A Behavioral Economics Approach to Reduce the Injectable Contraceptive Discontinuation Rate in Ethiopia:

A Stratified-Pair, Cluster-Randomized Field Study

JSI

L10K 2020 The Last Ten Kilometers Project

ideas 42

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DISCLAIMER

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COVER PHOTOS

FRONT Health Extension Worker Aysha Hussen from the Wanjashola health post in SNNPR counseling a family planning client using Client Care Checklist.

BACK Health Extension Worker Sadiya Sonkamo from the Dubegodabamo health post in SNNPR at her consultation desk.

RECOMMENDED CITATION

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ACRONYMS

BE	Behavioral Economics
CBDDM	Community Based Data for Decision Making
CPR	Contraceptive Prevalence Rate
FMOH	Federal Ministry of Health
FP	Family Planning
HEP	Health Extension Project
HEW	Health Extension Worker
IUCD	Intrauterine Contraceptive Device
JSI	JSI Research & Training Institute, Inc.
L10K	Last Ten Kilometers
LAFP	Long-acting Family Planning
MNCH	Maternal, Newborn, and Child Health
PHCU	Primary Health Care Units
RMNCH	Reproductive, Maternal, Newborn, and Child Health
SNNP	Southern Nations, Nationalities and Peoples'
WDA	Women's Development Arm

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EXECUTIVE SUMMARY

Background

The contraceptive prevalence rate in Ethiopia jumped from 6% in 2000 to 35% in 2016, and this jump was primarily attributed to the increase in injectable contraceptive use from 3% in 2000 to 23% in 2016. Nonetheless, the discontinuation rate among injectable contraceptive users was 38%.

Behavioral Economics (BE) offers one way to design interventions to change health-related behaviors and decision-making by improving understanding of why people choose as they do and what motivates their decision-making and action. BE has recently been used to improve reproductive health programming, suggesting that the approach could potentially be applied to mitigate the contraceptive discontinuation problem in Ethiopia. Given that injectable methods are the primary method of choice among married women of reproductive age in Ethiopia and that the government sector provides 82% of contraceptive methods, the Last Ten Kilometers project (L10K) of JSI Research & Training Institute, Inc. (JSI), in collaboration with ideas42, worked with Ethiopia's flagship Health Extension Program (HEP) to design and test behavioral approaches to mitigate the problem of discontinuation of injectable contraceptives.

Methodology

One health center with five health posts constitutes the primary health care unit (PHCU) of the Ethiopian rural health system. Each health post, staffed with two female health extension workers, (HEWs) provides HEP services, including injectable contraceptives, to a community of about 5,000 people. The study area comprised the eight PHCUs located in eight districts—two each from Amhara, Oromia, the Southern Nations, Nationalities and People's (SNNP), and Tigray administrative regions. Through a grant from the Bill & Melinda Gates Foundation, JSI supported the HEP to improve the quality of community-based long-acting family planning services. A stratified-pair, cluster-randomized experiment field study was implemented for the BE study. Health posts of one of the two PHCUs in each region were randomly allocated to the BE intervention and health posts of the other PHCU were the controls.

The project followed a BE methodology to conduct a behavioral diagnosis and design an intervention package, consisting of 1) a health worker planner calendar, 2) a client care checklist, and 3) client appointment cards.

Two-day training was developed and 74 people (HEWs, L10K technical staff, and health center and woreda health office supervisors) in the intervention area were trained to implement the intervention.

Control area HEWs were oriented on FP (family planning) client record-keeping. The project conducted post-training follow-up visits and quarterly supportive supervision visits to the health posts to ensure proper use of the tools. The control area health posts also received supportive supervision visits for the Bill & Melinda Gates Foundation-funded activities. Six-month performance review meetings were also conducted in both the intervention and the control area PHCUs.

Women who visited the health posts to initiate or switch to injectable contraceptives between February and November 2016 were enrolled for the study. Of those who accepted injectables, 335 from the intervention and 408 from the control areas who met the criteria were interviewed in December 2017. The health posts of the intervention area were also visited in October 2017 to assess adherence to the implementation. The primary outcome of interest was the injectable contraceptive discontinuation rate within 12 months of uptake. The discrete hazard model was used to estimate intervention effect, adjusted for study design, participants' background characteristics, and health post-level health system indicators. The intervention effects on intermediate outcomes were also analyzed.

Results

Other than using the planner, intervention adherence was universal. This was not surprising, as using appointment cards and client care checklists was within HEWs' routine workflow, while using a planner was not.

The number of women who reported experiencing side effects from the injections was 0.24 percentage-points higher ($p < .01$) among intervention area participants, indicating the effect of the client care checklist. The proportion who recalled being told of a local holiday or event as a reminder for the next appointment was 16.7 percentage-points higher ($p < .001$) among intervention area participants, indicating the effect of appointment card. The injectable discontinuation rate in 12 months was 10.8 percentage-points lower among the intervention area participants than among those in the control area ($p < .05$).

Conclusion

Health system factors like supply issues can influence injectable discontinuation. Nonetheless, the use of two BE tools—the appointment card and the client care checklist—effectively decreased injectable discontinuation in the presence other health system bottlenecks. Therefore, BE is an effective approach for enhancing family planning programs in Ethiopia and elsewhere.

INTRODUCTION

The national family planning program in Ethiopia has made considerable strides in providing access to services across the country. The contraceptive prevalence rate (CPR) in Ethiopia jumped from 6% in 2000 to 35% in 2016. This increase was mainly the result of a sharp increase in the use of injectable contraceptive methods, from 3% in 2000 to 23%, in 2016. Nonetheless, 35% of contraceptive users discontinued use within 12 months of uptake, while the discontinuation rate among injectable contraceptive users was 38% (Central Statistical Agency and ICF 2016).

The Ethiopian Federal Ministry of Health (FMOH) aims to increase the CPR to 55% by 2020 (FMOH 2015). High rates of discontinuation pose a threat to the achievement of this target, as well as to the intentions of many Ethiopian women to space births and to limit the number of children they have. High rates of contraceptive discontinuation impose a cost on the woman, her family, and her country's health system. Discontinuation can lead to unintended pregnancies, causing social, economic, and emotional distress, and also contributing to maternal morbidity and mortality (Ahmed, Li, and Tsui 2012; Ali, Cleland, and Shah 2012; Cleland et al. 2012).

Women may choose to discontinue a contraceptive method because their reproductive intentions have changed, and they no longer intend to use family planning. However, if women are discontinuing but still have intentions to use contraception, the system has not met their needs. Discontinuation rates may be high for a variety of reasons. Some of these are problems at the system level—for example, high rates of stockouts or distance from the source of the family planning method could be structural barriers impeding continued use. However, various nonstructural factors may also contribute. Often, the dominant reason for stopping a modern, reversible method is dissatisfaction (World Health Organization 2012). Dissatisfaction with the method could stem from gaps in counseling that lead to suboptimal initial method choices, health concerns or side effects, or choice of an inconvenient method, among other reasons (Bradley, Schwandt, and Khan 2009). In contexts where structural barriers have for the most part been eliminated, nonstructural, or behavioral, factors may be driving discontinuation. Ethiopia is likely to be such a context. The introduction of the country's flagship Health Extension Program (HEP) has brought family planning services to the doorsteps of the rural population (Admasu, Balcha, and Getahun 2016).

Behavioral Economics (BE) offers a promising toolkit for designing interventions to change health-related behaviors and decision-making, from both the provider and the client perspectives, by improving understanding of why people choose as they do and what motivates their decision-making and action (Buttenheim and Asch 2013; Datta and Mullainathan 2014). Insights from BE and a structured behavioral design methodology have recently been used to improve reproductive health programming (Spring, Datta, and Sapkota 2016), suggesting that the approach could be applied to mitigate the contraceptive discontinuation problem in Ethiopia.

Abandonment of injectable methods is an urgent matter, given that they are the primary method of choice among married women of reproductive age in Ethiopia, and that the government sector provides 82% of contraceptive methods (Central Statistical Agency and ICF 2016). The Bill & Melinda Gates Foundation-funded the Last Ten Kilometers project (L10K) of JSI Research & Training Institute, Inc. (JSI) collaborated with ideas42 to work with the HEP to design and test behavioral approaches to mitigate the problem of discontinuation of injectable contraceptives. The design and testing of the BE approach was funded by the William and Flora Hewlett Foundation.

STUDY CONTEXT

The health care delivery system of rural districts (woreda) in Ethiopia comprises of three to four primary health care units (PHCUs) supported by one primary hospital. A PHCU is formed by one health center for every 25,000 people in the woreda, with five satellite health posts (FMOH 2015). Health centers are staffed by health officers, nurses, midwives, and laboratory technicians, each with an undergraduate diploma or health degree. They provide preventive and curative services, including basic emergency obstetric and newborn care, as well as supervision of satellite health posts.

Ethiopia's HEP comprises health posts, with two female health extension workers (HEWs) serving a community (kebele) of about 5,000 people with basic community-based promotive, preventive, and curative health services (Wakabi 2008). A network of Women's Development Army (WDA) volunteers supports the HEWs to ensure community engagement in the delivery of HEP services.

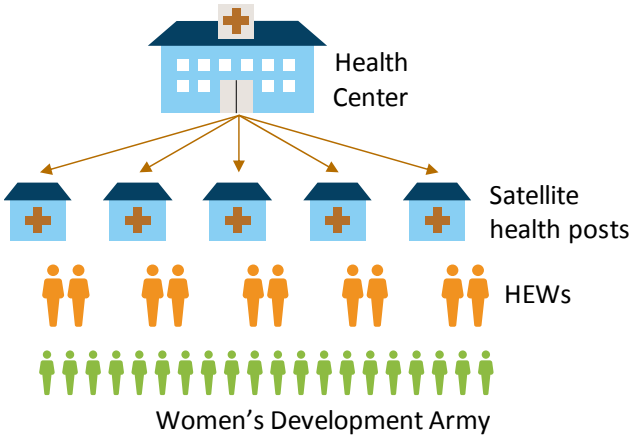


Figure 1: The PHCU model

The WDA network is organized into groups of 30 households led by one WDA team leader, with subgroups of six households led by one WDA member (Admasu, Balcha, and Getahun 2016).

The health posts provide condoms, oral contraceptive pills, emergency contraception, injectable contraceptives, and Implanon insertion services; health centers offer intrauterine contraceptive devices (IUCDs) and implant insertion and removal services in addition to the methods provided at health posts. Permanent methods are offered at primary hospitals or higher-level facilities.

The L10K program sought innovative, community-based strategies for the HEP to provide high-impact reproductive, maternal, newborn, and child health (RMNCH) services. To this end, L10K partnered with 10 local civil society organizations to enhance the interactions between HEP frontline health workers and communities to achieve more accessible, efficient, and equitable maternal, newborn, and child health (MNCH) services (Darmstadt et al. 2013). The L10K intervention area covered 115 woredas in the Amhara, Oromia, Southern Nations, Nationalities and Peoples' (SNNP), and Tigray regions, reaching a population of 17 million people, approximately 19% of Ethiopia's population.

Three community-based strategies—Community Based Data for Decision Making (CBDDM), Family Conversation, and Birth Notification—were implemented in the 115 woredas that constituted the L10K Platform. CBDDM, introduced in July 2013, fostered the HEP to generate and use data to improve MNCH practices. CBDDM aimed to improve HEWs' skills in organizing the WDA network, enabling WDA "1-30" team leaders to map their networks of 25 to 30 households and maintain surveillance to maximize uptake of MNCH services in these households. CBDDM was used to identify pregnant women and ensure that they received antenatal, intrapartum, and postpartum care; and that their infants received postnatal care, essential newborn care, immunization, and growth promotion services.

The Family Conversation Strategy was introduced early in 2014 to promote birth preparedness and essential newborn care; and the Birth Notification Strategy was introduced in mid-2014 to promote early postnatal care. L10K also encouraged HEWs to

work with the kebele administrations to organize community festivals to give public recognition to WDA members, both to motivate them and to sustain their engagement. L10K implemented the platform strategies by partnering with 10 local civil society organizations.

In eight of its 115 intervention woredas (two woredas per region), L10K collaborated with the FMOH and the respective Regional Health Bureaus to implement interventions to improve the demand for and quality of community-based long-acting family planning (LAFP) services. The eight woredas were purposely selected by the respective Regional Health Bureaus to avoid duplication of other partners' work. The family planning interventions began in 2014, and were implemented in one of the four PHCUs within each of the eight selected woredas. Intervention activities included family planning counseling training for HEWs, comprehensive family planning (including postpartum IUCD insertion training for health center staff and Implanon insertion training for HEWs who were not trained previously), development and supplies of tools and job aids for HEWs, institution of quarterly review meetings, enhancement of referral and linkages with the health center and health posts for LAFP and postpartum family planning services. The eight PHCUs where L10K was implementing the FP interventions were selected for participation in the BE study.

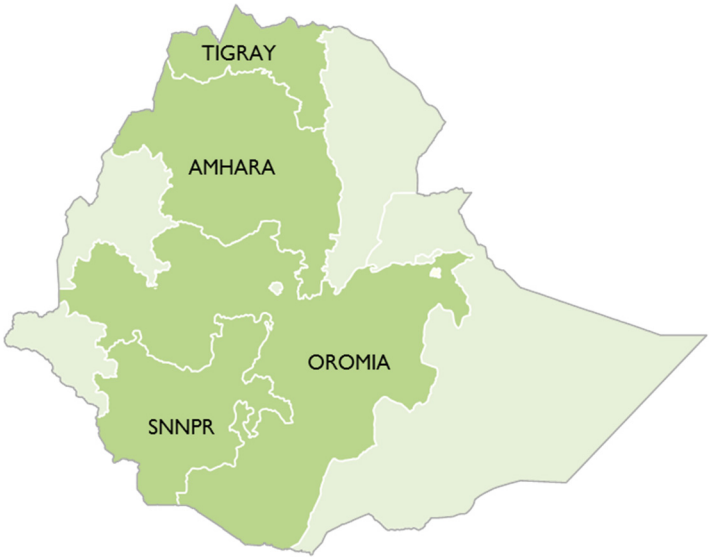


Figure 2: The regions of the intervention woredas.

METHODOLOGY

The Behavioral Design Methodology

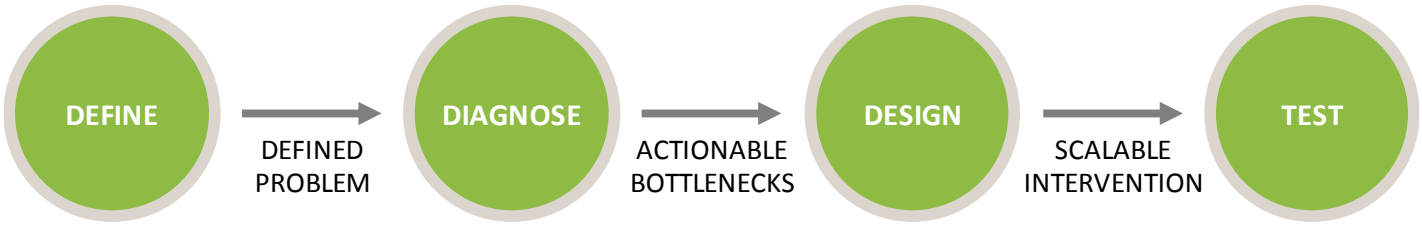


Figure 3: Stages of Behavioral Design Methodology (Datta and Mullainathan 2014).

To identify behavioral barriers impeding continued use of injectable contraceptives, the study team applied a four-stage behavioral diagnosis and design methodology. This process involved four distinct phases depicted in Figure 3: problem definition, behavioral diagnosis, intervention design, and testing (Datta and Mullainathan 2014).

Problem Definition (Step 1)

The general problem of contraceptive discontinuation is broad, and it encapsulates diverse methods, subpopulations, and manifestations of discontinuation. Thus, the goal of the problem definition process was to (a) identify the different problem definition candidates that represent these multiple dimensions and components of discontinuation in rural Ethiopia, and (b) evaluate these candidate definitions systematically along a set of criteria so that the strongest and most actionable problem or problems are identified. The criteria were:

1. The key drivers for discontinuation of contraceptives included behavioral issues among others (e.g., cultural issues, problems with the supply chain).
2. The existence of an intention-action gap, i.e., women have the desire to continue using contraceptives, but fail to follow through on this intention and discontinue.
3. The problem could be moved by a behavioral intervention; and,
4. Structures were in place for implementing cluster-randomized clinical trials to test the effectiveness of the behavioral intervention.

ideas42 led the problem definition process. Activities included analysis of the 2011 Ethiopian Demographic and Health Survey, informal conversations with L10K senior and mid-level managers, process mapping, preliminary behavioral mapping, and a field visit in October 2014. The field visit included conversations with frontline HEP workers (i.e., HEWs and the WDA) and contraceptive users, along with observation of family planning provision.

The process gathered anecdotal evidence that both passive (no conscious decision) and active (conscious decision) contraceptive discontinuation could be occurring. All long-acting (i.e., IUCD and implants) and short-acting (i.e., injectables, pills, and condoms) reversible methods may be subject to active discontinuation, while only short-acting reversible contraceptive methods may be subject to passive discontinuation. Several candidates for defining the problem were identified and evaluated based on the four criteria described above. The final problem definition from the process was: “Women of reproductive age who are using injectable contraceptives discontinue use within 12 months of uptake.” Details on the problem definition methodology and outcome are provided in Appendix 1.

Behavioral Diagnosis (Step 2)

The objective of the behavioral diagnosis was to identify the primary behavioral drivers ("behavioral bottlenecks") leading to discontinuation of injectable contraceptives within the study population. ideas42, in collaboration with JSI and L10K, led this process, which was finalized in May 2015. The process included detailed behavioral mapping to generate hypothesized bottlenecks; contextual reconnaissance to gather evidence; and synthesis of evidence and evaluation of hypothesized bottlenecks. Evidence gathered during the contextual reconnaissance stage included data from client and provider interviews, observations of family planning provision, analysis of data from Demographic and Health Surveys, conversations with L10K staff, and analysis of secondary literature. This evidence was used to confirm, reject, or refine the hypothesized bottlenecks.

The set of hypotheses that seemed to describe the primary bottlenecks driving observed behavior (i.e., discontinuation of injectable contraceptives) and its intervention design implications are presented in three categories: bottlenecks contributing to passive discontinuation, active discontinuation, and provider behavior. Details on the methodology, outcome, and design implications of the behavioral diagnosis are provided in Appendix 2.

Table 1: Overview of Behavioral Bottlenecks and their Design Implications (ideas42 Appendix 2)

Behavioral Bottlenecks	Design Implications
Bottlenecks Contributing to Passive Discontinuation	
1. Prospective Memory Failure to Follow Through on Next Injection: Due to prospective memory failure, women do not come to the health post at the appropriate time.	Salient, timely reminders for women.
2. Tunneling Leads to Myopic Planning or Failures to Plan for Next Injection: Women tunnel on the specific date of a follow-up appointment, yet they do not form any contingency plans for receiving their injection if they cannot make that exact date.	Prompt plan-making and contingency planning for return appointments.
3. Hassle Factors: Women may be deterred by hassles associated with successful continuation of injectable contraceptives.	Timely reminders of fertility intentions.
Bottlenecks Contributing to Active Discontinuation	
4. Perception of Limited Choice Set for Continued Use: Women experience and wish to eliminate side effects from injectable contraceptives, yet they do not feel that they have viable alternatives, nor do they consider switching methods.	Expand the choice set of methods women consider to be viable options; increase and maximize HEW and WDA touch-points with women.
Bottlenecks Contributing to Provider Behavior	
5. Bandwidth Tax: HEWs have limited time and attention to devote to client tracking and case management. Thus, the date of clients' follow-up appointment is not salient to HEWs at the appropriate time to provide prospective appointment reminders and retrospective follow-up for missed appointments.	Simplify case management systems to reduce cognitive load of HEWs.

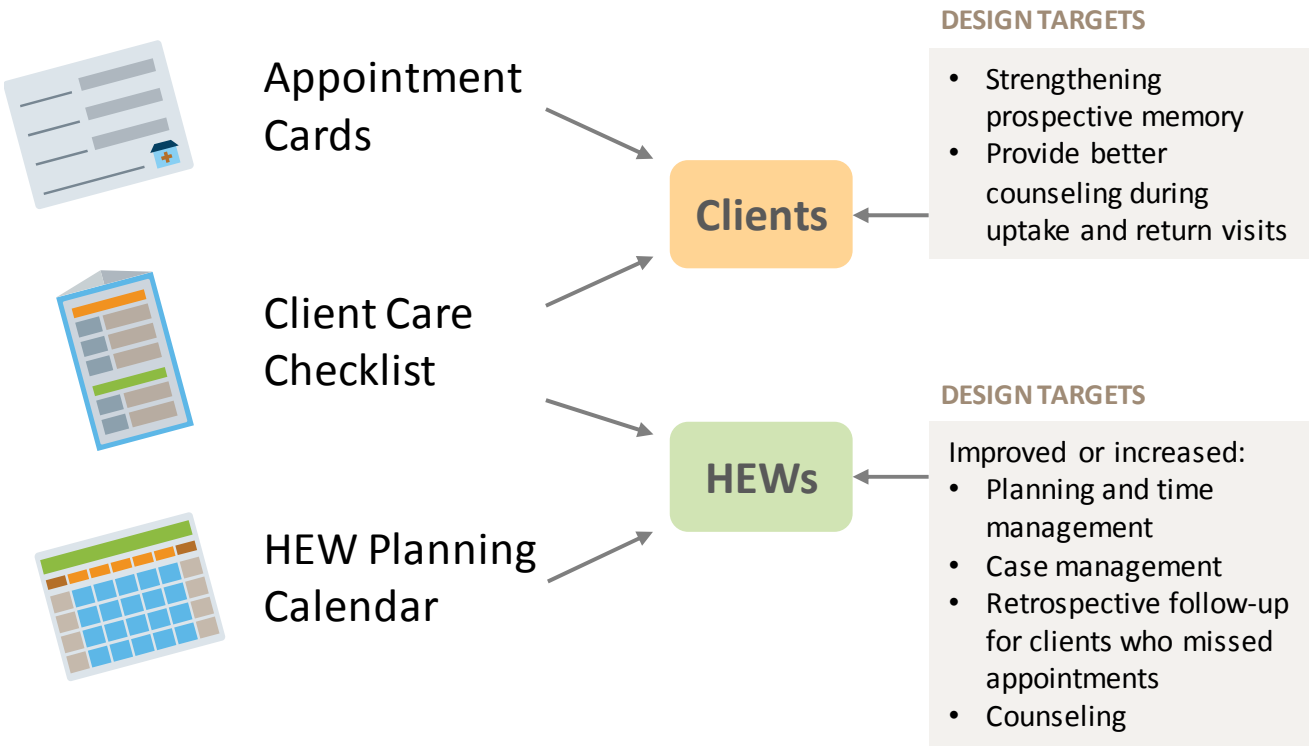


Figure 4: Conceptual Framework for the Intervention Package (ideas42 Appendix 3).

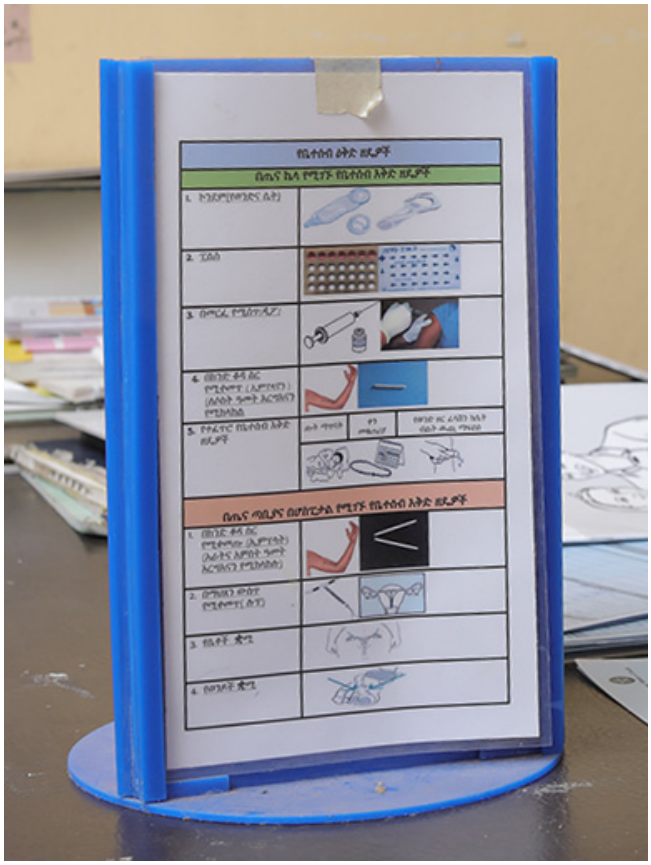
Intervention Design (Step 3)

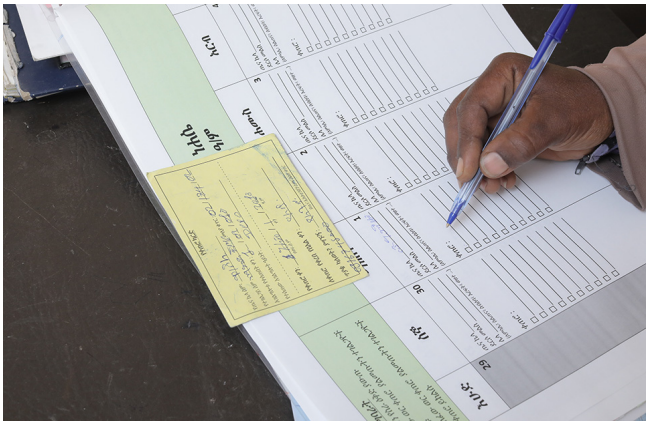
Building directly on the behavioral diagnosis and related design implications, ideas42 initially identified eight potential intervention concepts that addressed the key bottlenecks. Then, through an iterative discussion process between L10K staff and ideas42, a package of scalable interventions was selected and refined to ensure that the interventions were feasible, culturally acceptable, aligned with HEP policies, contextually appropriate, and human-centered. The initial intervention design package was produced in July 2015. This design package included three components—a HEW planning tool located at the health post; a client care checklist used by HEWs during service provision; and appointment cards distributed by HEWs during services provision and used by clients.

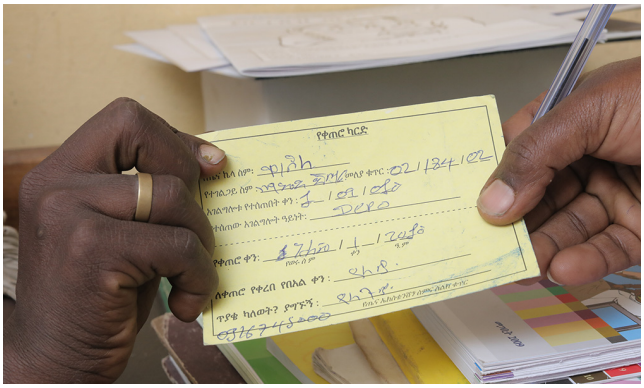
In October 2015, ideas42 led a field visit to test prototypes of the design package with end-users (clients and HEWs). Feedback from these end-users was repeatedly incorporated to revise the designs. The tools were finalized in December 2015 (Figure 4).

HEW planning calendar: The planning calendar is a desktop-based calendar, located at the health post and utilized by the HEW. The planning calendar serves as an aid for the HEW when scheduling future appointments and outreach, and it guides her toward better time management and planning (Figure 5).

Client care checklist: The client care checklist is a simple guide to frame the HEW service provision interaction with clients to (1) to prompt HEWs to provide high-quality services at every interaction' and to create an atmosphere in which the client feels comfortable and supported, (2) prompt the key components of family planning counseling, and (3) reduce the extent to which a provider needs to







remember exact protocols for setting return cluster field trial was adopted for testing the package

Figure 5: Clockwise from left: Client Care Checklist, HEW Planning Calendar, and Appointment Card.

appointments and managing records. Three checklists—one for counseling on available family planning methods for informed choice; one for counseling new family planning clients; and one for counseling returning clients—are displayed on three sides of a triangular tower and kept on the HEW's counseling table (Figure 5).

Appointment cards: HEWs distribute appointment cards to all clients requiring return appointments (Figure 5). They remind clients about future appointments and provide critical information on what to do if they cannot make their appointments or experience health concerns in the interim.

Test (Step 4)

The final step of the behavioral design methodology was to test the package of interventions rigorously to assess implementation feasibility and impact on outcomes of interest. A stratified-pair randomized of interventions. The methodology, findings, and implications of testing the package of interventions are described next.

STUDY DESIGN

A stratified-pair cluster-randomized field trial was implemented to test the package of BE interventions. The stratification variable was the administrative region. One of the two PHCUs from each region was randomly selected for the intervention arm, while the other served as the control arm. All 19 satellite health posts in the four intervention arm PHCUs received the BE intervention, while the 21 health posts in the four PHCUs of the control arm did not receive it (Table 2). In Adinebried, Alefa, and Ebot Tirora PHCUs, the BE intervention package was initiated in February 2016; and in Sentema began in March 2016.

Table 2: List of PHCUs by Study Arm

Study Arm	Region	Woreda	PHCU	# of Health Posts
Control	Amhara	Ensaro	Lemi	3
	Oromia	Chora	Kumbabe	8
	SNNP	Yem	Fofa	7
	Tigray	Samre Sehart	Finarwa	3
Intervention	Amhara	Burie Zuria	Alefa	5
	Oromia	Seka-Chekorssa	Sentema	4
	SNNP	Dalocha	Ebot Tirora	5
	Tigray	Laelay Adiabo	Adinebried	5

STUDY IMPLEMENTATION

Two-day training was developed, covering the purpose of the study and the implementation of the system. The training was conducted in all four intervention PHCUs, covering 19 health posts. In all, 74 people were trained, including L10K regional technical staff, HEWs, health center staff who provide RMNCH services, and Woreda Health Office staff. Because management of health services is done at the woreda level and supervision of the HEWs is done by the health center staff, it was critical that these staff members be included in all aspects of the implementation. During the training, the BE tools were distributed to the HEWs. The BE tools were produced by local vendors in Addis Ababa.

The control PHCUs received an orientation on the use of the new register to insure proper registration of family planning clients. This training in the control areas covered 21 health posts and 66 people, also composed of HEWs, health center RMNCH staff, and Woreda Health Office staff.

The above activities were completed by January 2016, with actual implementation beginning in February 2016. However, due to security issues, the training for the intervention could not be completed in Sentema PHCU until March 2016.

L10K staff supported the implementation through supportive supervision visits and performance review meetings. Both the intervention and control area health posts received quarterly supportive supervision visits, and performance review meetings were conducted every six months at the PHCUs to support the Gates-funded family planning intervention. In the intervention area, the supportive supervision visits and the performance review meetings emphasized use of the tools and support use of the system. Use of the family planning client register was reviewed in the control sites. Between February 2016 and January 2017, each health post received four supervision visits and two performance review meetings. After January 2017, the supportive supervision visits and performance review meetings were less frequent, as L10K staff focused on spreading the Gates-funded FP interventions in other L10K woredas.

STUDY PARTICIPANTS

The study participants were women who visited the study area health posts during the intervention period and fulfilled any of the following three criteria: (1) initiating use of injectable contraceptives; (2) returning to the use of injectable contraceptives after at least a six-month lapse; or (3) switching to injectable contraceptives from another family planning method. The outcome of interest was the injectable contraceptive discontinuation rate within 12 months of uptake.

SAMPLE SIZE

The sample size for the study depended on the caseload of the health posts and the duration of the recruitment period. Initially, it was decided that the recruitment period for the study would be six months. Based on the caseload records of the health

post, it was estimated that in six months about 660 eligible participants (330 from each study arm) could be recruited. If the expected discontinuation rate of injectable contraceptives within 12 months of uptake without the BE intervention was at 34% (the level reported in the Ethiopian Demographic and Health Survey conducted in 2011) (Central Statistical Agency and ICF 2012), the sample size that would be obtained in six months would have 80% power to detect at least a 14 percentage-point reduction in injectable discontinuation rate with a 95% confidence level, if the study design effect was 2.0 and the nonresponse rate was 5%.

DATA COLLECTION

Data collection was planned to take place 12 months after September 2016, i.e., in October 2017. However, due to competing priorities, the data collection was conducted in December 2017. Eligible participants were drawn from women of reproductive age who visited the study area health posts for injectable contraceptive services between the onset of the intervention and November 2016.

Ethical clearance for the study was obtained from each of the four Regional Health Bureaus and from the JSI Ethical Clearance Committee. Two types of questionnaire were used—one for the health post in the study area and the other for study participants. Data collection from the health posts was done in October 2017 to assess status of the BE interventions and other health system function status indicators using a structured questionnaire. One day of training was provided to four data collectors, who were public health professionals and who had previously conducted health facility surveys for L10K. The supervisors of the data collection were L10K regional office staff. Survey responses were electronically captured using SurveyCTO, a web-based survey data-collection platform using mobile technology (Dobility 2018).

The study participant questionnaire was pre-coded and translated into three major local languages: Amharic, Oromia, and Tigrigna. In SNNP, where there are several ethnic languages, the interviewers translated questions from Amharic informally. Twenty-eight public health professionals were given a two-day training on collecting data from the study participants, which included practical exercises. The data collectors had previously conducted household surveys for L10K. Eight of the data collectors who had good survey experience from conducting previous L10K surveys were oriented to supervise the data collection. The data collectors did not know which was the intervention arm and which was the control arm. The list of women of reproductive age who visited the study area health posts for injectable contraceptive services between the onset of the BE intervention and November 2016 was obtained from health post records. All the women in the list were visited at their households, and those who met the eligibility criteria and consented to participate were interviewed. The data collection from the study participants was done in December 2017. Survey responses were electronically captured using SurveyCTO.

MEASUREMENTS

Dependent Variable

To measure the primary outcome of interest, i.e., the injectable contraceptive discontinuation rate within 12 months of uptake, first the duration of injectable contraceptive use was measured from the three survey items: (1) the month and year the eligible participant visited the health post between intervention onset and November 2016 (uptake month); (2) whether the participant was still using the injectable contraceptive without interruption at the time of the survey, or with a maximum of a month (30 days) of interruption (survey month); and (3) if the participant was not currently using the injectable contraception, then the month and year the participant had last obtained injectable contraceptive without interruption or with a maximum of one month of interruption (dropout month). The duration of injectable contraceptive use from uptake is the difference between uptake month and survey month, or uptake month and dropout

month. The duration was measured in months. In a few of the dropout cases, where the participant did not accurately describe the last time she obtained an injectable contraceptive (without interruption), then the duration of use was obtained by asking how long she had used injectable contraception without interruption.

The intermediate outcomes considered were mean number of correct side effects of injectable contraceptive spontaneously recalled by the participant; mean number of different types of contraceptive methods spontaneously recalled by the provider; mean number of correct actions to be taken spontaneously recalled by the participant if she experienced side effects from injectable contraceptives; whether the participant was told about the side effects of injectable contraceptives by the provider; whether the participant was told what to do if she experienced side effects; whether the participant was informed about other methods of contraception; whether the participant was told, during her last visit to the health post for injectables, about a local holiday or event as a reminder of the next appointment date; whether the participant was given an appointment card during the last visit to obtain an injectable contraceptive; and whether the participant missed an appointment for injectable contraceptives.

Independent Variables

The major independent variable of interest is an indicator variable for the intervention area (study arm). The effect of the intervention was controlled for background characteristics of the participants and the health system functioning status indicators of the health posts. The background characteristics considered were age, education, number of children, age of last child, and wealth quintile. A wealth index score was constructed for each participant's household using principal component analysis of household possessions (electricity, watch, radio, television, mobile phone, telephone, refrigerator, table, chair, bed, electric stove, and kerosene lamp), and household characteristics (roof material, wall material, type of latrine, and source of drinking water). Households were ranked according to the wealth score and then divided into five quintiles (Filmer and Pritchett 2001).

The health system functioning status indicators measured for the study area health posts were population to HEW ratio of the kebele; household to active WDA team leader ratio of the kebele; number of Level 3 and Level 4 HEWs at the health post; whether the health post was closed for a month or more during the observation period; availability of contraceptives at the health post during the day of the visit; frequency of supportive supervision visit received by the health post; whether the health post maintained and updated the health management information system records; whether the health post maintained a tickler file system for family planning clients; and whether the health post had updated records for CBDDM activities. Adherence to the BE intervention was measured by observing the health post for the presence of appointment cards, placement of client care checklist on the counseling table, and use of HEWs' planning calendar.

STATISTICAL ANALYSIS

All statistical analysis was done using Stata version 15.1 (StataCorp 2017). The availability and use of BE tools in the intervention area health posts was assessed using descriptive statistics. Then, the distributions of study participants' background characteristics were analyzed and statistically significant differences in the background characteristics between the study arms were assessed using Pearson's chi-squared statistics, adjusted for clustering of the respondents within the health posts.

Distributions of the study participants according to health post characteristics were compared between study arms, and the statistically significant differences were assessed, also using adjusted Pearson's chi-squared statistics. The characteristics of the health posts were the health system functioning

status indicators described in the measurement section above.

The intervention effects on the intermediate outcomes were assessed using logit regression when the outcome variable was binary, and ordinary least square regression when the outcome variable was continuous. The analysis accounted for the matched PHCUs, and all the independent variables described in the measurement section above. Stepwise backward selection was implemented to identify regressors for each of the outcome models with p-values set at 0.2 for variables to enter or exit the model. The study arm indicator and the indicators for the matched PHCUs were forced to remain in the model. For each outcome, a health post-level random effects regression model was estimated using the independent variables from the backward selection process. If the health post level random effect was statistically significant ($p < 0.05$), then the health post-level random effects model was the final model; and if not, then the model identified by the backward selection was the final one. The goodness-of-fit of the final model was assessed using a global F-test, global Wald's statistics, or global likelihood ratio statistics, depending on the estimation method for the final model. The final model was used to obtain adjusted point estimates of the outcome and its 95% confidence intervals according to the study arm. The adjusted differences in the outcomes between the two study arms and its 95% confidence intervals were also estimated.

The intervention effect on the primary outcome was estimated with a discrete hazard model using logistic regression (Allison 1982; Canette 2016). Data were organized and analyzed using the methodology described by Canette (2016). The discrete units were months. The identification of the final model was done using the same procedure that was used to identify the models for the intermediate outcomes described above. The final model was used to estimate the injectable discontinuation rate during the 12 months following uptake.

RESULTS

In general, the catchment populations of the health posts in the intervention areas were nearly twice those of the control areas. The average catchment population of the health posts in the intervention area was 7,868; for the control area it was 4,064.

Assessment of the implementation status of BE tools at the health posts indicates that 12 of the 19 health posts in the intervention area had appointment cards available on the day of the visit, while only two health posts were stocked out of the appointment cards for more than a year (Table 3). Client care checklist towers were available in all the intervention area health posts, and they were on top of each HEW's counseling table. However, the HEWs from one of the intervention area health posts indicated that they did not use the checklist. Use of HEW planning calendar was poor. Only four of the intervention area health posts were using the calendar appropriately, while the rest were not using it during the four weeks preceding the survey, or they did not have the calendar for the most current year.

Health post records indicated that 2,490 women in the intervention area and 1,684 women in the control area visited the study area health posts between February 2016 and November 2016 to obtain injectable contraceptives (Table 4). Among them, 335 women (13%) from the intervention area and 408 women (24%) from the control area were eligible for the study and were interviewed after obtaining consent; 688 women (28%) in the intervention area and 550 women (33%) in the control area were not eligible; 1,047 women (42%) in the intervention area and 559 women (33%) in the control area could not be located due to erroneous records; while 420 women (17%) in the intervention area and 167 women (10%) in the control area could not be reached for interview. If the eligibility rate for participating in the study among those who could not be located for an interview was similar to those who were located, then the loss to follow-up of eligible study participants was 22% in the intervention area and 18% in the control area. There were no non-responses among those who were eligible.

Table 3: Adherence to BE Tools at the Intervention Area Health Posts during the Day of Visit

Behavioral Economics Tools	%	# of Health Posts
Appointment card		
Have card	63%	12
No card since > 3 months	16%	3
No card since > 6 months	11%	2
No card since > 1 year	11%	2
Client care checklist		
Always	74%	14
Usually	21%	4
Never	5%	1
HEW planning calendar		
Current calendar present and updated	21%	4
Current calendar present but not updated	32%	6
Current calendar not available	47%	9

Table 4: Frequency Distribution of FP Clients Who Visited the Health Posts in the Study Area between February 2016 and November 2016

Category		Control	Intervention
Number eligible and interviewed		408	335
Number not eligible		550	688
Number could not be located (erroneous records)		559	1,047
Number could not be reached		167	420
	Total	1,684	2,490

Table 5: Percentage Distribution of Study Participants by Background Characteristic

Sample Characteristics	Control (*N* = 408)	Intervention (*N* = 335)	*p*-value
Age group			0.441
16–22	26	26	
22–29	41	36	
30–39	26	33	
40–49	7	6	
Education			0.043
None	56	66	
Primary	19	19	
Higher	25	16	
Age of last child			< .001
> 3 years	92	81	
≤ 3 years	7	5	
No children	2	14	
Religion*			0.480
Orthodox	60	69	
Protestant	3	0	
Muslim	38	31	
Wealth quintile			0.273
Lowest	17	24	
Second	13	29	
Middle	23	16	
Fourth	25	14	
Highest	22	17	
Region			0.393
Amhara	16	25	
Oromia	41	21	
SNNP	23	12	
Tigray	20	42	

*For the statistical test, the Protestants were collapsed with Orthodox Christians

Table 5 compares the background characteristics of the study participants between the intervention and control areas. Compared to those of the control area, the intervention area participants were less likely to have higher education ($p < .05$); and the age of the last child was less likely to be more than three years ($p < .001$).

Table 6 shows the distribution of the study participants according to the health system functional status of the health posts to which they belonged. Although it appeared that compared to participants from the control areas, participants of the intervention areas were more likely to be in the catchment area of health posts with better-functioning health systems (i.e., more Level 4 HEWs, higher density of active WDA team leaders, fewer contraceptive stockouts, more frequent supportive supervisory visits, more frequently updated family folders, more updated CBDDM registers, and less likelihood of closure for more than a month during the past two years), the differences were not statistically significant. However, the HEWs in the intervention area were serving a larger population. Eighty-one percent of the participants in the intervention area were in the catchment area of health posts that that had more than 2,500 people for every HEW deployed; compared to 37% in the control area ($p < .01$).

The frequency distribution of person-months of follow-up according to the independent variables is provided in Table A1 of Appendix 4.

Table 7 gives the adjusted point estimates of the outcomes of interest by study arm and the intervention effects with 95% confidence intervals and depicted graphically in Figures 6, 7 and 8. The mean number of side effects from injectable contraceptive methods recalled was 0.24 higher ($p < .01$) among the intervention area participants than among those in the control areas. The proportion who recalled being told of a local holiday or event as a reminder for the next appointment for injectable contraceptives was 16.7 percentage points higher among the intervention area participants than among those from the control areas ($p < .001$). Although the intervention's effects on the proportion told about side effects, proportion told what to do if they had side effects, the proportion told about other methods, the proportion given appointment card, and the proportion who missed any appointment were in the expected directions, they were not statistically significant ($p > 0.1$).

The primary outcome of interest, i.e., injectable contraceptive discontinuation rate within 12 months of uptake, was 11 percentage points lower among intervention area participants than among control area participants ($p < .05$) (Figure 8).

Table A2 of Appendix 4 gives the list of independent variables that were used in the final models to obtain the adjusted intervention effect estimates.

Table 6: Distribution of Study Participants According to the Health System Functional Status Indicators of the Health Posts

Indicator	Control		Intervention		*p*-value
	% of Participants (*N* = 408)	# of Health Posts (*N* = 21)	% of Participants (*N* = 335)	# of Health Posts (*N* = 19)	
Population per HEW in the kebele					0.006
≤ 2,500	63	14	9	2	
2,501 to 5,000	30	5	84	14	
> 5,000	7	1	7	3	
Number of Level 3 HEWs					0.972
0	22	5	19	3	
1	29	6	29	6	
2+	49	10	52	10	
Number of Level 4 HEW					0.564
0	53	12	34	8	
1	23	4	38	7	
2	25	5	27	4	
Households per active WDA team leader					0.204
< 50	12	3	41	7	
50-100	54	10	34	6	
> 100	34	8	25	6	
Number of contraceptive methods stocked out on day of visit					0.647
0	49	9	65	11	
1	37	9	26	6	
2+	14	3	9	2	
Supportive supervisory visit received					0.164
Last month	40	7	60	10	
In last 3 months	26	6	32	6	
> 3 months	35	8	8	3	
Have family folder (HMIS)					
No	0	0	0	0	
Yes	100	21	100	19	
Household demographics of family folders updated in last 12 months					0.412
No	33	7	20	5	
Yes	67	14	80	14	
Family planning tickler file					0.761
Currently used	91	18	87	17	
Not currently used	3	1	8	1	
Not available	6	2	5	1	
CBDDM register updated					0.090
All updated	24	6	62	10	
Partially updated	17	4	10	2	
Not available/not updated	59	11	28	7	
Health post closed					0.310
No	93	19	98	18	
For > 1 month	7	2	2	1	

Table 7: Adjusted Effects of the Intervention on Intermediate and Primary Outcomes

Outcome	Control	Intervention	Difference (95% CI)	*p*-value
Mean # of side effects of injectable contraceptive recalled	1.43	1.67	0.24 (0.07, 0.41)	0.006
Mean # of contraceptive methods available recalled	1.67	1.67	-0.00 (-0.13, 0.14)	0.962
Mean # of actions that can be taken for side effects recalled	1.16	1.16	0.00 (-0.09, 0.09)	0.999
% told about side effects	39.8	49.6	9.8 (-3.7, 23.4)	0.156
% told what to do if they had side effects	48.0	51.5	3.4 (-4.8, 11.7)	0.415
% told about other methods	78.2	80.5	3.2 (-3.9, 8.5)	0.469
% told about a local holiday or event as a reminder for appointment	60.3	77.0	16.7 (7.4, 26.0)	< 0.001
% given an appointment card	60.6	73.6	12.9 (-3.1, 28.9)	0.113
% missed any appointment for an injectable contraceptive	15.7	11.8	-3.9 (-9.4, 1.7)	0.169
% discontinued injectable contraceptive within 12 months of uptake	52.6	41.8	-10.8 (-19.1, -2.4)	0.012

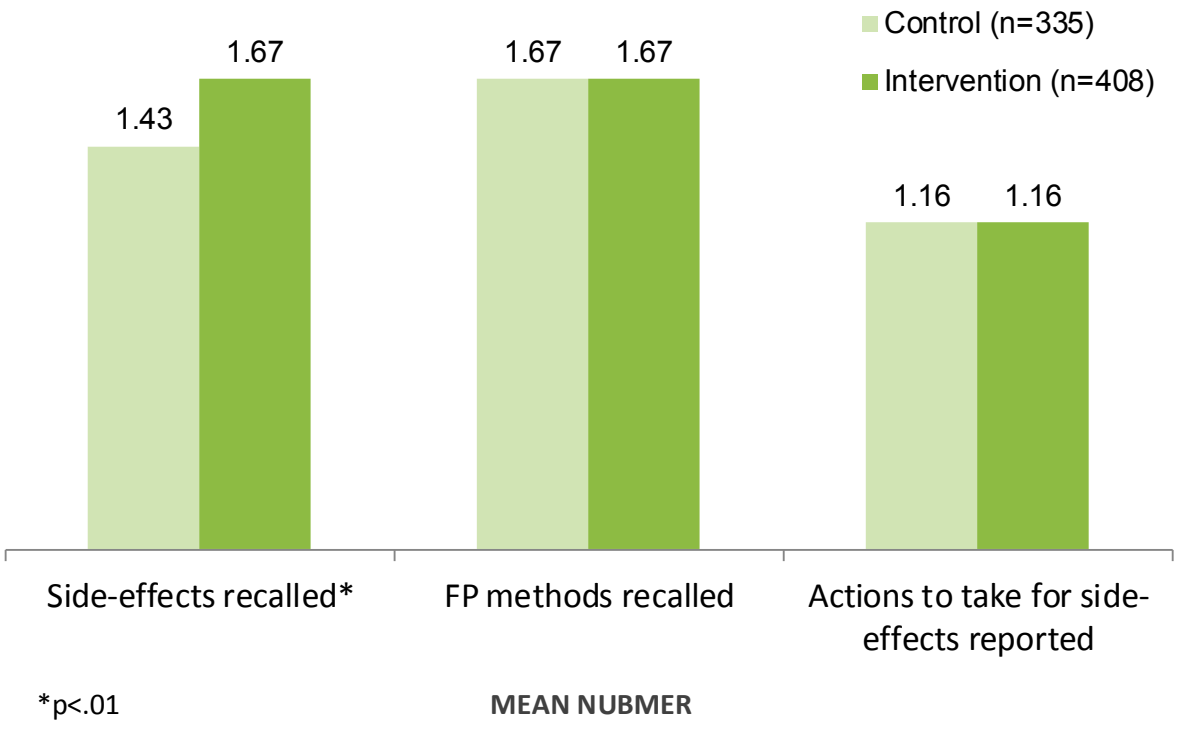


Figure 6: Mean Number of Side Effects, FP Methods and Action to Take for Side-Effects Recalled by the Participants

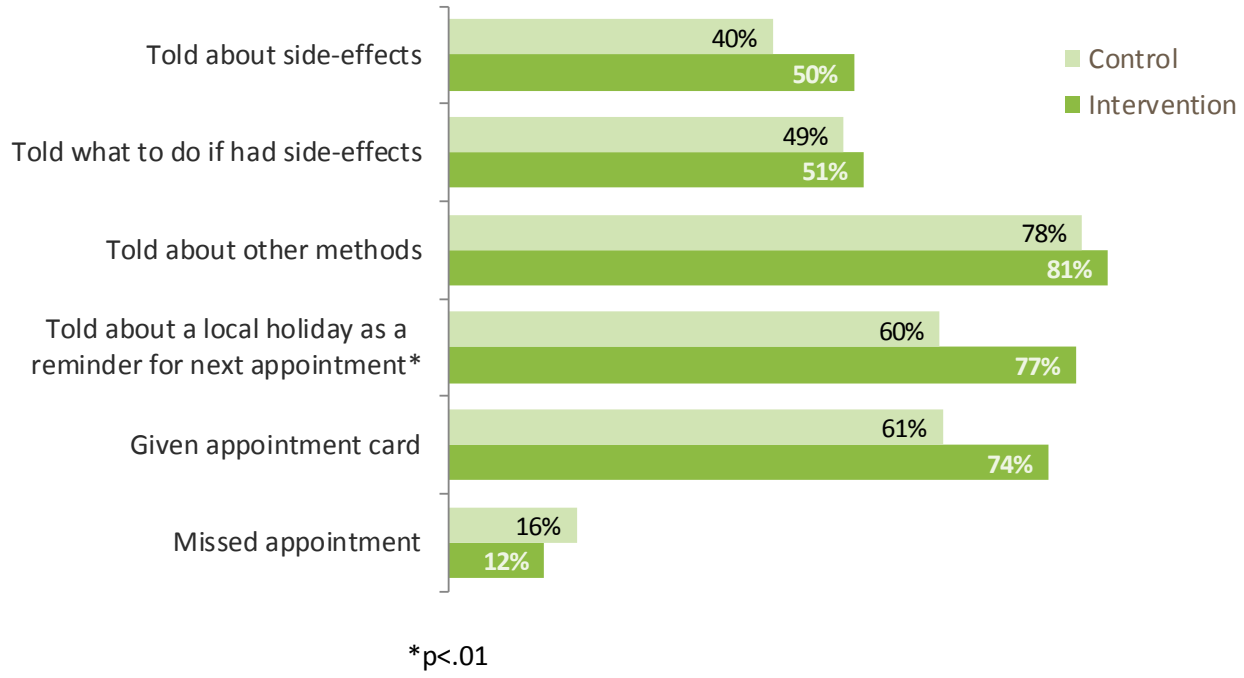


Figure 7: Percentage of Participants Who Receiving Method Information from Provider, Given Appointment Card and Missed an Appointment

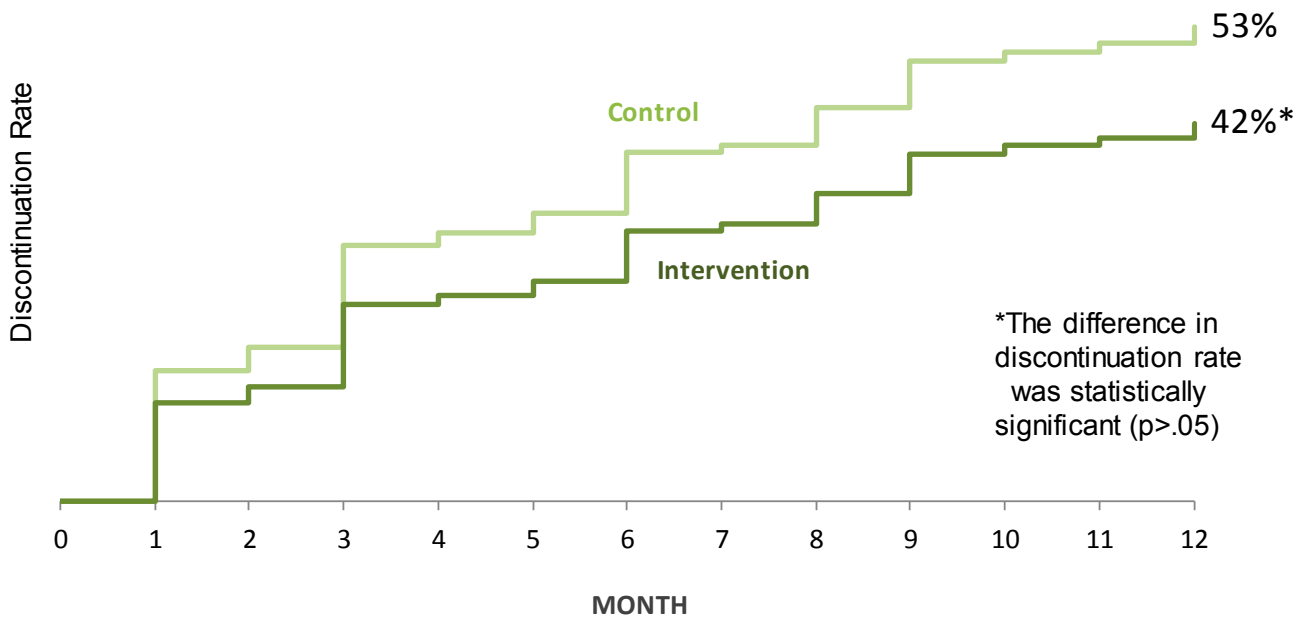


Figure 8: Injectable Contraceptive Discontinuation Rate

DISCUSSION

This is a unique study that applies a behavioral design methodology to reduce injectable contraceptive discontinuation in rural Ethiopia. Following a behavioral diagnosis to understand the behavioral barriers leading injectable contraceptive users to discontinue use, a package of interventions was designed and implemented. Behavioral factors (among others) that contributed to discontinuation of injectable contraceptives were assumed to be mainly active or passive from the client perspective, or contributed by the providers' action or lack of action. The hypotheses for passive discontinuation were prospective memory failure to follow through on next injection, myopic planning or failures to plan for next injection, and hassle factors. The hypothesis for active discontinuation was the perception of a limited choice set for continued use of contraception. The hypothesis for the provider's perspective was that the provider had limited time and attention to devote to client tracking and case management. Based on these behavioral insights, a package of interventions was designed and tested. The results of this study indicate that the BE interventions were effective in decreasing injectable contraceptive discontinuation in the study environment, thus supporting the hypotheses generated during the behavioral diagnosis phase. The intervention effects were controlled for the background characteristics of the participants and for the health system functional status indicators of the health posts.

Erroneous identification records of injectable users in the study area health posts were substantial. It is common knowledge among HEP workers, though not well documented, that some contraceptive users choose to use injectables discreetly and provide false identities to obtain services. The data collectors confirmed this assumption with the HEWs in the study area. Poor record keeping at the health posts may also be partly responsible for the errors.

Loss to follow-up could have biased the study result. However, if the injectable contraceptive discontinuation rate among women who were lost to follow-up was similar to that of women who were not lost to follow-up within the respective study arms, then the estimate of the intervention effect was unbiased. The possible bias due to loss to follow-up was minimized by the study design and by the application of regression methods.

The primary threat to the validity of the randomization is that there isn't baseline on a wide range of characteristics and that some of the treatment effects (eg: discontinuation) are highly sensitive to the specific controls used. To validate these treatment effects (especially for the main outcome we care about) we'd have to argue that the specific model and controls being used for discontinuation is the correct one and that there aren't other unobserved differences that are driving the difference. That is, we must argue that the current model controls for the most important confounders and there aren't any other unobserved characteristics that we don't control for that drive the results.

The existing family planning client tracking system for HEWs was the tickler filing system to track defaulters (Chewicha and Azim 2013), which appeared not to be a useful tool for prospective appointment reminders to avoid defaulting appointments for the next dose of injectable contraceptives (Appendix 2: Behavioral Diagnosis Memo). The planning calendar was designed to help the HEWs to provide prospective follow-up reminders to the FP clients. However, it is unlikely that the HEW planning calendar had any effect on the outcomes of interest, mainly because nine of 19 intervention area health posts did not have the most recent planning calendar, and among the 10 health posts that had copies of the most recent planning calendar, six were not using them. One of the possible reasons for not using the planning calendar could be that the HEWs are already overwhelmed by the existing recording requirements of the HEP, and the planning calendar was an extra

recording burden for them. The calendar was a parallel system to the HEWs' existing record-keeping efforts.

The study participants in both arms reported receiving appointment cards from the HEWs during the last time they visited the health post to obtain injectable contraceptives. This was not surprising, because during the problem definition and behavioral

diagnosis exercises it was noticed that the HEWs provided injectable contraceptive clients a paper note as a reminder for the next appointment. Thus, formal appointment cards were adopted as one of the intervention tools. While providing the appointment card and counseling clients, the HEWs in the intervention area were advised to relate the appointment date for the next dose of injectable to a local holiday or event, and to write it down in the appointment card. Thus, as expected, it was found that the intervention area study participants were more likely to recall being told about a local holiday as a reminder for the appointment date. Associating the return appointment date with a local event or holiday seemed to be a more common practice among the intervention area HEWs, even without the availability of printed appointment cards. Recall of the side effects of injectable contraceptives was also higher among the intervention area participants, suggesting the possible effect of the client care checklist. Although L10K provided refresher training to HEWs in both study arms on the family planning client care checklist provided by the national program, this job aid was long and cumbersome for counseling clients. The behavioral design process increased the concision of the original checklist by increasing the salience of key messages and reducing the amount of information included. The new checklist was mounted on a desktop tower to be

readily accessible during counseling. These two design adaptations may have made the checklist more effective.

It is interesting to note that the using the appointment card and the client care checklist were within the routine workflow of the HEWs, but the planning calendar required an alteration of the HEWs' working strategy. Thus, it is not surprising to note that HEWs complied with the use of appointment cards and client care checklist, but not with the use of planning calendar.

The study design did not allow distinguishing whether the appointment card or the client care checklist was more effective. Ideally the tools could have been tested one by one, with a shorter duration of observation, to identify the effectiveness of each. The one-year observation period required to measure the outcome of interest for the study prevented the use of rapid tests one by one. This could be a blessing, because it is possible that the appointment card and client care checklist had a synergistic effect. Nonetheless, a shorter testing duration is still essential to keep policy-makers interested, and to convert research findings into policy rapidly.

CONCLUSION

Alongside behavioral factors, injectable discontinuation can be influenced by a combination of health system factors (for example, injectable supply and availability of HEWs). The study's long duration provided an opportunity for health system factors to mask the effects of the BE interventions. Nonetheless, it appeared that the HEWs in the intervention area were consistently using the two of the three BE tools, which overcame externalities stemming from the inconsistent health system performance in the health posts. The overall findings of this study suggest that BE is a promising approach for enhancing family planning programs in Ethiopia and elsewhere.

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APPENDIX I

Problem Definition Memo

APPENDIX 2

Behavioral Diagnosis Memo

APPENDIX 3

Design Refinement

APPENDIX 4

Supplemental Tables

Table A1: Person-Months of Follow-Up by Independent Variables (*C* = Control; *I* = Intervention)

Independent Variable		*C* (4,769)	*I* (3,446)	Independent Variable		*C* (4,769)	*I* (3,446)
Follow-up month	1	408	335	Age of last child	None	68	295
(period)	2	351	278	(lage)	< 3 years	218	132
	3	344	267		≥ 3 years	4,483	3,019
	4	301	227	Religion	Other	2,724	2,120
	5	296	224	(rel3)	Muslim	2,045	1,326
	6	292	214	Wealth quintile	Lowest	524	773
	7	270	193	(ses_cat)	Low	369	637
	8	267	191		Middle	474	945
	9	252	181		High	1,271	651
	10	235	167		Highest	1,381	532
	11	231	165	# of level IV HEWs	None	2,437	1,375
	12	229	162	(level4)	1	1,121	1,195
	13	224	156		2	1,211	876
	14	196	139	Population to HEW ratio	≤ 2,500	3,403	297
	15	178	123	(chew)	2,501 to 5,000	1,028	2,800
	16	153	107		> 5,000	338	349
	17	136	94	Household to active WDA	< 50	666	1,262
	18	119	75	team leader ratio	50-100	2,219	1,125
	19	94	59	(chda)	> 100	1,884	1,059
	20	82	45	Supportive supervision	Last month	2,148	1,969
	21	58	32	(sup)	last 3 months	1,104	1,135
	22	38	12		> 3 months	1,517	342
	23	15	0	Family folder updated	No	1,513	831
Region	Amhara	590	901	(q802)	Yes	3,256	2,615
(region)	Oromia	2,263	877	Tickler file for FP clients	No	4,411	2,876
	SNNP	1,452	521	(tick)	Yes	358	570
	Tigray	464	1,147	CBDDM register updated	All	1,302	1,894
Age group	16-22	1,198	838	(q808a)	Partial	871	401
(agegr)	22-29	2,203	1,230		None	2,596	1,151
	30-39	1,120	1,207	Number of FP methods	None	1,851	2,057
	40-49	248	171	stocked out	1	2,136	1,107
Education	None	2,688	2,192	(so)	2+	782	282
(edu)	Primary	893	633	Health post closed for	No	4,431	3,347
	Higher	1,188	621	> 1 month (close)	Yes	338	99

Table A2: List of Independent Variables, Other than Study Arm and Matching PHCU Identifier, Used in the Final Model (see Table A1 for the key to the independent variables)

Models	Independent Variables and Goodness-of-Fit Statistics
Mean # of side effects of injectable contraceptive recalled	rel3, ses_cat, level4, chew, chda, sup, q802, so, q808a
Mean # of contraceptive methods available recalled	sup, edu, lage, so, ses_cat, tick, close, chda
Mean # of actions that can be taken for side effects recalled	q808a, close, lage, q802, level4, chda, chew
% told about side effects (x)	chew, edu, lage, chda, q808a
% told what to do if they had side effects	agegr, edu, close, sup, chda, lage
% told about other methods	agegr, edu, ses_cat
% told about a local holiday or event as a reminder for an appointment	chew, level4, chda, q802, tick, rel3
% given appointment card (x)	rel3, ses_cat, close, so, tick, q808a, level4, chew, chda
% missed any appointment for injectable contraceptives	edu, ses_cat, level4, sup, q802
% discontinued injectable contraceptive within 12 months of uptake	period, tick, so, lage, rel3, sup, level4

(x) Multi-level model used (kebele-level random effects)

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