

Evaluating the impact of mobiles for reproductive health on family planning knowledge and behavior

Research Protocol

**Protocol Version:** 4.0

**Version Date: November 13, 2013**

**Sponsor:** United States Agency for International Development (USAID)

**Investigators:**

**Principle Investigators:**

Johnson Douglas (MPA)

Associate; Abt Associates Inc. USA.

4550 Montgomery Ave,#800N

Bethesda, MD 20814 USA

Phone:+1 202-643-6841

Email:douglas\_johnson@abtassoc.com

Riley Pamela (MS, JD)

Senior Associate: Abt Associates Inc, USA

4550 Montgomery Ave,#800N

Bethesda, MD 20814 USA

Phone + 1 (301) 347- 5165

Email: Pamela\_Riley@abtassoc.com

Juras Randall (Ph.D)

Associate: Abt Associate Ince, USA

55 Wheeler St

Cambridge, MA 02138

Phone: +1 (617) 520-3679

Email: Randall\_Juras@abtassoc.com

Solomon Marsden (MB ChB,M. Med.)

Project Director, Applied Research Unit

FHI360

Chancery Building, 2nd floor, Valley Rd.

PO Box 38835-00623

Nairobi, Kenya

Phone: (20) 2824000

Ext 55204

Email: msolomon@fhi360.org

# Acronyms and Definitions

|  |  |
| --- | --- |
| Term | Definition |
| M4RH | Mobile for Reproductive Health |
| SMS | Short messaging service |

1. Executive Summary

m4RH is a free SMS-based platform, developed and implemented by FHI360, which provides information on various family planning methods to users in Kenya. This study will estimate the impact of m4RH on knowledge of family planning and use of contraception.[[1]](#footnote-1) The study will employ a randomized design with all new users of m4RH assigned to either a single treatment group or single control group. Members of the treatment group will receive full access to the m4RH service while members of the control group will not receive access to the m4RH service but instead receive general motivational messages. The impact of m4RH on knowledge of family planning and use of contraception will be estimated by comparing outcomes in the treatment and control groups using data gathered through SMS surveys.

1. Background

Despite substantial progress in recent years, unmet need for family planning, estimated at 25.6% of married women, is still high in Kenya.[[2]](#footnote-2) (Kenya National Bureau of Statistics, 2010, p XX) One factor which may contribute to high unmet need is lack of knowledge of, and misinformation about, contraceptive methods. While overall awareness of family planning methods is relatively high in Kenya, with 95% of women and 97% of men able to name at least one method of family planning, awareness of certain methods is low. For example, the proportion of women aware of the lactational amenorrhea method, emergency contraception, and male sterilization was less than 40% for each method. (ibid, p 57) In addition, misconceptions regarding family planning methods are rife. A survey of residents of Kenya’s five largest cities in 2010 found that a majority of men and women in these cities believe that contraception may cause birth defects and harm to the womb. In addition, a substantial proportion (>39% in each city for both men and women) believe that contraception can cause infertility and cancer. (MLE, Tupange, and KNBS, 2011)

The Mobile for Reproductive Health platform (m4RH) seeks to address this lack of knowledge by providing information on family planning methods via a free short-message service (SMS), sometimes referred to as a “text-messaging” service. Users who access the system are first sent a menu listing nine family planning methods along with a “keyword” for each. Users then SMS the keyword for the family planning method they want to receive information about and are sent a short, clear SMS with information about the family planning method. Users may request more information on the benefits, side effects, and common misconceptions of the method. In addition to receiving information about family planning methods, users may also request a list of health facilities in their region which provide family planning counseling and services. The system is free and confidential.

In this study, we seek to estimate the impact of access to the m4RH service on 1) knowledge about family planning methods and 2) use of contraception methods. The study will use a randomized controlled design, with all new users who access the m4RH assigned to either a treatment or control group. Users assigned to the treatment group will receive access to the normal m4RH service while users assigned to the control group will receive a set of text mesages stressing the importance of family planning but will not be able to access normal m4RH content regarding methods. Impact will be estimated by comparing knowledge and use of family planning methods between the treatment and control groups using data collected through SMS and phone surveys.

1. Rationale for Study

SMS is increasingly being used as a medium for providing health education to the general public and/or healthcare providers. Examples include a national health information service in Bangladesh providing stage-based messages for pregnant women tied to their due date[[3]](#footnote-3) , and a text campaign to promote HIV/AIDS testing in South Africa.[[4]](#footnote-4) Yet, to the authors’ knowledge there have been no evaluations of the impact of SMS-based family planning education platforms which use a rigorous randomized design. The Earth Institute, in a report commissioned by the mHealth Alliance, identified lack of evidence on impact as a major gap in knowledge of mHealth initiatives. (Mechael , 2010) This study will allow us to rigorously estimate the impact of m4RH on users’ knowledge and use of contraception thus allowing policymakers and others to determine whether an SMS platform is an effective means of promoting reproductive health education.

1. Literature Review

SMS has been used for a wide array of health-related purposes including disease management, sexual health promotion, and health education. The m4RH platform in particular was designed by FHI360 as a health education tool, with the goal of increasing knowledge about and use of family planning methods by members of the general public. There is little evidence of the effectiveness of text-messaging interventions aimed at improving family planning knowledge, but there is some limited evidence to suggest that SMS-based interventions can improve outcomes in other health applications (Lim et al, 2008). This section reviews that evidence.

The strongest evidence of SMS-based health interventions is in the area of adherence to treatment. Lester et al (2010) evaluate the impact of sending weekly reminder SMSs to patients on anti-retroviral therapy (ART) in Kenya using a randomized controlled trial. They find that SMSs led to increased self-reported adherence to ART and reduced viral loads. A similar randomized controlled trial, also in Kenya and also of SMS reminders to ART patients, by Pop-Eleches et al (2011) showed that SMSs increased adherence to ART and reduced the number of interruptions to treatment. Odeny et al (2012) find that SMS reminders may also increase appointment attendance; a randomized controlled trial demonstrated that SMS reminders to men undergoing circumcision increased the proportion of patients who show up for the mandatory follow-up clinical visit.

SMS has also been shown to be a safe and effective method of communicating test results to patients. Dhar et al (2006) report results from an initiative to SMS results sexual health screenings to patients of a large hospital in the UK. In a follow up survey, 100% of those contacted reported that they found SMS to be a quick, safe, and confidential means of receiving their test results. Menon-Johansson et al (2006) report results from a similar initiative to report results from tests for chlamydia to patients of a clinic also in the UK. They find that using SMS to communicate results to patients led to far lower costs and enabled the clinic to communicate the results more quickly, thus leading to prompter treatment, compared to communicating the results by phone.

The evidence that SMS may be an effective medium for disseminating health-related information to members of the general public is less robust. Levine et al (2008) report use and awareness figures for SEXINFO, a program to provide information on sexual and reproductive health targeted at at-risk youth in San Francisco. In the first 25 weeks of implementation, the service was accessed 4,500 times. Data on awareness were collected from a convenience sample of 322 patients at 3 sexual health clinics. Of these patients, a significant proportion (11%) were aware of SEXINFO and awareness of SEXINFO was found to be correlated with risk factors such as race and residency in a targeted area. These findings demonstrate that health-information SMS platforms can succeed at reaching the target population, but provides little evidence of the effect of the platform on the sexual health knowledge or outcomes of participants.

The m4RH initiative itself was the subject of a pilot study intended to determine the feasibility and reach of the program in Tanzania. In the Tanzania pilot, every user logged in by the system was sent a series of questions via text message to determine their age, gender, and how they found out about the program. About 35% of users responded to at least one question. The study provided useful information on marketing approaches, showing that most respondents found out about the program through posters placed in health facilities. The study also included an open-ended text question asking how m4rh has changed their use of family planning. The results, while non-rigorous, suggest that at least some users change their family-planning methods after accessing the system.

Likewise, while lack of knowledge is often cited as a barrier to use of family planning, there has been little research attempting to disentangle the effect of lack of knowledge from other potential barriers such as cost or access. For example, Kamau et al (1996) show that women in rural Western Kenya have low awareness of different family planning methods but their methodology prevents them from assessing the importance of lack of knowledge relative to other potential barriers in restricting use.

In sum, there is evidence to suggest that SMS-based systems can be effective at reaching a target population, and can be effective at achieving certain outcomes such as increased appointment attendance. However, little is known about whether SMS-based health information systems can successfully increase knowledge about health-related topics, and whether that will in turn lead to changes in behavior. Filling this gap is the goal of the present study.

1. Research Questions

The study will primarily seek to address the following two research questions:

1. What is the impact of accessing the m4RH service on knowledge about family planning methods?
2. What is the impact of accessing the m4RH service on use of contraceptive methods?

In addition to generating evidence regarding these two questions, the study will include a number of secondary research questions such as the impact on subgroups defined by age, gender, or other baseline characteristics. Secondary analyses will also test non-experimental hypotheses such as the effect of dosage and the impact of *use of* (rather than *access to*) the system, called the “Treatment on the Treated” estimate. Secondary research questions will be specified before data are analyzed, and will be identified in reports as providing suggestive (rather than conclusive) evidence.

1. Conceptual Framework

The primary objective of the m4RH platform is to provide accurate information on family planning in a confidential and convenient manner to a population that does not have easy access to healthcare providers. m4RH is a voluntary opt-in intervention (i.e. it requires users to send a text message to access the system), so the population of interest consists of individuals who desire more information on family planning; this desire may be pre-existing or may be prompted by program advertising. Once users access the system, they are provided with information on a range of family planning options—which serves to increase awareness of those options as well as provide a gateway to further content—and are given the opportunity to access additional information on any of the available methods.[[5]](#footnote-5) SMS is non-burdensome and anonymous, so access to information in this format is hypothesized to lead to increased awareness of the types of family-planning methods that are available. We hypothesize that it will also lead to increased knowledge about these methods as well as how to acquire and use them compared to a counterfactual in which individuals are unable or unwilling to obtain this information from other sources due to inconvenience, concerns over privacy, or other reasons. Increased knowledge is hypothesized to lead to increased uptake of modern contraception methods as many m4RH users may not use modern contraception due to lack of awareness or misconceptions regarding modern methods.

1. Description of Interventions

m4RH is a SMS-based platform developed and implemented by FHI360 which provides information on various family planning methods in a confidential and convenient manner. According to FHI360, the m4RH idea came from field work with family planning users in East and West Africa, where there is a lack of information about family planning methods but widespread access to mobile phones. Development followed a systematic process involving concept testing, message development, message testing, and usability testing. The service uses a “ping pong” mechanism for delivering content. Users access the M4RH by first texting “m4rh” to an SMS short code and are sent a menu listing the various family planning methods along with a “keyword” for each. Users then SMS the keyword for the family planning method they want to receive information about and are sent a short, clear SMS with information about the family planning method. In addition to receiving information about family planning methods, users may also request a list of health facilities in their region which provide family planning counseling. All SMSs between M4RH and users are free to users.

Family-planning methods listed in the menu of options include “natural” methods such as natural family planning (NFP) and Lactational amenorrhea method (LAM); and “modern” family planning methods such as implants, IUDs, Injectables, OCPs, and Condoms. A searchable list of clinic locations is provided so that users interested in clinic-based family planning methods can plan a visit to implement those methods.

Content of the SMS messages was developed by FHI360 in partnership with the Kenyan Ministry of Health and various partner organizations and was designed to clearly communicate key information about each method. Details of the existing SMSs available to users are included in appendix A. An expanded version of M4RH (“m4RH+”), which offers deeper content on topics such as misconceptions about methods, side effects and role model stories to address social norms, is currently being piloted in Tanzania. m4RH+ will be rolled out in Kenya prior to the launch of the study following content review and approval by m4RH partners. The study will evaluate the impact of m4RH+.

Currently, FHI360 advertises the m4RH service via their network of clinics and those of their partner organizations. Posters have been placed at these clinics and community health workers working with these clinics have been informed of the service and requested to promote it in their interactions with patients. Palm cards advertising the short code and the service are distributed by health workers in the communities they visit. In addition, FHI360 has also advertised the service over the radio. For examples of m4RH promotional materials see appendix C.

M4RH was launched in Kenya in 2010 and has been accessed by approximately 5,000 unique users as of December 2012.

1. Study Design

The study will use a randomized controlled design, which offers the most rigorous evidence of causal impact. Upon commencement of the study, all new users (identified based on the users’ phone number) will be randomly assigned to one of two groups. The first group (treatment) will have access to the full m4RH/m4RH+ service. The second group (control) will receive a message informing them that the full service is temporarily unavailable because a research study is being conducted, and that the full service will be made available to them in three months. During this time, users assigned to the control group will have access to more general family planning information but not to regular m4RH content. (For details of the messages which will be sent to the control group see appendix B.) Once a user has been assigned to a group, all further SMS interaction between m4RH and the user (phone number), for the duration of the research study, will be based on the group assignment.

In this study design, because no information is available to link a phone number to an individual, it is possible that individuals assigned to the control group could make additional attempts to access the m4RH system from new phone numbers. There is no way to guard against this possibility in the study; however, most users are unlikely to be aware that it may be possible to circumvent the random assignment process by attempting access from another number. Leakage may also occur if members of the treatment group share information they have received from the m4RH with members of the control group. This could occur, for example, if a husband and wife both access the service and are assigned to different groups. There is no way of guarding against this possibility either but we find it similarly unlikely that a significant portion of the control group would receive information provided through the treatment in this way.

Data on knowledge of family planning methods and use of modern contraception will be collected through a set of short SMS-based surveys administered one day after first accessing the m4RH service, a week later, and again three-months after first accessing the service. (See section below on data collection and data entry for more information on the methods to be used to collect this data.) An estimate of each user’s knowledge of family planning will be constructed using the total number of family planning questions the user answers correctly during the SMS survey.[[6]](#footnote-6) Similarly, our outcome variable for use of modern contraception will be based on whether the user self-reports that they, or their partner, are currently using a modern method of contraception.

The table below summarizes how the two outcome variables will be constructed:

|  |  |  |
| --- | --- | --- |
| Outcome category | Outcome variable | Method of measurement |
| Knowledge of family planning methods | Total number of questions on family planning answered correctly | Users will be asked a series of questions on family planning based on the content of m4RH. |
| Use of contraception | Proportion of users using contraception | Users will be asked whether they, or their partner, are currently using contraception. If they answer “yes” they will be asked what type of contraception they are using. |

Estimates of impact will be generated through comparison of outcomes for users in the treatment and control groups, as detailed in the “Data Analysis” section below.

In addition, qualitative data will be collected through semi-structured phone interviews with a small (30) sample of users of the m4RH service. During the phone interviews users will be asked questions such as why they accessed the m4RH service and what advantages and disadvantages they perceive in using m4RH as a source of information on family planning. This additional qualitative data may provide additional insight into the potential ways in which m4RH affects users. In addition, questions from the SMS survey will be asked again to the phone interview respondents. Significant discrepancies between answers provided in the SMS survey and the phone interview, if found, may indicate that the answers to the SMS survey questions are not reliable. Although in-person interviews would be preferable to phone interviews given the sensitivity of the subject, this was deemed to be infeasible.

Both the SMS survey and the phone interviews will be pilot tested on a small sample of users prior to full study implementation.

1. Power Calculations

The purpose of these power calculations is to demonstrate the size of the impacts that can be detected by the study. In particular, we determine the Minimum Detectable Impact (MDI), which is the smallest impact the study can detect as statistically significant with 80% probability. Based on our assumptions, we estimate that 8,500 new users will be enrolled in the study (i.e. all new users during the random assignment period) which gives an MDI of 3.9 percentage points for the outcome of “use of contraception.” In other words, if access to the m4RH system increases use of family planning among study participants from 28.0 percent to 31.9 percent, the study will be able to detect that impact with high probability. Staff at FHI360 involved in implementing this program believe that the impact of m4RH on user of contraception is likely 4 percentage points or higher. Due to the low cost of the m4RH program, m4RH would likely be considered cost effective even if the actual impact was significantly lower than 3.9 percentage points. Our choice of MDI is based on the limited sample size and program implementers’ confidence that m4RH achieves this level of impact.

For our power calculation we assumed an alpha of 0.05 for a two-sided test, and power of 80%. We use a random assignment ratio of 1:1 (i.e. 50 percent of study participants will be randomly assigned to the treatment), and make the conservative assumption that the R-squared from the regression will be zero. Additional assumptions are given in the table below:

### Inputs and Assumptions

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Description | Value | Justification |
| Baseline value for proportion of users using contraception | Baseline value for proportion of users using contraception | 28% | Based on figure for proportion of women using contraception from most recent DHS |
| Response rate | Proportion of users who respond to SMS survey | 50% (across both treatment and control groups) | This value is based on the response from a similar SMS-based survey conducted by FHI360 of M4RH previously as well as the response rate achieved during an initial pilot study of m4RH users. |

1. Sampling Plan

See section 12 below.

1. Instruments

See section 12 below.

1. Plans for data collection and data entry

Data to be used in the study will be collected via two methods: a set of short SMS-based surveys and a phone interview. All new users will be recruited to participate in the SMS-based surveys but only a small sample of users will be recruited to participate in the more in depth phone interview. The design of the SMS-based surveys was based largely on results from a small pilot of approximately 1,000 new m4RH users conducted in September, 2013. During the pilot, various question wordings, survey timings, and incentives were tested to gauge their effect on response rates and the proportion of responses which are legible. Details of how the SMS and phone surveys are provided below.

### SMS survey

All new users 18 years old and above will be recruited to participate in the SMS-based surveys. Three rounds of SMS questions will be sent to users: one shortly after users first access M4RH, one approximately one week later, and a final survey after approximately 3 months. The first round will contain two questions on use of contraception and is intended mainly to establish contact with users to increase future response rates. The second round will contain five questions testing knowledge of family planning. The third round will contain several questions related to use of contraception. (Appendix D contains details of the questionnaires to be sent to users via SMS.) All users who complete each questionnaire will be automatically entered into a lottery to win a large amount of talk time. (During the pilot, a talk time lottery was shown to be more effective in increasing response rates than a guaranteed talk time amount.)

The SMS surveys will be implemented by the same technology partner responsible for implementing the M4RH service. SMS survey responses will be stored securely at the technology partner’s site and transmitted securely to Abt Associates. As the only personally identifiable information included in this data will be users’ mobile numbers, prior to any data analysis all mobile numbers will be replaced with random unique IDs.

### Phone Interview

Phone interviews will be conducted with approximately 30 m4RH users in the treatment group who have completed the SMS surveys. These interviews will be conducted approximately three months after the users’ initial contact with m4RH. Target respondents for the phone interviews will be selected randomly on a rolling basis and sent an SMS requesting their participation in a phone interview. Only those users who respond to indicate that they are willing to participate will be contacted by a surveyor. Phone interviews will begin 3 months after commencement of the study and will end once 30 phone interviews have been conducted. Phone interviews will be conducted by an Abt staff person trained in research ethics. See appendix E for details of the interviewer’s guide for the phone interview.

1. Data Analysis

## Missing Data

If similar sets of users in the treatment and control groups participate in the survey and all of those who participate in the survey answer all questions, analysis of the m4RH data would be straightforward. A simple regression of the outcome variables on the covariates and a binary indicator for treatment status would generate unbiased estimates of impact.

Unfortunately, there is a high probability that a large portion of data will be missing. Users in the control group may be less likely to complete the full survey if they are not as satisfied with the service they receive. In addition, as survey questions will be delivered in three phases with considerable time between each phase, it is likely that a large portion of users who answer at least one survey question won’t answer all survey questions. The issue of missing data is particularly problematic for our analysis of the impact of m4RH on knowledge of family planning as our outcome variable will draw from approximately 10 different survey questions. Though we expect a substantial proportion of users to answer a majority of the survey questions, the proportion of users for whom at least one of the family planning survey questions is missing is likely to be very high. Thus, simply deleting cases in which the user did not answer all survey questions would lead to removal of a large portion of the data. Further, except under very strong assumptions, traditional estimators are biased if data are missing and with high rates of missing data the bias may be severe. (Little and Rubin, 2002) Thus alternate methods for analyzing data must be employed. (Puma et at, 2009)

### Results from Initial Pilot Survey on Patterns of Missingness

A pilot study of approximately 1,000 new users of m4RH was conducted in September 2013 to, among other things, gather data on likely patterns of missingness in the survey data. In the pilot study, just as in the planned main study, users were randomly assigned to either a treatment or a control group and sent a series of survey questions via SMS. Due to time limitations, pilot study participants were only sent two sets of questions.

The pilot study revealed that, contrary to expectations, users in the treatment and control groups respond to the surveys at very similar rates. (The percentage of users in the treatment group who started the survey was actually about 1 percentage point lower than the percentage of users in the control group who started the survey.) The pilot also revealed that there is very low correlation between responding to the first survey and responding to the second survey. These results have heavily influenced the survey design and the strategy for dealing with missing data.

### Target Populations for which We Seek to Estimate Impacts

In the sections below, we describe the strategy we will employ for dealing with missing data when estimating the impact of m4RH on use of family planning and when estimating the impact of m4RH on knowledge of family planning. Due to differences in the likely patterns of missing data, the techniques selected for dealing with missing data in the two analyses differ. In addition, the target populations for which we seek to estimate impacts in the two analyses differ as well. The target population for which we seek to estimate the impact of m4RH on use of family planning includes all users who respond to at least one question in the 3rd survey round (the round in which questions on use of contraception will be asked). The target population for which we seek to estimate the impact of m4RH on knowledge of family planning includes all users who respond to at least one question in the 2nd survey round (the round in which questions on knowledge of family planning will be asked). *Thus, the target populations for which the two analyses seek to estimate impacts differ*.

In theory, we could make these target populations the same by estimating impacts for the population of users who respond to at least one question on either survey round in both analyses. (Without very strong assumptions, we cannot draw inferences for those users who do not respond to at least one question.) Due to the likely low correlation in response across survey rounds, such a strategy would mean that our results would be heavily dependent on the assumptions used to model missing data.

### The Missing at Random Assumption

All of the approaches we describe below assume that the data observed from the randomized experiment are “missing at random.” If data are missing at random, missingness is random conditional on observed data or

where indicates the conditional probability distribution, M is the missing data indicator matrix, W is the complete data (including missing values), W\_obs is the observed data, and denotes unknown parameters.

Missing at random is a strong assumption yet a seemingly necessary one. While methods for analyzing data which are “missing not at random,” such as Heckman’s selection model, exist, they are not recommended by experts as these models essentially require the researcher to guess, without any means of verification, the model by which missingness is determined. (Allison, 2001) The missing at random assumption may be especially problematic if the proportion of users who respond to at least one survey question in the control and treatment groups differ significantly.

### Covariates

The following covariates are used in each of the models: religion, average age[[7]](#footnote-7), gender, use of contraception shortly after first accessing m4RH, education, marital status, mobile phone provider, and an indicator variable for time of day when the user first accessed the system. Average age and the indicator variable will never be missing. (The survey will not proceed unless the user indicates that his or her age is 18 or above and the indicator variable is based on system data). We anticipate that the gender variable will only rarely be missing as it is one of the first questions asked but that the religion variable may be missing in a relatively high proportion of cases as it is asked only toward the end of the survey. The list of covariates used in the final analysis may vary slightly from this list.

### Accounting for Missing Data When Estimating Impact on Use of Contraception

To account for missing data in our estimates of the impact of m4RH on use of contraception we will use multiple imputation combined with inverse probability weighting. In a first step, multiple imputation will be used to impute sets of values for missing covariates. Separate imputation will be done for treatment and control users. Next, we will fit separate models in the treatment and control groups to estimate the probability of selection conditional on the covariates. The type of model we fit at this first stage will depend on the final number of covariates in the model. If the number is limited to those covariates specified above, we may create bins of values for age (the only covariate with more than 3 possible values) and use a fully saturated (or nearly full saturated) linear probability model. Otherwise, we may use a logit/probit model. Last, we will use a weighted linear probability model to estimate the impact of access to m4RH on use of contraception.

### Accounting for Missing Data When Estimating Impact on Knowledge of Family Planning

Accounting for missing data in our analysis of the impact of m4RH on knowledge of family planning is complicated by the fact that we are measuring knowledge of family planning by using a composite score based on the number of questions a user answers correctly. We expect that a large portion of users (more than half) will have at least one answer missing and many may have multiple answers missing. Further, we expect answers across the questions will be highly correlated by user.

Using Monte Carlo simulations, we tested two alternate approaches to dealing with missing data when estimating the impact of m4RH on knowledge of family planning. In the first approach, we first imputed both covariates and answers to the knowledge questions using multiple imputation (with separate imputation for treatment and control) and then ran a linear regression of the total of all knowledge questions correct on variables for treatment status and covariates. Several different packages to perform multiple imputation were tested. In the second approach, we specified a complete probability model for the data and attempted to fit the model using maximum likelihood. The probability model used was a multivariate probit model. Full details of the Monte Carlo simulations as well as code used can be found at <https://github.com/dougj892/m4RH_missing_data_sim> .

Results from the Monte Carlo simulations revealed multiple imputation performed relatively well in recovering the true average treatment effects even in cases where the data was missing not at random. In contrast, the maximum likelihood model exhibited signs of non-convergence to the true distribution. Based on these results, we will use multiple imputation in combination with a simple linear model for this analysis.

1. Ethical Considerations

### Recruitment of study participants

We anticipate that approximately 8500 new users will access the m4RH service over the course of the study. All new users will be randomly assigned to either the treatment or control groups and sent a series of questions via SMS. Phone interviews will be conducted with approximately 30 users. Users under the age of 18 (as reported by the users themselves) will not be recruited to participate in the study (but will have access to program services). Prior to participating in the SMS survey, users will be informed that participation is completely voluntary, that their answers will remain confidential, and that declining to participate in the survey will not affect their access to services. Users will also be provided the name of the principal investigator (Douglas Johnson), a local phone number they may call for more information about the study, and KEMRI’s contact details if they indicate that they would like to receive more information about the study. Users selected to participate in the phone interview will first be sent an SMS asking if they are willing to answer some questions over the phone. Only users who respond to indicate that they are willing to be interviewed over the phone will be contacted. Users contacted for the phone interview will be informed that their participation is completely voluntary and their answers will remain confidential.

Consent will be requested for participants in both the SMS survey and phone interview via SMS. Only those who respond by SMS to indicate that they are willing to participate will be sent follow up questions via SMS or called on the phone.

### Confidentiality of Data

No personally identifiable information, other than mobile number, will be collected as part of the study. Upon receipt of the data from the technology partner, all mobile numbers will be removed from the data and replaced with unique IDs.

Data will be collected and stored securely by the technology vendor responsible for implementing the m4RH service. Data will be securely transferred from the technology vendor’s site to Abt Associates. After it is received, data will be securely stored in access-restricted folders. Abt Associates Inc. employs various FIPS 140-2 compliant encryption systems, such as PGP or McAfee Encryption, to encrypt data at rest. Access to raw data including mobile numbers will be restricted to the research team at Abt Associates. A copy of the data with mobile phone numbers replaced by a set of randomly assigned unique IDs will be shared with FHI360. Data will be stored securely for a period of 5 years after study completion.

### Compensation

Users who participate in the SMS survey will receive a small amount of talk time (around 50 ksh) for each questionnaire they participate in to compensate them for the inconvenience of participating in the survey.

Users who participate in the phone interview will receive an additional amount of talk time (approximately 200 ksh) to compensate them for the inconvenience of the phone interview.

### Changes to Standard Program Service

The study includes two changes to standard program services. First, some participants will be assigned to a control group which will experience a three-month delay in access to the full slate of information about contraceptive methods. Because of this delay, individuals assigned to the control group would have to seek this information from other sources (usual treatment) or forgo the information for several months, which may cause inconvenience. Second, all participants will be asked to participate in an SMS survey, and a subset of participants will be asked to participate in a phone interview. This requires a small amount of time.

1. Planned Products and Dissemination Plan

We will produce a final report containing detailed documentation of our activities and findings.

Results from this study will allow policymakers to better assess whether SMS is an effective method of promoting reproductive health education. This knowledge will help policymakers determine whether or not to focus efforts and funds on initiatives like m4RH in the future.

1. Calendar-Timeline

|  |  |  |
| --- | --- | --- |
| Activity | Months required | Approximate timeframe |
| Questionnaire and backend development | 2 | Feb 2012 – March 2013 |
| Piloting of questionnaire | 1 | April 2013 |
| Recruitment of new users | 6 | April 2013 – Oct 2013 |
| Data collection | 2 | May 2013 – Dec 2013 |
| Data analysis and report writing | 6 | Jan 2014 – June 2014 |

1. References

Allison, Paul D. *Missing data*. No. 136. SAGE Publications, Incorporated, 2001.

Cappellari, Lorenzo, and Stephen P. Jenkins. "Multivariate probit regression using simulated maximum likelihood." *The Stata Journal* 3.3 (2003): 278-294.

Dhar, J., Leggat, C., & Bonas, S. (2006). Texting–a revolution in sexual health communication. *International journal of STD & AIDS*, *17*(6), 375-377.

Horowitz, Joel L., and Charles F. Manski. "Nonparametric analysis of randomized experiments with missing covariate and outcome data." *Journal of the American Statistical Association* 95.449 (2000): 77-84.

Kamau, R. K., Karanja, J., Sekadde-Kigondu, C., Ruminjo, J. K., Nichols, D., & Liku, J. (1996). Barriers to contraceptive use in Kenya. *East African medical journal*, *73*(10), 651.

Kenya National Bureau of Statistics. (2010). *Kenya Demographic and Health Survey 2008-09.* ORC Macro

Mechael, P., Batavia, H., Kaonga, N., Searle, S., Kwan, A., Goldberger, A., ... & Ossman, J. (2010). *Barriers and gaps affecting mHealth in low and middle income countries: Policy white paper*. Columbia university. Earth institute. Center for global health and economic development (CGHED): with mHealth alliance.

Lester, R. T., Ritvo, P., Mills, E. J., Kariri, A., Karanja, S., Chung, M. H., ... & Plummer, F. A. (2010). Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTel Kenya1): a randomised trial. *The Lancet*, *376*(9755), 1838-1845.

Little, Roderick JA, and Donald B. Rubin. "Statistical analysis with missing data." (2002).

Lim, M. S., Hocking, J. S., Hellard, M. E., & Aitken, C. K. (2008). SMS STI: a review of the uses of mobile phone text messaging in sexual health. *International journal of STD & AIDS*, *19*(5), 287-290.

Molenberghs, Geert, and Michael Kenward. *Missing data in clinical studies*. Vol. 61. Wiley, 2007.

MLE, Tupange and KNBS. 2011. Report of the Baseline Household Survey for the Kenya

Urban Reproductive Health Initiative (Tupange). Measurement, Learning & Evaluation of the

Urban Reproductive Health Initiative (MLE) [UNC, USA]; Kenya Urban Reproductive Health

Initiative (Tupange) [Nairobi, Kenya]; and Kenya National Bureau of Statistics (KNBS) [Nairobi,

Kenya].

Odeny, T. A., Bailey, R. C., Bukusi, E. A., Simoni, J. M., Tapia, K. A., Yuhas, K., ... & McClelland, R. S. (2012). Text Messaging to Improve Attendance at Post-Operative Clinic Visits after Adult Male Circumcision for HIV Prevention: A Randomized Controlled Trial. *PloS one*, *7*(9), e43832.

Puma, Michael J., Robert B. Olsen, Stephen H. Bell, and Cristofer Price. "What to Do when Data Are Missing in Group Randomized Controlled Trials. NCEE 2009-0049." *National Center for Education Evaluation and Regional Assistance* (2009).

Pop-Eleches, C., Thirumurthy, H., Habyarimana, J. P., Zivin, J. G., Goldstein, M. P., de Walque, D., ... & Bangsberg, D. R. (2011). Mobile phone technologies improve adherence to antiretroviral treatment in a resource-limited setting: a randomized controlled trial of text message reminders. *Aids*, *25*(6), 825.

Warwick, Z., Dean, G., & Carter, P. (2007). B safe, B sorted: results of a hepatitis B vaccination outreach programme. *International journal of STD & AIDS*, *18*(5), 335-337.

Wooldridge, Jeffrey. (2010) *Econometric Analysis of Cross Section and Panel Data, Second Edition.* MIT Press.

Wilkins, A., & Mak, D. B. (2007). ... Sending out an SMS: an impact and outcome evaluation of the Western Australian Department of Health's 2005 chlamydia campaign. *Health promotion journal of Australia: official journal of Australian Association of Health Promotion Professionals*, *18*(2), 113.

1. Appendix A – Examples of m4RH SMS Messages

Several examples of M4RH messages sent to users are provided below. Message content may change as the M4RH service is upgraded to M4RH+. All messages are approved by partners and the Kenyan Ministry of Health prior to being used in M4RH.

|  |  |
| --- | --- |
| Information requested by user | M4RH response SMS |
| Main menu | Welcome to M4RH free info service. For implants reply 11, IUD 21, permanent 31, injectable 41, pills 51, EC 61, condoms 71, Natural Family Planning 81, LAM 91. |
| IUCD | IUCD is a small device placed inside the womb. Highly effective for 5 to 12 years. For married and singles. May increase monthly bleeding and cramps at first. When removed, can become pregnant with no delay. No infertility or birth defects. |
| Injection | Injection in arm or hip, like Depo. Effective for 1-3 months. Get on time, return even if late. Irregular or no monthly bleeding not harmful. May gain weight. For married and singles. After stopping may take a few months to get pregnant. No infertility or pregnancy loss. Private. |
| Emergency contraception | Take EC pills up to 5 days after unprotected sex. Take as soon as possible. Safe for all women. Get in pharmacies or clinics. Not recommended as regular contraception. Will not affect existing pregnancy. |
| Condom | Male condoms are effective when used correctly every time. Only method to prevent HIV, STIs, and pregnancy. Use a new condom every time. Easy to find, inexpensive. Best if discussed with partner. Easily used with practice. For married and singles. |

1. Appendix B – Details of SMSs sent to control group users

Members of the control group will not immediately have access to the full M4RH service but will instead be provided access only to the clinic database and a set of general messages about family planning. Control group members will be informed that a research study is being conducted and that the M4RH service will not be available to them for 3 months.

### Messages provided to control group members

Control group members will first be sent the following messages:

**Welcome Message (1st text):**

*Welcome to m4RH! We are working to improve our service through some research. Thank you for checking in. Full m4RH service will be available in 90 days.*

**Second message to appear**

*Reply “Clinics” if you would like to locate a family planning clinic near you. Reply “Info” if you would like to get family planning facts.*

**If Reply Info**

Choose from the following categories: Reply “Family Planning Facts”, or “Healthy Living,” or “Sexual Health”

**Family Planning Facts**

*Family planning protects the health of mothers and babies. All couples have the right to choose the number of children they want. Reply “Continue” for more.*

*Contraception allows people to attain their desired number of children and determine the spacing of pregnancies. Reply “Continue” for more.*

*By reducing rates of unintended pregnancies, family planning also reduces the need for unsafe abortion. Reply “Continue” for more.*

*Family planning is key to improving Kenya’s economy and environment by slowing population growth. Reply “Continue” for more.*

*Doctors agree, contraceptive methods are safe to use, they do not harm your health.*

**Healthy Living**

*If you feel ill, talked to a professional healthcare provider, they are trained to diagnose you properly. Reply “Continue” for more.*

*Financial security is important to reach your full potential. Get help learning how to budget and save for the future. Reply “Continue” for more.*

Life tips: setting long-term goals for your future helps you reach your full potential. Making a plan includes thinking about all the steps needed to get you where you want to go.

*Do you ever feel overwhelmed by life’s problems? Remember everybody needs help sometimes. Don’t be afraid to ask for help when you need it.*

*Life tips: think about what traits are important to you and strive for them every day: tolerance, confidence, respect, forgiveness, trust, honesty, commitment.*

*To maintain good health, eat lots of fruits and vegetables and get exercise every day.*

**Sexual health:**

*Pregnancy before age 18 risks health of mum. Bodies are still growing during teenage years. Health experts agree that pregnancy is best after 18.*

*Remember everyone has the right to make their own decisions about what kind of family they want to have.*

*Do you ever feel pressured to have sex? Be clear about what you want and talk about your reasons. Practice negotiation with a trusted friend*

*Talking to your partner about your desires for pregnancy or waiting for a time: communication is key to a good relationship and healthy families. Reply “Continue” for more.*

1. Appendix C – Example of M4RH Promotional Material

The card below is one example of the advertising material produced by FHI360 to increase use of M4RH. This card is distributed by community health workers and doctors working at FHI360 or partner clinics.



1. Appendix D –SMS questionnaires

All users, including those assigned to the control group, will be sent a series of SMS questionnaires. Contents of theSMS questionnaires are included below.

### First questionnaire (sent to users shortly after first accessing M4RH)

|  |
| --- |
| Thanks for using M4RH! Please help by answering 4 questions for a study by ABT/USAID on contraceptive use and knowledge. Answering is up to you. |
| You can use M4RH even if you don't answer questions. Chance to win 1000 ksh airtime for taking the survey. Reply YES for the survey. Reply INFO for more info |
| The principal investigator for this study is Douglas Johnson who may be reached at douglas\_johnson AT abtassoc.com. You may call 0701933565 to speak with a person who can answer further questions about this study. For any questions relating to your rights as a research participant please contact the secretary, KEMRI Ethics Review Committee, PO Box 54840-00200, Nairobi, Telephone numbers: 020-2722541, 0722205901, 0733400003, Email address: erc AT kemri.org |
| Reply YES if willing to take the survey. |
| Thanks! First question will arrive shortly. Remember to delete SMSs if you don't want others to see your answers. You can always skip the question. |
| How old are you? Reply with A and the number of years like A 25 for 25 years old. Reply A SKIP to skip this question. |
| Thanks for your participation. We are only surveying users 18 and older at this time. |
| Thanks for your answer! Next question arriving shortly. |
| Do you or your sexual partner use contraception? Reply B 1 if yes or B 2 if no. Reply B SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| What type of contraception do you or your partner use? Reply C and type of contraception like C CONDOMS. Reply C SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| What is your gender? Reply D 1 if you are female and D 2 if you are male. Reply D SKIP to skip this question. |
| Thanks for your participation! We will announce winners of airtime top up lottery within one month. |

### Second questionnaire (sent to users one month after first accessing M4RH)

|  |
| --- |
| Thanks for using M4RH! Please help by answering 7 questions for a study by ABT/USAID on contraceptive use and knowledge. Answering is up to you. |
| You can use M4RH even if you don't answer questions. Chance to win 1000 ksh airtime for taking the survey. Reply OK for the survey. Reply INFO for more info |
| The principal investigator for this study is Douglas Johnson who may be reached at douglas\_johnson AT abtassoc.com. You may call 0701933565 to speak with a person who can answer further questions about this study. For any questions relating to your rights as a research participant please contact the secretary, KEMRI Ethics Review Committee, PO Box 54840-00200, Nairobi, Telephone numbers: 020-2722541, 0722205901, 0733400003, Email address: erc AT kemri.org |
| Reply OK if willing to take the survey. |
| Thanks! First question will arrive shortly. Remember to delete SMSs if you don't want others to see your answers. You can always skip the question. |
| How old are you? Reply with E and the number of years like E 25 for 25 years old. Reply E SKIP to skip this question. |
| Thanks for your participation. We are only surveying users 18 and older at this time. |
| Thanks for your answer! Next question arriving shortly. Reply F SKIP skip question |
| When is a woman most likely to get pregnant? Reply F 1 for just after period F 2 for halfway between periods F 3 for just before period F 4 for don'tknw |
| Thanks for your answer! Next question arriving shortly. Reply G SKIP to skip this question |
| Women can avoid pregnancy for 6 months after birth if period has not returned and breast feed baby. Reply G 1 if true, G 2 if false or G 3 for don't know |
| Thanks for your answer! Next question arriving shortly. Reply H SKIP to skip this question |
| About how long does coil last before it needs to be replaced? Reply H 1 for 1 yr H 2 for 2 yrs H 3 for more than 2 yrs H 4 for don't know |
| Thanks for your answer! Next question arriving shortly. Reply J SKIP to skip this question |
| How many days after sex is EC pill effective? Reply J 1 for 1 day after, J 2 for 5 days, J 3 for 10 days, and J 4 for don't know. |
| Thanks for your answer! Next question arriving shortly. Reply K SKIP to skip this question |
| About how long do implants last before it needs to be replaced? Reply K 1 for 6 months, K 2 for 1 yr, K 3 for more than 1 yr, K 4 for don’t know |
| Thanks for your answer! Next question arriving shortly. |
| What is your highest level of schooling? Reply L 1 if no education, L 2 if primary, L 3 if secondary, L 4 for higher. Reply L SKIP to skip this question |
| Thanks for your participation! We will announce winners of airtime top up lottery within one month. |

### Third questionnaire (sent to users three month after first accessing M4RH)

|  |
| --- |
| Thanks for using M4RH! Please help by answering 7 questions for a study by ABT/USAID on contraceptive use and knowledge. Answering is up to you. |
| You can use M4RH even if you don't answer questions. Chance to win 1000 ksh airtime for taking the survey. Reply SURVEY for the survey. Reply INFO for more info |
| The principal investigator for this study is Douglas Johnson who may be reached at douglas\_johnson AT abtassoc.com. You may call 0701933565 to speak with a person who can answer further questions about this study. For any questions relating to your rights as a research participant please contact the secretary, KEMRI Ethics Review Committee, PO Box 54840-00200, Nairobi, Telephone numbers: 020-2722541, 0722205901, 0733400003, Email address: erc AT kemri.org |
| Reply SURVEY if willing to take the survey. |
| Thanks! First question will arrive shortly. Remember to delete SMSs if you don't want others to see your answers. You can always skip the question. |
| How old are you? Reply with M and the number of years like M 25 for 25 years old. Reply M SKIP to skip this question. |
| Thanks for your participation. We are only surveying users 18 and older at this time. |
| Thanks for your answer! Next question arriving shortly. |
| Do you or your sexual partner use contraception? Reply N 1 if yes or N 2 if no. Reply N SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| What type of contraception do you or your partner use? Reply P and type of contraception like P CONDOMS. Reply P SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| Have you discussed family planning with your sexual partner recently? Reply Q 1 if yes or Q 2 if no. Reply Q SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| Have you visited a clinic to discuss FP with a nurse or doctor in the past month? Reply R 1 if yes or R 2 if no. Reply R SKIP to skip |
| Thanks for your answer! Next question arriving shortly. |
| Are you married? Reply S 1 for yes or S 2 for no. Reply S SKIP to skip this question |
| Thanks for your answer! Next question arriving shortly. |
| What is your religion? Reply T 1 if Muslim, T 2 if Christian, or T 3 if other. Reply T SKIP to skip this question |
| Thanks for your participation! We will announce winners of airtime top up lottery within one month. |

1. Appendix E –Phone Interview Guide

Users selected for the phone interview will first be sent the following recruitment SMS.

### Recruitment SMS:

Thanks for using M4RH! Please help us learn more about m4RH users by answering some questions over the phone and stand a chance to win FREE air time. M4RH is free, voluntary and confidential. You can use M4RH even if you don’t answer these questions. Are you willing to speak to answer some questions over the phone? Reply Y if yes. Reply N or don’t reply at all if no.

Only those contacted who respond to indicate that they are willing to be interviewed over the phone will be contacted by a surveyor. Surveyors will use the following interview guide when conducting phone interviews.

### Introduction and Consent

Hello, my name is \_\_­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. I am calling on behalf of m4RH and USAID to assist the government and researchers to know more about users of the m4RH service. Your participation in this survey is completely voluntary. Y. you can use M4RH even if you don’t answer these questions. It is up to you to decide whether or not to take part in this study. If you decide to take part in this survey, you are still free to withdraw at any time and without giving a reason. You are free to not answer any question or questions if you choose. All information collected during this survey will be kept confidential.

Do you have any questions about the survey at this time?

Are you 18 years old or older? (If no, do not proceed.)

Do you agree to participate in the survey? (If no, do not proceed.)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature of interviewer indicating informed consent was provided.

The principal investigator for this study is Douglas Johnson who may be reached at douglas\_johnson@abtassoc.com. You may call XXXXXXX to speak with a person who can answer further questions about this study. For any questions relating to your rights as a research participant please contact the secretary, KEMRI Ethics Review Committee, PO Box 54840-00200, Nairobi, Telephone numbers: 020-2722541, 0722205901, 0733400003, Email address: erc@kemri.org

### Questions

The phone interview will include all questions from the SMS surveys plus the following questions as well:

* Did you find the information provided by m4RH easy to understand?
* Did you have any additional questions which the information provided by m4RH didn’t answer?
* What additional questions did you have which were not answered by m4RH?
* What did you learn from m4RH?
* How did m4RH cause you to change your behavior?

1. For the purpose of this study, a person is considered to be using contraception if that person or their most recent sexual partner use any of the following methods to avoid pregnancy: female and male sterilization, oral hormonal pills, the intra-uterine device (IUD), the male condom, injectables, implants, vaginal barrier methods, the female condom, emergency contraception, and lactational amenorrhea method. A couple which practices the rhythm method is not considered to be using contraception for the purpose of this study. [↑](#footnote-ref-1)
2. According to the World Health Organization, a woman has an unmet need for family planning if she is “fecund and sexually active but [is] not using any method of contraception, and report[s] not wanting any more children or wanting to delay the birth of their next child.” http://www.who.int/reproductivehealth/topics/family\_planning/unmet\_need\_fp/en/ [↑](#footnote-ref-2)
3. Mobile Alliance for Maternal Action Bangladesh, <http://healthunbound.org/mama/> [↑](#footnote-ref-3)
4. Project Masiluleke, http://healthmarketinnovations.org/sites/healthmarketinnovations.org/files/FINAL\_ProjectM042011\_0.pdf [↑](#footnote-ref-4)
5. A complete list of methods in included in Appendix A. [↑](#footnote-ref-5)
6. Alternatively, a second option would be to use answers to these questions on family planning to estimate a latent score representing knowledge of family planning through, for example, factor analysis or item response theory. Use of latent variable modeling is common in education studies but is not an ideal choice for measuring outcomes in this study. Unlike most education interventions, which seek to improve students’ general understanding of a subject, m4RH seeks to impart a relatively small set of information to users. (The service contains about 100 facts on several different family planning methods.) Thus, answers to the SMS survey questions are more appropriately interpreted as discrete indicators of knowledge transfer rather than as noisy proxies for some underlying trait. [↑](#footnote-ref-6)
7. Age is asked three times – once in each survey round. Average age is the average of these three responses. [↑](#footnote-ref-7)