a major pay-off”

Reaching those at the base of the pyramid

Figure 3

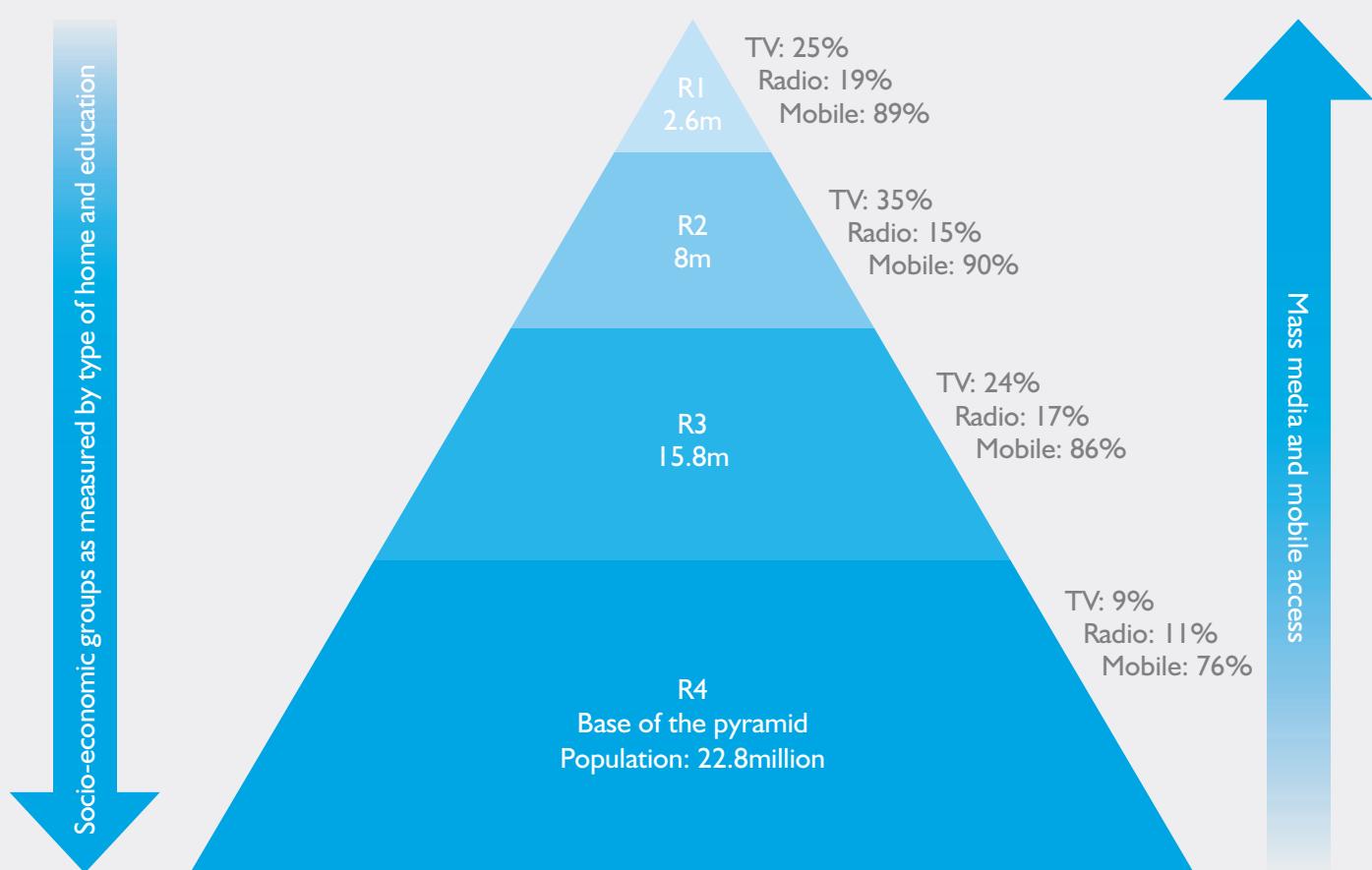


Figure 4



Figure 3 shows a pyramid representing rural Bihar. Each section of the pyramid symbolises a level of socio-economic class, from the highest at the top to lowest at the bottom.⁵⁸ The lower the socio-economic class, the lower the levels of income and literacy and the higher the maternal and child mortality.

Many of those at the base of the pyramid live in ‘media dark’ areas. For example, fewer than 10% watch television and 11% listen to the radio on a regular basis, and individual mobile ownership stands at 41%.⁵⁹ This figure rises to 76% if access to a shared household mobile is considered. Although difficult to reach, this demographic group is critical to the programme’s objectives given their isolation from essential information and their increased risk of ill health due to poverty.

To reach those further down the pyramid, then, it is all the more important to support the work of health workers who visit these households on a daily basis. BBC Media Action is training the community health workers in these communities via Mobile Academy and equipping them with an effective job aid via Mobile Kunji.

As argued throughout this policy briefing, mobile phones are an excellent tool for reaching areas where other means of mass communication aren’t available. But this does not mean that mobiles are the only way to reach otherwise remote and marginalised populations. “New technology doesn’t remove the need to employ a systematic approach to communication for development,” noted Raphael Obregon, Chief of the Communication for Development Unit at Unicef.⁶⁰

In order to further reinforce its key health messages to those who are otherwise difficult to reach, BBC Media Action thus deploys a range of core, community-level activities alongside its mHealth services. Such activities include street theatre, roaming vans playing advertisements and radio listeners’ clubs, all of which extend mass media campaigns into the community. These so-called ‘community mobilisation activities’ encourage further discussion around social norms and help facilitate behaviour change. Figure 4 shows how BBC Media Action is using a mix of communication approaches to reach the different target groups within rural Bihar.

“New technology doesn’t remove the need to employ a systematic approach to communication for development”

media exposure a person had, the better they were at comprehending pre-recorded health information on a telephone. (See box: Reaching those at the base of the pyramid.)

Making content sticky: meet Dr Anita

In addition to localising content to align it with factors influencing behaviour change, well-designed mobile content is often informed by local tastes as well, so that people can identify with the content. To use a term that’s popular in the information technology sector, the content needs to be ‘sticky’: ie, to compel users to want to return to the service again and again.

In India, as in many other mobile markets, users have a legal right to opt out of receiving subscription-based messages at any time if they choose to do so. Therefore, the importance of relevant, quality content is paramount for retaining users.

Creative techniques are used to make educational content engaging and entertaining. Popular mHealth content includes games and quizzes.⁶¹ Mobile Kunji, for example, features an empathetic yet authoritative female doctor character, Dr Anita, who ‘speaks’ to rural families. She is designed to be both trusted and respected by community health workers and families alike.⁶²

A nurse midwife in Samastipur, Bihar was surprised to hear someone in her local language giving such expert advice: “Even though she is a doctor and educated, she was speaking in Bhojpuri!” Another community health worker from Champaran, Bihar summed it up: “I have learned how to explain things in simple and easy language. Now I can explain the content to the beneficiaries in the same way.”⁶³

The audio message from the doctor is followed by rhyming couplets, punctuated by drum beats and the sound of a stringed instrument, which function as a mnemonic for key health messages. This rhyme is about preparing for delivery: “Keep three phone numbers in mind. Hospital, transportation and community health worker. To keep tension at bay. Plan as we say!”

Localised content is thus crucial for achieving resonance with users. One downside, however, is that it’s much harder to take context-specific content to scale across disparate geographical regions.



Above Dr Anita features on the Mobile Kunji cards and the accompanying audio content.

“Keep three phone numbers in mind. Hospital, transportation and community health worker. To keep tension at bay. Plan as we say!”

PART 5

Sustainability and scale: escaping ‘pilot-it’

The end game of any mHealth solution should be the achievement of sustainability. In order for an mHealth service to be sustainable, the ongoing costs involved in delivering the service need to be met.⁶⁴

The critical variable here is scale. If a service is only designed to be used by a small cadre of nurses in a district, for example, then covering costs can be fairly straightforward. But when a service needs to be used by hundreds of thousands of health workers or millions of families, making it self-financing is a much more daunting task.

Very few not-for-profit mHealth projects targeting poor people in the developing world currently operate at scale. This is, in part, deliberate. “The mHealth sector is filled with many projects [that] aren’t even intended to scale, since organisations have been competing on innovation and not scale,” said Jonathan Jackson, Founder and Chief Executive of Dimagi, a leading health software developer for developing countries.⁶⁵ Instead, many donors prefer to be cautious in this still nascent field, opting for pilots to demonstrate proof of concept before embarking on full-scale investments.⁶⁶

The lack of scaleable mHealth programmes for poor, rural populations may also be a function of project design. Many mHealth services remain at the pilot phase because the projects themselves rely on the target audiences using standardised phones or having a certain level of literacy. The cost of the service is also critical. If it’s too expensive for low-income communities to use, then the service may still be scaleable. But it might not reach the target group, which may be defined as those most in need.

Scale is thus directly related to the central issues of abundant handsets and appropriate technology – as highlighted earlier – as well as to cost.

Ultimately, however, the ability to move beyond ‘pilot-it’ relies on bringing a range of public and private stakeholders together in mutually beneficial, strategic partnerships.⁶⁷ BBC Media Action’s work in Bihar offers insights into a variety of ways such partnerships can be formed that foster sustainable business models – and do so at scale.

“Organisations have been competing on innovation and not scale”

The public sector: looking out for the poor

Governments are key stakeholders for the mobile health sector in the developing world, as they are the biggest customers for health products and services.⁶⁸ National and state governments may be the only players with sufficient resources to finance large-scale, long-running

mHealth services that benefit government employees or those who lack the purchasing power to pay for mHealth services themselves. Government involvement is also crucial for providing a regulatory environment in which mHealth can function and thrive.⁶⁹

Government leadership is also important, insofar as it allows mHealth initiatives to be fully integrated into wider public policy objectives. In Africa, for example, the Ugandan government is taking a lead gate-keeping role in ensuring that any and all mHealth projects complement the overall, national public health strategy and go to scale.⁷⁰ Many governments, including those in India and Bangladesh for example, have national information, communication and technology policies, which include a provision for the delivery of mHealth services to citizens.⁷¹

BBC Media Action’s Mobile Kunji is an example of a service that has been developed with a public sector business model in mind. When surveyed in the course of the project’s formative research, community health workers said they couldn’t afford to pay for the ongoing use of mobile phones required for daily family health visits. They felt the government should be required to cover the costs because it is the families who benefit from the service.

As a result, the donor agreed to cover the cost of calls to Mobile Kunji for the first year of the programme’s life-cycle.⁷² The idea was to demonstrate the efficacy of the service to the government, particularly within poor, marginalised communities that might not otherwise be able to afford mHealth services themselves.

And it worked. Thanks to health workers’ enthusiastic response to the service, and up-take rates that far exceeded projections (see Part 6), the government of Bihar agreed to cover health workers’ call costs to Mobile Kunji on an on-going basis. As the Executive Director of the State Health Society in Bihar, Sanjay Kumar, said in reference to mobiles: “Using this technology, we can build the capacity of frontline workers and also take health and nutrition facilities to the masses at the grassroots level.”⁷³

Governments have long been in the business of providing health services to the poor. mHealth represents a potentially efficient, affordable way for them to do so, particularly when it enables them to tackle enduring basic health challenges in remote, rural areas via the multiplier effects rendered through health workers. Less immediately obvious, however, is why private sector actors in developing countries would come on board to service those communities.



The private sector: what's in it for them?

There are two broad categories of private sector mHealth business models. In the first, services are provided free – or at a greatly reduced rate – with costs being partially or wholly funded by advertising or corporate sponsorship. In the second, premium rates are charged to access health information, whether via IVR, SMS, mobile internet, handset apps or call centres.

At first glance, both advertising-supported and premium rate business models would not seem to be of much use for poor, rural communities with little purchasing power like Bihar. In Bihar, for example, 53% of the population lives below the poverty line.⁷⁴

But this landscape is changing, and changing fast. A growing number of mobile operators and consumer goods companies are now looking to expand their presence in rural markets. This is because urban markets are rapidly reaching saturation for mobile subscriptions. Due to their large numbers, even poor consumers in the countryside have the potential to generate significant revenue for consumer goods companies.⁷⁵

Mobile operators and technology providers are also beginning to suspect that a segment of people with even limited purchasing power may choose to invest money – over a longer time period – in mobile services that offer real value. They are banking on the relatively poor being willing to spend more on mobile services focused on health, education and finance than those that merely provide entertainment.⁷⁶

Mobile Academy is an example of a business model that aims to achieve 100% commercialisation. Through its research, BBC Media Action learned that community health workers were willing to pay for services that they believed furthered their own skills, career prospects and job security. In light of their limited incomes, however, it was essential to set this price point at an affordable level.

That is why the entire course only costs the health worker approximately US\$1.50 to complete. This was the price that the workers themselves deemed affordable.

After much negotiation, mobile network operators agreed to subsidise Mobile Academy to a significant degree, offering some of the lowest IVR call charges in the world. Crucially, all six of India's major mobile network operators came on board. The rate obtained was up to a 70% reduction in the standard IVR rates, lower than 1 US cent per minute.⁷⁷

Mobile telephony is often a low profit margin, high-volume business. The low margin for profit per user means that the overall profit from Mobile Academy is small. The mobile operators' costs are covered, but other technology costs related to running the service are not.⁷⁸ Additional revenue streams, such as advertising and corporate sponsorship, will be required if the service is to become fully sustainable.

Mobile Academy is thus making progress towards demonstrating how project design and scale can interact to yield a potentially sustainable, commercial business model rooted in providing mobile health services to rural, low-income health workers. Technology that is appropriate to the target population, coupled with a revenue share that covers providers' costs and returns a small profit, allowed the project to bypass the pilot phase. Mobile Academy is now on track to reach the project's target of 200,000 community health workers, who in turn aim to reach almost 7 million families by December 2015.

Many mHealth services increasingly involve a hybrid business model that encompasses both public and private sector stakeholders. A common hybrid funding model involves donor funding during an initial research and development phase to test new ideas and technologies. Subsequently, the actual project is carried out in partnership with local government, mobile network operators and technology partners, with advertising increasingly being seen as an additional revenue stream that is critical to sustainability.

Above Even the most basic shop in rural India is in the mobile business.

PART 6

Evidence: does any of this actually work?

The goal of mHealth initiatives is to improve health. Because the mHealth field is still in its adolescence, there's a paucity of evidence demonstrating the impact of mHealth projects on health.⁷⁹

There are some exceptions, however. In Kenya, for example, SMS for anti-retroviral treatment medication reminders improved adherence by approximately 25% and SMSs on HIV/AIDS awareness contributed to an increase in those seeking HIV testing by nearly 40% in Uganda.⁸⁰ But the bulk of the results that are available tend to report intermediary benefits such as reach, uptake, cost savings and the improved reliability of data that comes with going from paper-based to digital formats.⁸¹ The mHealth field is in agreement on the need to provide robust impact assessments and cost-benefit analyses to help guide new investments as well as better enable scale-up and replication.

The same holds true for BBC Media Action's mHealth services in Bihar, as it is too early to report on health impact.⁸² Intermediary results are encouraging, however. In the short time that Mobile Kunji and Mobile Academy have been available (seven months at the time of writing), community health workers have taken to these services with great enthusiasm. During this period, use of these services has been eight times higher than expected.

Almost 75,000 unique users have already called Mobile Kunji, suggesting that use is going far beyond the 38,800 that have been trained directly.⁸³ Already, more than 1.4 million minutes of Mobile Kunji have

been played (each message is just over a minute long). Mobile Academy has had similar success. Considering that community health workers have to pay for Mobile Academy from their own pockets, it is impressive that 21,500 have called the service. Twenty two per cent of users have already completed the course. Just over 4,700 health workers are eligible for certificates for passing the course and trainees have accessed more than 1.7 million minutes of content.⁸⁴

In addition to these interim indicators, anecdotal evidence is also emerging on the health impact of these services. For example, one senior supervisor of community health workers in the district of Gopalganj reported a spike in women coming to the health facility.⁸⁵ The supervisor, who is also a doctor at the facility, attributed this increase in health-seeking behaviour to the more effective performance of health workers, nearly all of whom have completed the Mobile Academy course.

The team has also seen anecdotal evidence in the field that women are heeding the advice found in Mobile Kunji. One pregnant woman spoke, for example, of how she was convinced by her health worker – and Mobile Kunji – to register for free government health products and services, such as iron folic acid tablets and tetanus toxoid injections.⁸⁶

It is clear from stories such as these and the high levels of uptake that Mobile Kunji has grabbed the attention of community health workers and families in rural India. And the novelty does not seem to be waning.

Below Community health workers at a Mobile Kunji training session in Bihar, India.



BBC MEDIA ACTION



PART 7

Conclusion – mHealth as game changer

With much work still to go towards achieving the Millennium Development Goals, it's easy to embrace the lure of mobile phones as a quick fix for improving maternal health and reducing child mortality.

After all, we've long known that communication is critical to saving lives. Better access to information can stimulate demand for basic health services and help tackle negative social norms around health.

With its rapidly expanding penetration within the developing world, mobile telephony offers major new opportunities to build upon and augment existing health communication efforts. As Usha Kiran Tarigopula of the Bill & Melinda Gates Foundation India Programmes put it: "It is increasingly... clear that mobiles are an important platform and can be a game changer."⁸⁷

This does not mean that mobile phones are a panacea. There isn't – nor should there be – a one-size-fits-all approach to health communication. Indeed, a growing body of research indicates the value of a more integrated strategy, one that employs mobile platforms alongside interpersonal communication, community-based activities and mass media.

But when mHealth is embedded in a programme design that is equitable, highly-targeted and at scale, it has the potential to enable cost-effective solutions for reaching marginalised populations, many of whom lack access to essential health information and services.

This policy briefing has demonstrated how this is possible by examining one particular set of mHealth services in the Indian state of Bihar. The briefing's purpose is to crystallise some of the key lessons for those interested in applying mHealth services to similarly under-served populations elsewhere in the world.

Here are some of the main conclusions arising from BBC Media Action's analysis:

- **Do your homework.** All mHealth projects need to respond to the needs of the target group, whether that is the general public, health care workers or health system administrators. Detailed research is central to the planning and delivery of mHealth solutions. This research is critical to the selection of appropriate technology, content format (for

“It is increasingly... clear that mobiles are an important platform and can be a game changer”

example audio versus text), and the development of sustainable business models.

- **Explore ways of delivering information to existing handsets.** One of the key findings of this report is that it is possible to deliver health education to existing mobile phones effectively, using technologies such as IVR. Indeed, basic handsets that are already abundant within the developing world can be leveraged readily, inexpensively and at scale.
- **Content is king, but it must be localised and engaging.** In order to endure, content needs to be culturally resonant.
- **Size matters.** Commercial players are beginning to recognise that even at low charges, a large – albeit poor – rural market may eventually generate considerable revenue due to scale. And even if these markets don't directly generate huge profits, mobile services could still serve as valuable channels for data capture and future advertising revenue.
- **Public and private sector partnerships underlie sustainability.** Successful mHealth initiatives will leverage both private and public sector resources and will engage constructively with all relevant stakeholders to ensure synergies, resource sharing and the creation of sustainable solutions.
- **We need to understand how and why change happens.** It is clear that mHealth is a potential game changer, but not everywhere and not in all contexts. Developing a theory of change of why mHealth has value in different settings and contexts is key. Like any other tool for development, mHealth services also need to be rigorously assessed for reach, impact, sustainability and replicability. As the field progresses, more effort must be made to do impact assessments and cost-benefit analyses.

“There will be mistakes with the introduction of any new technology. The nature of innovation is that it is uncharted and, as such, there are risks. But the potential and excitement is there**”**

innovation within the field of mHealth, all of which also present challenges:

- **Replication.** As more and more mHealth projects begin to demonstrate efficacy at scale, there will be a desire to replicate these models in other areas of the world. This is to be encouraged, but only if content is carefully targeted to factor in local contexts. There are, however, challenges scaling up and replicating good programmes in new geographies. Critically, these include a limited supply of a skilled mHealth workforce.

• **Integration.** As noted earlier, the wave of the future would seem to be health's potential to offer integrated healthcare delivery systems which combine elements of both demand and supply. In some ways, the benchmark for just how transformational mobiles will be is whether – and to what extent – they can be seamlessly integrated into health management information systems that track health behaviours, even while also creating a demand for such services.

• **Extension.** The potential to extend the sort of technological innovation foregrounded in this paper – ie, mobile content and delivery mechanisms that can reach the poor – exists in other development sectors as well, such as agriculture, education and finance. The emerging field of mGovernance offers a particularly compelling example in this regard. On the supply side, mobiles are being used to provide people with basic information about local and national politics via SMS and voice-based communication software. On the demand side, quite basic mobile phones are being used for accountability ends as diverse as monitoring elections, improving service delivery and tackling corruption at the local level.⁸⁸ Here, too, however, issues of scale need further consideration.

As Pratap Vijay Sai, Account Director at OnMobile Global Ltd, summarised the future of mHealth: “There will be mistakes with the introduction of any new technology. The nature of innovation is that it is uncharted and, as such, there are risks. But the potential and excitement is there.”⁸⁹

Endnotes

- ¹ Eight international development goals along with measurable targets were established at the Millennium Summit of the United Nations in 2000. The goals are: (1) eradicating extreme poverty and hunger, (2) achieving universal primary education, (3) promoting gender equality and empowering women, (4) reducing child mortality rates, (5) improving maternal health, (6) combating HIV/AIDS, malaria, and other diseases, (7) ensuring environmental sustainability, and (8) developing a global partnership for development. See <http://www.un.org/millenniumgoals/>.
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- ¹² MDG Fact Sheet (2010).
- ¹³ Wakefield, M, Loken, B and Hornik, R. (2010) Use of mass media campaigns to change health behaviour. *The Lancet*, 376 (9748), 1261–1271; Bertrand, J, Babalola, S and Skinner, J. (2012) The Impact of Health Communication Programs. In: Obregon, R and Waisbord, S. (eds). *The Handbook of Global Health Communication*. Oxford, UK: Wiley-Blackwell, pp 95–120.
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- ¹⁶ BBC Media Action. *Improving Maternal and Child Health in Nepal Ghar Aagan radio programme Endline Report: 2012 August*. Kathmandu and London. BBC Media Action conducted baseline (2009) and endline (2012) surveys of knowledge, attitudes, and practices related to maternal and child health in 26 districts; sample size n=2,300 at both baseline and endline; respondents 15-49 years of age, 50% male and 50% female; survey samples selected independently of each other and proportionate to population size in rural and urban clusters. Among the survey respondents, the Ghar Aagan listeners were younger, married, and more likely to have had a secondary or higher level of education than were non-listeners. .
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- ²⁴ Interview with the lead author, Washington, DC, USA, 3 December 2012.

- ²⁵ Examples include Child Count+ by the Millennium Villages Project, which registers births and tracks care in five African countries. Supply chain management examples include SMS for Life in Uganda. See The Center for Innovation & Technology in Public Health Public Health Institute. (2012) *Leveraging mobile technologies to promote maternal & newborn health: The Current Landscape & Opportunities for Advancement in Low-Resource Settings*. Oakland, California: mHealth Alliance, pp 19, 23. Changamka is a micro-health insurance mobile service in Kenya – see Qiang, CZ, Yamamichi, M, Hausman, V et al. (2012) *Mobile applications for the health sector*. Washington, DC: ICT Sector Unit, World Bank, p10.
- ²⁶ Irish Global Health Education Innovation Institute (iheed). (2011) *mHealth Education: Harnessing the Mobile Revolution to Bridge the Health Education and Training Gap in Developing Countries*.
- ²⁷ Examples include: BBC Media Action's condom ringtone in India (see Frank, LB, Chatterjee, JS, Chaudhuri, ST et al (2012): Conversation and Compliance: Role of Interpersonal Discussion and Social Norms in Public Communication Campaigns. *Journal of Health Communication: International Perspectives*, DOI:10.1080/10810730.2012.665426); For frontline SMS reporting and monitoring avian flu outbreaks, see: Vital Wave Consulting. (2009) *mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World*. Washington, DC and Berkshire, UK: UN Foundation-Vodafone Foundation Partnership, p59.
- ²⁸ BabyCenter also reaches over 32 million moms monthly in 22 markets from Australia to India to China: See <http://www.babycenter.com/help-about-company>.
- ²⁹ See <http://www.grameenfoundation.org/press-releases/grameen-foundation-and-babycenter-join-forces-support-mobile-healthcare-initiatives-d> and <http://healthunbound.org/mama/>.
- ³⁰ Save the Children. (2011) *No Child out of Reach: Time to end the health worker crisis*. London: Save the Children UK, p13.
- ³¹ BBC Media Action. *District Coordinator's Monthly Report*: September 2012. Patna, India.
- ³² Irish Global Health Education Innovation Institute (iheed). (2011) *mHealth Education: Harnessing the Mobile Revolution to Bridge the Health Education and Training Gap in Developing Countries*, p23.
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- ³⁴ Rita Devi, ASHA Health Worker. BBC Media Action (2012) *District Coordinator's Monthly Report*: September 2012. Begusarai, India.
- ³⁵ Sachs, JD. (2012) mHealth Summit. Address. 5 December. Washington, USA: The Gaylord National Resort and Convention Center.
- ³⁶ Interview with the lead author, New York, USA, 15 December 2012.
- ³⁷ The maternal mortality ratio is 305 per 100,000 births, while the neonatal mortality rate is 35 per 1000 live births and infant mortality rate 55 per 1000 live births. See http://censusindia.gov.in/vital_statistics/AHSBulletins/files/07-Bihar_AHS_Bulletin_23x36_.pdf. Bihar's total fertility rate is the highest in the country. See Sample Registration System Statistical Report 2010, http://www.censusindia.gov.in/vital_statistics/srs/Chap_3_-_2010.pdf p48.
- ³⁸ Census of India, *Annual Health Survey of 2010-11*.
- ³⁹ The Annual Health Survey 2011 figures report that 47.7% women delivered in a health facility. Census of India. *Annual Health Survey of 2010-11*.
- ⁴⁰ BBC Media Action *Shaping Demands and Practices Benchmarking Survey 2012*. Estimation derived from India Census 2011, Indian Readership Survey 2012 Q-I Data.
- ⁴¹ There are three cadres of community health workers: Auxiliary nurse midwives (ANMs), Anganwadi Workers (AWWs) and Accredited Social Health Activists (ASHAs). The ANM operate out of a health centre serving a population between 3000-5000 people. The ASHA and AWW operate at the village level and serve a population of 1000 households.
- ⁴² This is true of both the phones held by community health workers as well as the families themselves. BBC Media Action (2012). *Shaping Demand and Practices Mobile User-testing Reports* (2011, 2012).
- ⁴³ 6.9 million women in Bihar will be pregnant or have a child under the age of 2 between 2013 and 2014, as per the Government of India's 2011 Census. BBC Media Action *Shaping Demands and Practices Benchmarking Survey 2012*. Estimation derived from India Census 2011, Indian Readership Survey 2012 Q-I Data.
- ⁴⁴ OnMobile is the 'aggregator' – i.e. a technology company that acts as an intermediary between content providers and the mobile operators. It enables mobile services to be made available across multiple operators. In India, OnMobile aggregates content and services across all the major operators in the country and provides the IVR platform that powers Mobile Kunji, Academy and Kilkari to BBC Media Action (see part 4).
- ⁴⁵ BBC Media Action *District Coordinator's Monthly Report*: September 2012. Khagaria, India.
- ⁴⁶ Alethea Clark-Lodge. Programme Manager, Public Private Partnerships, Microsoft. (2012) Special joint meeting of the Second and Third Committees of the UN General Assembly on "Communication for development: Using ICT and broadband to accelerate social and economic development". Address. 12 November. New York, USA: Economic and Social Council Chamber, UN.
- ⁴⁷ This number increases to 23% for women in Africa, 24% in the Middle East and 37% in South Asia. GSMA Development Fund, The Cherie Blair Foundation for Women and Vital Wave Consulting. (2010) *Women and Mobile: A Global Opportunity*. London: GSM Association, p6.
- ⁴⁸ BBC Media Action. *Kilkari User-testing Report*, November–December 2012.
- ⁴⁹ It's also possible that by disrupting existing gender dynamics, mobile phones might aggravate social tensions. In some villages, for example, it might not be acceptable for a female health worker to have a more advanced phone than her husband, let alone a community leader. This socio-political dimension of mHealth – particularly with respect to the question noted here of choosing basic vs. smart phones – is an interesting avenue for future research.
- ⁵⁰ This price could perhaps have been reduced by negotiating discounts with the handset manufacturer. But that wouldn't have solved the cost problem stemming from the additional inputs noted above.
- ⁵¹ Interview with the lead author, New York, USA, 7 January 2013. Rubinstein is also Special Advisor to Jeffrey D. Sachs.
- ⁵² For examples, see Lemaire, J. (2011) *Scaling up mobile health: elements necessary for the successful scale up of mHealth in developing countries*. Geneva: Advanced Development for Africa, pp15–24 and Vital Wave Consulting. (2009) *mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World*. Washington, DC and Berkshire, UK: UN Foundation-Vodafone Foundation Partnership.
- ⁵³ Specifically, while the majority of men had owned a phone for a little more than a year, the majority of women had been using a phone for less than four months.
- ⁵⁴ Anyone who has called a customer care line or used telephone banking will have used IVR. It enables people to listen to recorded audio content by dialing a number from any type of phone (including a landline) and interact with this content by pressing numbers on their phone. IVR has its roots in tone dialing technology that was first launched in 1961, and became a ubiquitous call centre technology in the 1990s.
- ⁵⁵ Cherie Blair. (2012) Women Leaders Forum: Connecting Women and Youth for Digital Development. Address. September 24. New York, USA: Yale Club of New York.

- ⁵⁶ Interview with the lead author, New Delhi, India, 19 December 2012.
- ⁵⁷ mHealth projects such as the Millennium Villages Project in sub-Saharan Africa and FrontLine SMS in Uganda illustrate the challenge of designing and delivering content even when working from pre-existing community health manuals. See Irish Global Health Education Innovation Institute (iheed). (2011) *mHealth Education: Harnessing the Mobile Revolution to Bridge the Health Education and Training Gap in Developing Countries*, p30.
- ⁵⁸ This SEC classification of Indian consumers is based on type of home (temporary versus permanent), occupation and education. (The calculations are slightly different for urban and for rural areas: the urban SEC grid uses education and occupational level of the chief wage earner; the rural SEC grid uses education and type of house as measures of socio-economic class and segments rural India into four groups: R1, R2, R3, R4.) Source: BBC Media Action. (2012) *Shaping Demands and Practices Benchmarking Survey 2012*. New Delhi, India. Estimation derived from India Census 2011, IRS 2012 Q-I Data.
- ⁵⁹ Access to television and radio is defined as having watched either medium in the last week at the time of the survey. BBC Media Action. *Shaping Demands and Practices Benchmarking Survey 2012*. Estimate derived from India Census 2011, Indian Readership Survey 2012 Q-I Data.
- ⁶⁰ Interview with the lead author, New York, USA, 30 November 2012.
- ⁶¹ Examples of mHealth solutions that use games and quizzes include ZMQ India, Young Africa Live Kenya and Text to Change Uganda.
- ⁶² Dr Anita also features on a local radio show. Re-versioning of content through a variety of communication channels helps to reinforce key health messages. It also helps extend reach among those lacking access to one or more communication channels.
- ⁶³ BBC Media Action. *Mobile Academy User Test Survey*, September–October 2011.
- ⁶⁴ These costs may include the mobile operators' network costs, technical infrastructure and support, IVR, SMS and data charges, replacement of handsets, updating content, promotion, etc.
- ⁶⁵ Interview with the lead author, Washington, DC, USA, 3 December 2012.
- ⁶⁶ Qiang, CZ, Yamamichi, M, Hausman, V et al. (2012) *Mobile applications for the health sector*. Washington, DC: ICT Sector Unit, World Bank, p12.
- ⁶⁷ Chamberlain, C. (2012) Pilot-itis: What's The Cure? BBC Media Action blog, 20 June. Available from: <http://www.bbc.co.uk/blogs/bbcmciaaction/posts/Pilot-itis-Whats-the-cure-> [Accessed January 2013]. See also: ExpandNet. World Health Organization. (2010) *Nine Steps for Developing a Scaling-Up Strategy*. Geneva: World Health Organization, ICT Sector Unit. (2012), pp12–13, 52–54; Vital Wave Consulting. (2009) *mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World*. Washington, DC and Berkshire, UK: UN Foundation-Vodafone Foundation Partnership, pp37–38.
- ⁶⁸ Qiang, CZ, Yamamichi, M, Hausman, V et al. (2012) *Mobile applications for the health sector*. Washington, DC: ICT Sector Unit, World Bank, p13.
- ⁶⁹ For example, governments are needed to develop legal guidelines around privacy and confidentiality in mHealth specifically, and around the availability of broadband more broadly.
- ⁷⁰ See ICTworks. A Ugandan mHealth Moratorium Is a Good Thing. <http://www.ictworks.org/news/2012/02/22/ugandan-mhealth-moratorium-good-thing>. [Accessed January 2013].
- ⁷¹ See Singh, PV. (2011) 'Sibal holds consultation on draft national ICT policy 2011', *Governance Now*, June 15, [Accessed January 2013], <http://www.governancenow.com/gov-next/egov/sibal-holds-consultation-draft-national-ict-policy-2011>.
- ⁷² The donor is the Bill & Melinda Gates Foundation.
- ⁷³ Dubey, B. (2012) 'Mobile phones for 2 lakh health workers', *Hindustan Times*, 13 October, p3.
- ⁷⁴ Report of the Expert Group to Review the Methodology for Estimation of Poverty. 2009. Government of India: Planning Commission.
- ⁷⁵ Private sector players also recognise that in countries where very little consumer profile data exists, even heavily-subsidised or free mobile services which capture accurate consumer data have huge value. Due to the relatively high cost and low reach of television advertising in rural areas, mobile services can act as a targeted, effective advertising channel.
- ⁷⁶ Based on confidential interviews with the authors.
- ⁷⁷ This tariff covers the operators' cost of delivering the services (including taxes) and generates revenue. Revenue is shared between the mobile operators, the technology platform provider and BBC Media Action. (As a registered non-profit, BBC Media Action puts all 'profit' towards covering operating and set up costs.) BBC Media Action has also invested in a technical infrastructure that enables advertising to be played around the audio content. It is now in the process of exploring how much — or little — advertising would be acceptable to the users of Mobile Academy, and whether revenue from this advertising might enable BBC Media Action to reduce the cost of the course even further.
- ⁷⁸ At this point in time, the cost of the IVR platform, which is owned and supported by OnMobile, is not covered by the revenue generated by Mobile Academy.
- ⁷⁹ Tatalović, M. (2013) 'Mobile phones may not solve health challenges in poor countries', *The Guardian*, 16 January, [Accessed January 2013], <http://www.guardian.co.uk/global-development/2013/jan/16/mobile-phones-health-challenges-poor-countries>.
- ⁸⁰ The Kenya example can be found in Ernst & Young. (2012) *mHealth Mobile technology poised to enable a new era in health care*, p6. Uganda example in Vital Wave Consulting. (2009) *mHealth for Development: The Opportunity of Mobile Technology for Healthcare in the Developing World*. Washington, DC and Berkshire, UK: UN Foundation-Vodafone Foundation Partnership, pp11, 15. For other examples, see Earth Institute. (2010) *Barriers and Gaps Affecting mHealth in Low and Middle Income Countries: A Policy White Paper*. Washington, DC: mHealth Alliance, p20; Qiang, CZ, Yamamichi, M, Hausman, V et al. (2012) *Mobile applications for the health sector*. Washington, DC: ICT Sector Unit, World Bank, p47; Lemaire. (2011), p24.
- ⁸¹ Earth Institute. (2010) *Barriers and Gaps Affecting mHealth in Low and Middle Income Countries: A Policy White Paper*. Washington, DC: mHealth Alliance, p12.
- ⁸² The first round of impact results will be available in mid 2013.
- ⁸³ Early research findings suggest that health workers are sharing the short codes with families, who are then calling the numbers themselves.
- ⁸⁴ BBC Media Action Online Reporting Interface for May–November 2012.
- ⁸⁵ This is in reference to the cadre of female community health workers called 'ASHAs' (Accredited Social Health Activists). ASHAs are selected from the villages themselves and are accountable to them. They are trained to work as an interface between the community and the public health system. Gopalganj, for example, has 120 community health workers, 110 of whom have completed the Mobile Academy course.
- ⁸⁶ Dutt, P. (2013) 'A mother's wisdom', BBC Media Action blog, 4 January, [Accessed January 2013], http://www.bbc.co.uk/blogs/bbcmciaaction/posts/india_blog_priyanka_dutt_mobile_kunji
- ⁸⁷ Interview with the lead author, New Delhi, 19 December 2012.
- ⁸⁸ See for example United Nations Development Programme. (2012) *Mobile Technologies and Empowerment: Enhancing Human Development through Participation and Innovation*. New York, NY: UNDP Bureau for Development Policy.
- ⁸⁹ Interview with the lead author, New Delhi/Bangalore, India, 19 December 2012.

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