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A Mobile Guide Toward Better Health
How Mobile Kunji Is Improving Birth Outcomes in Bihar, India

Innovations Case Narrative:
Mobile Kunji (Mobile Guide)

The state of Bihar in northern India—poor, rural, and populous—has some of the highest maternal and child mortality rates in the world.[1] With a population larger than that of Western Europe and a limited infrastructure, reaching the state's 27 million women of childbearing age is a daunting task.

The Ananya Program—a collaboration between the Bihar state government and the Bill & Melinda Gates Foundation—aims to reduce maternal and infant mortality in the state significantly by December 2015. BBC Media Action's role in Ananya is to communicate life-saving information and help to shape healthy behaviors that tackle the main causes of maternal, newborn, and child deaths.

BBC Media Action uses media to inform, connect, and empower people in more than 20 countries in Africa, Asia, the Middle East, and Central and Eastern Europe. Media Action, which reaches over 200 million people globally, has worked for more than 15 years in India on a wide range of projects focused on gender, labor rights, disaster preparedness, the environment, HIV/AIDS, TB, and maternal and child health.

The Ananya Program asked BBC Media Action to tackle 11 priority behaviors among rural women: (1) institutional delivery; (2) safe delivery at home with a skilled birth attendant; (3) preventive postnatal care; (4) skin-to-skin/"kangaroo" care; (5) early and exclusive breastfeeding; (6) age-appropriate complementary

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feeding; (7) postpartum family planning; (8) immunization compliance; (9) handwashing at critical times; (10) childhood diseases, malaria, diarrhoea, and pneumonia; and (11) open defecation. To do this, BBC Media Action has developed a comprehensive range of communication interventions, including mobile health services for both families and Bihar's 200,000 front-line workers (FLWs), which have become central components of the program.

Providing standardized, high-quality training and support to the hundreds of thousands of rural women FLWs in India and changing the health behavior of millions of low-literacy or illiterate pregnant women and mothers are significant public health challenges.

One of the BBC's key values is to ensure that "our audiences are at the heart of everything we do." What this means in practice is that audience research is critical to the development of our behavioral change communications strategies. We begin our strategic thinking process with formative research, including desk research and primary quantitative and qualitative research. Once we've arrived at a concept, we test it, usually by developing prototypes and testing them via an iterative user-centered design process.

Providing standardized, high-quality training and support to the hundreds of thousands of rural women FLWs in India and changing the health behavior of millions of low-literacy or illiterate pregnant women and mothers are significant public health challenges. In Bihar, we began by conducting a baseline survey of more than 6,568 people in Bihar, and both a quantitative and a qualitative mobile landscaping survey with men and women and FLWs age 15 to 49.[2]

INFANT MORTALITY IN INDIA: A DAUNTING CHALLENGE

The effort to reduce maternal and newborn mortality and improve women's and children's health has been central to the government of India's Reproductive and Child Health Program, which has attempted to improve both the availability of and access to quality health care. Despite these efforts, India's maternal and infant mortality rates remain below the targets of the UN Millennium Development Goals.

India currently has a maternal mortality rate target of 109 per 100,000 live births; based on the historical pace, this rate is expected to be 139 by 2015.[3] The targeted under-five mortality rate is 42 per one thousand live births; the projected rate by 2015 per the historical trend is 50.[4] At the current pace, deliveries by skilled personnel are likely to reach 62 percent by 2015, which will fall significantly short

of universal coverage. Rural populations and the urban poor suffer disproportionately high maternal and infant mortality rates, and they also are significantly less likely to have access to skilled personnel to support their deliveries.

The increased uptake of prenatal services, attended deliveries, and essential newborn care and postnatal care practices are urgently needed to lower infant and maternal mortality rates and achieve the MDG targets. Improving FLWs' capacity to support families effectively, and to influence both the drivers of and barriers to the adoption of positive reproductive, newborn, maternal, child, and health behaviors by families and communities, shift negative social norms, and improve risk perceptions, is critical to this process.

FLWs face a number of constraints in providing support to families, including, most critically, having limited time to build their skills on an ongoing basis. Some live far from centers of learning and lack the financial means to travel, while others have family obligations that prevent them from accessing formal training programs. Most also have financial constraints and large workloads that make significant demands on their time.

THE PROMISE OF MHEALTH

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

In so doing, mobiles have the potential to integrate the supply side of health systems (HIV diagnostics, vaccination registration, TB medication reminders, etc.) with the demand side (promoting healthy behaviors and the uptake of health services among the population). Many donors and governments are therefore justifiably eager to invest in providing high-tech handsets to health workers, such as feature phones or smartphones capable of hosting content and applications that can deliver clinical services and track patient data. This integrative mHealth model has the potential to transform health service delivery in the long term. However, such projects are challenging to scale because they require considerable financial resources, and they are difficult to support and maintain.

Thanks to the significant penetration of mobiles in rural India, the scale of the opportunity mHealth offers is huge. BBC Media Action's primary research found that 80 percent of men and women age 15 to 49 in Bihar have access to a mobile phone; 63 percent of men and 32 percent of women of childbearing age own their own phone; 85 percent of FLWs own their own phone; and nearly 100 percent of FLWs have access to a mobile phone in their immediate family.

Nevertheless, the challenges are immense: the majority of handsets are second-hand "grey market" phones that are often damaged; most have a tiny black-and-white screen and no memory card. The majority of phones don't support the

local language font, and the operating systems are in English, Chinese, or Arabic. As a result, technical literacy levels are very low; our research found that only 9 percent of men and women in Bihar in the 15-49 age group have ever sent an SMS. Language literacy is also very low; 70 percent of women in rural Bihar are illiterate. Due to all these factors, use of mobile phones, particularly among women, is generally limited to receiving and making calls.

However, it's easy to overlook the tremendous value and cost-effectiveness found in services that can make the most of the limited phones most families and community health workers have, no matter how basic. This is particularly relevant in resource-poor areas like Bihar, where the population often lacks the technical and language literacy needed to read and create text messages.

Given the lack of literacy and technical capacity among the general population and the FLWs in Bihar, BBC Media Action identified interactive voice response (IVR) as the most appropriate technology for the target population. IVR is a well-established technology used around the world to provide automated voice services to mobile phone users.

IVR FOR AN ILLITERATE POPULATION

IVR is well-suited to a population with the demographics found in Bihar. First, because IVR services do not require that any software applications or content be installed on a handset, they can be accessed from any phone. Second, using most IVR services requires only minimal technical skills, such as the ability to dial a number and to press numbers on the phone in response to audio instructions. Third, the IVR content is audio, thus a user need not be literate. In many cases, poor rural mobile phone users are already being exposed to IVR when they use automated customer service lines or "top up" their mobile phone with pre-paid credit.

IVR calling costs are not insignificant. However, when we began to develop business cases for scaling different types of mobile-based service to 200,000 FLWs in Bihar, we found IVR to be less operationally challenging, less risky, and less expensive than procuring 200,000 new handsets, which would have required developing and installing software and audio-visual content on the new handsets; training FLWs how to use them and providing ongoing technical support to the FLWs (who have a habit of deleting or over-writing the content on their memory cards); replacing handsets when they are stolen, lost, or broken; and providing a data package that would track software and content usage and transmit data the FLWs capture on the handsets to a central database. The cheapest viable retail data package currently available in Bihar is INR 155 (US $2.58) per person per month.[5] Thus it would cost approximately $516,666 to provide 525 MB of connectivity to 200,000 FLWs for 28 days.

One fundamental drawback of IVR is that it has no visual element, and educational efforts around the world have made it clear that having audio-visual content is more powerful than audio content alone.

When we realized that the economics and logistics of handset distribution, maintenance, and support at scale were not viable in the context of our work and budget, we initially thought of producing flipcharts for FLWs, an approach that has been used by governments and NGOs in India for a decade. However, research showed that FLWs in Bihar have to walk long distances to conduct their work and are not willing to carry flipcharts. We also considered whether FLWs would be willing to carry a larger purse, one in which a small flipchart would fit, if the bag was supplied by the project. However, we found that the FLWs were attached to their purses and were not willing to give them up for a standardized bag. Their purses were already bulging with personal items, so there was no way to cram in a flipchart.

At the time, we were also investigating FLWs' ability to navigate IVR menus. I already knew from my experience developing and managing IVR mobile services in Bangladesh that low-literate, low-income rural people find it difficult to interact with complex IVR menus. The same proved true in Bihar, where we found that 20 percent of FLWs had interacted with IVR menus in the past, but almost exclusively to call a customer care line (only 2 percent had used a value added service), and their experience had been poor. This finding is hardly unique; I would argue that frustration with poorly designed, overly complex IVR navigation is close to a universal experience. Our research found that FLWs had difficulty recalling and navigating more than 3-4 options, and that submenus caused confusion. This left us in a tricky position, because of the number of priority behaviors and simple, doable actions BBC Media Action had to communicate.

After many weeks of research, lunchroom discussions, and the occasional argument, we concluded that neither a print-based flipchart nor a mobile service requiring complex IVR menus would work in Bihar. Finally we thought of combining them. For some time we'd played around with the idea of using a deck of cards instead of a flipchart, which we had done in previous projects. After one particularly frustrating session trying to figure out how an IVR menu might work, we considered whether it would be possible to get a different mobile shortcode for every card that would be common across six mobile operators. Like a fool, I agreed to try, and thus the concept of Mobile Kunji was born.

MOBILE KUNJI: IVR PLUS ILLUSTRATED CARDS WITH SHORTCODES

Mobile Kunji—*kunji* means a guide or key in Hindi—is an audio-visual job aid used during counseling sessions with families. The content aims to redress long-standing misconceptions and negative social norms around health-related maternal and child behaviors. It covers the 1,000 day period from conception until the child is two years old.

Mobile Kunji includes both an IVR-based mobile service and a printed deck of illustrated cards held on a ring, which together provide essential audio-visual information on pregnancy and newborn health. The cards are made of durable, lightweight credit card material and are about the size of a large smart phone.

They are color coded and grouped by color according to the stages in the 1,000-day timeline.

Each card has a colorful illustration on the front and talking points on the back that remind the FLW what she needs to cover. In each counseling session she uses the cards relevant to the woman's stage of pregnancy, or to a child's age. A unique shortcode, a seven-digit mobile number, is printed at the bottom of every card. During a session, the FLW dials the shortcode and puts her phone on speaker mode so that she and the family being counseled can hear the content, or she gives the phone to the client. The content is delivered in the authoritative yet sympathetic voice of a woman doctor, "Dr. Anita." It is designed to be engaging and conversational, while also reinforcing the health message illustrated on the card.

By printing the shortcodes on the bottom of each card, no navigation of menus is required. Calls to Mobile Kunji are free and can be made from any mobile handset. Because the cards are made of waterproof material that can't be torn, each deck has an estimated shelf life of four years or more. A deck of Kunji cards costs approximately INR 290 (US $5). At current rates, Mobile Kunji calls cost approximately INR 13 (21 cents) per FLW per month.

BBC Media Action's mobile services are powered by an m-Health application called Mobile Technology for Community Health, a modular open-source software project. It was originally designed for mobile health but can also be used outside the health domain.[6] It allows organizations to use mobile technology to communicate information to patients, collect data, alert caregivers to a patient's status, and schedule caregivers' work. The modular system allows organizations to choose among multiple mHealth technologies and enables users to share data.

BBC Media Action was able to launch Mobile Kunji at scale, thanks to partnerships with all the major mobile network operators in India, which account for more than 90 percent of the mobile market in Bihar.[7] After nine months of contractual negotiations, 41 common shortcodes and tariffs were agreed to with all participating MNOs, which ensured ease of use and standardized access across mobile networks. All six MNOs reduced the cost of a standard commercial IVR call by 90 percent, a subsidy that currently amounts to over US $1.1 million.

MOBILE KUNJI IN THE FIELD

Mobile Kunji was introduced to 38,512 accredited social health activists (ASHAs) in eight priority districts in Bihar during a three-day training program rolled out between May and November 2012.

Over the last two years, Mobile Kunji has been accessed by more than 182,000 unique users, who have played 8.6 million minutes of critical health content. As of May 2014, more than 35,000 unique users in the Ananya Program's eight priority districts were using Mobile Kunji every month, playing a total of more than 600,000 minutes of content.

Our experience in Bihar has shown that Mobile Kunji gives ASHAs credibility in their communities and empowers them to engage effectively with families—and

Ananya Midline Evaluation Survey

The Ananya midline evaluation survey, carried out by Mathematica Policy Research in 2014, addresses several elements of the original Ananya theory of change, including improving the skills and performance of FLWs to drive coverage, service uptake, and behavioral change.

The analysis specifically examines the quantity and quality of FLW household interactions: advice given, tools used, and duration of visits; estimated changes in health practices/behaviors between the baseline and midline; and correlations between FLW household interactions and behaviors implied by the theory of change. It also examines the correlation between exposure to behavior change messages and actual behaviors. Mobile Kunji is just one of the many interventions the survey covered.

The Ananya midline evaluation survey uses a comparison group design to assess impact. A comparison group is required to ensure that changes in the focus districts are not just trends. The survey compares changes in key outcomes in eight focus districts to changes in the 30 non-focus districts between early 2012 and early 2014; this reveals the "difference-in-differences" in the estimated change between the baseline and midline in the focus and non-focus districts. Standard errors are adjusted to account for clustering. The comparison group design relies on baseline and midline household data that includes:

The baseline household data, collected between January and April 2012, from a total of 13,069 women. The survey compared a representative sample of women who gave birth in the previous 12 months, the focus of Ananya interventions, with similar women from the non-focus districts.

The midline household data collected between January and April 2014, which includes women who gave birth in the previous 12 months from the same villages covered in the baseline. They included 12,015 mothers of 0- to 11-month-old children and 2,549 mothers of 12- to 23-month-old children.

The midline also adds a smaller sample of mothers of 12- to 23-month old children for immunization and anthropometry measures.

thus to deliver and promote valuable health information. In acquiring knowledge and skills, the ASHA's status in the community rises and they gain respect as knowledgeable professionals.

Madhumala Devi, an ASHA in Mahadev Matha, says, "The recorded voice of Doctor Anita that I play out on my mobile has won [the people's] trust." She recounts how a reluctant woman in her village agreed to take zinc tablets after listening to Mobile Kunji. Madhumala's proud brother-in-law, who is a homeopathic doctor in the village, told us, "Nowadays, wherever she goes, even if it is to the local market, people come to her and ask for health advice." Manju Mehta, an ASHA in Bihar's Saharsa District, says, "People earlier might even say to me, 'We don't believe you; you are doing this just to earn money,' but now when I visit fam-

ilies along with my Mobile Kunji, they pull out chairs, invite me to sit, and gather around me."

EARLY IMPACT DATA: MOBILE KUNJI CHANGING BEHAVIOR

Early data from Bihar shows a strong positive correlation between the rollout of Mobile Kunji and changes in specific health behaviors. The Ananya midline evaluation survey[8] (see sidebar) carried out by Mathematica Policy Research found that almost 40 percent of the women who had received a home visit from an FLW in the previous six months had been exposed to Mobile Kunji. The research also found that households exposed to Mobile Kunji typically received longer home visits from FLWs (15 minutes on average, compared to 10 minutes in non-exposed households), although the two are not necessarily causal. This is welcome news, given that there was concern that the use of Mobile Kunji might shorten home visits. Longer home visits could be assumed to be beneficial because they allow the FLW to communicate more information and answer more questions. The research also found that use of other Ananya tools, such as the complementary feeding bowls,[9] uterus models, and IUDs, was 7-10 times more likely if the FLW was using Mobile Kunji.[10]

Most importantly, the midline research found that, among pregnant women exposed to Mobile Kunji in the period examined, there was a 28 percentage point increase in the number who prepared for birth (arranged transport, identified a hospital in case of emergency, saved critical phone numbers, saved money) over those who had not been exposed.[11] It found further that mothers of children 6-11 months old who were exposed to Mobile Kunji had a 13.5 percentage point increase in the practice of complementary feeding.[12] However, the use of Mobile Kunji was not found to be significant for certain behaviors, particularly where the adoption of the behavior was intrinsically linked to supply side management, such as facility delivery and immunization.

The Ananya midline research established that exposure to Mobile Kunji adds substantial value in predicting behavior change, especially for birth preparedness and complimentary feeding. In the Ananya baseline survey, Mathematica estimated that only 23.6 percent of women in the program's eight priority districts had prepared for the birth of their child. In the midline survey, it was predicted that, if all of the pregnant women in the eight districts had been exposed to Mobile Kunji in the six months prior to the midline, it is highly probable that the percentage who effectively prepared for the birth of their child would have increased to more than 43 percent—an increase of 19.7 percent over the baseline.[13] The Mathematica research found a similarly high probability that, if mothers of 6- to 11-month-old children had been exposed to Mobile Kunji, the number practicing complementary feeding would have increased from 65.4 percent to almost 77 percent—an increase of 11.5 percent over the baseline. At the 1 percent level, both of these increases are statistically significant. However, the following caveats should be noted: these are correlational analyses, and not necessarily causal; Mobile Kunji

exposure might be a proxy for general FLW ability or effectiveness; exposure is general–and not linked to specific advice. Reverse causality also needs to be considered–i.e. those adopting behavior may be less likely to need visits.

Further research in understanding when FLWs use Mobile Kunji, with which women, and what the quality of that engagement looks like will be invaluable. BBC Media Action has contracted IMRB to conduct qualitative and quantitative research to explore different Mobile Kunji use case scenarios, and the impact of Mobile Kunji and Mobile Academy on changes in knowledge, attitudes, self-efficacy, social norms, and specific practices.[14] The results are due in November 2014.

The Mathematic midline evaluation concludes that exposure to Mobile Kunji adds substantial value in predicting behavior, is strongly correlated with delivery preparation and complimentary feeding, and also serves as a good complement to other job aids and tools used by FLWs.

Among pregnant women exposed to Mobile Kunji in the period examined, there was a 28 percentage point increase in the number who prepared for birth than those who had not been exposed.

PAN-INDIA EXPANSION OF MOBILE KUNJI

Due to the unprecedented takeup and sustained use of Mobile Kunji in Bihar, the service has recently been launched in the state of Odisha, with the support of the National Health Mission (NHM) and the UK Department for International Development. NHM is providing all 58,000 ASHAs, auxiliary nurse midwives, and male health workers in the state with unlimited free calls to Mobile Kunji through a direct agreement with the government mobile operator, BSNL.

The services also will be launched in Uttar Pradesh in the fall of 2014, with the support of the NHM in Uttar Pradesh and the Bill & Melinda Gates Foundation. In Uttar Pradesh, NHM has signed a direct agreement with BSNL to provide 60 minutes of free usage per FLW per month to all 143,000 ASHAs and auxiliary nurse midwives for five years. The Uttar Pradesh government has agreed to cover the cost of printing the Kunji cards. Requests to launch Mobile Kunji services have come from a number of other state governments.

In August 2014, the Indian government's Ministry of Health and Family Welfare (MoHFW) approved the pan-India rollout of Mobile Kunji.[14] BBC Media Action and the Bill & Melinda Gates Foundation have been working closely with the MoHFW to develop a strategy for scaling the services. The Gates Foundation and BBC Media Action, in partnership with the Grameen Foundation and

Dimagi, will develop a national toll-free platform for BBC Media Action's three mobile health services for the MoHFW, which has agreed to make all three services toll free throughout India.

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1. The maternal mortality rate is 305 per 100,000 births, while the neonatal mortality rate is 35 per 1,000 live births; the infant mortality rate is 55 per 1,000 live births. Office of the Registrar General and Commissioner of India, "Annual Health Survey 2010-2011." Government of India, Ministry of Home Affairs, Census of India, 2012. Available at 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; "Registration System Statistical Report 2010." Available at http://www.censusindia.gov.in/vital_statistics/srs/Chap_3_-_2010.pdf, p48.
2. We interviewed 1,137 husbands, 1,085 mothers-in-law, 3,893 women with children under age two, and 453 pregnant women. "Shaping Demand and Practice Baseline." BBC Media Action, 2011.
3. Ministry of Statistics and Programme Implementation, "Towards Achieving Millennium Development Goals." Government of India, 2013.
4. Ministry of Statistics and Programme Implementation, "Towards Achieving Millennium Development Goals."
5. Airtel, which has a 60 percent market share in Bihar and one of the highest quality networks in rural areas, offers a 525 MB of 2G data with 28 days validity for INR 155. See http://www.plansinfo.com/airtel-prepaid-bihar-and-jharkhand-plans.html.
6. The MOTECH platform was developed by the Grameen Foundation, a not-for-profit organization headquartered in the United States. BBC Media Action uses the Voice Service Delivery Platform and aggregation services of OnMobile Global Ltd., one of the largest mobile technology solution providers in India.
7. The six are Airtel, BSNL, Idea, Reliance, TATA, and Vodafone.
8. Although this data was collected for an evaluation funded by the Bill & Melinda Gates Foundation, it does not represent the views or opinions of BMGF. All views and opinions are the author's own.
9. Complimentary feeding is a practice that is meant to start when the baby enters its 6th month. Mushed-up food includes protein (lentils if you're a vegetarian or don't have money for eggs, fish and meat), fat (oil or ghee), vegetables and starch in addition to breast milk.This is not widely understood or practiced in India because people think babies don't need anything other than breast milk well beyond six months. This leads to malnutrition.
10. The use of other tools could enhance effect of Kunji, although these mutual sets of effects were hard to separate out statistically.
11. The Mathematica research found that 57.8 percent of those exposed to Mobile Kunji prepared for birth, compared to 30 percent of those who were not exposed to it. The adjusted difference is 27.9 percent, which is significant at a 1 percent level. "Evaluation Findings from the Midline Data Analysis." Mathematica Center for International Policy Research and Evaluation, 2014.
12. The Mathematica research found that 80.4 percent of those exposed to Mobile Kunji practiced complimentary feeding, compared to 66.9 percent of those who were not exposed to it. The adjusted difference is 13.5 percent, significant at a 1 percent level. "Evaluation Findings."
13. Results from probit regression in eight focus districts. "Evaluation Findings."
14. Mobile Academy.
15. It also approved the rollout of two other BBC Media Action mobile health services: Mobile Academy, an IVR training course for FLWs, and Kilkari, an outbound IVR subscription service for families.