BMJ Global Health

The effects of text reminders on the use of family planning services: evidence from a randomised controlled trial in urban Mozambique

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To cite: Leight J, Hensly C, Chissano M, *et al*. The effects of text reminders on the use of family planning services: evidence from a randomised controlled trial in urban Mozambique. *BMJ Global Health* 2022;**7**:e007862. doi:10.1136/bmjgh-2021-007862

Handling editor Soumitra S Bhuyan

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjgh-2021-007862).

Received 1 November 2021
Accepted 5 April 2022

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ABSTRACT

Introduction Reduction of unmet need for contraception is associated with enhanced health outcomes. We conducted a randomised controlled trial in Mozambique analysing the effects of text messages encouraging use of family planning services.

Methods This trial was conducted within a sample of women served by the Integrated Family Planning Program implemented by Population Services International, in which community health workers provide clinic referrals for family planning services. The evaluation enrolled 5370 women between 20 January and 18 December 2020 who received a referral, reported access to a mobile phone and provided consent. Women were randomly assigned to a treatment group that received a series of text message reminders encouraging them to visit a clinic or to a control arm. An intention-to-treat analysis was conducted to analyse the effect of reminders on the probability of a clinic visit and contraceptive uptake. The final analysis includes 3623 women; 1747 women were lost to follow-up.

Results Women assigned to receive the text reminders are weakly more likely to visit a clinic (risk difference 2.3 percentage points, p=0.081) and to receive a contraceptive method at a clinic (2.2 percentage points, p=0.091), relative to a base rate of 48.0% and 46.9%, respectively. The effect on clinic visits is larger and statistically significant in the prespecified subsample of women enrolled prior to the COVID-19-related state of emergency (3.2 percentage points, p=0.042).

Conclusion Evidence from this trial suggests that text message reminders are a promising nudge that increases the probability that women receive contraception.

Trial registration number AEARCTR-0005383.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Text message reminders can be a valuable strategy to encourage uptake of health services in low-income and middle-income countries.

⇒ However, there is relatively limited evidence about the effect of such reminders on use of reproductive health and family planning.

WHAT THIS STUDY ADDS

⇒ A series of text message reminders sent over a month to women who had received referrals to public clinics for contraceptive services in Mozambique increased the probability that women visited clinics and received contraception, especially prior to COVID-19-related lockdowns.

⇒ The effects were concentrated among women under 25 who may be more digitally engaged.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE AND/OR POLICY

⇒ Text message reminders can be used to encourage uptake of reproductive health services for populations who have access to cellular phones and other electronic messaging.

INTRODUCTION

Worldwide, an estimated 10% of women of reproductive age are characterised by an unmet need for family planning—defined as women who want to stop or delay childbearing but are not using any method of contraception—including 17% of women in sub-Saharan Africa.[1] Access to and use of modern contraception has substantial health benefits, enhancing birth spacing and thus reducing maternal and neonatal mortality and morbidity.[2–4] There is also evidence of economic benefits in terms of higher earnings for women and enhanced educational outcomes for children.[5] Accordingly, high levels of unmet need in low- and middle-income countries (LMICs) can have meaningful consequences for welfare. While access to family planning has been increasing, progress has been slow in some regions, particularly in sub-Saharan Africa.[6]

Ensuring universal access to sexual and reproductive healthcare is identified as one of the Sustainable Development Goals,[7] and in Mozambique, the site of this evaluation, a commitment to the Family Planning 2020

global partnership was made in 2012 with the objective of accelerating progress towards family planning goals.[8] Despite this commitment, unmet need remains high: national unmet need for modern family planning method in Mozambique was estimated as 23% in 2015.[9] Among adolescent girls aged 15–19, a total of 46% are pregnant for the first time or already have one child, and in this group, only 14% are using any contraception method.[9]

Given these persistent challenges around access to contraception, researchers and policymakers have identified potential barriers informed by behavioural science for women who have unmet need for family planning or have not accessed their preferred method. For example, limited attention and present bias may prevent women from taking short-term steps to use a contraception method despite their long-term family planning goals. 'Nudges' designed to address these barriers have potential to be integrated into family planning policies and programming. The evidence around the effects of nudges on health-related outcomes is substantial[10 11] but derived primarily from high-income countries, and there is relatively limited literature from LMICs.

More specifically, one popular nudge is reminders or other information delivered by text message or mobile phone applications. Existing reviews of mobile health (mHealth) interventions in LMICS have noted there is no consistent evidence that these interventions lead to behaviour change,[12] and highlighted that many published papers do not provide any evidence on health outcomes.[13–15] In family planning specifically, a number of published studies evaluate the effects of short message service (SMS) or rapid message interventions, but report only effects on variables such as contraceptive knowledge or attitudes. These evaluations do not measure or do not find any evidence of shifts in behaviours such as contraceptive use.[16–20] Accordingly, a broader evidence base is needed.[21]

This paper reports on a randomised controlled trial conducted in the context of a large community health worker programme in urban and periurban Mozambique led by Population Services International (PSI). A series of text message reminders was designed to encourage women who had received a referral from a community health worker to visit a health clinic for a family planning consultation. The objective of the trial was to evaluate the effect of these text reminders on the probability of a clinic visit as well as the probability of contraceptive uptake.

METHODS

Trial design and participants

This two-arm, parallel randomised controlled trial was conducted between January 2020 and January 2021 in urban and periurban areas of two provinces in Mozambique, Nampula (including Nampula city, Angoche, Ilha de Mocambique, Murrupula and Nacala Porto) and Sofala (including Beira and Dondo). The trial was jointly conducted by PSI and researchers based at the Office of Evaluation Sciences in the US General Services Administration and the International Food Policy Research Institute. The trial protocol and Consolidated Standards of Reporting Trials checklist are available as supporting information (online supplemental material S1, S2).

The target sample for the study was women of reproductive age served by community health workers in the Integrated Family Planning Program (IFPP). PSI delivered IFPP services in the provinces of interest, deploying community health workers (known as promoters) who offered women information about family planning in visits to homes or neighbourhoods in their service area. Visits focused on providing information about family planning and addressing common myths, and did not entail the direct provision of any family planning methods; rather, promoters provided women who voluntarily expressed demand for family planning with referrals to public health facilities, where family planning counselling from a nurse and contraceptive methods are available at no cost. Promoters also conducted up to three follow-up visits with women as needed, to provide more information or address concerns about side effects of a method obtained. PSI recruited around 100—120 promoters in the target regions, organised into teams of around five promoters each working with a single supervisor. Promoters conducted around 13–15 visits per day on average and were compensated per visit conducted and for each woman referred who visited a clinic.

In addition, promoters recorded information about each visit and the woman who participated in PSI's mobile application, Connecting with Sarah (CwS). PSI and public nurses in local health clinics used the same mobile application to record when women presented a referral for family planning counselling, and to record if a contraceptive method was provided.

The following eligibility criteria were specified for enrolment in the trial. Women 18 or older were eligible if they were visited by a promoter and received a referral to a health facility for further services, provided a phone number, and provided written consent for inclusion in the evaluation. Enrolment commenced on 20 January 2020 and was suspended on 4 April 2020 due to the state of emergency (SOE) declared in Mozambique as a result of the COVID-19 pandemic. Enrolment then resumed on 1 October 2020, concluding on 18 December 2020. The target sample size was specified to be 5000 women enrolled; given this sample size, the trial could detect an increase in the probability of a clinic visit of 4 percentage points. The trial ultimately closed following a shorter enrolment period due to COVID-19 disruptions, and the timing of enrolment closure was dictated by the timeline for broader programme conclusion.

The two provinces included in this evaluation, Nampula and Sofala, are highlighted in figure 1. Demographic data from the 2015 AIDS Indicator Survey conducted by the Demographic and Health Surveys programme can be used to characterise the sample. In Sofala, 26% of urban

Figure 1 Trial sites.

adults surveyed report no education and 43% report primary education, while in Nampula, the corresponding figures are 36% and 41%. Nationwide in Mozambique, 35% of urban adults report no education, and 48% report primary education. Socioeconomic indicators are generally higher in Sofala, where 82% of urban adult residents surveyed report access to electricity, and around 70% report their residences have cement walls and cement floors; in Nampula, 64% of urban adults report access to electricity at home; 46% have cement floors; and 35% have cement walls. Nationwide in Mozambique, 38% report access to electricity; 40% have cement floors; and 30% have cement walls.[9]

Randomisation and masking

Eligible women enrolled in the evaluation had their consent forms verified by trial staff, and the sample was then aggregated across the two study provinces. Women were randomly assigned to the treatment or control arm using the phone number provided on their consent form. Randomisation was conducted at least twice weekly by PSI staff in Maputo in Stata V.14 using a reproducible seed, employing stratification at the level of the promoter supervisor. On average, randomisation was conducted 5 days following the provision of consent. (Given that only two provinces are included in the evaluation, randomisation at the province level was infeasible.)

The intended allocation ratio of participants to the treatment and control arm was 1:1. When the study was launched, the randomisation code had an unintentional error that slightly increased the probability of assigning women to treatment: if the number of women in a particular strata (defined by supervisor identity on a given randomisation day) was odd, the final observation was uniformly assigned to treatment. (The identity of the final observation was, however, determined randomly via assignment of random numbers.) This error was corrected as of 28 February 2020.

Given the nature of the intervention, it was not possible to mask participants assigned to the treatment arm to their assignment. However, participants assigned to the control arm may have been blind to their assignment. Promoters and health staff at the health facilities were blind to study group assignment.

Intervention design

The intervention of interest was a series of short text message reminders designed to encourage take-up of health facility visits for family planning counselling by women who had been provided referrals by promoters. The messages were developed by the research and implementation teams with the objective of providing women with targeted, brief reminders about the importance of family planning; the opportunity to visit the health facility; and the opportunity to follow-up with their promoter, as needed. The text of the reminders can be found in table 1 in English; in the trial, all messages were in Portuguese. To maintain an appropriate level of confidentiality, the messages refer to family planning but also use more general terms such as health, hospital and promoter.

Table 1 also describes message timing as follows: on the same day as randomisation, women assigned to the treatment arm were registered by the vendor (SISLOG) who was responsible for delivering the text messages. Message timing is defined relative to this registration date. (On average, the time elapsed between the date of promoter visit and the randomisation and the registration date was 5 days, the time required to verify and aggregate the sample of women providing consent across all promoters.) Messages were sent on the first and fourth days following registration, and then 1, 2, 3 and 4 weeks following the first message.

Women who received the messages were of course free to share information received with members of their social networks, and this may have included women who were enrolled in the evaluation and assigned to the control arm. Any such communication between treatment and control beneficiaries would serve to reduce the magnitude of the estimated treatment effect.

Table 1 Text message reminder timings and content

Message	Time since registration (since first message)	Content
1+2	1 day	Thank you for agreeing to participate in family planning research. Go to the hospital today for your planning appointment.
3	4 days (+3 days since first message)	Present your password at the hospital and receive a health/family planning appointment.
4	8 days (+1 week)	Have you been to your planning appointment yet? The activist will visit again soon.
5	17 days (+2 weeks)	Next visit to hospital, invite a friend to receive family planning services.
6	22 days (+3 weeks)	Family planning allows women to better plan their family.
7+8	29 days (+4 weeks)	Talk to (activist) if you have questions about your health. Thank you for taking part in family planning research.

Data and outcomes

The data employed in this analysis were collected via a mobile application, CwS, used by promoters and health facility nurses. Following each promoter visit, promoters used a PSI-provided smartphone to access the CwS platform and recorded information about the beneficiary (age; current contraceptive use, if any; and access to a mobile phone), and whether a referral was issued. The data were uploaded at the conclusion of the visit and were automatically stamped with the date, time and global positioning system (GPS) coordinates. Similarly, nurses or health staff at referring facilities used CwS to record visits from women who visit for family planning services with a referral, and the two records were linked by a referral number. These facility records were also time-stamped and include information about the type of contraceptive method provided (counselling only, contraceptive pill, Depo-Provera, Sayana Press, contraceptive implant, intrauterine implant or other).

The analysis includes data from 20 January 2020, the day on which enrolment was launched, until 31 January 2021, 6 weeks following the last enrolment. Between 5 April and 1 October 2020, enrolment in the evaluation was paused, but we still observe data from clinics in this period and are thus able to identify if women who were already enrolled in the evaluation visited a clinic. Our data do not include any records of women's receipt of contraceptive methods in locations other than public clinics (ie, pharmacies or private clinics). Also, should a woman visit a public clinic and fail to provide her referral information, she could still receive family planning services at no cost, but this visit would not be recorded in the CwS application and thus would not be visible in our data. Data from the 2003 Demographic and Health Survey (not reported in more recent survey rounds) suggest that among women reporting use of modern contraceptives, less than 5% report receipt from a private clinic, nurse or pharmacy, suggesting that our data presumably include the majority of contraceptive receipt for this population.[22]

The primary outcome of interest is a binary variable for a clinic visit following promoter referral. Secondary outcomes of interest include a binary variable for contraceptive uptake at the clinic and a continuous variable capturing the number of days between the promoter visit and the woman's visit to the clinic, conditional on the observation of a clinic visit. There were no changes to the primary outcomes following the commencement of the trial.

For the variables corresponding with clinic visit and contraceptive uptake, these variables are coded as one if any facility activity is recorded on any day following the woman's promoter visit. Within a given randomisation stratum, all women included were randomised into the sample on the same day and visited by promoters within the same approximately 3-day period; accordingly, within a randomisation strata, all are observed in the sample for approximately the same period of time. There is, however, variation across strata in how long women were observed in the sample: women enrolled in the evaluation in the first month were observed for roughly 10 months, while women enrolled in the final month were observed for 1 month. The inclusion of binary variables for strata in the primary specification will adjust for this variation across strata in the observable period. In addition, as a robustness check, we define an additional variable equal to clinic visit within 30 days, coded as one for all observations in which the respondent is observed visiting a clinic within this time period.

The analysis also draws on administrative data from SISLOG, a local text message vendor, allowing us to report whether text messages were recorded as delivered or undelivered because the number was out of service. (However, one of the three cell service companies in Mozambique did not provide this information to SISLOG, and messages sent to customers of this company would never be recorded as 'delivered'; accordingly, the estimated delivery rate can be considered to be a lower bound.) We are not able to access any data reporting whether a message was read.

Statistical analysis

The methods used in the statistical analysis were prespecified in a registered analysis plan.[23] We estimate risk

differences between the treatment and the control arms using ordinary least squares in an intent-to-treat framework. We use a linear model for ease of interpretation[24] and cluster the SEs with respect to the day of randomisation to account for potential correlation in the error term for women who were visited by promoters and referred to clinics in the same period.[25] We prespecified the estimation of a model that adjusted for randomisation strata (the interaction of randomisation day and a binary variable for supervisor), age, province and distance to the nearest health facility. Distance is estimated as the linear distance employing the GPS coordinates associated with the promoter visit conducted at home and the coordinate of the closest health facility, and included as a series of binary variables capturing deciles of distance to allow for non-linear effects.

The analysis plan also prespecified analysis of heterogeneity along a number of dimensions: beneficiary age, contraceptive use at first meeting with the promoter, sole ownership of phone, time elapsed between promoter visit and randomisation, and distance to clinic. Following the suspension of enrolment due to the COVID-19-related SOE, the analysis plan was also updated to specify the separate analysis of treatment effects in the pre-SOE and post-SOE period.

In addition, we estimate a treatment on the treated effect in a two-stage least squares specification. In this model, the independent variable is a binary variable equal to 1 if the phone number reports receipt of all eight reminder messages and 0 otherwise (and zero for all phone numbers assigned to the control arm), and we instrument for this variable with treatment assignment. The model adjusts for the same covariates described in the ITT model, and standard errors are again clustered with respect to the day of the randomisation. This analysis was also prespecified.

In some cases, the same phone number was enrolled in the evaluation more than once, or the same number was enrolled and randomised once but was observed multiple times in promoter data. This duplication could be accurate (multiple women use the same phone) or could be recorded in error. There are 201 cases in which a phone number was enrolled more than once, and 531 cases in which the phone number was observed more than once in outcome data; there are 598 phone numbers characterised by at least one form of duplication. Given this pattern, all the variables in the primary specification are converted to phone number-level means: the dependent variable (a binary variable for a clinic visit), the independent variable capturing treatment assignment and all covariates. The same procedure was used when a phone number that was uniquely enrolled via the consent forms matches to multiple observations of that number in the CwS database, indicating the number was recorded for separate visits to different women. Due to this procedure, there is some continuous variation in both the treatment and the dependent variables between 0 and 1, corresponding to phone numbers that were partially treated: some women who enrolled using this number were assigned to treatment, and some women were assigned to control. For example, if a phone number was enrolled twice (listed on two separate consent forms) and was randomised once to treatment and one to control, treatment status for this phone number would be coded as 0.5.

Intervention costs were also tracked and analysed as part of this trial using a provider perspective. This cost estimate includes the full cost of the contract with the vendor who provided text message services, and an estimate of staff and administrative costs required to design and implement the intervention.

Role of the funding source

The funders of the study (United States Agency for International Development) had no role in study design, data collection, analysis, interpretation or writing of the results. The corresponding author (JL) had full access to all data in the study and the final responsibility for the decision to submit for publication.

Patient and public involvement

During the design phase of this trial, interviews of women served by IFPP as well as focus groups of promoters, supervisors and PSI staff were convened in order to provide feedback about the challenges faced by women in accessing contraception, and by promoters in serving them. In addition, PSI staff shared sample messages with programme beneficiaries in focus groups to ensure clarity and relevance of the text messages and made adjustments based on participant feedback. An author reflexivity statement is attached (online supplemental material S3).

RESULTS

Figure 2 depicts the trial profile. During the period of enrolment, 110 200 women were visited by PSI promoters and assessed for eligibility; 41 642 women received referrals to health facilities. This sample receiving referrals was screened for inclusion in the trial, and 13 586 women met the primary criteria (provided a mobile phone number). A total of 5370 women provided written consent and were enrolled in the evaluation. There was some duplication of phone numbers across enrolled women; some women were registered by the text message vendor using the same phone number, either accurately (because two women in the sample share a number) or in error. Accordingly, 5169 unique phone numbers were enrolled: there were 170 numbers that were registered twice, 14 numbers that were registered three times and 1 number that was registered four times. Within the sample, 2728 enrolled women were randomly assigned to treatment, and 2642 enrolled women were randomised to control.

The phone numbers recorded on consent forms were matched to the phone numbers available in the CwS database. Only 3623 enrolled women could be matched with an administrative record of their promoter and (if

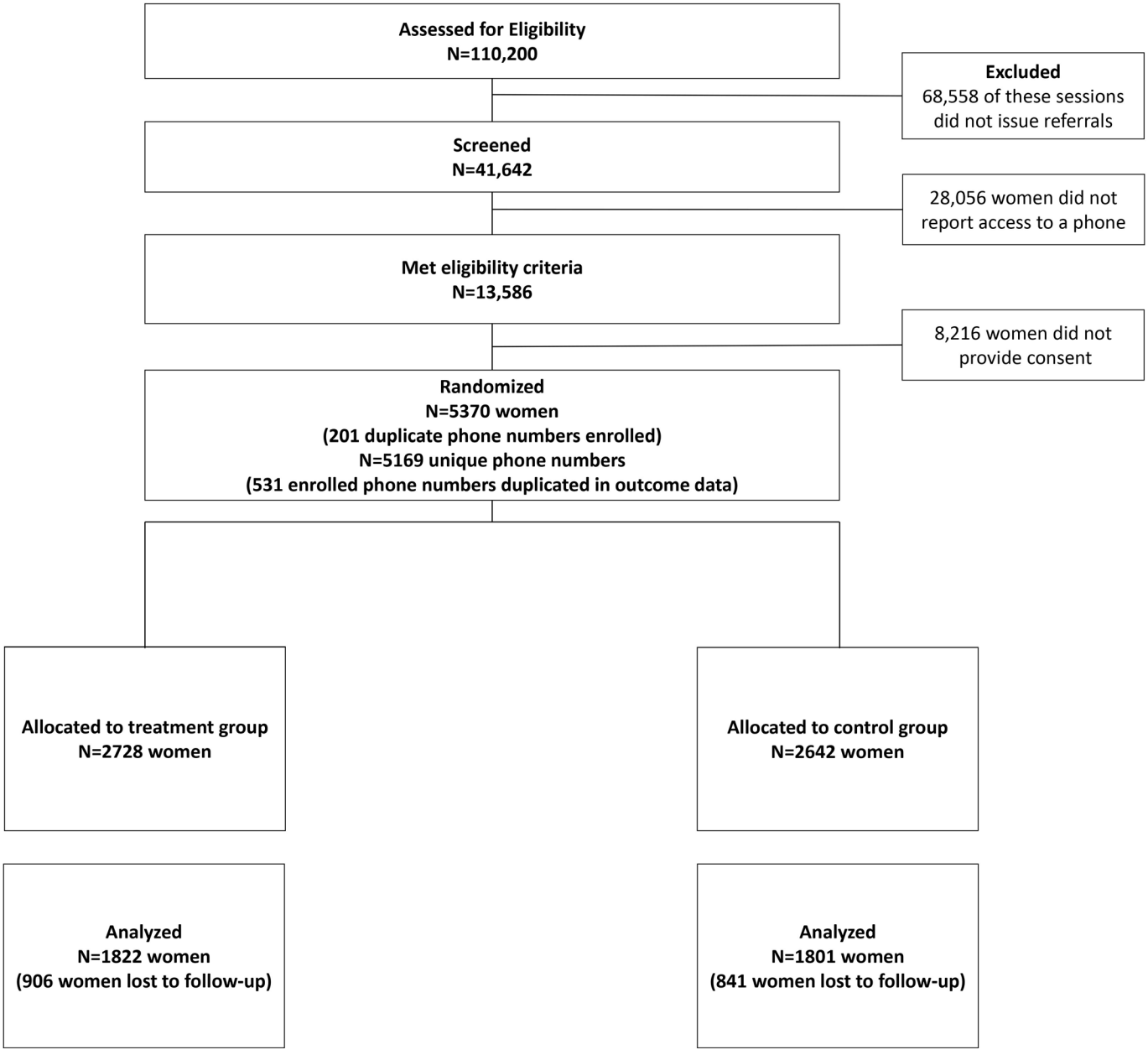

Figure 2 Trial profile.

applicable) clinic visits, corresponding to 3468 unique phone numbers. This results in 1747 women with written consent who were lost to follow-up or 32.5% of the sample: 906 or 33.2% assigned to the treatment arm and 841 or 31.8% assigned to the control arm, a difference that is not statistically significant (p=0.281). Women who were lost to follow-up are missing outcome data and summary data on covariates, as all CwS data are linked to the phone number.

We present characteristics of the study sample in table 2 for the full sample and the sample enrolled both pre-SOE and post-SOE. We also report summary statistics for the sample observed in treatment and control arms. The average age of women enrolled in the sample is 25.7 years. Distance to facility is low on average (less than four kilometres), though this is higher pre-SOE (5.02 kilometers) than post-SOE (2.63 kilometers). Within the sample, 69.6% report they are the sole owner of the phone number they have provided. Among the women, 30.9% report they are currently using contraception on their first interaction with the promoter, and this probability is dramatically higher pre-SOE (44.0%) compared with post-SOE (20.9%). We also report the p value corresponding to a χ^2 test of the joint hypothesis that these covariates are balanced across treatment and control arms; this hypothesis cannot be rejected (p=0.903).

Considering the outcome variables of interest, the probability of a clinic visit following a referral is around 48% on average, slightly lower pre-SOE (43.7%) compared with post-SOE (51.3%). The probability of a clinic visit within a month of the promoter's visit is 44.7%. The (unconditional) probability of contraceptive receipt

Table 2 Characteristics of sample respondents

	All	Pre-SOE	Post-SOE	Assigned to control	Assigned to treatment
Age (cont.)	25.652 (3468)	25.338 (1502)	25.891 (1966)	25.671 (1679)	25.634 (1789)
Distance to facility (cont.)	3.661 (3468)	5.018 (1502)	2.625 (1966)	3.580 (1679)	3.738 (1789)
Sole phone owner (binary)	69.6% (2289/3468)	67.2% (965/1502)	71.4% (1324/1966)	70.5% (965/1502)	68.7% (1324/1966)
Current user of contraception (binary)	30.9% (843/3468)	44.0% (583/1502)	20.9% (260/1966)	29.7% (583/1502)	32.0% (260/1966)
Joint χ^2 test of balance across covariates					p=0.903
Probability of clinic visit (binary)	48.0% (1547/3468)	43.7% (607/1502)	51.3% (940/1966)	47.4% (607/1502)	48.6% (940/1966)
Probability of clinic visit within 1 month (binary)	44.7% (1441/3468)	41.1% (573/1502)	47.5% (868/1966)	43.6% (573/1502)	45.8% (868/1966)
Probability of contraceptive receipt (binary)	46.9% (1505/3460)	42.3% (585/1499)	50.4% (920/1961)	46.3% (585/1499)	47.4% (920/1961)
Days elapsed: promoter to clinic visit (cont.)	11.459 (1779)	11.435 (704)	11.475 (1075)	11.661 (845)	11.276 (934)
Probability of receiving any text reminder (treatment arm only)					79.4%
Probability of receiving all text reminders (treatment arm only)					62.1%

This table reports summary statistics for the full sample for the sample enrolled in the pre-COVID and post-COVID state of emergency period; and for the sample assigned to the treatment and control arms. The labels indicate whether the variable of interest is continuous (for which the mean and the number of observations is reported) or binary (for which the mean and the number of observations is reported). For the purposes of the table, any phone number that is enrolled multiple times and partially treated is included as part of the treatment arm.

(without any time limit) is 46.9%. Around 11 days elapse on average between the promoter visit and the woman's visit to a clinic (median days elapsed is eight). In analysing summary statistics for numbers assigned to treatment and control, there is little evidence of any meaningful differences across the two arms.

Data from the text message vendor on intervention implementation are also reported. On average, phone numbers assigned to the treatment arm reported receipt of 79.4% of text messages, though as noted earlier this may reflect a lower bound due to missing information from one cell service company. Of the enrolled phone numbers, 62.1% reported receipt of all eight text messages.

Table 3 presents the primary results analysing the effect of the intervention on clinic visits and contraceptive take-up. In the intent-to-treat analysis, the estimated effect of the text reminders on the probability of a clinic visit is positive and marginally statistically significant at the 10% level: women who received text reminders were 2.3 percentage points (95% CI −0.003% to 0.048%, p=0.081) more likely to visit a clinic for family planning services, relative to a probability of 47.4% in the control arm. This is a proportional effect of 4.9%. The effect is larger (3.2 percentage points, or a proportional effect of 6.8%) and statistically significant at the 5% level in the pre-SOE period (95% CI 0.001% to 0.063%, p=0.042) and the same magnitude but noisily estimated in the post-SOE period (95% CI −0.017% to 0.064%, p=0.254). As a robustness check, we also estimate the effect of the reminder on a clinic visit within 1 month and here observe an effect that is larger vis-à-vis the main treatment estimate (3.7 percentage points) and statistically significant at the 1% level in the full sample (95% CI 0.012% to 0.062%, p=0.004).

We also report the estimated treatment effects for the two additional secondary variables of interest. For the probability of receiving a contraceptive method at a clinic, the estimated effect of the text reminders is positive (2.3 percentage points) and statistically significant at the 10% level (95% CI −0.004% to 0.048%, p=0.091) though again significant at the 5% level when restricted to the pre-SOE period. For the time elapsed between promoter visit and clinic visit (conditional on observing a clinic visit), we observe a negative coefficient of −1.219 that is statistically significant at the 1% level (95% CI −2.133% to −0.306%, p=0.009).

Table 4 presents the two-stage least squares analysis. The estimated effect of receiving all reminder messages is now larger (3.6 percentage points, 95% CI −0.005% to 0.076%, p=0.083) or a proportional effect of 7.6%. There is a 5.8 percentage point increase in the probability of a clinic visit within a month (95% CI 0.019% to 0.098%, p=0.004) and a 3.5 percentage point increase in the probability of contraceptive receipt (95% CI −0.006% to 0.077%, p=0.092). Redemption time is around 2 days shorter on average (95% CI −3.478 to −0.507, p=0.009).

Table 3 Effect of the text message reminders on primary and secondary outcomes: intent-to-treat analysis

	Full sample	Pre-SOE	Post-SOE
Clinic visit (primary)	0.023 (–0.003 to 0.048)	0.032 (0.001 to 0.063)	0.023 (–0.017 to 0.064)
	p=0.081	p=0.042	p=0.254
	3468	1502	1966
Clinic visit within 1 month (secondary)	0.037 (0.012 to 0.062)	0.042 (0.008 to 0.075)	0.040 (0.000 to 0.080)
	p=0.004	p=0.014	p=0.049
	3468	1502	1966
Received contraceptive method (secondary)	0.022 (–0.004 to 0.048)	0.034 (0.003 to 0.065)	0.021 (–0.019 to 0.062)
	p=0.091	p=0.033	p=0.306
	3460	1499	1961
Days between promoter visit and clinic visit	–1.219 (–2.13 to –0.306)	–0.643 (–2.170 to 0.884)	–1.302 (–2.541 to –0.062)
	p=0.009	p=0.409	p=0.04
	1779	704	1075

This table reports estimated risk differences corresponding to the effect of assignment to the text message treatment for the full sample, the sample enrolled pre-SOE and the sample enrolled post-SOE. For phone numbers that were enrolled more than once, we identify the phone number as pre-SOE if at least one enrolment was recorded pre-SOE. Eight phone numbers are missing data for method choice that would allow us to identify contraceptive receipt. Days between promoter visit and clinic visit are coded as missing for women who never reported a clinic visit. Each cell reports the coefficient and 95% CI, and p value and the number of observations.
SOE, state of emergency.

Table 5 presents the results by subsamples. The positive treatment effect is observed to be larger (4.1 percentage points) for women under the age of 25 (95% CI –0.001 to 0.083, p=0.055). By contrast, the estimated effect for women over the age of 25 is in fact negative, though statistically insignificant. There is no evidence of any meaningful heterogeneity in response with respect to whether the woman reports she is currently using contraception on meeting the promoter, whether she reports she is the sole owner of the phone registered, the time elapsed between the promoter visit and the date on which the woman enters the randomisation sample, or distance to the health facility.

Table 4 Effect of the text message reminders on primary and secondary outcomes: treatment-on-the-treated analysis

Clinic visit (primary)	0.036 (–0.005 to 0.076), p=0.083
N	3468
Clinic visit within 1 month (secondary)	0.058 (0.019 to 0.098), p=0.004
N	3468
Received contraceptive method (secondary)	0.035 (–0.006 to 0.077), p=0.092
N	3460
Days between promoter visit and clinic visit	–1.993 (–3.478 to –0.507), p=0.009
N	1779

This table reports estimated risk differences corresponding to the effect of receipt of a full set of eight text messages for the full sample, using a two-stage least squares analysis in which receipt of text messages is instrumented by treatment assignment. Eight phone numbers are missing data for method choice that would allow us to identify contraceptive receipt. Days between promoter visit and clinic visit are coded as missing for women who never reported a clinic visit. Each cell reports the coefficient and 95% CI, and p value and the number of observations.

Cost data for the intervention suggests a total cost of $7593.87 for the implementation of the text reminders, excluding the costs of the evaluation itself. Given the number of women targeted by the intervention (enrolled in the treatment arm and successfully reached by at least one text reminder), the cost per woman targeted is $2.74.

DISCUSSION

The evidence presented here from a randomised trial of text reminders suggests that this intervention can be an effective strategy to increase facility visits by women referred for family planning services in urban and periurban Mozambique. The effect of the text reminders is positive and statistically significant: women who received text reminders are more likely to visit a clinic, are more likely to report receiving a contraceptive method at a clinic and visit the clinic more rapidly (conditional on ever reporting a visit). Moreover, the effects are particularly large for younger women and prior to the COVID-19-related SOE. In addition, the fact that the effect on contraceptive use is also positive indicates that the marginal woman encouraged to visit the

Table 5 Effect of the text message reminders on primary and secondary outcomes: intent-to-treat analysis for prespecified subsamples

	Subsample of interest					
	Current non-user of contraception	Current user of contraception	Reports shared ownership of phone	Reports sole ownership of phone	Age ≤25	Age >25
Treatment effect (risk difference)	0.030 (–0.014 to 0.074)	0.022 (–0.025 to 0.070)	–0.004 (–0.064 to 0.055)	0.032 (–0.003 to 0.066)	0.041 (–0.001 to 0.083)	–0.016 (–0.064 to 0.033)
	p=0.184	p=0.356	p=0.883	p=0.074	p=0.055	p=0.53
N	2206	1262	917	2551	1918	1550
	Randomisation within 3 days		**Randomisation in more than 3 days**		**Facility distance ≤median**	**Facility distance >median**
Treatment effect (risk difference)	0.019 (–0.017 to 0.056)		0.017 (–0.017 to 0.052)		0.024 (–0.014 to 0.062)	0.030 (–0.007 to –0.068)
	p=0.299		p=0.324		p=0.209	p=0.112
N	1968		1500		1717	1723

This table reports estimated risk differences corresponding to the effect of assignment to the text message treatment on the probability of a clinic visit for the specified subsamples. For the analysis of heterogeneity, phone numbers that were repeated in the analysis and thus have a constructed (continuous) value for the covariate are included in the subsample reporting non-zero values; that is, current user of contraception includes phone numbers with multiple observations in which at least one is identified as a current user of contraception; current non-user of contraception includes those phone numbers for which no recorded observation reports any contraceptive use. 28 observations are missing estimated distance to the closest facility. Each cell reports the coefficient and 95% CI, p values and the number of observations.

clinic by a reminder message does in fact take up contraception, rather than visiting and ultimately choosing not to use any contraceptive method.

This paper joins a limited literature to date analysing the effects of mHealth interventions and nudges informed by behavioural science on primary healthcare use, including use of sexual and reproductive healthcare, in LMICs. Only two previous papers to our knowledge have analysed the effects of a nudge on family planning uptake. One evaluation conducted in urban Kenya found that there was no incremental effect of text message reminders for women offered vouchers to receive family planning at no cost at a private clinic.[26] A second evaluation conducted in rural Kenya found a statistically significant increase in contraceptive uptake among women who received a series of SMS messages postpartum providing information about danger signs and family planning; only women who recently delivered were enrolled into the intervention.[27] A third recent paper analysed an mHealth intervention designed to enhance contraceptive counselling (a tablet-based application) in Cameroon and found a very large positive effect on adoption of long-acting contraceptives.[28] Other papers have analysed the effect of mHealth interventions on knowledge or attitudes around contraception only.[16–20]

In the broader area of reproductive health, a randomised trial conducted in South Africa found that daily reminder text messages following adult male circumcision increased attendance at postoperative clinic visits by 6 percentage points.[29] Another mHealth intervention—which consisted of messages two times per month and then two times per week, and also allowed for two-way communication with a health provider—rolled out to pregnant women attending primary healthcare facilities in Zanzibar led to a 13 percentage point increase in the use of antenatal care[30] and an associated reduction in perinatal mortality.[31] In general, the magnitude of the effect observed here (ranging from 2 percentage points for the full sample to 4 percentage points for the sample under 25) seems plausible, given the existing evidence; it is approximately half the size of the effect observed for clinic visits following a non-trivial circumcision procedure in South Africa. Moreover, the effect is significantly larger (an increase of 3.6 percentage points) among women who received the full set of eight reminder messages.

The cost per woman reached of the intervention (less than $3) also compares favourably to other interventions targeting family planning. In particular, the previous evaluation of vouchers and SMS reminders in Kenya estimated the average value of the voucher redeemed as $4.26 for the contraceptive product alone and did not include cost estimates for the text messages or administration costs.[26] Given the estimated treatment effects observed in this analysis, the cost per woman induced to visit a clinic for family planning counselling is $104.82, and the cost per woman induced to take up contraception is $109.59.

In addition to encouraging take-up of contraception, the text reminders were particularly effective in encouraging women to visit the clinic promptly: the effect on clinic visits within 30 days was proportionally around 60% larger than the effect on any clinic visit, and among women who did visit clinics, they visited on average 1 day sooner relative to a median of 8 days. The timing of visits is potentially of relevance, given that use of long-acting contraceptives is relatively unusual in this sample: among women who visit a clinic, less than a quarter received a long-acting method (3% received an intrauterine device, and 19% received a contraceptive implant). (These summary statistics were not presented in the Results section, as they are simple means rather than treatment effects.) These patterns are broadly similar to those observed in the most recent Demographic and Health Survey conducted in Mozambique in 2011, as only 10% of women reporting use of contraception in that survey reported use of a long-acting method.[32]

In a context in which use of short-acting contraceptives is dominant, interventions that target more timely clinic visits may have significant health implications if they effectively reduce contraceptive discontinuation, given evidence from the literature around high rates of discontinuation in LMICs.[33 34] Discontinuation is especially high for short-acting methods,[35] though it is also observed for long-acting methods,[36] and is particularly common for adolescents.[37] Women who have discontinued previous use without switching to a new method thus constitute a substantial share of the population of women with unmet need.[38 39] While we do not have any systematic data about discontinuation of contraceptive methods in this evaluation, text messages encouraging more rapid follow-up at clinics or with promoters may be a promising strategy to reduce discontinuation (allowing for method refill or counselling about side effects or options for switching), particularly for the adolescent population that is shown to be more responsive to the reminders.

It is important to note that this evaluation was conducted in 2020 during a year of acute uncertainty and disruption linked to the COVID-19 pandemic and in a general environment of health-related fears. In Mozambique, an SOE linked to the pandemic was in effect from 31 March 2020 to 7 September 2020 (thereafter transitioning to a state of public calamity); however, promoters continued to operate throughout this period, and health clinics remained open. (Enrolment in the study was paused during the SOE, as described in more detail earlier.) Previous work by this research team analysing the short-term effects of the SOE on the behaviour of PSI promoters and women found a modest short-term drop in both service provision and use through June 2020, followed by a relatively rapid rebound.[40] However, the fact that the effect of the text reminders is generally reduced and more noisily estimated in the post-SOE period constitutes suggestive evidence that in this period, other barriers (eg, anxiety about visiting clinics or increased economic stress) may have become more salient, and our intervention did not effectively target these barriers.

This analysis has a number of strengths and weaknesses. It is only the third evaluation to analyse the effectiveness of text reminders on contraceptive uptake in LMICs and the first to do so including a sample of women who are not exclusively postpartum. We analyse a substantial sample using administrative data (ie, not relying on self-reported use measures or additional data collection) and successfully completed the evaluation in an environment of substantial COVID-related disruptions. Key limitations of the evaluation include a high attrition rate (due to an inability to match phone numbers recorded manually on consent forms to phone numbers recorded in administrative data by promoters) and the reliance on a relatively narrow administrative dataset. Accordingly, we are unable to analyse intervention effects on use of contraception in other contexts (outside of public health clinics) and are unable to analyse longer-term use or other health outcomes. We also do not have access to any data on women's literacy and their comprehension or recall of the messages. Finally, our findings are informative about the effectiveness of the reminders on a population of women that has already received referrals from health promoters and may not be informative about the effects of this intervention in a broader population.

CONCLUSION

This paper presents evidence from a randomised controlled trial evaluating a series of text message reminders designed to increase facility visits for family planning services in urban and peri-urban Mozambique. The results suggest that the reminders may be a promising strategy to increase clinic visits and associated uptake of contraception following referrals by community-based promoters, and these effects may be largest for younger women. Future programming and research work can explore the potential of incorporating mobile reminders to encourage consistent uptake of family planning services.

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Acknowledgements We acknowledge the support of a large team including (at Population Services International) Maria Dos Anjos Machonisse, Ryan Kelley, Hannah Hoover, Jennifer Wheeler, Susannah Gibbs, Paul Bouanchaud, Donato Gulino, Yolanda Chongo, Sebastião Libombo, Elvira Cambe, Cindy Pereira, Narciso Cau, Paulo Mandevo, Lourdes Jossias, Alexandre Lucas and the whole team of Assistentes Comunitários in Sofala and Nampula (at Pathfinder International): Luc Vander Veken, Riaz Mubaracaly, Adalgisa Viola and Ana Jacinto and (at United States Agency for International Development) Raquel Zaqueu.

Contributors JL, CH, MC, ES and JJ designed the evaluation. MC, LA and DD led the field implementation and administration of the evaluation in the field. JL conducted the analysis and drafted the manuscript. All authors provided the

final review of the manuscript. JL is responsible for the overall content of the manuscript as the guarantor.

Funding The funders of the study United States Agency for International Development had no role in study design, data collection, analysis, interpretation or writing of the results. The corresponding author (JL) had full access to all data in the study and final responsibility for the decision to submit for publication.

Map disclaimer The inclusion of any map (including the depiction of any boundaries therein) or of any geographic or locational reference does not imply the expression of any opinion whatsoever on the part of BMJ concerning the legal status of any country, territory, jurisdiction or area or of its authorities. Any such expression remains solely that of the relevant source and is not endorsed by BMJ. Maps are provided without any warranty of any kind, either express or implied.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, conduct, reporting or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and ethical review and approval was provided by the institutional review Board at International Food Policy Research Institute and the Comité Nacional de Bioética para Saúde in Mozambique (protocol number 477/CNBS/19). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data underlying the study cannot be made publicly available due to ethical restrictions. However, deidentified data will be freely available to researchers upon signing a data use agreement with the collaborating organisation (Population Services International) that includes confidentiality policies. Requests for data should be submitted to jwheeler@psi.org.

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Increasing the Effectiveness of Family Planning Promoters in Nampula and Sofala Provinces

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1. Introduction and justification

1.1 Description of the project

This project is conducted by the International Food Policy Research Institute (IFPRI) and the Office of Evaluation Sciences (OES), an interdisciplinary team housed at the US General Services Administration (GSA), and Population Services International (PSI)-Mozambique as part of Pathfinder International's Integrated Family Planning Program (IFPP), which is funded by USAID. Specifically, this project is in collaboration with PSI-Mozambique in urban areas of two provinces in the country: Sofala and Nampula.

As part of the IFPP program administered by PSI, community "promoters" meet with beneficiaries one-on-one at home to promote family planning uptake and utilization by providing referrals to local clinics. These community agents utilize a mobile platform (Connecting with Sara, or CwS) to record real-time information about the beneficiaries and community agent activity. Nurses employed by PSI and working in local health clinics similarly utilize the mobile platform to record real-time information about referral redemptions. However, interactions with beneficiaries have been limited to face-to-face only; the potential for mobile interaction or follow-up has yet to be fully realized. The first phase of this project therefore aims to explore one way in which mobile technology can be leveraged to promote family planning knowledge and utilization in this context.

This project contributes to the literature in three key ways: (i) examining how alternative forms of communication can supplement existing family planning promotion programs, (ii) providing a rigorous analysis of a family planning intervention leveraging mHealth across a relatively broad population, and (iii) evaluating how the timing and frequency of messages impacts behavioral health outcomes. Finally, it provides an opportunity for similar interventions to be replicated in other countries where PSI operates.

1.2 Justification

In both Sofala and Nampula, Mozambique, only about 50% of women who receive a referral for family planning from a Population Services International (PSI) promoter actually follow through and visit a clinic where they can receive contraceptive counseling and access a contraceptive method if they wish; this redemption rate is estimated based on administrative data on ongoing program operation. This pattern suggests that there is room to increase redemption rates by improving the efficiency of PSI promoters when they interact with beneficiaries. Among women who receive referrals, around 50% of women who ultimately redeem their referral do so the same day, while 75% redeem within four days. This pattern is consistent with the hypothesis that redemptions are most likely to be observed in the extreme short-term while the information provided by the promoter is still highly salient, and this salience may diminish rapidly over time as women who have not redeemed their referral quickly are much less likely to ever redeem.

General reviews of the literature on mobile health highlight how thus far it has been leveraged primarily either by providers as an alternative mode of communication to reach out to clients who already have appointments for facility-based care, or to promote adherence to medication managing chronic conditions like HIV (Chib et al. 2015; Gurman et al. 2012). Meanwhile, family planning interventions primarily entail hotlines or SMS mass media campaigns rather than targeted reminders (Corker 2010, Higgins-Steele et al. 2015).

In general, there are very few evaluations examining the effectiveness of mobile reminders designed to encourage take-up of a preventive health product such as contraception. Previous literature analyzing electronic follow-up in roughly similar contexts has found effects of differing magnitude contingent upon initial design and sample size.

One study in Zanzibar utilized a cluster-randomized trial to analyze the effects of SMS follow-up reminders for pregnant women receiving antenatal care (Lund et al. 2012). A total of 2,550 women were divided between an intervention group of twelve clinics receiving an intensive SMS and voucher intervention and a control group of twelve clinics receiving standard care. The mobile intervention generated an average increase in skilled delivery care at birth of 13 percentage points across all participants from a base rate of 47% in the control group. This increase was driven by urban women (rather than rural women), who saw a 32 percentage point increase from a base rate of 50% skilled delivery in the control group. However, it should be noted that this intervention entailed very regular follow-up messages in conjunction with mobile phone vouchers enabling beneficiaries to contact health workers over the entire period of pregnancy and postpartum care.

Pregnant women attending antenatal care who received a standard voucher and SMS reminder in Nairobi, Kenya were found to have an increased probability of reporting utilization of a modern family planning method compared to the control of no voucher/no reminder in a limited pilot study (McConnell et al. 2018). In the medium-term, 58% of the control group participants reported using family planning. In comparison, those receiving a standard voucher with SMS were estimated to be 25 percentage points higher than the control arm. Voucher redemption rates (measuring behavior, rather than self-report) were 20% among those receiving a voucher.

Another study evaluating the effects of SMS encouragement on family planning uptake amongst women with unmet need in Western Kenya relied on a very small sample size of 112 women (Green et al. 2018). Given high attrition, the actual effect estimates are noisy and largely uninformative. In that study, only 1.8% of the control group (1/56) reported taking up family planning, compared to 33.9% of the treatment group receiving SMS encouragement (19/56).

Finally, one other relevant paper analyzed the effect of SMS reminders for a follow-up appointment after male circumcision in South Africa; messages were sent daily during the week between the procedure and the scheduled follow-up, and resulted in a significant increase in attendance at the follow-up procedure. The increase in attendance at follow-up was 6 percentage points from a base rate of 59.7% in the control group (Odeny et al. 2012).

2. Objectives of the evaluation

2.1. Primary objective

The general objective of this project is to generate high-quality evidence about how to increase the effectiveness of the services provided by PSI community promoters, and pilot a strategy of RapidSMS reminders designed to increase the uptake of contraceptive referrals generated by those promoters.

2.2. Secondary objective

The study's specific objectives are as follows:

1. Implement an intervention in which SMS messages are sent to eligible, consenting parties who receive referrals for family planning;

2. Evaluate the effectiveness of these messages using a randomized controlled trial to identify whether the messages are effective in increasing family planning referral redemption rates amongst the current target population;
3. Determine the viability of the intervention to extend its application within PSI-Mozambique.

3. Study population

3.1. Population

The target population is the current beneficiary base served by PSI-Mozambique promoters, namely women of reproductive age (WRA) residing in urban areas of Nampula and Sofala. These include both current users of family planning who wish to switch methods as well as those with unmet need for family planning.

3.2. Inclusion and exclusion criteria

Eligibility criteria for the evaluation can be described as follows. Women of reproductive age over the age of 18 who agree to receive a referral from the PSI promoter and provide a mobile phone number will be offered the opportunity to enroll in the evaluation. (Women who are currently pregnant are ineligible for referrals and hence ineligible for inclusion.) Only those who provide informed written consent will be included in the evaluation

4. Study methods

4.1 Test arms and treatment conditions

This evaluation is designed as a randomized controlled trial with two arms. In the control arm, beneficiaries will receive status quo programming in line with current IFPP program protocols.

In the intervention arm, beneficiaries will receive a series of electronic SMS follow-ups reminding them to redeem their referrals or follow up with their promoter, as described in the table below.

1	24 hours	*Vai hoje ao Hospital para a tua consulta de planeamento.*	Go to the Health Facility today for your planning appointment
2	72 hours	*Apresente a sua senha no hospital e receba uma consulta de saúde/planeamento familiar.*	Show your voucher at the clinic and receive a consultation for health and family planning services
3	1 week	*Já foste à tua consulta de planeamento? A activista fará uma nova visita brevemente..*	Have you been to your planning appointment? The promoter will be visiting you again soon.
4	2 weeks	*Na próxima visita ao hospital convide uma amiga para receber os serviços de planeamento familiar*	On the next visit to the health facility, invite a friend to receive family planning services

5	3 weeks	*O Planeamento Familiar permite as mulheres planearem melhor a sua família.*	Family planning allows women to better plan their families
6	4 weeks	*Fale com a activista se tiver questões sobre a sua saúde.*	Talk to your promoter if you have questions about your health

4.2. **Randomization**
This intervention will be randomized at the individual (beneficiary) level. Randomization will be conducted twice-weekly for women who have enrolled in the evaluation following promoter visits over the preceding three days; the research manager will conduct randomization in Stata using a reproducible seed.

Immediately after the randomization is conducted, the contact information of beneficiaries assigned to the intervention arm will be provided to the vendor delivering SMS messages, and messaging will commence the following day. Each randomization cohort of beneficiaries (both treatment and control) will be carefully tracked to facilitate analysis of relevant outcomes.

4.3. **Sample Size**
Promoters reach around 12,500 beneficiaries monthly; around 130 promoters are employed in this program at any given time, though the number can fluctuate due to promoter attrition. (This estimate and all subsequent estimates cited here are based on administrative data about the current progress of IFPP programming.)

Based on data from the last 6 months (June-Nov 2019), there were 867 referrals with phone numbers each month on average. Assuming that 85% of women also provide consent for the evaluation, we estimate that around 740 women will be enrolled in the evaluation each month. We plan on seven months of data collection, yielding a total sample of 5,180 women.

4.4 Power
Given a sample size of 5,300 and a baseline redemption rate for referrals of 50%, the evaluation can detect an increase in the redemption rate of about 3.8 percentage points.

5. Data collection and management

The primary source of data will be collected via the Connecting with Sara (CwS) application by promoters and nurses tracking referrals and redemption rates, respectively. The CwS platform is used by promoters and nurses in this capacity already as a core part of the IFPP program. As such, this research evaluates a new intervention using existing outcome data.

Data is subsequently stored in the District Health Information System (DHIS2) and is accessed via Power BI, a Microsoft business analytics tool. The information from individuals who do not provide consent to be part of the study and are not issued a referral will still be recorded within the CwS app per standard data collection practices conducted by the organization. However, the PI team will not have access to this data; data access and analysis will pertain only to the sample that provided consent.

5.1. Data Collection Instruments

The primary source of data will be data collected on the CwS application as loaded to promoter and nurse mobile phones. The app is already used in this capacity as a core part of PSI's IFPP program. The key data fields collected to be used in this analysis include:

Data Field Name	Description
Marieta - ID (non-unique)	Beneficiary identification code based on location and birth order
Date	Date and time of transaction recorded; this then is used to calculate the time between when a beneficiary is issued a family planning voucher and when she redeems it with a nurse
Longitude	Longitude coordinate as recorded at the time of data upload by the GIS functionality of the phone being utilized
Latitude	Latitude coordinate as recorded at the time of data upload by the GIS functionality of the phone being utilized
Provider – New or Continuing Users	Categorizes beneficiaries who redeem referrals as a continuing user, method switcher, or new user as recorded by a nurse
Phone Ownership	Phone ownership as described by the beneficiary at the time of entering the phone number (i.e. owned, shared with partner, none, etc.)
Actor Type	Role of the individual uploading the information (i.e. promoter or nurse)
Marieta - Age	Age range of the beneficiary in five-year increments
Geography – Province	Province identifier differentiating between Sofala and Nampula
Transaction Type – Acronym	Session type as categorized by: IFPP promoter session with referral, IFPP promoter session without referral, reminder voucher issue by the IFPP promoter, or, nurse recorded redemption of IFPP voucher
CwS – FPL – Service received	Type of method issued by the nurse (i.e. pill, implant, injection – depo, counseling)
Program	Classifies each interaction by program type (i.e. IFPP, Nurse, Tem+, etc.) – we are interested in FPL-IFPP for referral issues and Nurse for nurse redemptions

In addition, beneficiary phone numbers will be used to merge the datasets from enrollment and randomization (in which beneficiaries are identified using their phone numbers) to the outcome data in the CwS app; the latter data similarly reports beneficiary phone number. Following the completion of this merge process, an anonymized version of the dataset excluding all phone

numbers will be saved and utilized for analysis. No other personally identifiable information will be accessed for the purposes of this evaluation.

7. Results and Dissemination

The results of this project will include:

- High-quality, robust evidence about the effectiveness of SMS messaging to increase promoter effectiveness;
- Additional evidence about promoter-facing methods to increase promoter effectiveness;
- An example process of how to overlay variations of program components on top of existing programming, where the variations aim to increase promoter efficiency, and are introduced randomly;
- Publication package to include an abstract, webpage hosted by OES, and slides where the audience is the general public, USAID Missions, PSI and international organizations like it, and especially the government of Mozambique; and
- Draft manuscript for submission to an academic journal.

8. Ethical Considerations

Recruitment
There is no specific recruitment for this study; rather, the intervention will be incorporated as a part of the existing IFPP program procedures in which promoters meet with beneficiaries and issue referrals. The intervention is only delivered to women who agree to receive a referral from the promoter, provide a cell phone number, and consent to enroll in the evaluation.

Benefits
Participants will not receive any direct benefits from participating in this research. The intervention is designed to increase family planning referral redemption at local clinics where such services are provided for no monetary cost. Redeeming a referral at a clinic facilitates contraceptive counseling as well as family planning uptake among women who are either interested in switching methods or have an unmet need for family planning.

Risks and Mitigation
Phones may be shared (or outright owned) by spouses or partners, and so mobile SMS messages may be read by other parties. As a result, there is the potential for stigmatization or retaliation. Ultimately, this risk is reasonable in relation to the benefits given that the intervention adds SMS encouragement messages to the standard operating procedures of IFPP as conducted by PSI-Mozambique. Nevertheless, to mitigate this risk, beneficiaries must consent to receive messages to be eligible to participate. Message content has been designed to encourage beneficiaries to visit health professionals while also mitigating social risks based on PSI's piloting. Beneficiaries also will be able to discuss any questions they have about the SMS messages and potential risks therein with the promoters; promoters can follow-up with the beneficiaries directly should there be any concerns.

Informed Consent
During the data collection phase, all eligible women will provide informed consent for enrollment in the evaluation. The consent process will be administered by promoters. The consent form provides the following information: study objectives and procedures, risks and benefits of study participation, strategies used by researchers to minimize risks, costs associated with the study, the voluntary nature of the study, the participant's right to refuse to answer questions or leave the study, and contact information of staff.

All health promoters will be carefully trained on the consent process and the importance of the voluntary nature of participation. The consent form has been written in language that is easily understandable to participants as well as promoters.

For respondents who provide consent, the physical consent form will be collected by the promoters' supervisors and retained for the duration of the evaluation; digital images of the consent forms will also be recorded.

Compensation
No additional compensation will be offered to beneficiaries for participating in the research.

Data Management and Privacy Protection
The study will not access any identifiable data for beneficiaries other than the phone number and longitude/latitude of the location where the session was conducted, as noted above. In addition, data on phone numbers will not be included in the dataset used for analysis following the completion of the merge. In the Connecting with Sarah application, no beneficiary names are recorded; instead, a code is assigned based on location and birth order. All data is collected via the CwS application and stored via the DHIS2 per standard operating procedures. This affords electronic maintenance of records in the cloud rather than reliance upon paper records. No data collected in the course of the study is considered as sensitive in nature.

Consent forms provided by the respondents include their name and signature (or in the case of illiterate respondents, a thumbprint). The thumbprint is obtained by the staff member administering the consent form following completion of the consent process and if the respondent indicates she cannot sign her own name (the thumb is dipped in ink and pressed onto the page).

Consent forms are stored under lock and key in the PSI office and will be stored there until one year after the completion of data analysis and publication; they are accessible only to field research assistants. The digital versions are similarly stored in a password-protected folder that is only available to field research assistants and the principal investigators. Thumb prints are not used for any purpose of analysis, matching, etc., but solely to document consent for the illiterate respondents. Given that no follow-up is planned for this study, the consent forms (both digital and hard copy) will be destroyed one year following the completion of analysis and publication.

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Appendix S3 – Reflexivity Statement

1. How does this study address local research and policy priorities?

This trial was designed to address a challenge identified by the PSI-Mozambique team in their implementation of IFPP programming: relatively low contraceptive take-up rate following the provision of referrals by community-based promoters.

2. How were local researchers involved in study design?

The trial was designed jointly by the full author team including three researchers and implementation experts from PSI-Mozambique, and in collaboration with other PSI-Mozambique staff leading on the implementation of the IFPP program.

3. How has funding been used to support the local research team?

This project was conducted using relatively minimal funding from the Office of Evaluation Sciences that funded primarily researcher time (JL and CH). Additional funding for the PSI-Mozambique team was provided separately under the main IFPP grant.

4. How are research staff who conducted data collection acknowledged?

Research and implementation staff who assigned in designing the intervention and conducting the trial (managing the consent and randomization process) are included as authors (for those who had a principal role) or noted in the acknowledgment statement.

5. Do all members of the research partnership have access to study data?

All members of the partnership have access to data.

6. How was data used to develop analytical skills within the partnership?

Data analysis was led by JL, with input and feedback from the broader partnership and particularly the data team at PSI (led by MC and supported by LA).

7. How have research partners collaborated in interpreting study data?

The study findings were shared iteratively with PSI Mozambique colleagues, both coauthors and others, for feedback and responses to pending questions.

8. How were research partners supported to develop writing skills?

The development of the manuscript was led by JL with support from all research partners.

9. How will research products be shared to address local needs?

The article will be published as open-access. The key findings were presented in a range of forums organized by both PSI and OES and are also available in a more accessible format (a short policy-oriented abstract) on the OES website.

10. How is the leadership, contribution and ownership of this work by LMIC researchers recognised within the authorship?

Three research and implementing leaders from the PSI-Mozambique team are included as co-authors.

11. **How have early career researchers across the partnership been included within the authorship team?**

Two early-career researchers, one based in Mozambique (LA) and one based in the U.S. (CH) were included as co-authors.

12. How has gender balance been addressed within the authorship?

Four authors are female (JL, ES, CH, and LA) and three are male (MC, DD, and JJ). The lead author is female.

13. How has the project contributed to training of LMIC researchers?

While the project has not included any explicit training, there was an opportunity for the Mozambique-based researchers to lead in the design of the intervention and trial and the implementation of the trial procedures.

14. How has the project contributed to improvements in local infrastructure?

This project has not directly contributed to improvements in local infrastructure.

15. What safeguarding procedures were used to protect local study participants and researchers?

Informed written consent was obtained from all participants. All ethical procedures were reviewed by a Mozambique-based IRB.