# Using the Standard Days Method® (SDM) via SMS: Proof-of-Concept Testing of CycleTel™

## Report on Results from Lucknow, Uttar Pradesh

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The Institute for Reproductive Health
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The Institute for Reproductive Health (IRH) is part of the Georgetown University Medical Center, an internationally recognized academic medical center with a three-part mission of research, teaching and patient care. IRH is a leading technical resource and learning center committed to developing and increasing the availability of effective, easy-to-use, fertility awareness-based methods (FAM) of family planning.

IRH was awarded the 5-year Fertility Awareness-Based Methods (FAM) Project by the United States Agency for International Development (USAID) in September 2007. This 5-year project aims to increase access and use of FAM within a broad range of service delivery programs using systems-oriented scaling up approaches.

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## Acronyms

| | |
|---|---|
| **FAM** | Fertility Awareness-based Methods |
| **GOI** | Government of India |
| **IRH** | Institute for Reproductive Health, Georgetown University |
| **mHealth** | Mobile Health |
| **SMS** | Short Message Service |
| **SDM** | Standard Days Method® |
| **USAID** | United States Agency for International Development |

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## Executive Summary

Georgetown University's Institute for Reproductive Health (IRH) has developed CycleTel™, a Short Message Service (SMS)-based application that enables couples to use the Standard Days Method®(SDM) using their mobile phone. CycleTel represents the first application to actually deliver a family planning method to individuals and couples via mobile phones.

The objectives of this proof-of-concept study were to determine the acceptability and feasibility of supporting SDM use using the CycleTel mobile phone application and to refine the messages and message pattern that are used for this service. The study sought to understand mobile phone use patterns; the appropriate content, frequency and timing of the messages of the algorithm; whether women would like their husbands to participate in sending or receiving text messages; and how to reach potential users.

The results of this testing will inform the next stage of development of this innovation, which is the development and pilot test of an automated software platform for CycleTel.

This study was conducted in the city of Lucknow, in the state of Uttar Pradesh, India. India was selected as a location for the study as SDM has been shown to be an attractive method, and studies have shown that Indians can use it correctly. We are targeting urban areas for CycleTel since that is where mobile phone use is most prevalent.

The study was conducted in three phases. The first phase consisted of focus group discussions with women, men, and couples to determine potential interest in CycleTel, to understand if this intervention would be appropriate in light of the way in which potential users currently use mobile phones, and to explore appropriate messaging.

**Table A. Research Phases for CycleTel Proof-of-Concept Testing**

| 3 Phases | Objectives |
|---|---|
| Focus Group Discussions<br>54 participants | Understand phone use patterns<br>Determine potential interest among target audience<br>Explore appropriate messaging and preferences for the service |
| Cognitive Interviews<br>18 participants | Verify comprehension of messages<br>Adapt and finalize messages |
| Manual Testing<br>26 women/couples | Enroll women for 2 cycles to assess feasibility, satisfaction and correct method use (using FrontlineSMS software)<br>Troubleshoot problems and determine how to improve service |

We held a total of seven focus group discussions—four with women, two with men, and one with couples, with approximately 54 participants total—which yielded many valuable findings. We learned that there existed a potential demand for the service, as many men and women wished to use a natural family planning method but did not have correct knowledge of their fertile days. Second, we learned that messages should be discreet and non-technical. For example, all participants strongly preferred the message, "*Unsafe day,*" to the more literal, "*You can get pregnant today*."

From the focus group discussions, we also learned that "Hinglish"—Hindi words spelled in the Roman alphabet—was the preferred language for the messages; that approximately half of the respondents felt that men should also have the opportunity to receive messages; and that people were willing to pay for a subscription to a monthly CycleTel service.

The second phase consisted of cognitive interviews to verify comprehension of the CycleTel messages and finalize the message content. This phase resulted in significant reworking of the messages to make them easier to understand by simplifying the language, removing unnecessary words, and substituting commonly used, simple English words for Hindi words and phrases that were more complicated and less familiar to users.

The third and final phase of this proof-of-concept research was to test the application with actual users. Since an automated system had not yet been developed for CycleTel (it was to be developed based on the results of this research), IRH hired and trained a individual CycleTel "operator", who sent the CycleTel SMS messages to participants, and tracked them, using FrontlineSMS software on a laptop. To keep it manageable, we limited the number of manual testing participants to 30 women.

The manual testing phase confirmed that CycleTel could be used successfully. Participants were very satisfied with the method, felt that it improved their communication with their partner, and would have liked to continue using it if the service was available. Participants were willing to pay up to 50 rupees per month to subscribe to such a service.

Although 32 women were interviewed upon admission, only 26 women ultimately started using CycleTel, and 19 completed two cycles. Some reasons for dropping out include lack of motivation to prevent pregnancy, and potential difficulty comprehending and sending text messages due to the lower educational level of some of the participants.

Based on the results of the proof-of-concept testing, the manual testing phase will be conducted with additional users in Delhi to ensure appropriateness of the service to a slightly more educated group of users in a larger city. Simultaneous to this testing, software development will be undertaken and a test market with 300-500 users will be launched in early 2011.

In addition to informing the next steps in the CycleTel development trajectory, the proof-of-concept testing revealed important findings that are applicable to mobile health (mHealth) interventions more broadly. Specifically, this experience has demonstrated how much users value confidentiality and discretion; the importance of short, simple, non-technical messages using every-day spoken language; and above all, the importance of proof-of-concept testing for development of mHealth interventions.

As a result of this study, we can say confidently that CycleTel holds great promise as an mHealth intervention with potentially large impact, and we suspect this to be the case not only in India but other countries where mobile phone use is prevalent.

## 1. Introduction

Georgetown University's Institute for Reproductive Health (IRH) has developed a concept for CycleTel™, a Short Message Service (SMS)-based application that enables couples to use the Standard Days Method® (SDM, described below) using their mobile phone. This research represents the first stage of the development of the innovation: proof-of-concept research. It was conducted in India in collaboration with an Indian research organization.

## 2. Objectives

The objectives of this study were to determine the acceptability and feasibility of delivering SDM using the CycleTel mobile phone application and to refine the algorithm that is used to deliver this service. The study sought to understand mobile phone use patterns; the appropriate content, frequency and timing of the messages of the algorithm; whether women would like their husbands to participate in sending or receiving text messages; and how to reach potential users.

The results of this proof-of-concept testing will inform the next stage of development of the application, which is software development for CycleTel.

## 3. Background

Significant numbers of women in union worldwide want to avoid pregnancy yet are not using any method, because they cannot access family planning services and/or commodities, do not like available options, or are opposed to particular methods on cultural or religious grounds. More than 200 million women in developing countries have an unmet need for family planning. United Nations estimates show this figure growing by 40% by 2050 as young people reach their reproductive years. Over half of these women live on the Indian sub-continent and parts of Southeast Asia (Speidel et al. 2009).

In addition, millions of couples, especially young people who represent the largest segment of the population in need of methods to delay and space pregnancies, rely on incorrect information about their fertile days and fail to protect themselves from unplanned pregnancy. Widespread dissemination of accurate information about the fertile window of the woman's menstrual cycle would contribute to efforts to address this situation.

### 1. The Standard Days Method

SDM is a fertility awareness-based family planning method developed by IRH with support from the U.S. Agency for International Development (USAID). It has been shown to be more than 95% effective in preventing pregnancy with correct use, and 88% effective with typical use (Arevalo et al. 2002). It is recognized as an evidence-based practice by the World Health Organization and is currently is offered in over 30 countries worldwide. SDM identifies a fixed fertile window in the menstrual cycle when pregnancy is most likely. To prevent pregnancy, users avoid unprotected

sex on days 8-19 of the woman's menstrual cycle. It is appropriate for women with cycles between 26 and 32 days long (approximately 80% of cycles).

SDM is an important addition to the method mix that helps many couples prevent unplanned pregnancy (USAID 2009). Given its ease of use and lack of side effects, SDM may appeal in particular to couples who currently are not using any method, are relying on the rhythm method or withdrawal, or are dissatisfied with their current method. IRH has been studying the introduction of SDM into family planning programs around the world since 2001. Results have indicated that SDM introduction has a positive effect on family planning programs in that it attracts new family planning users, improves access to family planning methods, improves condom counseling, empowers women, and involves men (Gribble et al. 2008). In addition, since SDM is a knowledge-based method, it does not need to be provided by a clinician. Rather, it can be offered at community level or directly to consumers.

SDM is usually used with CycleBeads®, a color-coded string of beads that serves as a visual tool to help the woman and couple to track her fertile days. The method appeals to many users because of the CycleBeads tool. However, market segmentation research reveals that the population of reproductive age has different needs and interests, and as a result, among some segments of this population, other tools and strategies could be used to foster interest in and use of SDM.

### 2. Use of Mobile Phones as a Health Intervention

Mobile phones are the fastest-growing technology in the developing world, with approximately 70% of more than 3 billion mobile phone subscribers living in developing countries. The vast majority of subscribers are women and men of reproductive age (15-49). SMS technology has been used to provide health-related information directly to users (e.g., One World's Mobile4Good in Kenya) and to serve as reminders to people needing to take medicines at regular intervals (e.g., SIMpill® Medication Adherence System in South Africa and Botswana). These and other health health-related SMS interventions have had considerable success in reaching and connecting people with information they need.

Limited resources and fragile health systems in many developing countries are not adequate to meet the needs of people of reproductive age for family planning and related reproductive health information. There is significant potential to help them avoid unplanned pregnancy and improve their reproductive health by providing them with timely, actionable, personalized information through SMS.

No current SMS application guides family planning method use. SDM is uniquely appropriate for this intervention because by providing women (and their partners) with information on their fertile days, they will know when to avoid unprotected sex in order to prevent pregnancy.

### 3. Why India

India represents an ideal location for the proof-of-concept testing. First, there is a significant need for family planning. The family planning program in India is dominated by sterilization. Access to spacing methods such as pills, condoms, and IUDs is low. In urban Uttar Pradesh, the location for

this proof-of-concept testing, the contraceptive prevalence rate is 56%, with 19% of women opting for sterilization, 14% opting for traditional methods, and 17% for condoms (IIPS and Macro International 2007).

Recently, the Government of India (GOI) has put greater emphasis on "spacing" methods of family planning—methods that allow women to delay a first birth and space subsequent births—recognizing that early and closely-spaced childbearing have negative effects on the health of women and children and impede social and economic development.

Though it has not yet been included in the national family planning program, SDM has been offered in various locations in India since 2002 with great success. Through pilot studies with NGOs, expansion studies through public sector programs, and a range of experiences integrating SDM into services ranging from urban hospitals to rural villages, SDM has consistently been adopted by significant numbers of women and couples, particularly those who had never used a family planning method, and has been shown to be feasible to integrate into programs. SDM has attracted the interest of medical professional associations in India and was included in various policy documents, including the GOI's Reproductive and Child Health Phase II program implementation plan as a method that can expand choice. (For more information on SDM integration in India, see http://www.irh.org/?q=content/fam_india.)

In addition to the fact that SDM has been demonstrated to be feasible and popular in India, India has the second fastest growing telecom market in the world, with 360 million subscribers in 2009, according to the Hindustan Times (Singh 2009). SMS reach is increasing rapidly among potential beneficiaries. This, combined with evidence from SDM experience in India, suggests that offering SDM and related reproductive health information through SMS would be a significant, scalable, and sustainable approach to address unmet need for family planning.

## 4. The Concept

IRH has developed CycleTel as an alternative tool to support SDM use. Unlike other methods (e.g., pills, IUD, injectables), SDM is knowledge-based, requiring no commodity or visits to a health care provider. Women can use SDM without using CycleBeads, as long as they are able to track their cycle to know if they are on a fertile day (days 8-19) and to monitor their cycle length to ensure they are in the 26-32-day range.

To use SDM via CycleTel, the user must both send and receive text messages. First, the user must respond positively to screening questions to determine if the method is appropriate for her. Specifically, she will need to affirm that her periods come about a month apart (every 26-32 days) and that she and her partner will be able to avoid unprotected intercourse during the fertile days.

If she meets the screening criteria, the user will send an SMS message to CycleTel with the date her menstrual period starts each cycle. Then, CycleTel will send her text messages throughout her cycle informing her when she is in her fertile ("unsafe") phase. Additional messages sent to the user will help her monitor her cycle lengths to ensure her cycles are in the 26-32 day range.

Ultimately, through the CycleTel service, women and men will be able to access, via SMS, answers to their questions about SDM and other frequently asked questions about reproductive health issues. They will also be able to access information on other family planning options and reproductive health issues, with an emphasis on the importance of optimal birth spacing.

## 5. Study Design

This study has three phases, summarized in Table 1: focus group discussions, cognitive interviews, and manual concept testing phase that includes interviews with actual users.

**Table 1: CycleTel Proof-of-Concept Study Design**

| Study Phase | Objectives |
|---|---|
| **(1)** Focus Group Discussions | • Understand phone use patterns<br>• Determine potential interest among target audience<br>• Explore appropriate messaging and preferences for the service |
| **(2)** Cognitive Interviews | • Verify comprehension of messages<br>• Adapt and finalize messages |
| **(3)** Manual testing | • Enroll women for 2 cycles to assess feasibility, satisfaction and correct method use (using FrontlineSMS software)<br>• Troubleshoot problems and determine how to improve service |

### 1. Focus Group Discussions

We conducted focus group discussions to determine potential interest among women and men for CycleTel, to understand if this intervention would be appropriate in light of the way in which they currently use mobile phones, and to explore appropriate messaging.

The research questions we hoped to answer from the focus group discussions included the following:

1. Are women and men interested in the SDM and willing to try it using SMS?
2. Do women have their own mobile phone? Do they share it with someone else? With whom?
3. How did women obtain their mobile phone? (purchased it for themselves, gift, other)
4. How do women and men currently use mobile phones, and in particular, SMS (e.g., how often do they use it and for what purpose)?
5. Do women and men have to pay to send or receive text messages? If so, how much, and is it a flat fee or per message?
6. What mobile phone carriers do women and men use?
7. What is the appropriate language (i.e., English or Hindi) and phrasing of the SMS text messages?
8. What time of day would women like to receive the messages?

9. How frequently would women like to receive messages (e.g., every day, just when they are transitioning into or out of a fertile window, etc).
10. Are women interested in the option of having their husbands receive text messages as well?
11. Would men be interested in receiving SMS messages along with their wives?
12. Are women and men interested in receiving information about health topics in general along with SDM-related text messages? If so, what topics are they interested in?
13. Would women and men value other type of links or information in their reminder messages?
14. Would women and men be interested in a help line? If so, what types of questions might they have, and how can it be made easily accessible? What about a help menu that they could access through SMS?
15. What would be effective ways of reaching potential users (women and men) with information about CycleTel?

IRH hired CART, an experienced research agency, to conduct focus groups in the city of Lucknow, Uttar Pradesh. Participants met the following criteria: 1) desire to avoid a pregnancy but are using either no method, a traditional method, or condoms inconsistently; 2) a mobile phone user who has sent text messages in either English or Hindi; 3) age 18-27 (or, for men, married to a woman between those ages); and 4) married.

A total of seven focus groups were conducted. First, we held four female groups with eight participants in each group. All of them categorized themselves as homemakers, although some had jobs outside the home in areas like the teaching and financial sectors.

We then held two male groups with eight respondents in each group. These men represented service class, such as petty traders and small businessmen. Finally, we held one focus group discussion with three couples. One of the couples had both partners working whereas the other two females did not have a job outside the home.

Before the focus group discussions, participants were screened to ensure that they met the criteria for being in the study and informed of their rights as a study participant. All participants signed an informed consent form. The research agency provided a moderator and a notetaker for each discussion.

We used the results of the focus group discussions to refine the CycleTel messages, which were tested through cognitive interviews.

### 2. Cognitive Interviews

The cognitive interviewing approach was designed during the 1980s through an interdisciplinary effort by methodologists and psychologists to evaluate sources of response error in survey questionnaires. It was designed to focus on the thought processes that respondents go through to answer survey questions. This study adapted the cognitive approach for use with both questions and statements.

The purpose of the cognitive interviews in this study was to have a clear understanding of whether or not the text message content, whether in the form of a question (e.g., screening questions) or a statement (e.g., a message that tells the woman whether or not she is fertile or if her cycle was too long or too short to use CycleTel), was correctly understood by the potential user. Specifically, the research questions we hoped to answer through the cognitive interviews included the following:

1. How do women, men, and couples interpret the text messages?
2. What would be more effective ways to formulate the text messages?

During the cognitive interviews, respondents viewed a range of messages on their mobile phone. For each message, they were asked probing questions to determine how they interpreted the message. They were also asked how the message could be improved.

The same research agency that conducted the focus groups conducted the cognitive interviews, in conjunction with IRH staff. Participants were women and men in Lucknow who met the same criteria as used for the focus groups: 1) desire to avoid a pregnancy but are using either no method, a traditional method, or condoms inconsistently; 2) a mobile phone user who has sent text messages in either English or Hindi; 3) age 18-27 (or, in the case of men, married to a woman between these ages); and 4) married.

The number of cognitive interviews was based on the outcome of the focus groups and on the cognitive interviews themselves. We did an initial round of interviews with ten women and two men. We then further modified the messages and did a second round of interviews with four more women and two men. Participants were recruited through door-to-door visits. Those who agreed to participate in the study signed an informed consent form.

Cognitive interviews were conducted individually, in-person. The participants were asked to bring their mobile phones to the cognitive interviews so that they could receive text messages during the meeting. In this way, they could react to and comment on the messages that were received in SMS form. Basic demographic information was collected from the participants by having them fill out a brief form indicating their age, educational level, religion, number of years married, parity, age of youngest child, previous family planning use, and family planning intentions (spacing or limiting) prior to the interview. All participants received mobile phone credits to cover any costs of sending and receiving text messages during the interview.

Based on the results of the cognitive interviews, we refined the messages for testing during stage 3, manual testing.

### 3. Manual Testing of CycleTel and User Interviews

The manual concept testing and user interview phase was designed to answer questions pertaining to acceptability, feasibility, correct use, satisfaction, and partner involvement in the use of SDM via SMS. Specifically, the study questions for the manual testing phase were as follows:

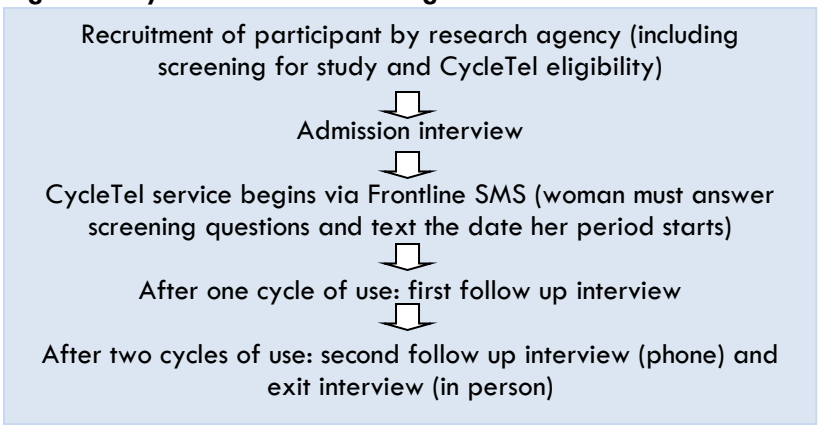
1. Do women and their partners find using CycleTel feasible? That is, were they able to access their phone at the appropriate times each day in order to send and receive text messages?
2. Do women find that the text messages help them to know which days to avoid unprotected sex in order to prevent pregnancy?
3. Are women and their partners complying with the messages and using the method correctly? That is, do they avoid unprotected sex on the specified days and send a text message on the day they get their period?
4. Do women like learning about their fertile days from text messages?
5. How do women and their partners feel about avoiding unprotected sex on the fertile days?
6. Are women and their partners satisfied with the CycleTel as a family planning method?
7. Do women and their partners feel confident that using CycleTel will help them to prevent pregnancy?
8. Would women and their partners wish to continue using CycleTel after the study?
9. What are their preferences in terms of the frequency and content of messages telling them when they are fertile?
10. For women who had an out-of-range cycle, did they understand the message and do they intend to obtain another method?
11. How did women let their partners know which days they needed to avoid unprotected sex? Did they send the messages they received to their partners? Did they show the messages they received to their partners?
12. Would they like to have the option of having their partner receive messages? (And would their partner like the option of receiving messages?)
13. Did they find the help line useful?
14. What are suggestions for improvement?
15. Would they be willing to pay for CycleTel? If so, how much?
16. What type of messages or incentives, if any, would be appropriate to encourage continued and correct use?

We recruited 30 women volunteers who wished to test CycleTel use. The criteria for participation was as follows: 1) she and her husband desire to avoid a pregnancy but are using either no method, a traditional method, or condoms inconsistently; 2) she must be a mobile phone user who was in the habit of sending text messages in either English or Hindi; 3) married; and 4) between the ages of 18-27. Focus group participants were invited to participate in the manual testing phase. Women were also recruited from the community via household visits.

In addition to the above criteria, participants also had to be eligible to use SDM. Therefore, they were screened before being invited into the study to ensure that the woman had menstrual cycles between 26-32 days long (about a month apart) and that she and her husband would be able to avoid unprotected sex on the fertile days. Those who met the screening criteria were given more information about the study, informed of any risks or benefits of participating in the study, and informed of rights as a study participant. Those who agreed to participate signed an informed consent form.

The process for the manual testing phase is depicted in Figure 1. Upon admission to the study, IRH administered an admission interview. Following that, the participant began to receive text messages as specified in the CycleTel algorithm. Because this study tested the concept manually before the development of a software program, messages were sent and received by a human operator (IRH study staff) as opposed to an automated program. FrontlineSMS open source software was used to allow the operator to send messages using a laptop. The operator was specially trained on SDM, CycleTel, and FrontlineSMS.

**Figure 1: CycleTel Manual Testing**




The messages the woman received on different days were determined by her current cycle day. The operator maintained a detailed record for each study participant documenting her first day of menstruation, the fertile and infertile days of her menstrual cycle according to SDM, and messages received by and sent to each participant. Participants had the option of contacting the operator via text message or phone via a helpline at any time with any questions or problems, or if she needed assistance. All instances of contact were documented by the operator in the women's log as well.

Women participated in the study for up to two complete menstrual cycles. Participants began receiving text messages according to the CycleTel algorithm upon admission. If she knew the date her last period started, she could start using CycleTel right away. If she didn't know the date her last period started, she would start using CycleTel on the day her next period started.

After study participants completed one cycle of use, they were interviewed via phone to determine whether they were using the method correctly and identify any problems they were having.

When each participant had completed two menstrual cycles, she completed a second follow-up interview over the phone and an exit interview in person. The exit interview was an opportunity to provide her reimbursement for any SMS charges she incurred as part of the study as well as inform her of the range of family planning methods available, including SDM with CycleBeads, if she wished to continue to use a method to prevent pregnancy.

Although we initially planned to invite the husbands of CycleTel users to be interviewed after her exit interview, that did not happen as couples were not interested.

## 4. Results

The results of the three phases of the study are described in the following sections.

### 1. Focus Group Discussions

As stated previously, IRH conducted focus group discussions with four groups of women, two groups of men, and one group of three couples. There were 54 participants in all. There was a mix of income levels represented. Whereas most of the women were homemakers, most of the men worked in either office jobs or service-related professions.

#### Mobile phone usage

All the participants—both women and men—owned a mobile phone of their own, and there were a variety of different service providers used by the participants. Most women obtained their phones as a gift from their husband so did not have a choice in the brand of phone or service provider. Men reported choosing a particular service provider based on economical reasons such as price and free calling within a certain network. Men reported paying an average monthly expenditure of 300-400 rupees (Rs) for mobile phone service including calls and accumulated SMS fees (Rs 1 per SMS).

Whereas women mostly used their mobiles to keep in touch with relatives and friends, the men tended to have a wider list of contacts that included business associates in addition to family and friends. Men reported sending and receiving calls between 10 and 15 times per day, and women reported sending and receiving calls from 9 to 14 times per day.

Women and men reported being receptive to and having a positive attitude towards sending and receiving SMS messages but stated that calling is done more than messaging as they find calling to be quicker and easier than composing a text message. Women and men reported that on occasions like festivals, however, messaging becomes more frequent as it is a convenient way to send greetings to friends and family. Forwarding messages with interesting jokes and poetry is also very common.

Mobile service providers offer monthly subscription services for things such as games, banking, ring tones, and jokes. Both male and female focus group participants reported receiving messages frequently from the phone service providers about these services, and about 25% of the men had subscribed to such a service. Reasons for not subscribing included the fact that many of the services (such as ring tones and jokes) can be obtained from other sources (i.e., friends) free of cost. Another reason to avoid a subscription was that it was difficult to unsubscribe if they decided not to keep the service.

#### Need and demand exists for CycleTel

Among male and female focus group participants, there was a strong interest in using natural methods to prevent pregnancy, but most people lacked correct knowledge of fertile days. After the interviewer explained SDM to each group, both women and men in all the groups expressed interest and enthusiasm for the method. Women liked the method because it is natural with no side effects and low-cost. Males appreciated the method as a natural way to achieve family

planning goals while avoiding side effects for the woman, saving money, reducing fear of getting pregnant and increasing satisfaction compared with using condoms.

Both women and men expressed an interest in CycleTel as a way to know when they could get pregnant. As one male participant stated, "This is an idea that could change your life."

### Messages should be discreet and non-technical

Women and men did not necessarily share their phone with others but said there was a possibility for others to view messages or calls on their phone. Therefore, they expressed a preference for CycleTel messages to be discreet. For example, participants in all the groups preferred the Hindi versions of the phrases "safe/unsafe day" rather than "you can/cannot get pregnant today" to protect privacy and confidentiality. Women and men preferred precise messages that did not offer more information than necessary about their fertile days (i.e., they just wanted to know if it was an unsafe day and didn't need further advice regarding the need to use a barrier method if they decided to have sex on a fertile day).

The groups were divided on the preferred frequency of messages. While some participants favored receiving messages on all 12 fertile days, many preferred to receive fewer messages (e.g., only on the first and last fertile day).

Also, respondents felt they did not need the service to inform them how many days remained before their unsafe days began or ended (e.g., "you have 5 more unsafe days"), as they found that information confusing. They also felt that it led them to feel like they needed to track their cycle on a calendar, whereas the purpose of the CycleTel service was to do the tracking for them.

### SMS in "Hinglish" is best

Generally, individuals preferred to send/receive messages in Hindi with English letters (Roman/Latin alphabet)—sometimes referred to as "Hinglish"—as this is the way in which they usually transact messages. Also, they preferred text rather than voice messages.

### Timing of the messages

Most of the females who did not work outside the home tended to have free time to view messages between 1pm and 4pm. For working females, they reported being free between 9pm and 10pm. For those men and women who had office jobs, a good time to receive a message was between 10am and 5pm as they were at their workplace and had their mobile phone. Service class respondents said that after 6pm was the best time for them to read messages as they were home from work at that time.

In general, though, it did not matter much when the message was sent because the respondents said that the messages could be stored in their inbox and read whenever they have time.

### Males may sign up for the service

Women preferred that they receive CycleTel messages and not their husbands. Although many women thought the option of having their husband receive messages in addition was a good idea, they were concerned that it would cost too much.

Male respondents were divided about who should receive the messages; half mentioned that both partners should receive the messages, while the other half favored that messages be sent only to the female partners.

### People were willing to pay for a monthly service

Through the focus group discussions, we learned that individuals were willing to pay a monthly fee to subscribe to CycleTel. Women were willing to pay 20-25 Rs monthly; men were willing to pay 15 Rs monthly; and the couples were willing to pay 30-35 Rs monthly. (Note: current exchange rate is 44 Rs to USD $1.)

### Interest in additional health-related messages

Both males and females expressed interested in receiving additional messages on health related topics, new product announcements, entertainment, and cooking tips. In particular, health messages were welcomed, and participants were interested in unique information that they would not necessarily get by reading the paper, such as information about HIV and launches of new health products.

### Helpline is a must

All participants felt that it would be necessary to have a helpline associated with CycleTel so that people could call with any questions. Men and women suggested that the helpline be staffed by females, as callers would likely feel more comfortable discussing CycleTel-related issues with a female. The helpline could also serve to educate people about the method before signing up for the service.

### Ways to reach potential users with the service

Participants said that television commercials would be the best way to inform people about the availability of CycleTel. Other possible venues suggested were magazines (i.e., Grehshobha, Sarita, and Meri Saheli), newspapers, SMS messages, billboards, and posters.

## 2. Cognitive Interviews

Whereas the focus group discussions enabled IRH to solicit feedback from potential users on the CycleTel concept more broadly, the cognitive interviews conducted on a one-to-one basis allowed us to hone in on the optimum language and phrasing for each of the text messages that would be sent through the CycleTel service.

As stated earlier, based on results from an initial round of cognitive interviews with 10 women and two men, IRH made substantial revisions to the messages which were then tested in a second round cognitive interviews with four women and two men.

General findings from these interviews included the following:

### Simple, everyday language is best

In general, we learned the importance of keeping messages as short as possible to keep the attention of the reader, to replace long words with short and simple ones for easy comprehension, and to eliminate all unnecessary words. Additionally, as each SMS is limited to 160 characters,

participants indicated that it is best to ensure the message is sent in one SMS as opposed to two "broken" SMS.

Initially, cognitive interview participants had difficulty comprehending certain Hindi words which were not commonly used and which they were not accustomed to see written in Roman English, such as *sandesh* (message), *prakritik* (natural), and *saral* (easy). Therefore, we made revisions to ensure the messages reflected common spoken Hindi and to incorporate a few English words that are commonly used and well understood among Hindi speaking people. For example, the Hindi expression *Likh kar bheje* was perceived to be long and confusing, so we replaced it with the English word "Reply" which was simpler and better understood.

Although we initially included the Hindi versions of supportive or introductory words and phrases like "Great!" (*Badia*) and "Be advised" (*Dhyan de*) in some of the messages, we eliminated them. Respondents perceived them to be out of place, unclear when written in Roman English, and unnecessary.

The Hindi words for "unsafe day" (*Asurakshit din*) and "last unsafe day" were well understood by all.

#### Avoid numbers when possible

Including numbers in the messages was not well understood. For example, asking women if their periods came every 26-32 days was not well understood. Therefore, we asked women if their periods came about a month apart, and this was better understood. We also found that asking women if they could avoid sex or use a condom on 12 unsafe days each month was also difficult and therefore eliminated the number 12, and the message was better understood.

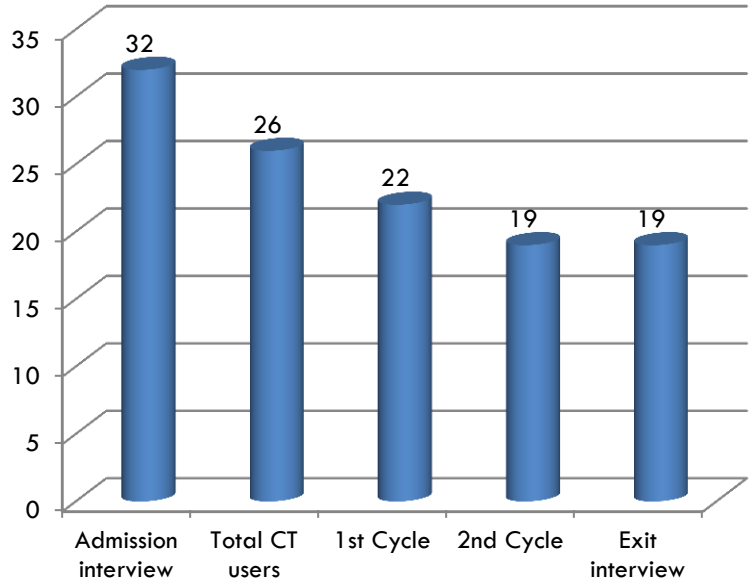
CycleTel requires the user to text the date her period started. We found that the way we wanted to ask the woman to send the date was not well understood. Therefore we revised the message and asked the woman to text her date in the format "26 NOV", which was better understood than other formats. Participants also found the word "date" to be better than "*dinank*", and the word "use" to replace "*prayog*" as the former is easier to read and understand.

### 3. Manual Testing Phase

Following the cognitive interviews, the message content and pattern were finalized for the manual testing phase. Once IRH's trained operator was in place, the research agency recruited female participants by inviting focus group participants to participate and by recruiting from the community via household visits. As stated earlier, the criteria for participation was as follows: 1) she and her husband desire to avoid a pregnancy but are using either no method, a traditional method, or condoms inconsistently; 2) she must be a mobile phone user who was in the habit of sending text messages in either English or Hindi; 3) married; and 4) between the ages of 18-27.

Whereas 32 women were initially entered the study and were interviewed upon admission, 19 of them completed two cycles of use, as depicted in Figure 2.

**Figure 2: CycleTel Manual Testing Participants in Lucknow**




Of the 26 women who started using CycleTel, all of them were homemakers and 85% had at least one child. Their demographic characteristics are presented in Table 2.

**Table 2: Demographic Characteristics of CycleTel Users**

| | |
|---|---|
| Age | Between 21-28yrs. Mean age 26 years |
| Education | 73% were graduates and above, and 27% had completed secondary school |
| Employment | All 26 were homemakers |
| Language | 25 spoke Hindi and 1 spoke Bengali at home |
| Religion | 65.4 % Hindu; 23.1% Muslim and 11.5% were Sikh |
| Age of husband | Between 24 to 40 years with mean of 30 years |
| Parity | 85% had at least one child, 15% had no children |

Some 42% of participants desired no more children, and 58% wanted to delay their first birth or space their next birth. Most participants (77%) were inconsistent condom users, and the others were traditional method users (abstinence and withdrawal).

All the participants owned personal mobile phones. Some 88% did not share their phone with any others including their husband.

### Timing of messages

Some 63% of CycleTel users viewed the CycleTel messages between 5-10pm, and 37% viewed them between 12-5pm. All the users told said the messages arrived at an appropriate time. As one participant shared, "I am mostly free at that time and it is easy to read the message. It maintains privacy."

### Frequency of messages

During the manual testing phase, users received a message on all 12 unsafe days, plus at least one reminder message toward the end of their cycle to remind them to text the date their next period

starts. All of them agreed that the messages were not too many. Some direct quotes included, "Right number of messages;" "It reminds me about all the unsafe days for me, so I am cautious (careful) on those days."

Sending or receiving SMS was very easy for 84% of users, while 11% said it was easy and 5% mentioned that it was neither easy nor tough. One participant stated, "We were just sending the day of our menstruation and the received message was also not very long and complicated."

### Helpline use

Some 21% of CycleTel users utilized the helpline. The reasons for calling the helpline included:

- User did not receive the message on the expected day.
- User had sent a wrong date to CycleTel and she called to correct her mistake.
- User forgot to send the date of her period.

Callers to the helpline number were satisfied with the quality of help by the support. Three users had forgotten to send SMS on the first day of their cycle. Two of them had received a reminder call from the operator to send a message with the first day of their menstrual period.

### Method use and couple communication

Some 95% of the respondents reported that CycleTel made it easy for them to know the days when pregnancy is more likely. All the users mentioned that the messages received on the fertile days were very easy to understand. One participant stated, "Asurakshit Din (unsafe day) is itself explanatory."

Regarding couple communication, 84% of the users mentioned that it was very easy for them to make their husband understand about the unsafe days, while 16% said it was easy: "I was just showing the messages to my husband and we were managing our fertile days accordingly."

Similarly, 69% participants reported that it was very easy to avoid unprotected sex on her fertile days, and 26% said it was easy. As one participant said, "I used to share the messages with my husband. He is quite supportive and on those [unsafe] days we were avoiding unprotected sex." Some 5% said that it was neither easy nor difficult.

With regard to the couple relationship, 95% of the participants reported an improved relationship with their spouses as a result of CycleTel use. Specific ways in which their relationship was improved are listed in Table 3.

**Table 3: Reasons for Improved Relationship**

| | No of Users |
|---|---|
| Better communication | 8 |
| More supportive of each other | 9 |
| More respect for each other | 8 |
| Husband has better understanding of female cycles | 6 |
| Improved sexual relations | 9 |

When asked if they would like to have the option of having their husband receive CycleTel SMS on his phone regarding her fertile period, 89% of the users said no while only 11% of users were fine with their husbands also receiving CycleTel SMS. The reasons for this were unclear.

### Satisfaction with the service

94% of the CycleTel users were very satisfied with the service, while 6% were somewhat satisfied with CycleTel as a method to prevent pregnancy. Some 78% of users were very confident that using CycleTel will help them in preventing pregnancy.

The top reasons users liked CycleTel were convenience and ease of use. Few reasons for disliking CycleTel were cited, among which included the need to abstain or use condoms on fertile days. Tables 4 and 5, respectively, list the features that users liked best and least about CycleTel.

**Table 4: What Users Liked Most about CycleTel**

| Features | No of Users |
|---|---|
| It is easy to use | 18 |
| Convenient | 18 |
| It is effective | 17 |
| Doesn't affect health | 16 |
| No side effects | 16 |
| It is low-cost/free | 11 |
| Husband opposes using another method | 10 |
| Religious/moral reasons | 2 |

**Table 5: What Users Liked Least about CycleTel**

| Features | No of Users |
|---|---|
| Need to abstain during fertile days | 1 |
| Need to use condoms on fertile days | 1 |
| Concern about getting pregnant | 1 |
| Others | 6 |

All the participants were interested in continuing with the CycleTel service. While 6 users decided to continue using SDM with CycleBeads, 13 CycleTel users decided to continue using the method on a calendar.

All participants who completed two cycles of use reported that they would recommend this method to their friends who want to prevent pregnancy. As one woman stated, "In this method there is nothing to eat or use. Also there is no need to keep track of your fertile days [on a calendar]. Through the SMS we get to know when we are fertile."

### Willingness to pay for the service

All the CycleTel users were willing to pay for the service apart from the normal cost for sending a text message (which is about one rupee). The amount they were willing to pay per month for such a service is presented in Table 6.

**Table 6: Willingness to Pay for CycleTel**

| Amount | No of Users | Percentage of Users who completed 2 cycles |
|---|---|---|
| Between 25-30 Rupees per month | 19 | 100% |
| Up to 30 Rupees per month | 14 | 74% |
| Up to 40 Rupees per month | 8 | 42% |
| Up to 50 Rupees per month | 3 | 16% |

### Reasons for drop out

Of the six women who completed the admission interview but did not send in the first message of start date of menstruation, three did not take reminder calls, two said they were busy while in one case the husband replied that his wife did not have time to read and respond to the messages.

Of the four CycleTel participants who had sent in the start date of their period but dropped out by the time the first cycle got completed, only one replied back to the reminder call and said that she would send a message when her period came. There were no messages from her later on. The other three never responded to any reminder messages or calls.

Of the three CycleTel users who completed one cycle but did not send in the start date of their next period (signifying the completion of their second cycle), two users did not respond to any reminder calls or messages from the operator, while one user disconnected the phone and on another occasion the husband received the call and said she was not available anymore on the number.

## VI. Discussion

This proof-of-concept research enabled us to refine the CycleTel concept and bring it to life with actual users. The focus groups and cognitive interviews were instrumental in shaping the messages and the message pattern. It was challenging to compress information that is typically given verbally during a counseling session to fit into a text message containing no more than 160 characters. In this regard, the focus groups and cognitive interviews were absolutely essential to ensure that the CycleTel messages not only were comprehensible to the user, but used appropriate language that held their attention.

The manual testing with actual users on their mobile phones enabled us to verify that this application can be used successfully and satisfactorily by users in the target areas. The fact that so many CycleTel users wished to continue with the service, and that they were willing to pay for it, signifies that such a service could be successful in the market place and would meet the needs of many couples.

It is important to note that the study participants in this proof-of-concept research had the benefit of learning about CycleTel from a real person—namely, from the study recruiter—prior to participation. We must take into account the fact that when CycleTel is offered to more people, it

may not be feasible to have one-on-one interaction with all users prior to CycleTel enrollment. However, a user who has not had the benefit of learning about CycleTel or SDM prior to signing up for it may have a lower level of understanding or comfort regarding the service and therefore may not use it as successfully as those from this study. Therefore, future research will need to experiment with ways to educate potential users about CycleTel, and respond to their questions about it, prior to their signing up for the service.

Along these lines, we found that it was important to have a helpline. About one-fifth of CycleTel users called the helpline because they either did not receive a message when they expected to, or did not send the date of their period when they should have. These factors are critical for being able to use the method correctly. Therefore, any future CycleTel service should also have a helpline. Notably, in a few cases, the helpline operator had to call women to remind her to send the date her period started. When scaling up the services, consideration should be given to how the system should respond when users do not send the date of their period.

In the manual testing phase, of 32 women who were interviewed upon admission, only 19 completed two cycles. It is possible that some of the women initially recruited for the study were not motivated enough to use a method to prevent pregnancy to remain in the study. The service requires initiative on the part of the user to send text messages; therefore, women who have a sincere desire to avoid pregnancy using the service are best suited for participation in the manual testing as others are less likely to respond to or engage in the service.

Another barrier we encountered when recruiting participants into the manual testing phase was the ability of users to receive, understand, and send SMS. Although mobile phone use is common, we found that fewer women than we expected in the research area were in the habit of regularly writing and sending their own SMS. Consequently, we found that we needed to recruit women of a higher educational level than we had previously anticipated for the manual testing phase.

This is an important lesson learned for CycleTel and mHealth interventions as a whole: the fact that someone owns a mobile phone does not mean they will be able to comprehend and/or respond to SMS prompts, even if these prompts are written in the simplest way possible to maximize understanding. This means that the target market for the service should be literate women, likely middle income quintile or above in urban areas, as opposed to reaching rural areas where educational levels are generally lower and women do not rely as much on phones for making calls and sending SMS.

While the manual testing was successful with a group of highly screened women in Lucknow, we will expand the manual testing group to include women in New Delhi to determine usefulness for this audience.

In addition to considerations for the target audience, this research provided other lessons that are applicable to mHealth interventions more broadly. For example:

- Confidentiality and discretion are concerns of users—even when cell phones are individually owned. Therefore, the words used in the messages should be chosen carefully to ensure acceptability by the target audience.
- It is important to minimize the number/frequency of messages to not overwhelm the user and to keep the wording precise to ensure comprehension and keep the users' attention.
- For service-based applications, consider how users may be able to learn about the service prior to signing up. This might include educational campaigns and supplementing the screening process with voice calls or, when necessary, clinic-visits. This is to ensure that users understand the application and can use it successfully.
- Our operator found that FrontlineSMS did not work with all mobile services, and therefore had to send some messages directly from her phone rather than through the FrontlineSMS software. Prior to rolling out an SMS service with a larger group, it would be important to ensure that the mobile application/solution selected for a given innovation works across mobile providers.

Based on the results of the proof-of-concept testing, the manual testing phase will be conducted with additional users in Delhi to ensure appropriateness of the service to a slightly more educated group of users in a larger city. In addition, simultaneous to the Delhi phase of testing, IRH will explore software development and deployment.

## VII. Conclusion

Proof-of-concept research is an essential step for any mHealth application—but particularly in the development of CycleTel given that CycleTel will actually be a woman's family planning method and it will interact with the end-user over time. Moreover, as evidenced by the important product revisions that resulted from the proof-of-concept testing, the value of formative research before making significant investments in technology and software/systems development is tremendous. Although extensive research has been conducted on SDM, both in India and around the world, bringing the innovation to mobile phones required starting at a very basic, small-scale level in order to build an application that would meet users' needs in a way that was appealing to them. Moreover, it enabled us to define the target market who would benefit most from this application.

As a result of this study, we can say confidently that CycleTel holds great promise as an mHealth intervention with potentially large impact, and we suspect this to be the case not only in India but other countries where mobile phone use is prevalent and where there are couples who are interested in using non-hormonal means to prevent pregnancy.