Ford SUMURR

by

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Abstract

SUMURR (Sustainable Urban Mobility with Uncompromised Rural Reach) is a private-public partnership (PPP) between the Ford Motor Company, the U.S. Department of State, the University of Michigan, George Washington University, the Indian Institute of Technology Madras (IIT Madras), and the Indian healthcare NGO Hand in Hand. The partnership objective is to launch a pilot that leverages OpenXC, a recently introduced Ford technology, to improve maternal mortality rates in rural areas outside of Chennai, India.

The School of Natural Resources and Environment (SNRE) team engaged in secondary research and visited Chennai twice to carry out primary research. By the end of the second trip to Chennai, the PPP had determined that the goal of the pilot was to use the SUMURR vehicle and technology to increase the mobility of the government healthcare worker, called a Village Health Nurse (VHN), and improve her ability to enter patient information accurately into PICME, the government database that registers and tracks health data of pregnant mothers. Hand in Hand will be the local partner that works with high-risk pregnant mothers in rural villages and Ford will develop applications for maternal health in partnership with IIT Madras.

The pilot's success depends on whether Ford hires a Project Manager to ensure that the partners communicate and each partner's milestones are achieved. It also depends on whether the rural communities and the Tamil

Nadu State Government respond positively to the pilot. If the pilot is

successful, its long-term scalability depends on whether Ford can find a way

to monetize the product and sell it at a price point that is affordable.

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Problem Definition

In 2011, Ford partnered with students at the University of Michigan with the goal of employing Ford vehicles and SYNC technology in developing nations. Providing sustainable urban mobility with uncompromised rural reach, the SUMURR project aimed to combine Ford's automotive expertise, recent technological advancements and robust human rights code to make a positive global impact.With a presence in both India and Brazil, Ford recognized that this was an opportunity to positively impact their own communities, areas surrounding Ford facilities in developing nations. India and Brazil are fast-growing nations whose relevance in the global market increases every year. Ford wanted to partner with female social entrepreneurs, providing access to Ford vehicles and technology as empowerment tools with which the women would grow their local impact. Ford understood the resources they could bring to the table in such an endeavor, but the company was otherwise unclear how to proceed.

Ford's SYNC technology was released in 2007, in partnership with Microsoft, to redefine Ford as an automotive company excelling in consumer electronics (Hochman, 2010). Ford is turning its vehicles into powerful smartphones by providing access to the cloud in its vehicles and allowing consumers to access all of the same applications available on a smartphone while driving. The company's number one goal for SYNC technology is safety. Therefore, features like calling or texting contacts from a driver's phone, navigation, Pandora and weather are accessible through voice

recognition (Ford, 2012). OpenXC was designed as an open source platform that allows developers outside of Ford to create hardware and software that works with SYNC's operating system (Hochmann, 2010). Currently, there are 4 million users of Ford's SYNC technology in the US and the company hopes to increase this number to 13 million worldwide users by 2015(Nield, 2012). With the SUMURR project, Ford's goal was to determine if the OpenXC platform could be used to create "applications for society" that would help female social entrepreneurs provide the rural poor with better access to healthcare or potable water.

The process of moving from these initial ideas to the final problem definition spanned more than one year and several teams. Making use of student resources at Michigan, Ford began the process with mWomen Multidisciplinary Action Project (MAP) team through the Ross School of Business, from March to May 2011. The SNRE Masters Project team attended the final MAP presentation in May 2010. To provide team cohesion and project continuity, Ira Shaughnessy transitioned from full-time MAP consultant to SNRE Masters Project team member, and Masters Project team member Maureen Bossi spent the summer of 2011 as an intern in Ford's Sustainability & Vehicle Environmental Matters Group in Dearborn, Michigan. Maureen picked up where the MAP team left off and continued to work on the initiative over her three months there. Maureen kept the SNRE team abreast of developments, enabling members to transition back into the project after their return that fall.

The following recounts the evolution of the problem definition to its final iteration – what our team tackled to complete this Masters Project.

Refining the problem

Multidisciplinary Action Project: Ford mWomen 2011

Ford sponsored a MAP team at the Ross School of Business to consider social impact, scalability and potential monetization of Ford vehicles and SYNC in India and Brazil. The MAP team's objective was to uncover potential opportunities through which Ford vehicles and SYNC technology could improve access to potable water and adequate healthcare for rural, entrepreneurial women. Priscilla Chang (MBA/MPP '13), Chenen Chiang (MBA '12), Emily Cucco (MBA '12), Lauren Foukes (MBA '12), Kristen Schultz (MBA/MPP '13) and Ira Shaughnessy (MBA/MS '13) made up the 2011 mWomen MAP team.

In-depth secondary research led the mWomen MAP team to recommend health and water access in Tamil Nadu, India, as the focus for the pilot. The team set out to provide Ford with six comprehensive partnership scenarios, each considering financial impact, social impact and partnership viability. The scenarios identified how Ford vehicles, technology or both could benefit the partnership, whether with a nonprofit, an NGO or a private organization. The MAP team presented the following scenarios as part of their final deliverable.

10,000 Women: Building upon Goldman Sachs' commitment of $100M over 5 years, Ford would utilize the SUMURR platform to create business-based

mobile phone applications. The 10,000 Women program provides business training for female entrepreneurs around the globe. This partnership would provide mobile connectivity, Ford vehicles and business-specific mobile applications as a way to further empower the entrepreneurs selected by Goldman Sachs.

*For She***:** Addressing concerns of gender discrimination, For She trains women as taxi drivers in Tamil Nadu. For She provides female commuters a safe, dependable transportation option while empowering women through consistent employment. Ford's SUMURR technology would bolster the For She training program, providing company specific mobile application while also allowing commuters to track the location of For She vehicles.

*NextDrop***:** With limited, undependable water affecting nearly 90% of the population, the NextDrop app would send mass text messages to remote villages. Helping communities plan around the arrival of unpredictable water trucks, this app would benefit from the SUMURR technology via rural connectivity and personalized mobile applications.

*Rural Water Access***:** Rural communities depend largely on boreholes and pumps to access water. Unfortunately, many of these water sources are in disrepair for extended periods of time, rendering the facilities useless. Improved remote internet connectivity provided by SUMURR technology would allow rural communities to report maintenance needs in real time, minimizing down time and drastically improving access to potable water.

*Apollo Hospitals***:** Suffering from long wait times, low healthcare quality and long distances to emergency care, rural communities are in need of improved resources. This partnership scenario between Ford and Apollo Hospitals would enable Apollo to improve telemedicine resources and data collection while offering emergency transport and remote connectivity via SUMURR. *ASHA Assist***:** This scenario would bring a network of 500,000 Accredited Social Health Activists (ASHA) together with Pfizer and Ford. Ford vehicles and technology would allow ASHA workers to reach remote villages, using the SUMURR technology to collect detailed healthcare data. Ford would provide a picture-based mobile application, allowing ASHAs of all literacy levels to improve rural diagnosis, and gain access to Pfizer medicines and resources for treatment in the field.

This range of partnership scenarios left Ford representatives enthusiastic to pursue the project further. Detailed public-private partnership opportunities were outlined to help shed light on the impact potential of Ford vehicles and technology, but lacking monetization and feasibility information, these scenarios were only the beginning of the process. At this time, the MAP team transitioned off of the project. Maureen and the SNRE Masters Project team joined the initiative, tasked with further developing the scenarios in the hopes of completing a pilot program in 2012.

Summer Internship

Building off of the mWomen MAP team's progress, Maureen Bossi (MBA/MS '13) engaged domestic stakeholders and performed due diligence on potential partners in India. Ford committed to a public-private partnership

(PPP) with the U.S. Department of State Global Partnership Initiative (State Department) and the George Washington University Institute for Corporate Responsibility (GW). The group ultimately decided that the Apollo Hospitals partnership scenario had the most promise of the six provided. Maureen would help vet the Apollo partnership to determine the feasibility of success.

Maureen participated in weekly conference calls during which representatives from the PPP discussed priorities, limitations, and goals of the partnership. This effort culminated in a launch meeting held in Washington, D.C., on June 29, 2011, that included representatives from Ford, GW and the State Department in addition to local non-governmental organizations focused on development in rural India, women's issues, and maternal health. The meeting was especially productive in identifying the weaknesses in the plan – NGOs expressed concern that very few stakeholders on the ground had been engaged, and an afternoon brainstorming session brought out information regarding the original target partner, Apollo Hospitals, that made the group question whether that organization was the ideal affiliate to work with in Chennai. A contact at the U.S. Consulate in Chennai advised the group that Apollo Hospitals did not have a flawless reputation in India – it is commonly viewed as a hospital for the wealthy, and it did not have a human rights code for operation. The latter fact was a significant issue for sponsors at Ford. In addition, Apollo asked Ford to contribute financial resources to the project that Ford did not want to comply since it had already made an investment in the SUMURR technology and in the vehicle it would be providing.

In light of this new information, other potential partners were considered though a final partner was never identified.

Final Problem Defined for the SNRE Team

The SNRE Masters Project team took over as the primary University of Michigan team in September 2011. Despite the progress made by both Maureen and the MAP team, the project remained largely undefined. The MAP team proposed potential impact work for Ford's vehicles and SUMURR technology. Maureen, the State Department and GW showed the limitations of projecting partnerships based largely on secondary research. Still, the SNRE team had loosely defined objectives, knowing only the potential of Ford's resources and its goal to impact health and empower women in Tamil Nadu, India.

Maureen Bossi, Becky Martin (MBA/MS '12), Eshanthi Ranasinghe (MBA/MS '12) and Ira Shaughnessy made up the SNRE Masters Project team. The team brought extensive experience in international development, finance, NGO partnerships and project management to the initiative.

The team's defined objective was to assist in the design and implementation of a mobile health initiative in India focused on women's health that could test the SUMURR technology.

Questions and Hypotheses

With the SUMURR pilot, Ford's goal was to determine if the SYNC technology and Open XC applications installed in a Ford vehicle could be used to improve health, and more specifically reduce maternal mortality rates (MMR) in rural areas. We theorized that the vehicle could give rural health workers physical access to remote, underserved communities in Tamil Nadu, and that the technology would help track how many pregnant mothers were reached, recording important health information and communicating with doctors in urban areas. In making these improvements to the healthcare system in Tamil Nadu, SUMURR would reach more pregnant mothers and reduce MMR.

Ford envisioned the SUMURR pilot, connecting Ford to public organizations, supported by government agencies, and by academic institutions. Ford, with the SNRE team in agreement, believed this model, the Public Private Partnership, would position the pilot to have the greatest impact, engaging entities with broad reach and complementary skills. The goal of the PPP was to leverage the State Department's experience and relationships, GW's public-private partnership expertise, Ford's innovative technology and local plant in Chennai, and the SNRE team's knowledge of international development and social impact to lay the foundation for achieving uncompromised rural reach. The Indian government would also be

an important stakeholder in providing health-related data in rural Tamil Nadu, access to existing healthcare services networks, and approvals to being doing work there.

After the pilot was complete, Ford would evaluate if the SUMURR vehicle was scalable to the other applications for female empowerment. Our hypothesis was that a social entrepreneur would be the right player to scale the concept, assuming the SYNC Open XC technology was successful. We realized it would be expensive for a social entrepreneur to purchase the vehicle, particularly a Ford Endeavor like the one used in the pilot, which made pricing sensitivity to a lower income buyer an important component to successful implementation. For the purposes of the pilot, we started with the initial question – could the SUMURR Ford technology reduce maternal mortality rates in rural Tamil Nadu?

Understanding Ford's goal for the pilot, the SNRE team, working with Ford and other partners, set out to identify a local partner with expertise in rural healthcare initiatives in Tamil Nadu. Once a partner was selected, the next step would be to set up the pilot. These two areas would lead to our most important tasks and questions to be answered in the project:

1. Identify a problem; or What are the critical women's health issues in Tamil Nadu and how could Ford technology address them?

2. Identify the appropriate partners; or Who should Ford work with in India?

3. Finalize the pilot structure; or What should this relationship look like?

4. Help lay the groundwork for the pilot in the final months; or How should this pilot be executed, who is responsible for what, and what next steps should guide us moving forward?

5. Identify opportunities for long-term impact; or How can this model achieve scale and sustainability?

Methods and Approach

In our approach to answering the questions above, we would research potential partnerships; gather data on the state of healthcare in our target area via primary and secondary sources; go to India to gain engagement through face-to-face meetings with prospective partners; determine final partnership structure; and return to India to finalize pilot details, kicking off into pilot timeline, analysis, risks and next steps to complete our project.

One of the methods we used throughout to better answer the questions posed as part of our Masters Project was triangulation of sources – using both primary and secondary resources to get a full understanding of what we were researching. This method became necessary because, while attempting to research, for example, women's health issues in rural areas in Tamil Nadu as well as potential partners Ford could work with, we ran into two problems – information was either limited or excessive. Data online regarding potential partners Ford could use in the pilot was incredibly limited. Few groups were mentioned in third-party publications, which restricted us to NGOs that had websites, and among those it was difficult to tell which ones would make responsible partners and which ones were more marketing engines for donations and did little work of impact. Information regarding health issues in Tamil Nadu, on the other hand, was in great quantity, making it difficult to sift through and determine which ones were critical. To rectify this, we used secondary sources for an initial study of the areas we were researching and primary sources, such as health experts in India, connections

at the U.S. Consulate in Chennai, etc., to get a more intimate look at how all of this information tied together.

Secondary Research

Through our initial research, we learned that health and mobility were both key issues in Tamil Nadu. The lack of quality transportation infrastructure in much of the developing world limits people's physical mobility, and in turn their access to basic health services. According to the World Business Council for Sustainable Development (WBCSD), roughly half of the world's population, including 70% of people in the poorest countries, live in rural areas, further exacerbating the impact of limited physical mobility on the quality of life of those most in need (refer to Exhibit 1) (World Business Council for Sustainable Development, 2007). In India, the federal and district governments have begun to address this issue by introducing services that provide virtual mobility to isolated communities. One service that aligns with our PPP's agenda is the provision of telemedicine to rural populations, often with a focus on maternal health. One area of particular interest within the realm of maternal health in developing countries is the maternal mortality rate (MMR). MMR is defined by the World Health Organization (WHO) as number of women who die from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy or childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, per 100,000 live births (100,000 births = 1 lakh). In 2008 the

developing world accounted for 99% of maternal deaths worldwide, likely due to insufficient access to prenatal care and the absence of a skilled health professional during labor (World Health Organization, 2010). While MMR in India has declined steadily since 1990, it is still unacceptably high. In 2008 India recorded 230 maternal deaths per lakh, as compared to 24 in the United States (World Health Organization, 2010). Our team, along with the entire PPP, quickly agreed that we should explore the idea of addressing maternal health with this pilot project. Now that we understood it at a high level, we would use our contacts through the PPP and other sources to get a more intimate understanding of the issues.

While gaining an understanding of local health issues, the team continued the search for local partners. Maureen, Becky, Eshanthi and Ira used State Department resources to uncover social entrepreneurs, nonprofits and NGOs. The team focused on organizations within a 2-hour radius of Chennai, aiming to ensure a hands-on relationship on behalf of Ford. The team defined ideal partners as those with established relationships and reputations in the area of social impact. The team did due diligence on a list of potential partners, including Acumen Fund, Ashoka's Healthpoint Services, Hand In Hand International, mHealth Alliance, the Mobile Alliance for Maternal Action, the Skoll Foundation, Vital Voices, the UN/WHO Every Woman Every Child program, and Voluntary Health Services. We continued to conduct weekly conference calls among the PPP stakeholders to vet the potential on-the-ground partners, and ultimately our team recommended to the

PPP that we engage with NGOs or similar type organizations. We realized

that, because of the uncertain financial sustainability of the effort, any partner

we chose to execute the pilot on the ground would have to be committed to

health impact above all else, even financial return. The pilot would still be

testing and developing the SYNC-Open XC application to SUMURR– there

was no guarantee that it would be adaptable to the situation, and we were not

yet certain whether an opportunity for impact or revenue generation even

existed. While these uncertainties were natural to Ford, which looked at the

project as both an investigation into its own technology, the Indian market and

as an opportunity to do good in its international communities, a social

entrepreneur would expect a more thorough business case defending the

sustainability of the project – in terms of impact and profit. The ideal partner

for the pilot would be something more akin to a non-profit, but identifying one

was challenging. Secondary research proved to have severe limitations. Few

organizations had robust webpages and local reputations were hard to glean

via email and phone calls. It became clear that face-to-face interaction would

be needed as part of the vetting process. The SNRE team received approval to

make two trips to Chennai in early 2012, and the team outlined Tamil Nadu-

based organizations it wanted to meet with.

We identified Voluntary Health Services (VHS) and Hand in Hand

(HiH) as potential partners – both non-profits with backgrounds in healthcare

work in Tamil Nadu, but with different skills. VHS was an established

healthcare organization that had its own network of health centers in and

surrounding Chennai, and HiH was an expert in community empowerment using government partnership in rural Tamil Nadu. Our partners agreed, and the team reached out to both organizations in advance of Maureen and Ira's trip to Chennai in January 2012.

First Trip to India: Primary Research & Stakeholder Engagement

During their trip to Tamil Nadu, January 1-5, 2012, SNRE team members Maureen and Ira saw firsthand the benefit of engaging stakeholders and working with a respected ally on the ground. One of our contacts at Ford, Prasad Venkatesh, connected us with his mother, Jaya Krishnaswamy, who would act as our hostess and guide during the visit. Mrs. Krishnaswamy created the Madhuram Narayanan Centre for Exceptional Children, a school for children 0-6 years old who have developmental delays and disorders that prevent them from immediately matriculating into the mainstream school system. She was very well-connected and respected in Chennai, and she was able to connect us with invaluable resources during our visit.

The first meeting Mrs. Krishnaswamy arranged during our visit was with Dr. Kolandaswamy, a director with the Tamil Nadu Department of Public Health. Dr. Kolandaswamy published his doctoral thesis entitled *Maternal Mortality in Tamil Nadu During 2001-10: Varied Progress in Reducing Maternal Mortality at the Health District Level and Preventable Causes Remain Unchanged,* in 2010. While India has made substantive progress toward reaching the United Nation's goal of decreasing MMR by

75% from 1990 levels by 2015, the country is still likely to miss the mark

(refer to Exhibit 2) (World Health Organization, 2008). The meeting with Dr.

Kolandaswamy provided an opportunity to gather current data from a primary

source, and gain an understanding of his perspective on and attitude toward

existing maternal health telemedicine services in the district. The MMR in

Tamil Nadu had dropped precipitously since between 1980 and 2005, falling

from 450 maternal deaths per lakh, or 100,000, to 90 (refer to Exhibit 3)

(World Health Organization, 2009). The WHO attributes this drop to the

district government's commitment to prevention and termination of unwanted

pregnancies, greater access to prenatal care and institutional delivery, and

improved emergency obstetric care. However, in our interview Dr.

Kolandaswamy mentioned that as one of the most socially and economically

developed districts in India, Tamil Nadu should be able to leverage its

educated population, technological capabilities, and financial resources to

push its MMR much lower than its current level. Tamil Nadu has a

comprehensive system of primary, secondary, and tertiary healthcare facilities

(see Exhibit 4) but in his research Dr. Kolandaswamy has found that an

ongoing lack of data management and prenatal care in rural communities has

made the decline in MMR become stagnant. His study found that while MMR

in Tamil Nadu had declined 2001-2010 (refer to Exhibits 5 and 6),

hypertension and hemorrhage were still the primary preventable causes of

maternal death, socio-economically disadvantaged mothers were at higher risk

for maternal mortality, and in 13 of 42 health unit districts in the state, MMR had remained static (Kolandaswamy K. , 2010).

In 2003 the district government instituted the Tamil Nadu Health Policy which sought to improve access, equity, and quality of care and to reform healthcare financing. In doing this the government created Village Health Committees, assigned Village Health Nurses (VHNs), and instituted a limited network of mobile medical units to reach tribal and mountainous areas. In addition, there was a significant push to encourage institutional deliveries to enable access to adequate care and resources during delivery (refer to Exhibit 7); this effort provided monetary incentives to VHNs if prenatal care is provided and the woman is referred for institutional delivery (World Health Organization, 2009). The data collected by Dr. Kolandaswamy showed that while home delivery had decreased and institutional delivery in rural communities had increased 2001-2010, MMR was almost three times higher in rural areas than in urban areas. He attributes this disparity to a lack of access to supplies, specialists, and preparedness, inadequate prenatal care, and delay in transport between medical institutions in rural areas (Kolandaswamy K. , 2010). Dr. Kolandaswamy agreed that engaging with the Tamil Nadu government and local NGOs would be the most effective way to leverage Ford's OpenXC technology platform to enhance existing telemedicine initiatives by enabling more comprehensive management of patient data and effective case follow-ups and improving communication among the primary, secondary, and tertiary medical centers.

Further meetings during this trip provided more insight into the deficiencies in the existing health services system in Tamil Nadu. We interviewed Dr. J. Kumutha, Head of the Department of Neonatology at the Institute of Child Health and the Institute of Obstetrics and Gynecology, to gain insight into the post-natal care options for children born from high-risk pregnancies in and around Chennai. Dr. Kumutha runs a neonatal hospital unit for pre-term babies in Chennai, and during our visit there were 63 babies being treated in the unit. Families of the children camp out in the stairwell and outside the facility during the day (refer to Exhibit 8), and mothers are brought in to feed and interact with their babies, and learn how to care for them from the nurses. Dr. Kumutha sees a lack of commitment to follow-up care as the biggest issue with her patients – she said that people seek help when they are sick, but they do not understand the value of continuing care. The government had recently set up a program to push SMS reminders for maternal appointments, but Dr. Kumutha thinks that follow-up care needs to be managed in a more organized way, and the infrastructure for that kind of system is lacking outside of the city limits. Again, it was clear that improved infrastructure and data management could enhance the existing system, as Dr. Kumutha would be able to track children once they leave the facility, and in turn be able to track which treatments bring success and which do not (Kumutha, 2012).

Our interview with Dr. Joseph Williams, Project Director of the Community Health Alliance for Research, Training, Empowerment, and

Resource Development, and Dr. Bimal Charles, Project Director of the AIDS

Prevention and Control Project, of Voluntary Health Services (VHS) provided

us with more information about existing community outreach and mobile

medicine initiatives in Chennai. VHS is a non-profit hospital in central

Chennai focused on curing illness by fostering care for the family unit and

employing an income-based insurance scheme, with assistance and grants

from the government of Tamil Nadu (VHS, 2011). This system makes

treatment affordable for the poor population. The hospital has developed 14

sub-centers for community outreach to address maternal care issues and

maternal death prevention in peri-urban areas. VHS advised us that mobile

medicine in Chennai has been in existence for a while, and that for VHS to

partner on SUMURR the scope would need to be very specific, and the pilot

would need to address issues that other programs have failed to. Dr. Williams

asked that we come back to VHS with a specific, comprehensive plan and

suggested that we focus on what he sees as the areas that have yet to be

addressed: aligning and organizing information, monitoring and managing

patient cases, and providing feedback to both health care centers and VHNs

(Williams, 2012). He agreed that MMR in Tamil Nadu had reached a plateau,

and advised us that addressing access to prenatal care and robust data

management were the keys to crossing that threshold.

The final meeting during the trip was a site visit to Hand in Hand

International's office in Kancheepuram, about 80 kilometers outside of

Chennai (refer to Exhibit 9). We had met with Abi Murali, Director of

Communications for Hand in Hand India in Chennai on January 3, 2012, to discuss the idea of partnering with the PPP on the SUMURR pilot. Hand in Hand (HiH) is a non-profit organization that began with a focus on ending child labor, before expanding into women's empowerment. In making this transition, HiH used what it identified as the societal elements that keep people poor to establish its areas of expertise: microfinance, education, health, citizens' centers, and the environment (Murali, 2012). Abi was thrilled that we were taking the time on the ground to reach out to NGOs and local organizations, but she did not hide her skepticism that the multi-national corporation and an arm of the United States government were not genuinely interested in this initiative. We assured Abi that we were sincere, but understood her doubt; ultimately she agreed to set up a site visit at the Kancheepuram location for January 5. Ira and Maureen traveled to Kancheepuram and met with K.S. Sudhakar, Director of Special Projects for HiH India. Mr. Sudhakar and his team focus on preventative health in rural areas. He told us that it is not the existence of affordable healthcare services that is the problem, but rather access to those services. He shared that the government of Tamil Nadu has focused on rural health, primarily maternal health, but that the programs lacked coordination; HiH looks for the gaps in the system that the government is not reaching. The organization must get permission from the government to work in these communities and is only permitted to screen for basic health issues, provide medications, and perform follow-up appointments (Sudhakar K. , 2012).

During the interview we learned that HiH agrees with the PPP's position that in order for the pilot to turn into a successful program that is a long-term tool for these rural communities, the model needs to be at least partly financially sustainable. HiH has begun to establish pay clinics that are more than ten kilometers from the nearest primary health center and/or have poor road accessibility. In doing this, HiH enters into a memo of understanding with the community – in exchange for bringing health services to the community, the community agrees to provide a building with water and electricity to house the clinic, to procure a community volunteer to manage patient intake, and assures to pay a small fee for the services (10-20 rupees per doctor visit to begin with). Mr. Sudhakar explained to us that by involving the community in the process of providing care, the community takes ownership of the project, and by contributing financially, even in a small way, the community better comprehends the value of those services (Sudhakar K. , 2012). HiH has established a strong project infrastructure and developed solid relationships with the rural villages in Tamil Nadu, but Mr. Sudhakar expressed interest in the partnering on the SUMURR pilot to broaden the reach of their existing programs and solve the data management and patient tracking vulnerabilities in the current initiatives.

Having entered India with a solution to an undefined problem, Maureen and Ira returned to the Ross School of Business with a clear sense of the maternal health situation in Tamil Nadu. SUMURR could improve maternal healthcare in the area, addressing longstanding needs in the state.

Next steps for the team would be to collaborate with Ford, GW and the State Department to identify potential pilot structures and continue the dialogue with representatives from Hand in Hand, Voluntary Health Services and the Indian Government with the goal of fully defining a partnership.

Building Consensus

Upon returning to the US, Ira and Maureen debriefed the rest of our team on the trip. Our group began by identifying the symptoms that indicated there was room for improvement in the existing Tamil Nadu health system: MMR had reached a plateau, specialists were often unavailable at primary health centers, undiagnosed pre-eclampsia during pregnancy remained an issue, and there was a lack of proper post-natal care. From our research and interviews we determined that these issues stemmed from insufficient coordination of care, and the SUMURR pilot program could be used to address inadequate preventative care and aid in follow-up management. Based on the feedback we received during the trip our team agreed that the best route to achieving this goal would be to expand the PPP to include HiH and VHS to build on their existing telemedicine and community engagement initiatives. Both organizations had something to contribute – VHS had experience and resources in providing healthcare services to the poor, and HiH had a wide rural reach that could get the pilot to remote areas where the Ford technology could be properly tested and maximum impact could be achieved. We revised our stakeholder map, with VHS providing healthcare

professionals, such as doctors and nurses, and HiH providing access to the rural communities.

We envisioned the structure of our pilot as follows:

- Educator (HiH) - The educator is the manager and primary contact point. (S)he will make sure resources are well -used, impact goals are met, info is being tracked and disseminated to appropriate parties, and appropriate changes are made to improve. (S)he will lead general health education sessions to the villages.

- Doctor/Nurse (VHS) - The doctor will work with the educator to improve rural health by conducting routine check-ups, focusing on preventative care for pregnant women. (S)he will monitor patients' health and make sure they are aware of issues that might affect their pregnancy and delivery.

- Field Mobilizer - The field mobilizer will act as a liaison to make sure local health concerns are shared with and addressed. (S)he will help spread knowledge shared during ed sessions and encourage community engagement. (S)he will record attendance, patient information, etc.

In this scenario, the SUMURR technology could track data – including attendance and number of patients – to measure the reach of the program, act as an information source to the educator and healthcare provider, provide feedback to the partners, and create patient histories to track information. With SUMURR technology, the pilot would improve access to

preventative care; enable better follow-up care by aggregating information and making it accessible remotely; and improve the reach of the program by enhancing relationships and communication channels between rural villages, the NGO, healthcare professionals, and the government. An updated version of our stakeholder map is included as Exhibit 10. Ford, State and GW agreed with the recommendation, and began making plans for the follow-up trip to Chennai.

Second Trip to India: Reaching Agreement & Finalizing Details

Eshanthi and Becky visited Tamil Nadu, February 14-24, 2012, to launch the SUMURR pilot with Dave Berdish and Prasad Venkatesh from Ford of Michigan, Gloria Cabe from the State Department and potentially Voluntary Health Services and Hand in Hand. They traveled to Chennai in advance of the other partners to meet with local stakeholders and conduct more field research before launching the pilot. Their first meeting was with VHS, Dr. Joseph Williams, the doctor Maureen and Ira met with in the first trip to India, and Aarthi Kandasamy, a Senior Research Fellow working on VHS' AIDS Prevention and Control Project. They learned that VHS uses a "hub and spoke" model to provide healthcare in Chennai and surrounding areas (Kandasamy, 2012). VHS uses a paper system to track data and impressed on us that they believed it was functioning efficiently. Although their knowledge of and expertise in providing healthcare in the area surrounding Chennai was impressive, their interest in engaging in a new model that would test technology in remote areas was lacking.

The key takeaway from the meeting was that VHS had limited interest in the partnership. There is little need for the SUMURR vehicle in their model and VHS field health workers are not comfortable driving, and are less familiar with computers. VHS Office Managers who would be able to use the technology and who could drive did not need to travel to the field. VHS also did not have a need for better data management and analysis capabilities. They would appreciate a cost-effective way to better collect, track, analyze and share data, but they have limited funds to achieve this goal and would rather the technology be in a mobile form, perhaps on a phone or PDA.

Next, Becky and Eshanthi met with Newdigm, a social entrepreneur at the Rural Technology Business Incubator at the Indian Institute of Technology in Madras (IIT Madras). Newdigm has developed a handheld device called Amrita that can assist Accredited Social Health Activists (ASHAs) in diagnosing health conditions and recommending treatments (Parija, 2012). ASHAs are local women in rural communities trained by the government to provide health education and promote the use of local health services. Although effective, there is a skill and competency gap with the ASHAs. By writing protocols and loading them into Amrita, Newdigm transfers a doctor's knowledge to the ASHA. With a focus on decreasing child and maternal mortality rates, Newdigm entrepreneurs determined they could have a significant impact with only a few protocols because six diseases account for a majority of the cases seen in rural areas. The protocols produce a series of questions that the ASHA asks and she keys the answers into the device. The

cause of the ailment is narrowed down and an appropriate medicine and dosage level is given, along with additional instructions. The device has a printer attached to it so patients can walk away with a printout of their diagnoses and treatment plans. If the ASHA is unable to read the plan, Amrita has a sound system that can be activated.

When ASHAs work with pregnant women, Amrita registers the pregnancy with the government and gives the mother a unique identifier. The device ensures that pregnant women take the appropriate steps to address health issues because it alerts ASHAs to track important indicators for follow-up antenatal and postnatal care. The diagnoses generated by Amrita are approved or adjusted by health workers at subcenters. Newdigm collects the data from all mobile interactions between the ASHAs and subcenters into a centralized digital system. Newdigm analyzes this information to track whether there is an endemic occurring and whether the behavior of an ASHA or patient is above or below baseline measurements of performance. They can inform government health services of the information and allow them to respond appropriately.

Becky and Eshanthi asked Newdigm to reflect on the SUMURR pilot and how it could be effective in reducing MMR. First, they considered potential location of the project near the Ford plant outside of Chennai. They did not think the pilot would have much of an impact there because the healthcare system is already efficient. However, the technology adoption would be greater and the infrastructure is there so it would be a good place to

test the technology. They believed that more impact would be achieved in more rural areas. Next, they proposed some potential uses for the Ford vehicle:

1. Emergency vehicles –The vehicle could be used as an emergency vehicle to transport sick people to care centers. The problem with this use is that Emergency Management & Research Institute (EMRI), Tamil Nadu's emergency medical ambulance service, already runs efficiently. Hospital vehicles have started using advanced technology. The SUMURR vehicle could provide an additional level of efficiency in tracking, monitoring, diagnostics and treatment.

2. Government worker vehicles – SUMURR vehicles could help ASHAs travel to more remote villages and care for patients.

3. Mobile clinic – The vehicle could be outfitted with basic medical equipment and serve as a clinic on wheels. The SUMURR vehicle should have a doctor or highly qualified nurse because the villagers would expect an experienced medical professional to be present on what they would consider an expensive car. Patients should pay a small fee to ensure financial sustainability.

4. Vehicle spreading health awareness – The vehicle could show health education videos with projectors and screens. Awareness for preventive care is a popular healthcare initiative in India right now.

Of all of these options, Newdigm thought the most feasible uses for the SUMURR vehicle were a mobile clinic and a vehicle spreading health awareness.

Newdigm also commented on the potential challenges the SUMURR pilot may face. They questioned the financial sustainability of the technology because the future of remote healthcare innovation in India is on mobile phones, not on computers or other interfaces. This technology may have a place in the United States, but it would be a tougher sell in India because of its cost. In their opinion, it would be better if Ford could separate the technology from the car and sell it that way for financial viability; though it could make sense as a CSR campaign. Newdigm discussed several errors previous telemedicine projects in India have made:

1. Assuming there are doctors available – Often, there is a shortage of doctors so their time is scarce. Pilots that are built on doctor treatment have limited impact.

2. Unexpected costs are not taken into consideration – Examples of these costs that are often overlooked include how much a health worker must be paid, how much it will cost to invest in technology and how long it will take to breakeven. The cost of the car may be more than the value it creates.

3. Not building in sustainability – Health workers must charge for their service in order to make the project sustainable. They must treat people who actually need to see the doctor and subsidize the cost

through community insurance. Ford would have to give a grant to the local partner to run a new project. Human resources and supplies cost money and the funding that NGOs have is already earmarked for specific projects, as per conditions listed in the grants that fund them. Even if the local partner charges for the healthcare services provided by the pilot, it is unlikely to be able to cover all costs.

4. Focusing too much on urban and sub-urban areas – The impact is not as great if the project focuses on areas around Chennai because patients have better access to care here.

5. Pilot representativeness error – In a pilot, projects are effective in achieving their goals because there is a lot of funding and easy access to transportation and doctors. After the pilot ends, the project lead is short of money, patients are geographically too rural to access the service or the project does not have enough doctor support. When the location is truly rural, a villager may have to walk 20 km (12.5 mi) to get to the doctor and cannot spend as much because of the higher costs of treatment, transportation costs and the opportunity cost of a lost day's wages.

Later that afternoon, Becky and Eshanthi traveled to Kancheepuram to visit three different sites where Hand in Hand (HiH) is working. They met with Mr. Sudhakar, Project Direct for HiH's Health Initiative, Usha Somasundaram, Chief Operating Officer, and Sandip Mookerjee, Chief Operating Officer of Partnerships and Alliances. The first site they visited was

a panchayat community center, or anganwadi (Exhibit 11). A gram panchayat, or panchayat, is a local self-government that is set up in villages with a minimum population of 300. It is the smallest unit in the Indian government's administrative structure (see Exhibit 12). Anganwadis can be used for community services, including child care, library and health and wellness (Sudhakar, 2012). The maintenance and use of the structure is the responsibility of the panchayat community. While anganwadis can provide excellent resources, many times they are unused and are not properly maintained or staffed. HiH partners with the panchayat government system and its community members make sure the building is being effectively used. Basic renovations are organized by HiH, using money supplied by the government or a local company. The improvements to the specific anganwadi the team visited were funded by a company. Many of HiH's efforts in the panchayat communities are in conjunction with the Integrated Child Development Services Scheme (ICDS), run by the Indian Ministry of Women and Child Development (Development, 2009). The ICDS program focuses on improving child and maternal health in rural, tribal, and slum areas by targeting the cycle of birth in antenatal, postnatal, early childhood and adolescent phases in an integrated system. Despite the overlap in their missions and target groups, ICDS and the Department of Public Health are not coordinated. HiH works to bridge this gap as well.

HiH provides many services to the 143 families served by the center we visited. With the villagers' support and help, they clean up the facility,

paint it and add a garden and play area. They work with the village to assist in managing government services including neonatal and pediatric camps, prenatal services and community awareness camps. Neonatal and pediatric camps provide nutrition and sanitation education to children ages three to six and feed them a midday meal supplied by the government and by food from a small community garden HiH help them plant. Prenatal services register pregnant women with the government, provide them with regular health check-ups and track their health. HiH gives them a pamphlet to use during their pregnancy with appropriate nutrition regimens, weight targets, and more helpful health information. Community awareness camps provide ICDS materials, hold health rallies, screen educational movies and perform street plays on sanitation.

HiH provides additional healthcare support by contributing staff and improving access to VHNs and ASHAs. They train a "field mobilizer" in each panchayat to reinforce the government healthcare system, create engagement and acceptance within the community and report data provided by healthcare workers to a coordinator. The coordinator then puts the information into a centralized computer system called Monitoring Information System (MIS). Field mobilizers are similar to ASHAs and can be absorbed into the ASHA system. Village Health Nurses are educated by the government to function mainly as midwives in panchayat communities and facilitate access to specialty health institutions offering additional health services, including immunizations, more intensive medical care and counseling, using a referral

system. Efforts in healthcare are especially important because all government doctors are in the Kancheepuram city area and rarely visit the rural areas where the panchayats are. Also, most panchayat members cannot afford doctors' services or the cost of traveling to the city to receive care.

The second HiH site the team visited was a panchayat self-help group meeting and a health sub-center run by a VHN (see Exhibit 13). An HiH self-help group is a collective of women in a panchayat that meets regularly to discuss issues like sanitation, health, finances, job creation and education. The group starts out as a learning forum, and as they develop, they make decisions together that can help their families and the panchayat. Some of HiH's self-help groups start enterprises, supporting each other's business aspirations through a group-regulated fund that makes small loans to individual members so they can make investments into, for example, a loom or seeds to start a commercial garden. The session taking place during this visit was on sanitation and taught women how to build toilets. At this panchayat, HiH did not provide the extensive services it did for the first anganwadi visited. The self-help group is often one of the first initiatives HiH leads with when it moves into a new panchayat. This anganwadi was in need of updating, cleaning, better maintenance and additional resources. HiH was in the process of applying for additional funds from the state government and looking for private company donors.

Most significant on this stop was being able to meet a VHN and visit her sub-center. The primary responsibility VHN has is pregnant women,

though she provides basic healthcare and monitoring to everyone. She is

responsible for submitting health updates on pregnant women, getting them

registered, making sure they deliver at a subcenter, and delivering the babies.

She knows everything about the women she assists, even their socio-economic

status. There is generally one VHN for approximately 5,000 people and 11

VHNs for one Primary Healthcare Center (PHC), which services at least

50,000 people. As the state government has expanded its health offerings, it

has not hired and trained enough VHNs to serve the villages effectively. They

are often spread thin, resulting in a compromise of quality in the health

services they provide. The VHN at this particular site works every day of the

week, 24 hours a day. She lives at the sub-center and is on-call to her

panchayat and the other panchayats she serves. She is highly regarded in the

community and has a demanding weekly schedule (see Exhibit 14).

The last site the team visited was a panchayat with an evening clinic

held in a its library (see Exhibit 15). Ideally, each panchayat should be 10 km

(6.2 miles) away from a healthcare center. Often, this is not the case and many

panchayats are well out of reach of healthcare centers. Some are 14 to 15 km

away from the nearest PHC and it takes 2.5 hours by bus to reach them. In

such situations, HiH will set up a clinic by coordinating with the panchayat

government and community members (see Exhibit 16). Once health has

improved, the community should take over and run the clinic independently,

as HiH exits the panchayat. The clinic the team visited is open in the evening,

5-7 p.m. every other Friday, and charges 20 rupees per visit. The day, time

and price of the visits are set by the community. Demand at this clinic is high, with people coming in even from the surrounding areas. The community coordinator wants to hold the clinic weekly instead of once a fortnight because the villagers often forget when the clinic will be held. The clinic reports back to the Model Kairwaasi Clinic, an "office clinic" in Kancheepuram, which has 10 field clinics reporting to it (see Exhibit 17).

Becky and Eshanthi made several conclusions following their meeting with HiH. Most importantly, a pilot could be structured that fits well with HiH's field clinic concept. It could incorporate similar elements, but have enhanced data tracking and reporting through the SUMURR technology. The government VHNs are severely understaffed and overworked; therefore, starting additional rural clinics similar to HiH's field clinics as part of the pilot would be of great value to rural Tamil Nadu. HiH seemed like it would be a favorable partner because it has a strong presence in the rural Tamil Nadu panchayats, is regarded very favorably and does a notable job of using the resources provided by the government and the panchayats to maximize impact. In addition, HiH appeared to be an entrepreneurial organization eager to test new ideas.

After several days of data collection and partner interviews, Becky and Eshanthi were ready to brief the team on what they learned and prepare for final decisions to be made. The next week, Dave and Prasad from Ford of Michigan and Gloria from the State Department arrived for a new set of meetings during which the pilot structure, goals and partner responsibilities

would be finalized. On Tuesday, February 21, the team met with Dr.

Kolandaswamy, from the Tamil Nadu Department of Public Health, and Hand

in Hand. Prasad's mother (as mentioned previously) is connected to Dr.

Kolandaswamy through her work with the Madhuram Narayanan Centre for

Exceptional Children. She was the one who reached out to Dr. Kolandaswamy

and invited him to our meeting. His buy-in has been essential for the pilot's

success because government approval is necessary to gain access to the health

services that exist in rural areas. In the meeting he candidly revealed

important statistics about MMR in Tamil Nadu. Of all pregnant mothers in

rural Tamil Nadu, fifty percent are considered high-risk, meaning that the

mother or the baby has a high risk of having health issues. One third of that

fifty percent are treated and the other two thirds are somehow missed by the

system (see Exhibit 18). The Tamil Nadu Department of Public Health created

a database called Pregnancy Infant Cohort Monitoring Evaluation (PICME) to

assist in decreasing maternal mortality rates (MMR) (Kolandaswamy, 2012).

When a pregnant woman visits a government healthcare facility, or when she

meets with a VHN, her information is logged into PICME and is available to

all government healthcare facilities. She gets a unique number and an ID card

to carry with her wherever she goes. Although the system tracks and

centralizes information, the best use of that information has yet to be

identified and implemented. The PICME system was considered a pioneer in

India, but its efficacy in tracking high-risk pregnant women is surprisingly

low. This fact was little known mainly because pregnant women were often

"lost" to the system as a result of both process issues relating to the technology, and physical mobility issues of both the VHN and the pregnant mother. Here was our perfect cause – a real need in Tamil Nadu that Ford technology and its vehicle could address. Details of how this would occur are outlined in the Conclusion section.

With information on partner interest gathered, and a need for health technology improvement identified, the last task was to finalize the partnership, goals and structure of the SUMURR pilot. On February 22, team members met at the Rural Technology Business Incubator at IIT Madras with this goal in mind. The attendees included Ford of Michigan, the State Department, Hand in Hand, Ford of India and the University of Michigan. As a result of the strong relationship between Mrs. Krishnaswamy and Dr. Kolandaswamy, we also gained access to Mr. Nambi, a statistician from the Tamil Nadu Department of Public Health who worked with the National Informatics Centre to develop PICME. He joined the meeting to give the group a demo of the health database. He said that the software was created because the government saw a wide gap of information in the tracking of pregnant mothers by VHNs (Nambi, 2012). Although useful, the database is online; therefore VHNs had to have access to a computer with internet to make updates. They would walk or take the bus to a PHC or computer center to enter the data they gathered at their panchayats. Mr. Nambi loaded PICME on his computer and guided us through an extensive series of screens VHNs must fill in to complete a patient's record, including but not liited to:

- General information, such as the date of the visit, age, height, weight, blood type, blood pressure, blood sugar, etc., of the patient

- Whether they are high-risk

- Pregnancy outcome, including the date of delivery, location, baby's weight, and if there were any complications or conditions

- Summary of all of the patient's health information, which can be printed by the VHN to keep for her records. It can also be viewed by all medical professionals at the PHC, district and state levels

Overall, Nambi believed that there was ample room to improve the quality of the data logged into PICME. He saw the system as becoming more useful over time as VHNs get used to managing and logging the data. PICME could eventually be delivered through mobile phones, low cost tablets or smart phones. He mentioned that the national government wants to implement PICME in other states.

Subsequently, Nambi and Sudhakar explained Tamil Nadu's incentive program to reduce MMR in which pregnant mothers are paid to register with the government. There are three opportunities for pregnant mothers to be paid 4,000 rupees (~$79) – before, during and after her pregnancy. The first occurs when a mother registers in the first trimester, the second occurs when she gives birth in a government healthcare facility, such as a subcenter, and the third occurs a few months after birth when the newborn gets inoculations. The program has been successful in registering women, with 95% of pregnant mothers said to be registered with the government. Learning this statistic

made the team question how so many women – two thirds of the 50% of pregnant mothers who are high risk, or one third of all pregnant mothers, are not treated. Nambi and Sudhakar explained that many rural women disappear after they are registered because, in their culture, a woman goes to her mother's house to give birth, she may also receive care from non-government trained midwives or healers. It is difficult to convince these women to seek treatment at healthcare centers. They are even more likely to travel to their families and seek out alternative healing if they are high risk.

Later that afternoon, Dr. Ashok Jhunjhunwala ,who is the Chairman of the Rural Technology Business Incubator (RTBI), joined the meeting with his team. Engineers from RTBI are to assist Prasad in developing the technology required for the pilot out of Ford's SUMURR platform. Dr. Jhunjhunwala gave several examples of health projects that RTBI has been involved in, featuring ideas and technology that could be useful for the SUMURR pilot. His first example was a mobile eye surgical unit which has completed 200 cataract surgeries, at the same level of quality as the best hospital in Chennai (Jhunjhunwala, 2012). The second example he presented was a telemedicine kit designed in 2001 with World Health Partners and the Bill and Melinda Gates Foundation. The kit measures four vital signs of a patient – heart rate, body temperature, blood pressure and blood oxygenation, and can take photos. The information gathered is sent to doctors in urban locations who diagnose the patient and prescribe medicine. RTBI is now designing a kit where the vital signs can be saved as files on a server and sent to mobile phones. Dr.

Jhunjhunwala also told us that RTBI engineers were working on a voice recognition system that could help improve maternal and child health in rural Madhya Pradesh, a state in central India. Most women there are illiterate and data can be easily falsified, so voice recognition software is extremely useful when tracking phone calls and health worker visits. The software is used to identify mothers, gather information about their health and their children's health, and track the services they have received from ICDS. This information is transmitted to a web portal and can instantly be viewed by healthcare administrators. It was apparent from the demonstration that RTBI was an excellent choice as a technology partner to help in developing the platform that could be used in the pilot – they understood the impact group (rural pregnant women in Tamil Nadu), and were already developing several technologies that could be incorporated with SUMURR and Open XC to increase impact.

Meetings held during this second visit to Chennai uncovered insights and led to decisions that would shape the pilot.

Conclusion

The second trip to Chennai culminated in what we had been seeking from the start – all the elements necessary for a successful pilot. Commitment was gained from all partners, responsibilities were agreed upon, and a timeline was put into place to set the pilot in motion. Most importantly, a clear area of impact was identified, along with the beginnings of an application that, fueled by Ford SUMURR technology, at the most had the potential to transform Tamil Nadu's rural healthcare, and at least could save a few lives in the meantime. Below is documentation of final decisions regarding the structure, partner responsibilities and timeline of the pilot, with an assessment, recommendations and next steps to follow.

Please note that the Conclusion section is written as a standalone piece so that the client, Ford, and its representatives, may pull it out separately and use it as it sees fit. For this reason, some details are repeated.

Results

Overarching Goal

Ford has developed innovative technologies that capitalize on open architecture and networks to make available unprecedented connectivity. This pilot's aim is to use a Ford vehicle outfitted with Open XC Sustainable Urban Mobility with Uncompromised Rural Reach (SUMURR) technology to help improve maternal health and decrease maternal mortality rates (MMR) in remote areas in Tamil Nadu, creating "apps for society" based on open-source application programming interfaces (APIs).

Ford will apply the SUMURR technology to improve PICME,

Pregnancy and Infant COHORT Monitoring and Evaluation, Tamil Nadu's

online health database used to track pregnant women and young children.

PICME software was developed by the National Informatics Centre in

conjunction with the Tamil Nadu Department of Public Health in 2008. It is

used by outreach workers, particularly Village Health Nurses and other rural

health workers, to track health information of newborns and expectant

mothers during the pre- and ante-natal period. VHNs go into the field and

check up on pregnant women and children in their districts, and then return to

a Primary Health Center where a computer is in place to record the

information collected. PICME's manual data collection process can be

cumbersome and can take up a great deal of the VHN's precious time. A VHN

may spend one day out of her seven-day work week reporting back to the

PHC to input manually recorded information into a computer system (see

Exhibit 14). PICME even becomes less effective in rural communities, where

distances from the PHC, or a place with internet and a computer, are longer,

and where the chance of losing track of a high-risk mother is greater. In

addition, expectant mothers in India often return to their childhood home to be

with their families for the final trimester of their pregnancy and for delivery.

This move to the mother's home is especially common in rural areas among

women in their first pregnancy or those who have experienced a previous

miscarriage – women who are generally considered "at-risk" by the health

system. These women are more likely than others to lose the baby or die

during childbirth. Approximately 2/3rds of high-risk pregnant women, who make up 50% of the overall population of pregnant women in Tamil Nadu, are "lost" to the health system. They "fall off the PICME map," because: they migrate to their mother's home; they live in rough terrain or far from health clinics; and the VHN is often overburdened by the manual system. Without these regular check-ups, the VHN cannot offer medical advice, report back updates to the PHC where they could get appropriately flagged for additional attention, or help them take other measures that would normally increase their chances for a uncomplicated birth. The result is an excessively high degree of risk for approximately 33% of pregnant women in Tamil Nadu

Pilot Goal

The SUMURR pilot will design, build and implement iPICME, a mobile version of PICME, to better meet the needs of VHNs and expectant mothers, thereby reducing the tendency to lose track of high-risk pregnancies, and ultimately saving lives. With further planning and development, this technology may be scaled beyond the pilot location to the rest of Tamil Nadu, and possibly to the country.

The goals of iPICME are

    i.   Improve use of PICME – PICME should be viewed and monitored by the Village Health Nurse, her supervisor, and the PHC (Primary Health Centre). Right now, someone is making the entry, but not always looking at it for further analysis

ii.   Improve communication – The mother and VHN should be able to

send and receive an SMS with further information and follow-up

instructions, making the process more efficient

Ex. VHNs receive a semi-automated message to check on a

specific high-risk pregnancy woman, and are prompted to send

certain update information back to the PHC

iii.   Improve physical mobility – VHN and mother can access

transportation, as needed

iv.   Improve efficiency by tracking

a. Number of entries vs. total population that should be entered

b. % correct entries

c. % complete

Partners and Responsibilities

Ford will do this as part of a partnership with a group of engineers

from the Rural Technology Business Incubator (RTBI) unit of IIT Madras and

Hand in Hand, an NGO based out of Chennai with experience working with

health systems in rural Tamil Nadu, with further support from (3) the U.S.

State Department, (4) George Washington University, and (5) University of

Michigan School of Natural Resources & Environment.

<u>IIT Madras</u>

Ford will work with IIT Madras to develop the mobile version of

PICME, or iPICME. A mobile version, developed through Ford Open XC

SUMURR technology and accessible via mobile phone, would make it easier

for VHNs to access the PICME database from any location with a cellular

signal, and could even allow mothers to "check in" to the system through their own phones. This extended accessibility would be especially useful in areas where healthcare is sparse and mobility is low, improving the efficacy of the PICME tracking system which should then help lower maternal and infant mortality rates. Combining this technology with Ford wheels could even give VHNs in more remote areas increased physical mobility to get to at-risk mothers with more regularity.

<u>Hand in Hand</u>

With experience improving child and maternal health in rural Tamil Nadu and coordinating efforts with government officials, Hand in Hand's role in the partnership is to act as a link to local communities, volunteer and government health workers. Hand in Hand will identify suitable communities for the pilot by conducting site surveys and interviews as appropriate; will provide community education to potential mothers and their families, opinion leaders in the panchayats; will interface with government officials; will coordinate and integrate efforts with the VHN, primary health nurses, ICDS, and others as appropriate; and will identify and train field mobilizers and other volunteers, providing compensation and reimbursement when necessary.

Partner Responsibilities in Pilot

<u>Hand In Hand Responsibilities</u>

Hand in Hand will undertake the following activities during the pilot:

- Manage the program, and act as the primary lead and contact point for pilot. HiH team members will make sure resources are well-used, impact goals are met, info is being tracked and disseminated to appropriate

parties, and changes are made to improve the program. (S)he will also be the primary contact point for program partners and external parties

- Identify ideal rural communities to target

- Provide access to targeted rural communities for improved preventive care

- Schedule community visits for optimal health impact

- Develop and conduct maternal health education sessions, tailored to local health concerns

- Identify and train field mobilizer to assist with pilot

- Coordinate with VHNs and other health workers to implement the project

- Assess existing data records to provide baseline for impact findings

- Track project impact; lead efforts to improve program effectiveness in final impact

- Input impact metrics into system through Ford SUMURR technology

- Provide insight on qualitative and quantitative data to track for pilot

- Staff medical professionals, such as doctors, registered or certified nurses, and other trained healthcare providers, for rural community consultations as needed

- Provide medical equipment and appropriate medicine for blood pressure readings, inoculations, anemia testing and other basic care

- Ensure proper data is collected and recorded into SUMURR system

- Create patient histories and provide copies regularly to patients

- Coordinate efforts and share information with local medical professionals, including midwives and birth centers, especially those targeting women's health

Ford Motor Company Responsibilities

Ford Motor Company will undertake the following activities during the pilot:

- Support project on the ground in India with other partners by:
  - Providing and equipping a vehicle with the Ford technology
  - Using existing relationships with IIT Madras and other tech organizations to ensure that appropriate, useful applications are designed and put in place to facilitate data collection and increase effectiveness of pilot
  - Monitoring and tracking effectiveness of Ford car, SUMURR technology and Ford relationship, as part of pilot
- Develop and provide technology by:
  - Providing affordable connectivity that can be used to deliver physical goods and people via the vehicle, and deliver connectivity to outlying rural areas
  - Focusing on the social sciences and "apps for society"
  - Providing the Open XC Platform for which the developer team and others can develop applications that will address key issues affecting maternal and child health

Pilot Location

Based on conversations between Ford and Hand in Hand, the pilot will be tested in a rural community within three hours of the Ford plant located

outside of Chennai. The initial location identified for the pilot was near

Kallakurichi, in the Kalrayan Hills block, a hilly part of the Easter Gnats

located within the Viluppuram district in the state of Tamil Nadu. Specific

communities within the block are being identified based on the results of a site

survey conducted by Hand in Hand, which will include a needs and

infrastructure assessment that will make sure that the communities have both

the need for improvement and the necessary resources to make sure impact is

achievable.

Hand in Hand completed a preliminary visit to Kalrayan Hills in early

March, submitting a brief written assessment to the team on March 8, 2012.

Kalrayan Hills has a population of about 60,000, home to 15 panchayats and

188 villages, with Kallakurichi being the closest town. Kariyaloor and

Vellimalai are two of the biggest panchayats in the area. For a full copy of the

report, see Exhibit 19.

Pilot Outline

As part of the pilot, Ford will work with IIT Madras and Hand in Hand to

complete the initial phases. The Technology Team, comprised of engineers

from Ford and IIT Madras, will begin developing iPICME, while the Process

Team, made up of members from Ford Sustainability and Hand in Hand,

begins shaping the pilot on the ground, conducting site surveys of potential

villages in Kallakurichi, forming relationships with local community members

and government officials, and creating connections with the village health

nurses and primary health centers.

Pilot Timeline

The pilot timeline is a coordinated effort between the Technology and Process teams. Scheduling can be broken down into four phases.

Phase I: Pre-plan | Feb-April, 2012

Process team & Tech team – During the first phase, both teams will conduct initial studies of existing structures, getting to know the stakeholders and processes involved in both systems. Outputs of this phase include a baseline metrics assessment and a preliminary technology assessment, completed by mid-April. Baseline findings will be considered the "status quo," or current health standards in the pilot location against which future improvements will be measured. From that point, the teams will split, though communication and interaction between them will continue.

Phase II: Engage the field, study PICME | April-July, 2012

Field engagement (Process team) – The Process team, led by Hand in Hand, will begin working in the field. Hand in Hand will work with the pilot communities in Kalrayan Hills just as they do in the communities we visited in Kancheepuram. They will work with the panchayat communities to teach them better health and sanitation practices, and identify and train community health workers. They will connect with local government officials to locate state resources, especially in connection to the VHNs, the ICDS and others. They will also begin mapping and screening all ANC (antenatal care) and high-risk mothers.

PICME study (Tech team) – The Tech Team will do a study of PICME by visiting the pilot target community sites with HiH, as appropriate. They will

identify potential areas of improvement and begin designing technology that could solve these issues. Technology process improvements will be reported by the end of June.

Phase III: Application development, with on-ground testing | Aug-Sept, 2012

Both Teams – The Technology Team will have the iPICME application ready by the end of August, with a full pilot, including the apps in the Ford car ready to test by the end of September. In the meantime, Hand in Hand and the Process team will help with appropriate ground-level testing to make sure the application is being developed in a way that meets the needs of community and health stakeholders, with the ultimate goal of improving PICME, easing the workloads of VHNs, better tracking high-risk pregnancies, and reducing the maternal mortality rate of the pilot location in Kalrayan Hills.

Phase IV: Run full pilot with PICME app and Ford vehicle; assessments & presentations | Oct-Dec, 2012

The last phase of the pilot will be running it with all systems in place – the PICME application, the Ford vehicle, community health workers, Village Health Nurses, and other stakeholders. The team will conduct assessments of the pilot and its commercialization and scalability potential.

A more detailed account of the pilot timeline and HiH-specific timeline can be found in Exhibit 20 and 21, respectively.

Tracking Metrics and Indicators

Appropriate metrics will be identified in the baseline assessment, conducted by Hand in Hand, based primarily on health data maintained by the state government of Tamil Nadu, at the district, municipality and panchayat
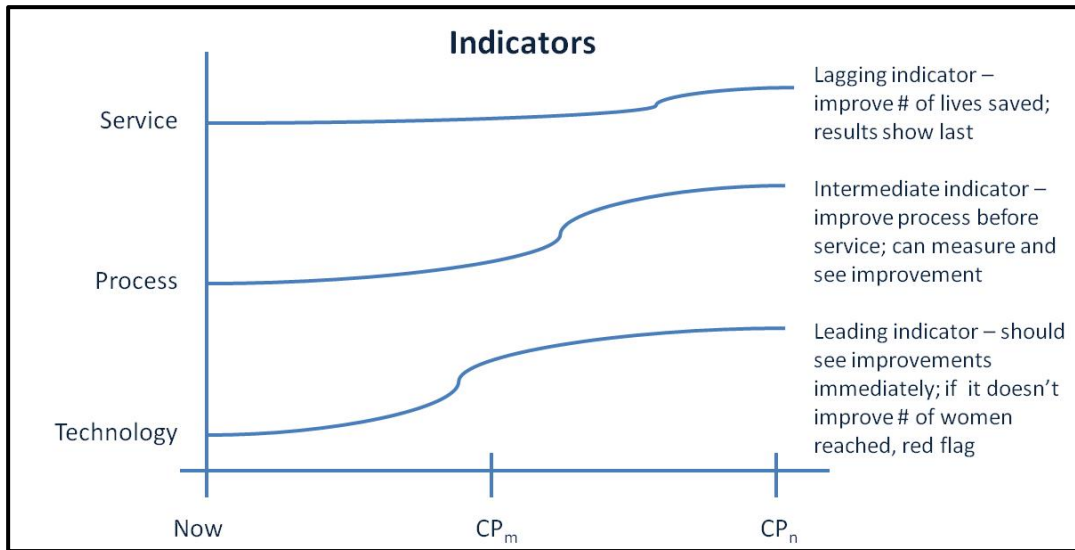
level. The baseline will be complete mid-April and will be reviewed further by Ford and other partners. Hand in Hand has conducted several such assessments before. The following are some of the questions, among others, they will consider.

- How many high-risk mothers are being tracked at the PHC?

- What services do they have? Are they accessible?

- What does government data say on the target region? What are some issues prevalent in the hills and tribal areas that require intervention?

- How is accessibility in the region now? What are the issues regarding accessibility? Which PHC should we work with? What is the population size of the target area? Is impact large enough?

The results of the baseline will help researchers assess whether short- and long-term impact was made. The order of impact will be seen in three phases, or waves, demonstrated by indicators grouped into three categories – technology, process and service. These three indicators are connected, and when all three are present, social impact can result. As technology improves, process can improve; as process improves, service can improve, as service improves, impact can result. Consider the following example: iPICME will be a better way to track the health of pregnant women (technology improvements). This improved tracking will make it easier for VHNs to input data on their patients, increasing the number of updates and the amount of information in the health system (process improvements) With additional information, the health system will be able to locate and track high-risk

pregnancies better, getting important preventive and emergency care to them that should, ultimately, save lives (service improvements). The result is a long-term impact on the health of pregnant women in Tamil Nadu and a decrease in the maternal mortality rate.

This relationship among the indicator groups makes technology a *leading* indicator. The indicators are the areas that the Tech team will directly attempt to impact. Process indicators are *intermediate*; as technology improves, process can improve, as long as new behaviors associated with the technology changes are accepted and adopted by the system. HiH will be instrumental in making sure this social change occurs. Service indicators are *lagging*; change in these indicators take the longest to show, but they are most closely connected to the final goal of reducing maternal mortality rates. For a set of indicators to improve, it is necessary but not sufficient for the indicator group occurring before it to also improve. Service indicators cannot improve without improvements in process, and process indicators cannot improve without improvements in technology. If technology indicators don't improve, that is an immediate red flag that the pilot is not on track to achieve social impact. This relationship will prove valuable at check points (CPs) throughout the timeline to ensure long-term goals can be achieved.

Indicators

Service — Lagging indicator – improve # of lives saved; results show last

Process — Intermediate indicator – improve process before service; can measure and see improvement

Technology — Leading indicator – should see improvements immediately; if it doesn't improve # of women reached, red flag

Now CP_m CP_n

Illustration

Assessment of Pilot

Strengths and Opportunities

At a high level, the pilot seems well-designed. Capital outlays are low, scale is achievable, partners contribute diverse, complementary strengths, and responsibilities have been clearly laid out. Below is a summary of pilot strengths.

Capacity building potential exists for all partners.

Many MNCs (multi-national corporations) enter developing nations solely for their own benefit. This pilot is positioned to build capacity of each partner, allowing them to improve reach and impact. Ford benefits from the pilot but not at the expense of stakeholders or partners.

Pilot has low capital intensity.

The pilot is testing technology that has little to no physical product. Although the car adds a significant cost to the pilot, the technology itself, which has the widest reach and greatest impact potential, will have little incremental cost

once developed. This low capital outlay increases the possibility of scaling it beyond the pilot.

Scaling beyond initial panchayats is possible.

In its basic structure, the pilot could be scaled beyond the initial test communities to other panchayats in Kalrayan Hills, and then on to the rest of Viluppuram and throughout Tamil Nadu. Scaling could occur with few significant barriers, especially if spread to areas that already host regular community training and education sessions so that new technology adoption could be integrated easily. Scaling beyond Tamil Nadu would be a problem, however. PICME and the village health nurse system only exist in Tamil Nadu. Health infrastructure is significantly weaker in other Indian states. Considering that Tamil Nadu is more than 70 million people, there is still a great deal of impact that could be reached scaling just throughout the state. Also PICME may be implemented at the national level, with iPICME, the mobile version, fully integrated into it.

The environment for is right. India is of strategic interest to Ford; and Tamil Nadu provides both a Ford plant to help with testing and a health system infrastructure that could benefit from the innovation while still being able to support it.

India, with its growing population and increasing per capita income, remains a key market for Ford's future. Knowledge gained through the pilot on obstacles that face connectivity in rural areas is likely to prove useful, along with the positive PR gained as a result of the project. The pilot itself is also helped by its location. The Ford plant outside of Chennai is sizeable and has access to resources critical to making the pilot a success, especially in terms of human

capital and technical support. In addition, the health system in Tamil Nadu has the right infrastructure for the pilot – it is developed enough that technology is in use and government officials welcome improvements, but it still exhibits need, as demonstrated by the 33% of pregnant women that don't get care they need through the current system.

Pilot has extensive access to target beneficiaries and final users of the technology.
Having a close connection to the users and beneficiaries of the pilot, namely pregnant women, VHNs, and community health workers, will give partners the ability to gain real-time feedback on various test phases of the pilot. This shortens the timeline of tech and process developments, increases the accuracy and relevance of field testing, and allows the tech team to investigate frequent iterations of the technology platform.

Partner organizations bring diverse strengths that align well with their responsibilities.
The goals of partners remain realistic. Hand in Hand is leading the on-the-ground effort by developing assessments, establishing community and government relationships, identifying and training community health workers, and coordinating and supporting VHNs, all tasks they have experience with as part of their current efforts to improve health in rural areas of Tamil Nadu. Ford CSR and Sustainability team members are familiar with how to operationalize projects like this from Ford's perspective, and know how to manage HiH to ensure they are following through with their responsibilities. The Technology team, comprised of engineers from Ford and RTBI/IIT Madras, has people who are both experts in understanding Ford's new

technology, and engineers who are familiar with creating mobile applications to answer health needs in rural India. The team as a whole has the intellectual capital and experience required to execute an effective pilot.

Early planning documentation is easing the transition to the next phase of the pilot.

Ford and HiH created timelines with clear expectations, distributed almost immediately after initial talks in Chennai ended. Documentation continues to guide scheduling and meetings.

Risks

Many of the potential risks of the project are a result of having many unknowns in the pilot, a factor that could limit or prematurely end the project. The following is an outline of these unknowns and other risks that should be taken into consideration.

Whether Ford will gain long-term value out of the pilot is unknown.

This area of concern could be unfounded. From the prospective of the SNRE team, there seems to be some risk that Ford will not gain long-term value out of this pilot. Part of our uncertainty with this claim is because we do not know how this project fits into Ford's long-term strategy. We were brought in to mediate the role of the local partner, and in many ways our PPP was kept separate from understanding the perspective of Ford, the company. Whatever Ford's goal is with this pilot, there is always the risk that it may not be achieved. If its goal is to test the technology, which is what we assumed at the start, then there is risk that building this application will not properly test

SUMURR. If its goal is to create market opportunity for Ford vehicles, then this goal is under great risk of not being achieved.

Implementation and widespread acceptance may not be achievable.

It is not known whether the technology, if it works, will be accepted by community health workers and other local stakeholders who would use it and benefit from it. If it violates cultural or social norms too much, acceptance and impact will be limited.

The government has significant power and influence over the pilot; government support level is unknown.

The government's role in this pilot is already apparent. Even at the time of this paper submission, the team awaits approvals in order to complete baseline studies. The government has the ability to end or delay progress on a whim. This situation is common in almost every developing country. In India it is a bit more complicated in that there are so many levels of government (Exhibit 12), with government officials at every level that can become an obstacle to the pilot.

No plan exists yet to create user technical support group or roll off the pilot.

While a stellar team may be in place to develop the technology, long-term technical support after implementation, when the platform is fully in-field and the pilot is over, has not yet been planned. iPICME is a live piece of technology and introducing it to a community creates a long-term change in ingrained habits. Community members will continue to use it, and they may run into glitches as time goes on. Who will be there to manage these problems, five years or even one year after the pilot has ended?

Financial sustainability of the pilot remains unknown.

There is no clear way to incorporate financial sustainability into the model. As it is now, the pilot does not feature anyone paying for iPICME. The end beneficiary – pregnant mothers – does not receive clear perceived value from it. They cannot see the system-wide efficiency improvement it would provide. In addition, it's an offshoot of an already free government-run program. VHNs also directly benefit from it, but it is part of their job. You and I wouldn't pay for a company software upgrade, and they wouldn't pay for iPICME. The remaining possibility is that the government pay for it. But, would they? This is a big investment into something that seems to only have one customer – a slow-moving one with limited resources.

The possibility of achieving scale is unknown and faces obstacles.

Scale is possible, but many obstacles exist. Most conversations on scale have been based on the assumption that a social entrepreneur will do the scaling. A social entrepreneur will only be interested if some form of financial sustainability exists, which has proved elusive. If the Tech team comes up with a useful mobile application, and if Hand in Hand is able to socialize it into the panchayat health system among VHNs and expecting mothers, and if a way to build in financial sustainability is identified and then incorporated, and if the government approves of it, the initiative could be scaled throughout Tamil Nadu. But, it would stop there. PICME is still not used throughout India. Although discussions are taking place to do so, final decisions have not been made. It is unknown whether the PICME system can be used in other

states, all of which are considered to have a worse health system than Tamil Nadu, as mentioned earlier.

A Ford car is still a large expense for small NGOs, and they are unlikely to purchase many of them in a year.

While small NGOs do purchase and use cars in developing countries, they carefully control their spending and they use the cars for much longer than buyers do in the U.S. What results is few averages purchases per year, and limited funds to spend.

Recommendations

Although obstacles exist, the pilot has the potential to have significant impact. Answering weaknesses with the following recommendations can improve the chances of success.

Address scale and financial sustainability: Form a cross-functional team to (1) assess how the pilot will roll off and (2) identify a model structure that is scalable and financially sustainable.

Throughout the pilot, both the Tech team and Process team should be considering the possibility of scale, and what needs to be in place for that to happen. Part of this process is determining logistically what needs to be in place to achieve scale. As the pilot approaches conclusion, a cross-functional team made up of members of both the Tech and Process teams, and perhaps someone with a background in social enterprise, should come together with these perspectives and begin developing a final model that is scalable and financially sustainable.

To come up with such a model will probably require a significant amount of follow-up research, including conversations with major stakeholders, potential sellers and buyers of the "product," and others. Stakeholders that should be part of these conversations include Ford, HiH, the Tamil Nadu government, the national government (as a potential buyer and/or approver), social entrepreneurs that could scale it, and others. Several iterations of the model are likely to result before a potential one emerges. Once this happens, a new partnership should be established to implement the full-fledged project. Take into account best practices and lessons learned from setting up the PPP to mitigate future delays. The following is a list of possible ways to add scale to the project.

Brainstorm on Scale:

  i. Involve a social entrepreneur similar to Newdigm to scale SUMURR, assuming revenue generation can be built into the model, perhaps through government contracts

  ii. Turn the Ford vehicle into a telemedicine unit by adding treatment space on the bed of the truck

  iii. Use a smaller Ford SUV or car, such as the Figo, and add 4-wheel drive, making it more affordable and able to handle difficult terrain on small roads common in rural areas

  iv. Take the iPICME and SUMURR application out of the car and scale it as its own health technology application

       v. Broaden social impact by extending its health applications to

          children

Determine pilot value to Ford: Talk to internal strategy and build the business

case.

If Ford has a better understanding of what they want out of each partnership, they will be able to move forward with more clarity. If it's PR/CSR, they can move forward understanding the goal.

The PPP should connect with Ford's internal strategy group to get a better understanding of what Ford's goals for India are. They could build a case on how this project fits into it, and begin conversations with internal strategy about it, keeping them tied into the project. Knowing this perspective would help when evaluating future opportunities.

Achieve successful implementation and widespread acceptance: Define and articulate the added value of the technology.

 Creating this pilot was based on finding a problem for existing solution. Ensure that the technology is meeting the core needs of the VHN in a way that is consistent with their values and behaviors, as well as those of pregnant mothers and their families. Use the pilot's extensive access to these groups to conduct thorough field testing, with both Tech team and Process team members present to ease communication and ensure both perspectives are observing, conveying, and sharing information. By better defining the value, the technology will sell itself.

Turn the government into an advocate: Build relationships and open communication.

Bring in government stakeholders early in the process and ensure they are kept engaged. Make connections with government officials through as many means as possible. Much of the work done in developing countries is done through relationships. This method, while inefficient at times, facilitates trust-building. Trust, engagement and support built during the pilot can prove to be very valuable later on during widespread implementation, when additional approvals are necessary. Government officials engaged early can prove to be advocates at this later stage. HiH may have additional experience with this that should be tapped in to.

Make Ford fit the market: Size the NGO market opportunity in India and similar markets; tailor a Ford vehicle as appropriate.

It remains to be seen whether a Ford vehicle will be ideal for this partnership. Find out if and how many NGOs would be interested in such a car, and what their price expectations are and how much of this market can be captured by Ford. Estimate a market size based on this information. If this market seems lucrative, investigate what their needs and prices expectations are. Rural roads around the world require 4x4 capabilities and frequent maintenance. Determine whether an existing vehicle, such as the Figo, can be adapted to capitalize on this market opportunity.

Ease uncertainty: Keep communication constant and open.

Build on the strength of the PPP to continue weekly communication. Keep partners engaged; make sure all parties are sticking to the timeline. Encourage

conversations regarding scale and sustainability. Keep in mind that all

partners are critical to success, and record lessons learned as they come up.

Conduct regular visits and face-to-face meetings as possible. These measures

will help issues that could impact the success of the pilot come to light early,

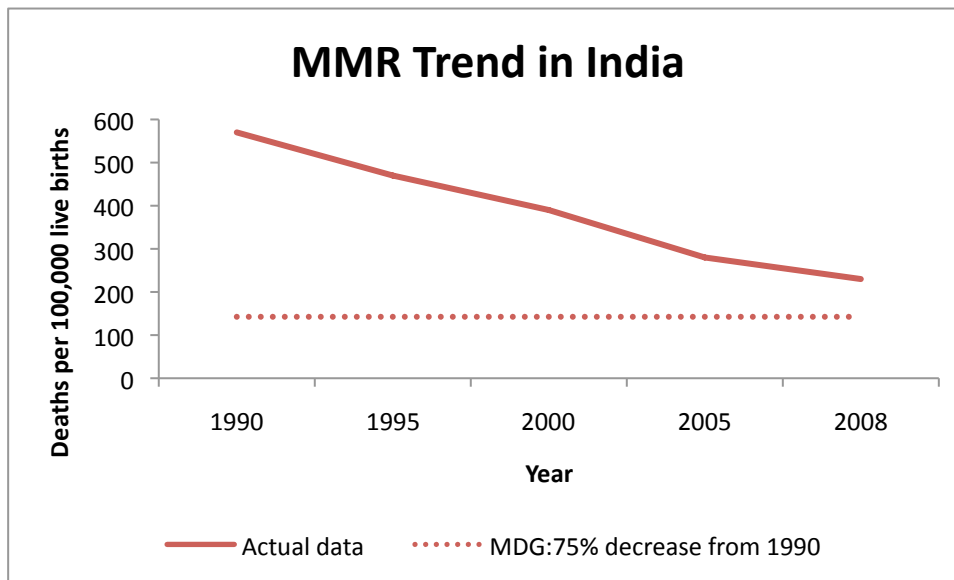increasing the chance that they can be resolved.

Exhibits

Exhibit 1

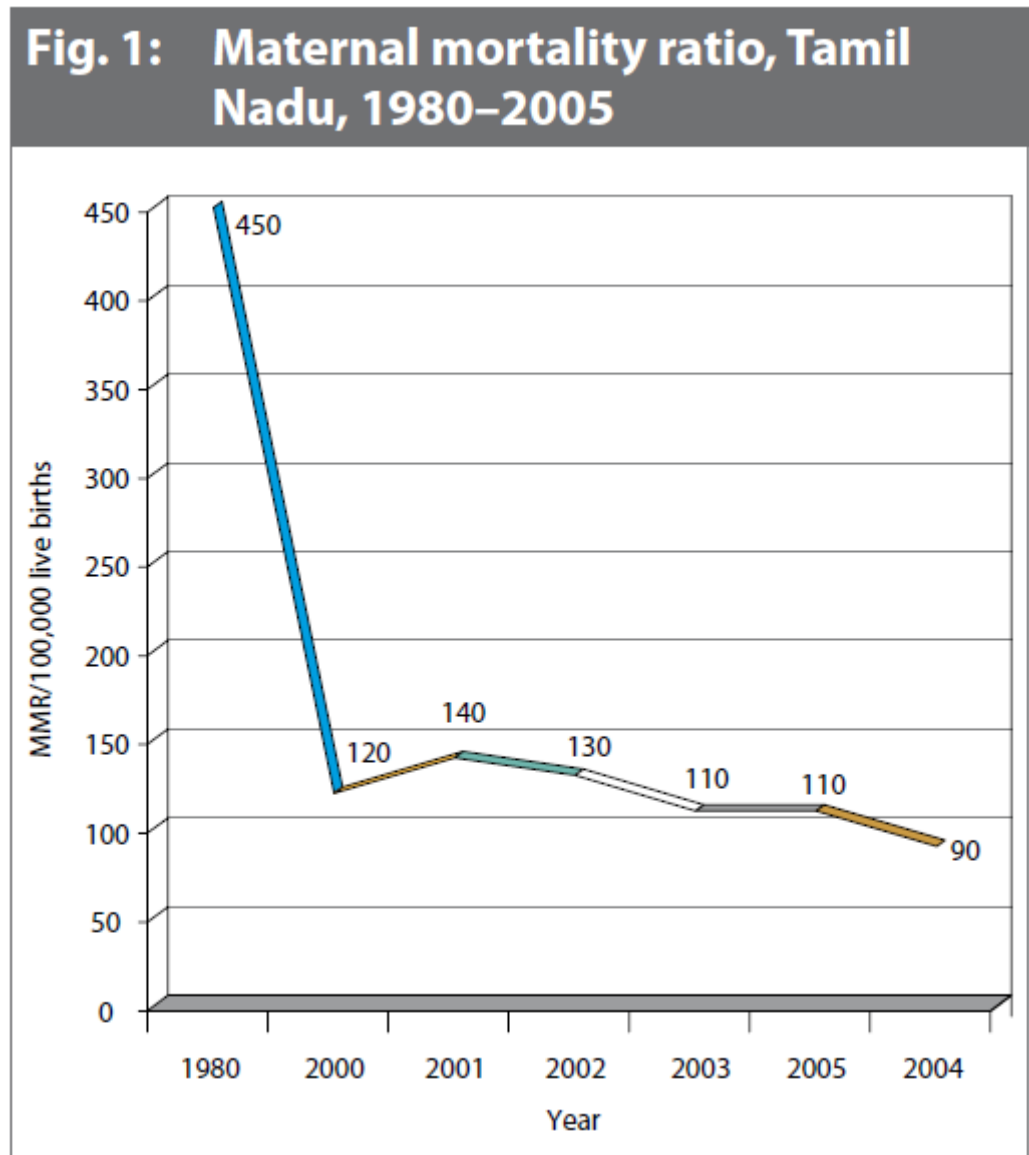Percentage of people within a 30min walk of an all weather road (no. of countries included)

Source: World Bank Rural Access Index (2006)
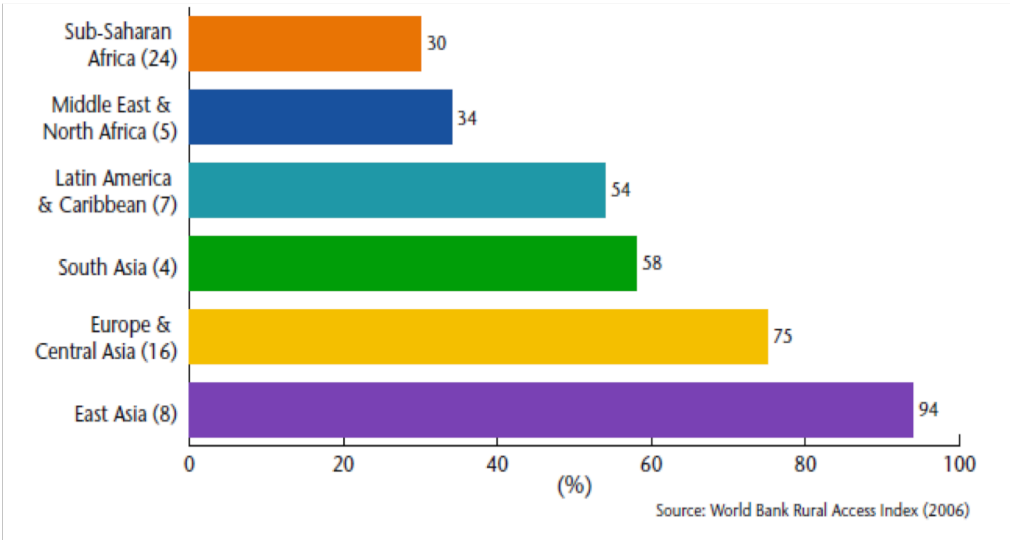
Source: World Bank Rural Access Index, 2006

Exhibit 2

MMR Trend in India

Source: WHO, UNICEF, UNFPA, and World Bank Maternal Mortality Inter-Agency Group

Exhibit 3

Fig. 1: Maternal mortality ratio, Tamil Nadu, 1980–2005

Source: World Health Organization: Safer Pregnancy in Tamil Nadu: From Vision to Reality

Exhibit 4 Tamil Nadu Health System

Category	1980		1990		1999		2006	
	No.	Beds	No.	Beds	No.	Beds	No.	Beds
Teaching hospitals	32	14 689	33	16 374	37	18 742	44	21 399
District HQ hospitals	15	4641	22	6609	26	8263	29	8478
Taluk hospitals	117	6156	121	7550	162	10 266	155	10 017
Non-taluk hospitals	108	9095	72	2014	77	2265	80	2268
PHCs and CHCs	392	2298	1386	5208	1399	5334	1421	7191
Health sub centres	ND	ND	ND	ND	8682	ND	8683	ND

PHCs (Primary health centres); CHCs (Community health centres) ND (not determined)

Source: Directorate of Medical Education, Directorate of Medical and Rural Health Services, Directorate of Public Health and Preventive Medicine

Source: World Health Organization: Safer Pregnancy in Tamil Nadu: From Vision to Reality

Exhibit 5

Time trends in MMR, Tamil Nadu, India, 1999-2010
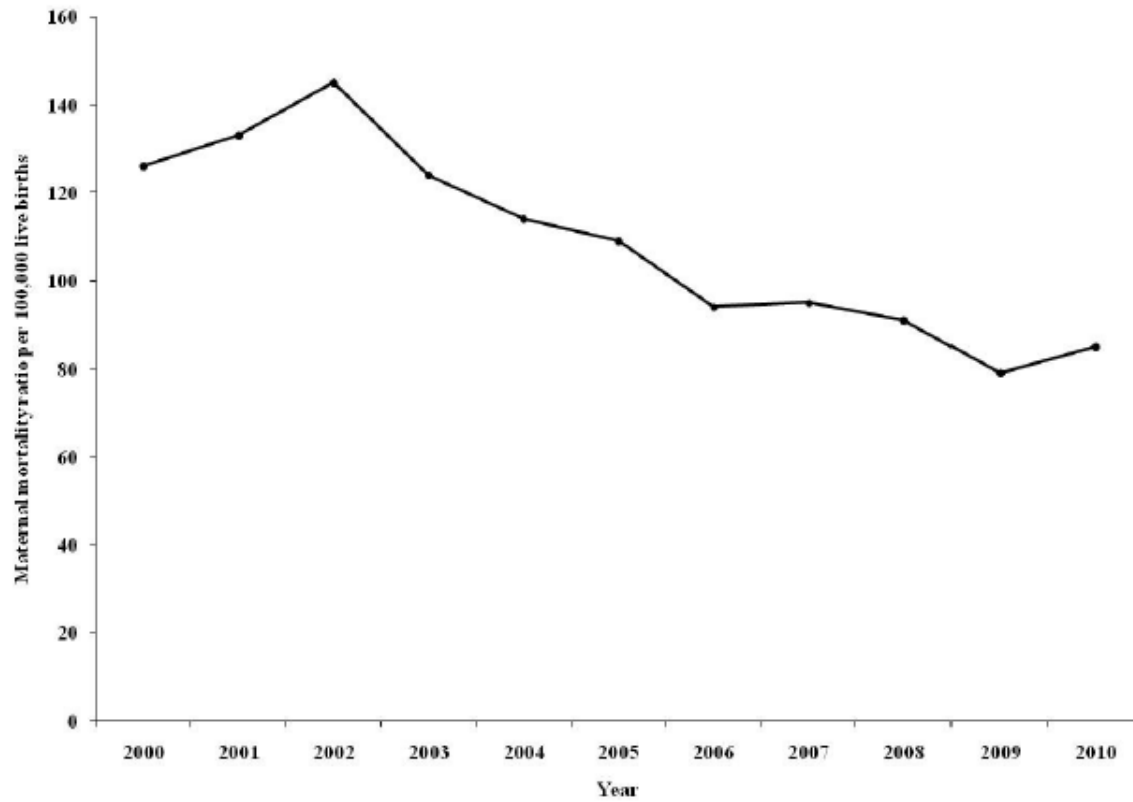
Source: Maternal Mortality in Tamil Nadu During 2001-10: Varied Progress in Reducing Maternal Mortality at the health District Level and Preventable Causes Remain Unchanged; 2010

Exhibit 6: Varied Progress in Reducing Maternal Mortality Rates in Tamil Nadu.

2008-2010
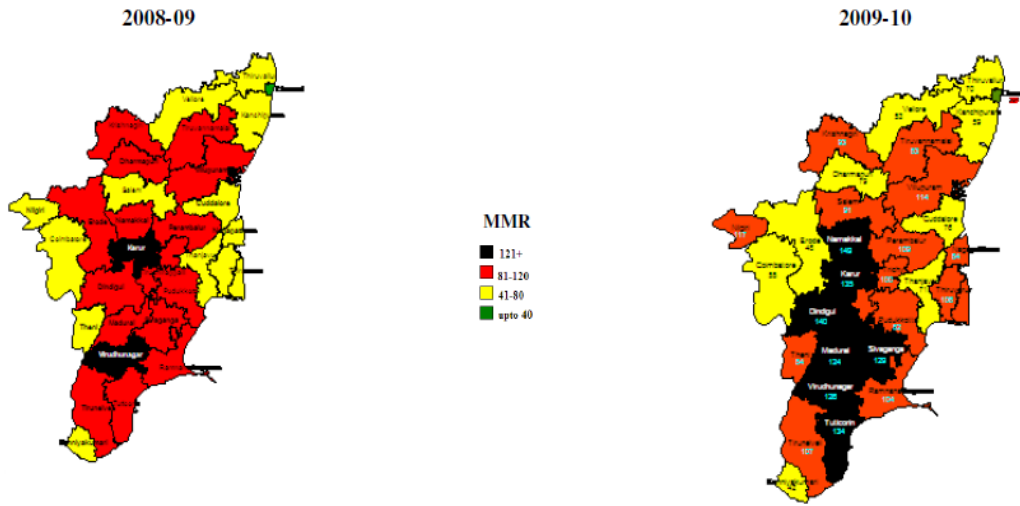
Source: Maternal Mortality in Tamil Nadu During 2001-10: Varied Progress in Reducing Maternal Mortality at the health District Level and Preventable Causes Remain Unchanged, 2010

Exhibit 7
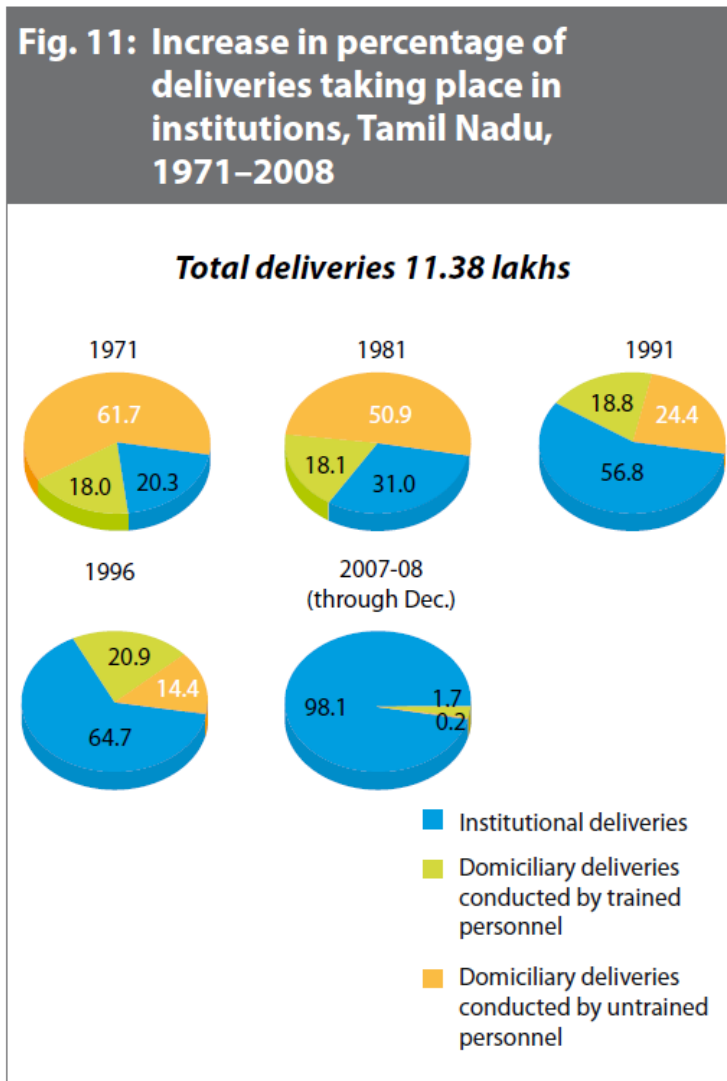
Fig. 11: Increase in percentage of deliveries taking place in institutions, Tamil Nadu, 1971–2008

Source: World Health Organization: Safer Pregnancy in Tamil Nadu: From Vision to Reality

Exhibit 8: Government-run Women & Children Hospital in Chennai

Source: Waiting area outside of government-run Women's and Children's Hospital in Chennai, photo taken by Maureen Bossi, 1/2/12

Exhibit 9: Hand in Hand India

Source: Visit to Hand In Hand International in Kancheepuram, Tamil Nadu, photo taken by Maureen Bossi, 1/5/12

Exhibit 10: Stakeholder Map v2
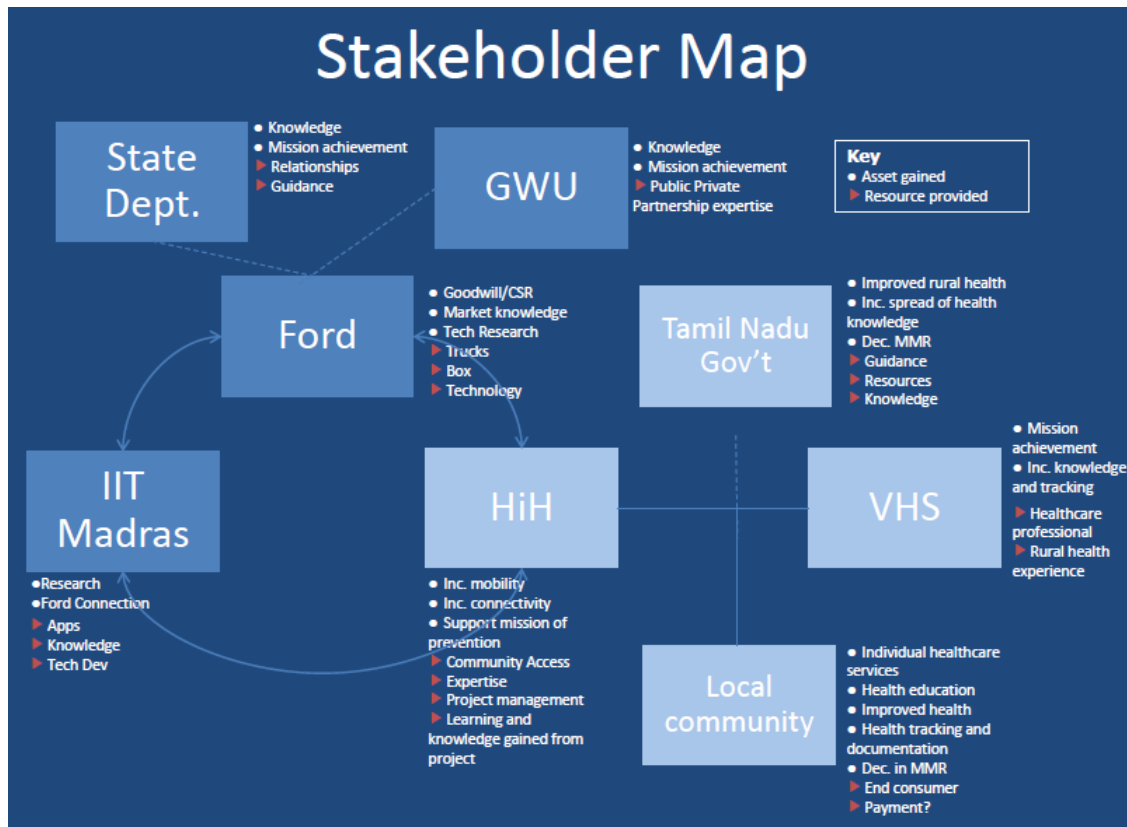
Source: SNRE Team Presentation to PPP, 2012

Exhibit 11: Panchayat Community Center or Anganwadi

Source: Visit to anganwadi in Kancheepuram panchayat with HiH, photos taken by Becky Martin, 2/17/2012

Exhibit 12: Administrative Structure of Indian Government
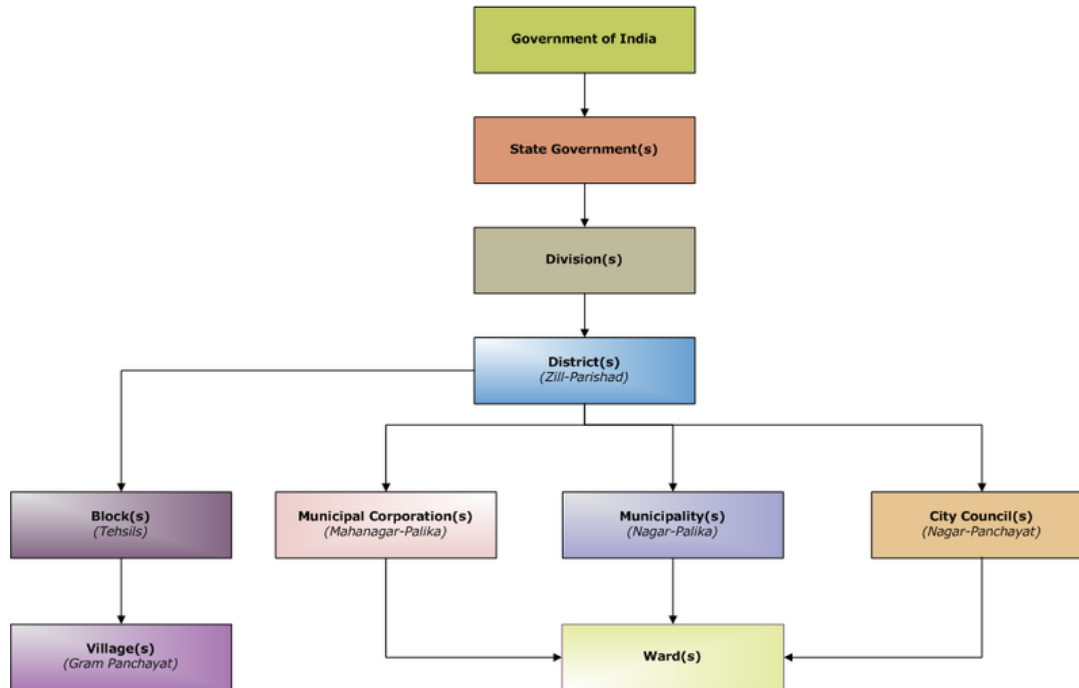
Source: V. Prajkumar, Wikipedia

Exhibit 13: Village Health Nurse and Subcenter

Source: Visit to subcenter in Kancheepuram with HiH, photos taken by Becky Martin, 2/17/2012

Exhibit 14: Village Health Nurse Sample Weekly Schedule

Monday	Conduct immunizations at subcenter (VHN service population travels to subcenter)
Tuesday	Travel to Primary Health Center and give feedback about cases, get more supplies, and meet with block medical officer
Wednesday	Travel to anganwadis, or panchayat centers, to conduct health screenings, nutrition or sanitation education, etc., as appropriate
Thursday	Conduct school visits to build health education and awareness among children
Friday	Travel to anganwadis to conduct health screenings, nutrition or sanitation education, etc., as appropriate
Weekend	Work as needed; VHN works every weekend, both Saturday and Sunday

Source: Interview with Village Health Nurse met during visit to Kancheepuram with HiH, 2/17/2012

Exhibit 15: Evening Clinic

Doctor and nursing assistant host evening clinic hours in a panchayat in

Kancheepuram, Tamil Nadu.

Source: Visit to HiH-run evening clinic in Kancheepuram, photos taken by Becky Martin, 2/17/2012

Exhibit 16: Services Provided by HiH When Running Clinics

1. Identify communities in need of a clinic

2. Engage community – Engage panchayat in health discussion and
   gauge interest in a clinic

3. Identify appropriate building or structure with community – Get
   community to make necessary changes to structure, i.e. clean it up and
   get electricity

4. Identify, train, manage field mobilizer

5. With community, set visit schedule, open hours and a price for each
   visit

6. Hire and train doctors and provide transportation as needed – Doctors
   are sourced from city hospitals and medical colleges and paid at a very
   reduced rate. They may be retired or practicing doctors or MBBS
   doctors, students who have completed coursework for medicine but are
   not yet full-fledged doctors.

7. Source medical supplies, purchased near- or at-cost

8. Run Model Kairwaasi Clinic – Run office clinic in Kancheepuram
   with one doctor that is employed full-time by HiH and a pharmacist
   who manages the medicine. The HiH staff doctor provides training and
   orientation to the field doctors and also staffs experienced nursing
   assistants. The pharmacist keeps track of medicine inventory.

9. Track medical information – Information on health cases is tracked
   and monitored at the model clinic. As needed, advice can be sought
   from the doctor and nurses there.

Source: Interview with HiH during visit to Kancheepuram, 2/17/2012

Exhibit 17: Map of HiH's Village Clinic Model
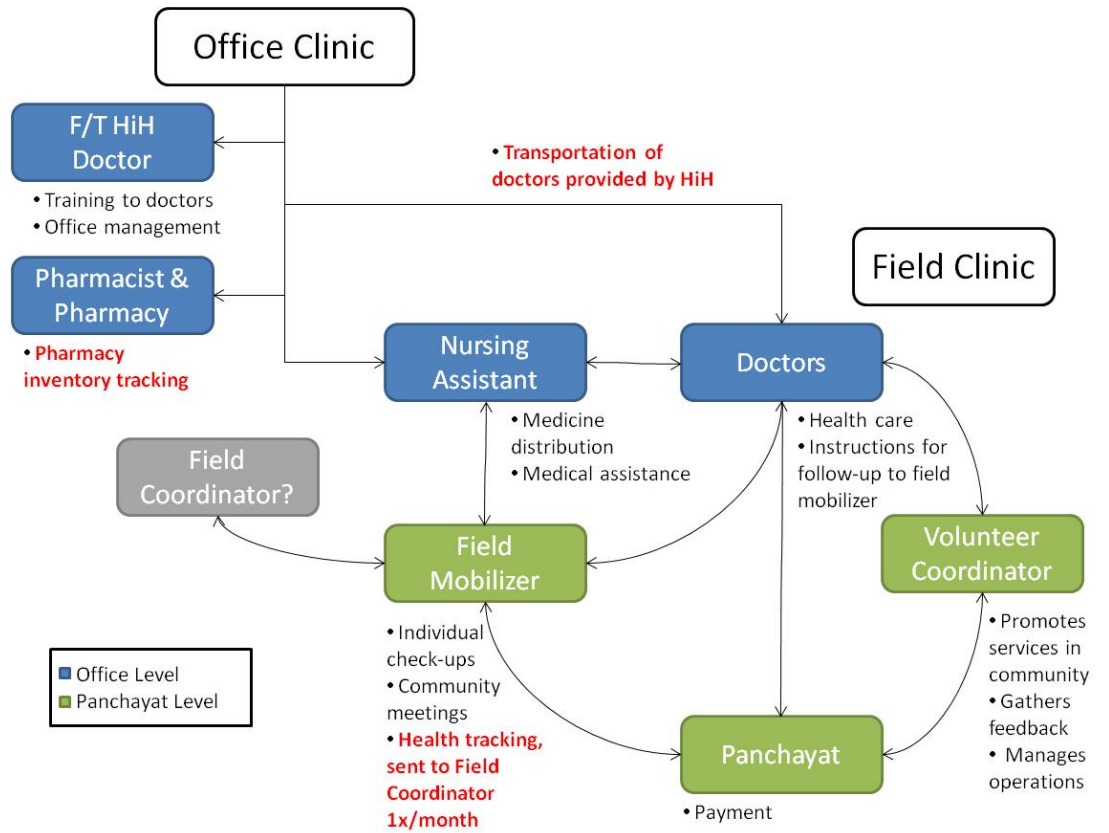
Source: SNRE Team notes from 2/17/2012 visit to Kancheepuram with HiH

Exhibit 18: Pregnant Mothers In Rural Areas
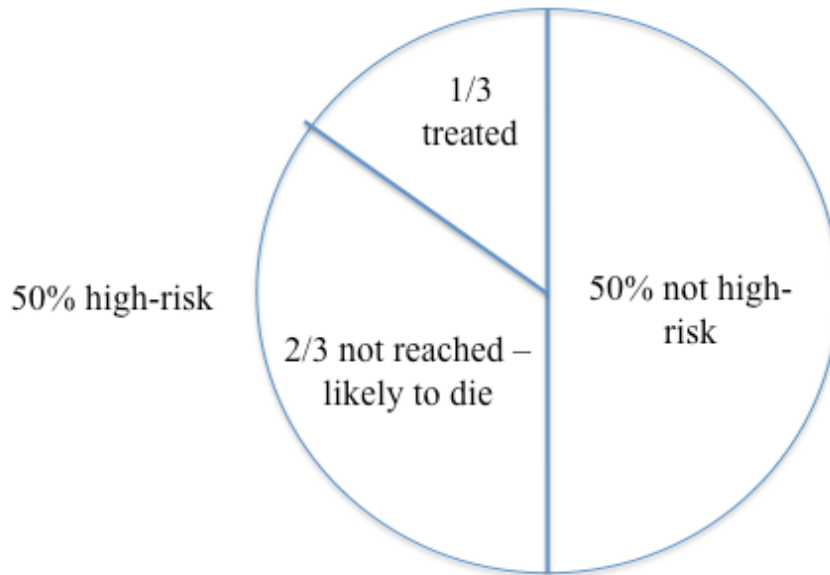
Source: Dr. Kolandaswamy, described in person during meeting at Madhuram Narayanan Centre for Exceptional Children, Feb 21, 2012.

Exhibit 19: HiH Reconnaissance Visit to Kalrayan Hills – March 8th & 9th

Source: Hand in Hand Report submitted to PPP 3/2012

Geography:

Kalrayan Hills is a hilly terrain and is a part of Eastern Ghats. Kalrayan Hills is in Villupuram District and Kallakurichi is the nearest town. Kallakurichi is 235 Kms from Chennai. Kalrayan hills has about 15 Panchayats and 188 villages. Kariyaloor and Vellimalai are two of the biggest Panchayats in Kalrayan

Villupuram : Kalrayanhills Block
Panchayat Villages

(Map Not to Scale)
Digital Map Source : TWAD Board, Chennai
Web Design: NIC,TNSC

Hills. Kalrayan Hills Block has a population of around 60000.

Kariyaaloor is about 42 kilometers from Kallakurichi. Kariyaloor panchayat comprises 8 villages. The Community Health Centre (CHC) is located in Maavadipattu village.

People and Livelihood:

People of Kalrayan Hills belong to the Malayali Tribes who are primarily into agriculture and also depend on Non-timber forest produce.

Medical Services available:

People of Kalrayan Hills Block access medical services from the following sources:

a) Kariyaloor CHC which has 9 Health Sub-Centers and 9 VHNs and covers a population of 28,965 people.

b) PHC in Mottampatti (covers a population of 14731)

c) PHC in Kilakadu (covers a population of 9629)

d) PHC in Serapattu (covers a population of 6883)

e) Some tribal population avail services from Edutthavaainatham PHC in the foot hill as it is easily accessible than the one in the hills

f) CHC in Karumandurai. Karumandurai actually falls in the neighbouring district of Salem though it is only 10 Kms from Kariyaloor.

- In total, there are a total of 18 Health Sub Centers and each sub-center has a VHN.

- Kariyaloor CHC has 2 doctors, about 4 nurses and one health Inspector. It is the only centre having a operation theatre of all the four facilities in the Block.

- Kariyaloor and Karumandurai has only ambulance (108) each

- Kariyaloor has also 2 anganwadi (ICDS) centers

Key Health Issues:

- Infant mortality and maternal mortality is not very uncommon. In the last week there was an incident in Kariyaloor where both Mother and Child died

- Most emergency cases especially pregnant women are taken to Kallakurichi or Salem Hospitals. In most cases, they first take the patient to Kallakurichi and the cases are referred again to Salem.

- There are traditional DAIs (only few and very old) and also untrained local women who perform deliveries. Some gover nment field staff also do home deliveries. There was a mention of a local ANM who had conducted more than 100 successful deliveries without the assistance of any doctors.

- There are also traditional Vaidhyas in villages especially for snake bites and simpler ailments.

- As per the local sources, the VHNs do not visit the villages very often because of accessibility issues. VHNs take the help of local women who volunteer to facilitate some of the services.

Accessibility Issues:

- Of the 188 villages in Kalrayan Hills, nearly 50 villages can not be accessed 4 wheelers. Buses connect only the main Panchayats.

- People in some of the remote villages transport patients in 2 wheelers or carry them to the nearest point from where they get access to Govt. ambulance services.

- Pregnant women from remote areas had to walk for 7-8 Km or brought in 2 wheelers for delivery .

Key takeaways:

- There are definitely maternal and infant mortality in the area

- Deliveries at home is a common thing

- Accessibility is the biggest issue

- Very little services reach the people especially those in the remote areas

- Kariyaloor CHC covers nearly 50% of the tribal population .

- Telephone signals are available in most of the areas

- We can source staff from each village to work has Community Health Worker / Health Mobiliser.

Villupuram District Blocks

District Map

Villupuram : Kalrayanhills Block
Panchayat Villages

(Map Not to Scale)
Digital Map Source : TWAD Board, Chennai
Web Design: NIC,TNSC
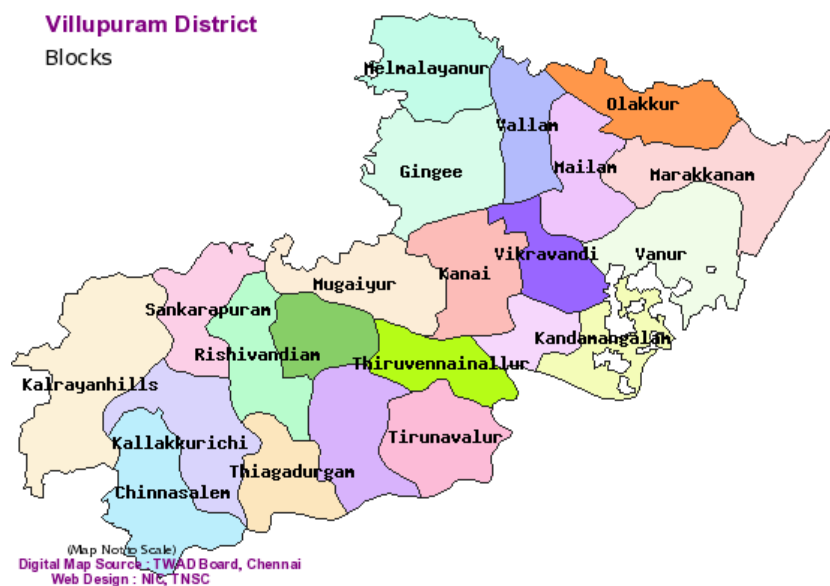
Exhibit 20: Pilot Timeline

Milestone	Description	Date	Responsibility
Initial Meeting	Ford and State Department	1/25/11	Berdish
Introduction	First look for Sue Cischke	3/14/11	Prasad, Berdish
Internal Alignment	Appropriate Leadership	4/27/11	Prasad, Berdish
Report	"Empowering Women Through Ford Technology"	4/28/11	U-M MAP Team
GW Meeting	Ford, State, GW, NGOs	6/27/11	Berdish, GW
MOU Signed	Ford, State, GW	7/18/11	GW
OpenXC	SUMURR platform is public	9/9/11	Prasad
Report	"Global Policy and Women Empowerment"	10/28/11	GW
Report	"Innovative Alternative Financing"	10/28/11	GW
Report	"Landscape of Global Telemedicine Sector"	10/28/11	GW
Provider identified	Hand In Hand, IIT-Madras	11/18/11	Berdish, Prasad
Ford India support	Provide vehicles, communication	11/28/11	Berdish, Sethi

Milestone	Description	Date	Responsibility
U-M SNRE Trip	Immersion, meet stakeholders	1/6/12	U-M SNRE Team
Report	Insights: IIT, Hand-in-Hand, community	1/20/12	U-M SNRE Team
Roundtable	Ford, State, GW	2/6/12	GWU
Chennai Trip	Ford of India and State Department meetings	2/20/12	DB, Prasad, Cabe
Chennai Trip	Meet VHS and Hand-in-Hand	2/21/12	DB, Prasad, Cabe
Chennai Trip	HCL, IIT-Madras Technology Workshop	2/22/12	Prasad, DB, Cabe
Chennai Trip	"Wheels -on-ground, apps-in-cloud"	2/23/12	Prasad, DB, Cabe
Launch Pilot	2/23/12 to 9/30/12	2/24/12	Prasad, Berdish
Begin cadence	Weekly Friday call for all partners	3/2/12	All
Draft #1 MOU	Define Hand In Hand Role	3/5/12	Hand In Hand, DB
Reconnaissance	Visit to Kalrayan Hills	3/9/12	Hand In Hand
Gov't Approval	Letter to Dr. Kolandaswamy	3/14/12	Sweta, Berdish
Topline findings	Kalrayan Hills visit, stakeholders and experts	3/21/12	Hand In Hand
Report	Baseline established, proposal complete	3/31/12	Hand In Hand, DB
Report	Preliminary Technology Assessment	3/31/12	Prasad, IIT-Madras
Report	Preliminary Pilot Assessment	4/30/12	U-M SNRE Team

Milestone	Description	Date	Responsibility
On-ground team	Identify local Health Ministers	4/30/12	Hand In Hand
On-ground team	Training of VHNs and ICDS workers	4/30/12	Hand In Hand
Checkpoint	Boneham, Brown, Mascarenas, Day	4/30/12	DB, Prasad, GW
ASM	SUMURR may be part of Blueprint for Mobility	5/2/12	DB, Prasad
Education	Maternal and child health, Panchayat Raj	6/30/12	Hand In Hand
Report	Technology Process Improvements	6/30/12	Prasad, IIT-Madras
Government	Interface established, services facilitated	7/31/12	Hand In Hand
Checkpoint	Boneham, Brown, Mascarenas, Day	7/31/12	DB, Prasad, GW
PICME App	Open XC, computer, phone	8/31/12	Prasad, IIT-Madras
Report	Explore scaling, replication, partners	8/31/12	GW
PICME App	Beta complete, running on wheels	9/30/12	Prasad, IIT-Madras
Checkpoint	Boneham, Brown, Mascarenas, Day	7/31/12	DB, Prasad, GW
Report	Full-Pilot Assessment for Ford and State	10/31/12	Cabe, DB, GW
Presentation	Commercialization for Brown/Mascarenas	11/30/12	DB, Prasad, GW
Presentation	Scalability for Clinton/Brown/Mascarenas	11/30/12	GC, DB, VP, GW
Presentation	ASM	12/21/12	Berdish, Prasad

Source: Ford, March 2012

Exhibit 21: Hand in Hand Timeline

Source: Hand in Hand, March 2012

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