



FINANCIAL SERVICES ASSESSMENT

Do Formal Savings Feed Food Security? Evidence from a Matched Pair, Cluster-Randomized Encouragement Trial in Rural Malawi

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Financial Services Assessment project can be found on the web at <http://www.fsassessment.umd.edu/>

ABOUT THE PROJECT

The *Financial Services Assessment* project is designed to examine the impact of financial services on the lives of poor people across the developing world. This project is funded by the Bill & Melinda Gates Foundation, which is committed to building a deep base of knowledge in the microfinance field. The IRIS Center at the University of Maryland, College Park, together with its partner, Microfinance Opportunities, will assess a diverse range of innovations in financial services. The results of this project will shed light on the design and delivery of appropriate financial products and services for the poor and the potential to scale up successful innovations to reach larger numbers of low-income households.



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REPORT SERIES

This report is part of a series that will be generated by the *Financial Services Assessment* project. The reports are disseminated to a broad audience including microfinance institutions and practitioners, donors, commercial and private-sector partners, policymakers, and researchers.

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ABSTRACT

Does access to formal financial services affect household food security? To date, research has answered this question by focusing on rural credit, by using simple measures of food security, and by relying on quasi-experimental designs. By contrast, this paper concentrates on microsavings, employs multi-dimensional indices of food security, and conducts a field experiment to induce product take-up. Using a cluster-randomized encouragement trial, this study exploits several different identifications strategies to estimate the impact of savings on food security. Furthermore, exploiting an external income shock that affected several savers, this evaluates whether the affected population experiences a heterogeneous impact of savings on food security. Results suggest that the overall impact of savings on food security is modest to none, for all dimensions of food security.

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ACRONYMS

ATMs	Automated Teller Machines
EAs	Enumerated Areas
FBPA	Field- Based Promotional Assistance
HDDS	Household Dietary Diversity Score
HFIAP	Household Food Insecurity Access Prevalence
HFIAS	Household Food Insecurity Access Scale
ITT	Intention to Treat
LATE	Local Average Treatment Effect
OIBM	Opportunity International Bank of Malawi
RCT	Randomized Control Trial
RET	Randomized Encouragement Trial
VBVs	Village-Based Volunteers

EXECUTIVE SUMMARY

STUDY OBJECTIVE

The recent global food price crisis has renewed international interest in finding means for supporting the food security of rural households. The short-term solutions are clear: food aid and social safety nets (United Nations High-Level Task Force on the Global Food Security Crisis, 2010). Among the longer-term solutions, some have volunteered improved access to formal financial services, such as savings, loans, and insurance (Zeller, Schrieder, von Braun, and Heidhues, 1997; Zeller and Sharma, 2000; Davis, Abed, and Hossain, 2011).

Yet, there is currently little rigorous evidence on the impact that formal finance has on food security. Only a handful of studies have explored the empirical link (e.g., Diagne, 1998; Berg and Emran, 2011; Hasan, 2010). Furthermore, those studies seem to have three limitations. First, they focus on credit, which exclusively offers an ex-post coping mechanism, rather than on savings, which both provides ex-post coping capacity and can facilitate ex-ante risk management. Second, they use fairly simple metrics for measuring the complex concept of food security—that is, metrics that only partially cover a multi-dimensional concept, and that largely exclude measures of frequency and severity of food security issues, and diversity of the household diet. Third, they rely on evaluation designs that cannot cleanly identify impact, and that make strong identification assumptions.

Using a field experiment funded by the Gates Foundation and implemented by Opportunity International Bank of Malawi (OIBM), this study aims to fill that evidentiary gap. In particular, this study explores the potential role of formal savings on promoting and preserving household food security by analyzing the extent to which opening an OIBM savings account affects the frequency and severity of food security issues that households face and the diversity of their diets.

STUDY METHODOLOGY

Recognizing the topic's complexity, this study uses a rich data set to study household food security, a panel survey of 2,006 rural households that collects information on the food security issues households faced and how they dealt with them. Conducted during the hungry season, this survey captures households at their least food secure, and at the moment where one might presume formal savings would help households most. To measure food security in a multi-dimensional way, we compute three complementary dimensions: the frequency of food security issues, the severity of food security issues, and the diversity of the household diet.

To isolate the role of savings in food security, this study relies on a field experiment implemented in partnership with OIBM. Unable to randomize savings accounts at the household level, this study instead randomizes information about savings at the village-cluster level. Through this strategy, the study both encourages uptake of savings accounts and provides a strong instrument for causal identification of impact.

To understand the impact fully, this study will estimate the impact of OIBM savings on food security through three complementary calculations, taking each as offering some degree of

evidence about the savings-food security relationship. In the first, we will compare the average food security outcomes between areas where OIBM savings accounts were encouraged through intense information campaigns and those where they were not, thus estimating the intention to treat (ITT)—that is, the average impact of savings on food security for areas encouraged to save.

In the second, we will compare changes in food security between comparable new OIBM savers and non-savers, thus estimating the average treatment effect on the treated (ATT)—that is, the average food security effect of saving for those that save with OIBM.

In the third approach, we will focus our analysis on those households whose savings behavior could be changed by the intense information campaign, yielding the local average treatment effect (LATE)—that is, the average treatment effect for those households whose take up of OIBM savings is predicted to be due to the intensive information campaign, and that would not have opened an OIBM savings account otherwise.

KEY FINDINGS AND AREAS FOR FUTURE STUDY

This study presents initial evidence that there are no discernable direct effects of opening a saving account with OIBM on household food security outcomes. Using a cutting-edge randomized encouragement research design, a large panel data collected over a period of two years, three dimensions of food security, and appropriately rigorous estimation techniques to adequately capture impacts, these findings shows that opening a savings account with OIBM does not by itself likely result in any decrease in the frequency and severity of food insecurity issues, or in any increase in the dietary diversity.

But does this suggest that increasing access to formal savings services may have modest or no impacts on improving household-level food security outcomes? The evidence does not support this assertion, and instead raises further questions about the how savings might affect the mechanisms of food security, if not its outcomes.

Is it possible that improving access to savings could affect households' actions that are linked to food security without affecting food security? Could savings, for example, be associated with an improved ability to smooth consumption, an increased capacity for bearing production risk, or a more extensive level of investment in productive inputs—that is, in the means, but not the outcomes, of improving household food security? A follow-up paper will examine these issues in detail.

STUDY BACKGROUND

The *Financial Services Assessment* project, undertaken by the IRIS Center at the University of Maryland and Microfinance Opportunities, is assessing the impact of grants provided by the Bill & Melinda Gates Foundation to microfinance organizations for the design and development of innovations in providing financial services in developing countries. The research will assess the impact of new financial products, services and delivery systems on outreach and client welfare.

The *Financial Services Assessment* project addresses issues such as access to financial services and the role of the enabling environment. Through the use of quantitative surveys and qualitative studies, the research examines if and how the financial innovations affect access and use of financial services by the poor and impact client and community welfare. In this way, the research helps reveal the value proposition of innovations: the unique added value of the innovations to the poor through the financial service providers.

INTRODUCTION

A. OVERVIEW

The recent global food price crisis has renewed international interest in finding means for supporting the food security of rural households. The short-term solutions are clear: food aid and social safety nets, among others (United Nations High-Level Task Force on the Global Food Security Crisis, 2010). Among the longer-term solutions, some have volunteered access to improved access to formal financial services, such as savings, loans, and insurance (Zeller, Schrieder, von Braun, and Heidhues, 1997; Zeller and Sharma, 2000; Davis, Abed, and Hossain, 2011).

Yet, there is currently little rigorous evidence for the food security impacts of formal finance. Only a handful of studies have explored the empirical link (e.g., Diagne, 1998; Berg and Emran, 2011; Hasan, 2010). Furthermore, those existing studies seem to have three limitations. First, they focus on credit, which exclusively offers an ex-post coping mechanism, rather than on savings, which both provides ex-post coping capacity and can facilitate ex-ante risk management. Diagne (1998) investigates how access to credit affects food expenditure and nutritional status in Malawi. Hasan (2010) and Berg and Emran (2011) explore whether credit improves the hungry season coping ability of poor households in Bangladesh.

Second, these studies use fairly simple metrics for measuring the complex concept of food security—that is, metrics that only partially cover a multi-dimensional concept, and largely exclude measures of frequency and severity of food security issues, and diversity of the household diet. Berg and Emran (2011) and Hasan (2010) measure food security as the number of meals eaten per day. Diagne (1998) measures food security, variously, as household food expenditure, household calorie intake, and height-to-weight ratios for the household's children (i.e., Z-scores). Each of these captures only a single dimension of food security—and sometimes only a single aspect of that dimension.

Third, these studies rely on evaluation designs that cannot cleanly identify impact, and that make strong identification assumptions. Diagne (1998) relies on simultaneous equations to identify the impact of formal finance on food security, which assumes that the right structural model is specified. Hasan (2010) uses simple difference in difference, which assumes that the selected treatment and control groups are indeed comparable. Berg and Emran (2011), a partial counter-example, employ instrumental variables and a unique propensity score matching method to identify the impact of credit on the number of meals the household eats during the hungry season, yielding a relatively strong identification strategy but a relatively poor measure of food security.

In this paper, we examine the potential role of formal savings in promoting and preserving household food security, through providing a reliable and liquid way to smooth consumption during periods of scarcity and enhancing household production. In so doing, we join a fairly small circle of evaluations that focus on savings instead of just credit (e.g., Dupas and Robinson (2011)), and may be the first to investigate savings' link to food security.

Cognizant of the topic's complexity, we use a rich data set to study household food security, a panel survey of 2,006 rural households that collects information on the food security issues households faced, and how they dealt with them. Conducted during the hungry season, this survey captures households at their least food secure, and at the moment where one might presume formal savings would help households most. To measure food security in a multi-dimensional way, we compute three complementary dimensions: the frequency of food security issues, the severity of food security issues, and the diversity of the household diet.

To isolate the role of savings in food security, this study conducts a field experiment in partnership with Opportunity International Bank of Malawi (OIBM), a savings-led banking institution. Unable to randomize savings accounts at the household level, this study instead randomizes information about savings at the village-cluster level. Through this strategy, the study both encourages uptake of savings accounts and provides a strong instrument for causal identification of impact.

The paper is organized as follows. In the first section, the paper addresses why food security matters and why savings should affect it, providing the study its conceptual framework. In the second section, it discusses the savings intervention, the experimental design, the empirical strategy, and the data. In the third section, the study presents results for the overall impact and investigates the possibility of heterogeneity in impact. In the last section, it concludes on what we know and what this might mean for policy makers.

B. WHY DOES FOOD SECURITY MATTER?

According to Feed the Future's country review, Malawi is "a nation of poor farmers"—where 80% of households are smallholder farmers, 60% rely on subsistence agriculture, 70% have less than 1 hectare of land, and 50% of the food supply comes from a single crop: maize (USAID, 2011). As a consequence of this and other environmental constraints, households in Malawi face four problems that contribute to endemic food insecurity.

First, households have incomes that are limited in both type and timing. As subsistence farmers, rural households derive most, if not all, of their income from farming. Moreover, farm income comes from a limited number of crops, such that rural livelihoods may rise and fall with the uncertain yields and market prices of maize and tobacco.

Given the provenance of rural revenue, the timing of income is tightly linked with the cropping calendar. That calendar is of relatively limited length, as most crops are harvested at roughly the same time of year. To simplify for the sake of clarity, the implication for rural incomes is that it is as if households only received revenue one time during the year (harvest time).

Second, as if to compound the prior problem, households have few and relatively unreliable means of storing food or income for buying food. For in-kind income (i.e., the harvest), most villages lack reliable granaries to store maize for use later in the year (Food Security Group, 2010). Households instead store maize in their homes, or sell any surplus at market. For monetary income, most rural areas have few viable savings options. Most banks are too distant, too expensive, or too difficult to join. Households instead keep their savings in their homes, with friends, or in other informal savings vehicles.

Third, households plant maize to the exclusion of other crops. Beyond the implications on the timing of income and of edible foodstuffs, this cropping pattern contributes to limited dietary diversity for subsistence farmers. Failing to grow other crops, in other words, could imply failure to eat other crops.

The fourth problem is a structural one: households face an annual period of penury during the "hungry season", which lasts roughly from January to March. With the next maize harvest still a few months away, agricultural households have no new income. Without a new harvest, households start to deplete their remaining food stores. When food stores fail, households procure food from the market, and pay the highest annual food prices to do so.

C. WHY SHOULD SAVINGS AFFECT FOOD SECURITY?

Theory suggests three ways in which savings may favorably affect food security. The first is through consumption smoothing (Morduch, 1995; Zeller and Sharma, 2000). Poor rural households receive few injections of income, yet face expenditure demands throughout the year. They also have few and inefficient informal means for storing their income for later use. The few mechanisms they do possess may not be available when needed.

Formal savings accounts could provide households with a vehicle for accumulating savings during good times and drawing it down during bad times that is more reliable and efficient (if not less expensive) than informal savings options. In particular, formal savings should make households more able to spend income from an earlier harvest on food purchases during the lean season, when food household stocks have been depleted.

The second is through bearing greater risk and reaping greater returns (Dercon, 1996; Dercon and Christiaensen, 2007; Zeller and Sharma, 2000). Poor rural households are risk averse by necessity. The slightest error in cropping decisions, for example, could have dire consequences for the household's post-harvest livelihood. This risk aversion translates into engaging in relatively few and relatively low-risk but low-return income-generating activities.

Formal savings accounts could help households bear more risk by providing them the means of insuring against the downside of adopting marginally riskier income-generating activities. Formal savings could provide households with a more effective method of self-insurance than their informal options.

The third is through upgrading production. Poor rural households face pecuniary obstacles in adopting more productive technologies. For lack of a secure place to store their money, households may be unable to accumulate adequate funds for purchasing productivity-enhancing inputs, such as fertilizer, despite the demonstrably large returns to their use (Duflo, Kremer, and Robinson, 2008).

Formal savings accounts could provide a safe place for households to amass money for making the large lump-sum payments required for most productive investments. In particular, formal savings accounts protect household savings from theft or loss in a way that informal options simply do not.

Whatever the causal mechanism, savings should be instrumental in increasing household food security by helping households consume more, produce more, or both.

METHODOLOGY AND EMPIRICAL FRAMEWORK

A. THE CONTEXT

Most households in rural Malawi are unbanked. According to the 2008 FinScope Survey, 55% of households are not engaged in formal or informal finance. Of those few that are involved in finance of any sort, only 45% have access to formal financial services.

There are at least three reasons for this (Meagher, 2010). First, many rural households are physically distant from formal financial institutions. Most are located in urban and semi-urban locations, while the majority of the Malawian population lives in rural areas.

Second, rural households face substantial financial and administrative obstacles to opening a formal bank account. Most formal institutions have account terms—such as relatively large minimum balances—that set formal financial services out of the reach of rural populations. Many banks also require formal identification cards—such as a passport or other government ID—that rural populations may not have and may find prohibitively expensive to procure.

Third, households lack information regarding formal financial services¹ Focus group discussions conducted in early February 2008 by the IRIS Center among villagers in the areas serviced by the mobile van found that information was largely spread through word of mouth, followed by limited exposure to mass media such as radio.² There was demand for improved access to accurate and specific information on financial services. Many suggested that easy and continuous access to information on terms and conditions of the products and methods to access them would improve take up of financial services (Nagarajan and Adelman, 2010).

B. THE ACCESS TO SAVINGS

In recognition of these constraints, Opportunity International Bank of Malawi (OIBM), with funding from the Bill and Melinda Gates Foundation, developed an innovative approach to address these impediments to financial inclusion. The first part of this approach was simply to bring banking services closer to their potential clients through a “bank on wheels”—a van offering full-service banking—that stopped at select call points in rural Malawi. This is expected to enable rural clients travel less in order to conduct their financial transactions.



¹ There was misinformation and misunderstanding about financial services due to the low education level of rural residents. It was not uncommon to hear reports that “banks have enough customers and do not want any more” or “the bank’s computer system is full and they cannot take any new customers” even from community leaders (McGuinness, 2008).

² Word of Mouth Advertising Media (WOMAM) was the primary mode of information dissemination in interior areas.

The second part of OIBM's intervention was to make its savings products better suited to rural populations. This involved creating accounts with low minimum balances and, importantly, allowing alternative forms of identification for opening account³ (see Stuart et al., 2011 for more details).

The “banks on wheels” started operating in August 2007 and stopped at a total of six call points along the roads from Lilongwe to Dedza and from Lilongwe to Mchinji. All of these six call points are located at trading centers. Four of them were not served by any other financial institution. Two call centers faced competition from other formal service providers.

C. THE EXPERIMENTAL DESIGN

This study aims to evaluate the impact of opening an OIBM savings account on household food security, and therefore requires identifying the effect of savings and isolating it from other possible causes.

In principle, a randomized control trial (RCT)—which randomly assigns a part of the population to a savings product and randomly withholds that product from the rest—provides the ideal identification strategy. In practice, an RCT is not always logistically feasible or ethically desirable. It may not be possible, for example, to physically exclude portions of the population from a product that serves a geographic area or ethically desirable to bar potential clients from taking a product that should help them.

Such is the case for this study. For both operational and ethical reasons, it was not possible to deny savings product to potential clients of OIBM. Operationally, it was prohibitively difficult to accept applicants only from areas randomly selected to receive OIBM services. Ethically, it was impossible to deny households a service that one has every reason to believe should help them.

Instead, this study applied a randomized encouragement trial (RET) framework to supply information about savings products offered by OIBM. Recognizing that information is a constraint to the take-up of savings accounts, this study designed and implemented an intensive information campaign, which simply explained the terms, conditions, and application process for a savings account to some areas and withheld that campaign from others. It randomly encouraged some areas to take up OIBM's savings product and randomly withheld this information-based encouragement from the others. (see annex 1 for more details on the content and conduct of the information campaign).⁴

The information campaign serves a twofold purpose for this study. First, it increases the likelihood of account take-up for households in areas served by the intensive information campaign. This can be seen from two complementary analyses and data sources. Computing the probability of take-up using household survey data, we find that the cluster-randomized information campaign significantly increases the likelihood that a household will open a savings account with OIBM (columns 1 and 2 in Table 1 below). We find furthermore that the information campaign only affects the probability of adopting OIBM savings products, and does not affect the likelihood of opening a savings account with any other service provider, formal or informal (columns 3 and 4).

³ Most other financial institutions require government issued IDs. In contrast, OIBM accepted a letter of reference from village authorities as a form of identification.

⁴ A randomly chosen 56 pairs of clusters (enumeration areas - EAs) were matched by population size and by distance from the major trade centers where formal financial providers including OIBM operate to provide financial services. Utmost care was taken to ensure that control clusters were located at least four kilometers away in every direction from the treatment clusters to avoid the dissemination of the information from treatment areas to control areas. Within each of the 56 matched pairs, we then randomly assigned the provision of intense information campaign to boost outreach for formal finance, especially for OIBM products.

Table 1: Intense Information Campaign Increases the Probability of OIBM Take-up

	OIBM			
	Overall (1)	Controlling for Lilongwe (2)	Other formal providers (3)	Informal providers (4)
Treatment (intense information campaign dummy)	0.0362** (0.0117)	0.0488*** (0.0113)	0.00881 (0.0179)	0.000146 (0.0115)
Lilongwe(dummy)		0.0565** (0.0189)		
Treatment*Lilongwe		-0.0510 (0.0327)		
Intercept	0.0231*** (0.00605)	0.00931** (0.00322)	0.0683*** (0.00947)	0.0533*** (0.00857)
N	2,006	2,006	2,006	2,006
r ²	0.00827	0.0157	0.000287	0.000000106
F	9.533	10.13	0.241	0.000161

Note: Clustered standard errors are given in parentheses; ***, ** and *, respectively, represents significance at the 0.1%, 1%, and 5% levels. Treatment represents the dummy variable for receiving the intensive marketing campaign. Lilongwe denotes a household being located in the Lilongwe district. The interactive term captures the differential effects of being in a treatment area in the Lilongwe district. This latter term is not statistically significant at any commonly acceptable level but does have a p value of 0.121, and thus borders on statistical significance.

Drawing on OIBM's management information systems, which track all account openings in the study areas, Nagarajan and Adelman (2010) find that adoption of OIBM savings accounts is substantially higher in encouraged areas where the information campaign was conducted (933 new clients) than in non-encouraged ones where no additional product information was provided (489 new clients). Furthermore, the relative level of product adoption is consistent across data sources. The number of OIBM adopters is roughly twice as high in encouraged areas than in non-encouraged areas, regardless of the data source.

Table 2: Number of New OIBM Clients (April 2008 to April 2010), by Information Campaign Status

Items	Intensive information (Treatment)	Non-intensive information (Control)	Total
OIBM administrative data	933	489	1,422
IRIS study sample	60	23	83

Source: OIBM; IRIS Panel Data.

Second, through its influence on the probability of opening an OIBM savings account, the information campaign offers a strong instrument for identification of causal impact. In effect, it created circumstances that are essentially the same as those of a randomized control trial. Since information was provided to households in randomly selected clusters from the pool of all eligible clusters, households from areas that randomly received the intense information

campaign are, on average, no different than their counterparts in areas that were randomly withheld that same campaign. Therefore, households from areas that randomly received the information campaign are expected, in the absence of this intervention, to fare much the same as households in areas that did not. Any difference between these two sets of households can be attributed to savings alone.

D. THE EMPIRICAL STRATEGY

To determine whether savings affected food security, this study will compare the outcomes of savers and non-savers, and then attribute any differences between the groups to savings.

To do so, this study will estimate the impact of OIBM savings on food security through three complementary calculations, taking each as offering some degree of evidence about the savings-food security relationship. In the first, we will compare the average food security outcomes between areas where OIBM savings accounts were encouraged through intense information campaigns and those where they were not, thus estimating the intention to treat (ITT)—that is, the average impact of savings on food security for areas encouraged to save.

In the second, we will compare changes in food security between comparable new OIBM savers and non-savers, thus estimating the average treatment effect on the treated (ATT)—that is, the average food security effect of saving for those that save with OIBM.

In the third approach, we will focus our analysis on those households whose savings behavior could be changed by the intense information campaign, yielding the local average treatment effect (LATE)—that is, the average treatment effect for those households whose take up of OIBM savings is predicted to be due to the intensive information campaign, and that would not have opened an OIBM savings account otherwise.

SAMPLE SELECTION

This study uses a panel survey of randomly selected 2,006 households located within the 15 kilometer catchment area of each of the six call points served by OIBM's mobile bank. The panel data consists of baseline information gathered in 2008 before the start of the intense information campaign, and endline information collected in 2010, immediately after the intense information campaign ended.

This survey data has four unique features. First, it was designed to be evenly geographically distributed across OIBM's service area. In particular, it samples a balanced number of treatment and control households within the bands of 0-5 kilometers, 5-7 kilometers, and 7-15 kilometers from each call center (Table 2). In this way, the study recognizes the importance of distance in household uptake decisions of formal financial services and integrates this consideration into the sampling design, resulting in a sample that is balanced in its distance from OIBM's points of service.

Table 3: Distribution and Number of Sample Household, by Distance to Call Centers and Assignment to Information Campaign Type

Distance	Intense Information (Treatment)	Non-intense Information (Control)	Total
< 5 km	195	203	398
5-7 km	217	173	390
7-12 km	454	501	955
> 12 km	145	118	263
Total	1,011	995	2,006

Second, the study provides further balance by creating 56 pairs of treatment and control clusters that are matched within the pair on observable characteristics such as population and distance from major trading centers. This ensures comparability between treatment and control areas in observable attributes, and particularly on those important to this study. Table 3 shows strong similarities in baseline household characteristics between the treatment and control clusters before the intense information campaign.

Third, the study collects data during the hungry season, between January and March of every year. This captures the situation of households at their most food insecure, when the effects of savings would presumably be most salient for ensuring food security.

Fourth, the study included households that would be eligible for accessing financial services from microfinance organizations such as OIBM. To do this, households were screened based on three simple questions about age, residency status, and economic activity before inclusion in the study.⁵

⁵ Most MFIs in Malawi only include adults above 18 years of age that are engaged in some economic activity, and also require proof of residency of over a year and Malawian citizenship.

Table 4: Initial Characteristics of Sampled Households Before Intensive Information Campaign

Characteristics	Intense Information area (Treatment)	Non-intense Information area (Control)
Demographics		
Household head		
Percentage that are female	13.75	15.88+
Age	41.63	41.66
Household		
Household size	5.3	5.07
Number of dependents, ages 0 - 17	2.85	2.76
Income generating activity		
Agriculture		
Percentage that grow crops	98.91	98.49
Total number of crops grown	2.92	2.97
Number of consumption crops grown	2.58	2.57
Number of cash crops grown	0.34	0.41
Total acres of agricultural land owned (acres)	2.56	2.46
Non-agricultural business		
Percentage that operate a business	26.01	25.03
Number of businesses operated	0.32	0.28
Number of households	1,011	995

Note: + denotes a statistically significant difference between the treatment and control groups at 10% level

E. MEASURING FOOD SECURITY

Although food security may be simply summarized as access to adequate food at all times⁶, the concept is more complex. Accordingly, this study considers food security through four complementary domains: quantity, quality, variety, and frequency.

To be food secure, households must have access to food in adequate quantity that meets their daily nutritional needs. Inadequate quantity could arise from missing meals, or from eating meals with significantly smaller than preferred portions.

For food security to exist, quality must also follow quantity. To be food secure, in other words, a household must have food not only of adequate quantity but also of adequate quality. Poor quality entails both obstacles to accessing food of adequate nutritional quality as well as problems of accessing preferred foods.

⁶ This rendition of food security aligns well with the most commonly used definitions, and fits perfectly with the definition followed by USAID, which emphasizes economic access to food of sufficient amount and diversity. See USAID's policy determination document for more details: <http://www.usaid.gov/policy/ads/200/pd19.pdf>.

For food security to have a nutritional basis, it must also entail adequate variety. To be food secure, households must access foods that span across a reasonable number of food groups and, thus, macro- and micro-nutrients. Poor variety—for example, eating only cereals—is assumed to indicate poor access.

Food security furthermore has a temporal component. To be food secure, a household must be able to access food at all times. Households are food insecure to the extent that they experience a relatively frequent inability to access food of adequate quantity, quality, or variety.

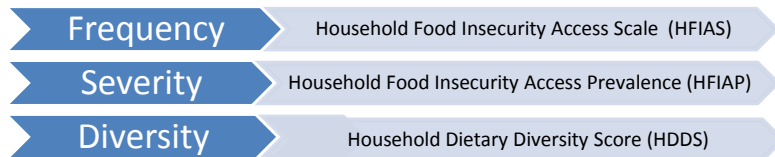


Figure 1: How the Study’s Measures Capture Food Security Concepts

To capture these food security concepts, this study uses three separate metrics (Figure 1). To measure the frequency of food security issues, we use the Household Food Insecurity Access Scale (HFIAS) (Coates, Swindale, and Bilinsky, 2007). This measure captures the frequency with which households experience inadequate quantity or quality of food. The data are captured through a short series of questions about the occurrence and frequency of food security issues. These questions range from minor to major issues and concern limits to both quality and quantity of food. For example, the questions progress from being unable to eat preferred foods to being unable to eat all day. The food security score is then calculated by computing the simple sum of frequency of experienced food security events, taking frequency as the relevant metric of insecurity and giving no weight to the relative severity of the issues. HFIAS is, thus, a discrete variable that ranges from 0 to 21, with 0 being the most food secure and 21 the most food insecure.

To measure the severity of food insecurity, this paper uses the Household Food Insecurity Access Prevalence (HFIAP) (Coates, Swindale, and Bilinsky, 2007). This measure captures the relative severity of food security issues that households face, and is drawn from the same set of questions used for HFIAS. The food security score is computed by attaching importance to the relative severity of food security issues and taking as a household’s food security level the most severe level of food insecurity experienced. HFIAP is a discrete variable with four levels of increasing food security—the first food secure, the second mildly food insecure, the third moderately food insecure, and the fourth severely food insecure.

To measure food security as food variety, this paper uses the Household Dietary Diversity Score (HDDS) (Swindale and Bilinsky, 2006). This measure captures nutritional variety of food consumed by the household. Its data are captured through simple questions about types of foods were consumed within the recall period. Its score is computed by the simple sum of the number of food categories consumed by the household. HDDS is discrete variable that ranges from 1 to 12, with a higher score reflecting a broader set of foods being consumed.

EMPIRICAL ANALYSIS

A. WHAT IS THE INITIAL FOOD SECURITY STATUS OF STUDY HOUSEHOLDS?

Almost all sampled households in this study suffer from some degree of food insecurity. 92 percent of households reported at least one food security problem at baseline. 86 percent of households reported food issues serious enough to be classified as moderately or severely food insecure. 44 percent consume less than six out of twelve different food groups. But sampled households are not homogenous in the type or degree of their food security problems. As shown in Table 4 below, the baseline food security status of study households fit into a distribution that ranges from absolute food security to abject food insecurity.

Table 5: Overall initial food security situation of sampled households

Frequency (HFIAS)		Severity (HFIAP)		Diversity (HDDS)	
Number of food security issues experienced in the past 30 days		Food security status, based on type of events experienced in past 30 days		Number of different types categories consumed in past 30 days	
Score	%	Score	%	Score	%
0-4	25.99%	Secure (1)	7.83%	1-3	7.28%
5-9	34.68%	Mild (2)	5.78%	4-6	37.39%
10-14	31.63%	Moderate (3)	41.38%	7-9	33.95%
15-21	7.70%	Severe (4)	45.01%	10-12	21.39%

Yet despite the range of this distribution, the average food (in)security situation at baseline is identical for areas that receive and do not receive the intensive information campaign. As shown in Table 5, the average frequency and severity of food security issues are statistically the same between these experimental divisions of the sample. The diversity of household diets is statistically different between these experimental groups, but the magnitude of that difference—on the order of one quarter of food group—is not economically important enough to call into question the baseline balance of the sample’s initial food security characteristics.

Table 6: Food Security Status at Base Line (Prior to Information Campaign)

	Intensive information area	Non-intensive information area	Difference:	
	(Treatment)	(Control)	Control – Treatment	
Frequency of food security issues (HFIAS)	7.861 (0.145)	7.955 (0.148)	0.094 (0.207)	
Severity of food security issues (HFIAP)	3.243 (0.028)	3.228 (0.028)	-0.015 (0.039)	
Dietary diversity of household diets (HDDS)	7.256 (0.081)	6.940 (0.081)	-0.316 (0.114)	***

Note: ***, **, and * represents significance at the 0.1% 1%, and 5% level, respectively. Standard errors are given in parentheses. Higher values of HFIAP and HFIAS represent lower food security while higher HDDS scores show higher food diversity.

Given this baseline balance, any systematic changes from these common starting positions will suggest an impact of access to OIBM savings accounts on food security.

B. DO SAVINGS AFFECT THE FOOD SECURITY IN AREAS ENCOURAGED TO SAVE WITH OIBM?

What is the average overall food security impact of expanding access to OIBM savings services? The answer to this question can be estimated through comparing average food security outcomes across areas that received intense information that encouraged the take-up OIBM savings products and those that did not.

The validity of the estimates relies on two assumptions. The first is that encouragement to save through provision of information is randomly assigned. This means that the encouraged and non-encouraged populations are, on average, the same in all observable and unobservable ways. This implies that the only difference between the two groups, then, is the randomly applied information about OIBM savings accounts. This assumption—which, indeed, is not an assumption—is satisfied by this study's experimental design. The intense information campaign was cluster-randomized within each of the 56 groups of matched pairs.

The second assumption is that there was compliance with encouragement—that is, that take-up of OIBM savings accounts is significantly higher in encouraged than in non-encouraged areas. As shown earlier in Table 4, both the survey and administrative data confirm that this is indeed the case. While there is some up-take in non-encouraged areas, the number of new OIBM savers is more than twice as high in encouraged areas. Furthermore, the information-based encouragement significantly affected the probability that households adopted OIBM savings products, as shown in table 1.

Using ordinary least squares (OLS), we examine the average difference in food security scores between areas that received intense information campaigns and those that did not. Results in

Table 6 show that the food security status—as measured, in turn, by the frequency of food security events (HFIAS), the severity of food security events (HFIAP), and the diversity of household diets (HDDS)—is not significantly different across intensive information and non-intensive information areas. In other words, the information campaign alone—and its associated take-up of savings accounts—explains little of the observed food security outcomes.

These results, however, should be interpreted with caution. On one hand, they may only provide some *prima facie* evidence that savings has little impact on food security. To the extent that encouragement is tightly linked with uptake—that is, to the degree that most encouraged household take up OIBM savings and that non-encouraged household do not—these results could be taken as an evidence of impact of savings on food security. In other words, the results can be interpreted as impact if the comparison between information and non-information areas nicely reduces to a comparison between OIBM savers and non-OIBM savers. On the other hand, there are three reasons that these results may not clearly say what, at first blush, they seem to say. First, in encouraged areas, the average food security outcomes are computed over takers and non-takers of OIBM savings accounts. The inclusion of non-takers in this encouraged-area average may obscure the impact of savings on the area's savers.

Table 7: Impact of Information Campaign on Food Security

Independent variable	Dependent variable: Percentage Change in Food Security Measures		
	Frequency (HFIAS) (1)	Severity (HFIAP) (2)	Diversity (HDDS) (3)
Intensive information	-0.0332 (0.4071)	-0.00393 (0.0728)	0.39422 (0.2247)
Intercept	8.023*** (0.3035)	3.159*** (0.0541)	7.019*** (0.1712)
Sample Size	1,989	2,005	1,989
R square	0.0057	0.0000	0.0057
F Statistics	0.01	0.00	3.08

Note: Clustered standard errors are given in parentheses; ***, ** and *, respectively, represents significance at the 0.1% 1%, and 5% levels. The dummy variable for the intense information campaign is 1 for households that lived in areas that received intense information campaigns, 0 otherwise. Higher levels of HFIAP and HFIAS represent lower food security while higher HDDS shows higher food diversity. Thus, negative coefficients represent improvements in food security for HFIAS and HFIAS, while positive signs represent improvements in HDDS.

Second, in non-encouraged areas, there are not only non-takers but also households with OIBM takers too. The average difference in food security computed for these areas is thus a combination of outcomes for savers and non-savers.⁷

Third, the estimate does not provide definitive evidence that there are no food security effects of savings both on savers and on non-savers. Households that do not save directly with OIBM may indeed benefit from the others' new engagement in savings. In rural areas, there is often a strong norm to share private returns publicly or at least with one's support network. Flory (forthcoming, 2011), shows that savers with formal institutions in treatment clusters inject more funds into support networks, in the form of gifts, relative to control clusters. Households that do save may also benefit privately from their savings.

Nevertheless, these results do provide some indication that the impact of savings on food security—if, indeed, there is one—is not large enough to overshadow the changes in non-savers or to impact the overall food security.

C. DO SAVINGS AFFECT THE FOOD SECURITY OF THOSE THAT SAVE WITH OIBM?

What is the impact of savings on food security? A natural answer to this causal question might consist of comparing the final food security outcomes of households with new OIBM accounts with those of households without new OIBM accounts. But such an answer would fail to address the possibility that these groups may differ in systematic ways other than holding OIBM savings accounts.

This section will follow that natural logic of comparing savers to non-savers, but will address its naïve shortcomings in two ways. First, this section's estimation strategy will compare differences in changes rather than simple differences in outcomes. In so doing, it will assess whether adoption of formal savings is firmly associated with changes in food security, rather than simply associated with more food secure households. In other words, it will identify the impact of savings by disentangling whether households that adopt formal savings see savings-induced improvements in food security, or have higher food security outcomes simply because of their possibly higher initial food security scores.

Second, the estimation strategy will measure changes for comparable households. Using propensity score matching analysis, we will pair OIBM savers with similar non-savers—that is, with households that offer the closest match possible on several observable dimensions. Having matched households on baseline characteristics, analysis will then estimate the impact of savings as the difference between households that are otherwise comparable apart from OIBM savings. This will isolate impact from other explanations of change in food security status.

The validity of this estimation strategy rests on three assumptions. The first is that households are well matched—in other words, that households are matched on the most meaningful dimensions and are properly paired with the most plausible counterfactual.

⁷ The inclusion of these takers in the non-encouraged area—just as the inclusion of non-takers in encouraged areas above—confounds interpretation. In particular, if there are both non-takers in encouraged areas and takers in non-encouraged areas, the difference in averages between encouraged and non-encouraged areas is not equivalent to that of savers and non-savers.

The second is that by matching households on observable characteristics we identify the causal impact of savings. In other words, controlling for observable differences eliminates possible confounders for the causal relationship between savings and food security.

The third is that the two groups—households with new OIBM accounts and comparable households without new OIBM savings accounts—would have followed the same food security trend in the absence of savings. In other words, the changes observed for households without new OIBM savings offer a valid counterfactual for households that have new OIBM savings. Other potential explanations for trends in food security could be explained by changes in other observable factors, such as demographic characteristics or wealth.

These assumptions seem reasonable. Concerning the quality of matching, several measures are taken to address this issue. To ensure meaningful matching, propensity scores are computed drawing variables from several different domains: potential access to information, potential transactions costs of savings, prior engagement in savings (formal and informal), baseline income-generating profile, and initial education and wealth. To test whether the pairing method matters, sensitivity analysis was conducted using several different algorithms for matching households. Each matching method used yields the same conclusion as shown in Table 7 below⁸.

Concerning the problem of confounders, propensity score matching addresses this issue as well. Among the variables that enter into the propensity score calculation, there are several that could affect food security outcomes even in the absence of OIBM savings. Among these are a household's wealth, its engagement in cash crops, and its land holdings. By controlling for the propensity score, analysis also controls for these variables, and thereby controls for other possible explanations for observed change in food security.

As for whether household's would have followed the same trend in the absence of savings, this assumption may be satisfied simply by the fact that, thanks to propensity score matching, OIBM savers and their controls are largely comparable.

Results in Table 7 suggest that opening an OIBM savings account has no demonstrable impact on changes in food security—neither in reducing the frequency of food security issues, nor in mitigating the severity of food security problems, nor in expanding the diversity of the household's diet.

⁸ Results available upon request.

Table 8: Impact of savings on food security: Propensity Score Matching Estimates

	Dependent variables: Percentage change in food security metrics		
	HFIAS (1)	HFIAP (2)	HDDS (3)
Opening a new OIBM account	-0.0970 (0.3184)	-0.1375 (0.1009)	-0.0005 (0.0708)
T-test	-0.30	-1.36	-0.01

Note: Clustered standard errors are given in parentheses. Higher levels of HFIAP and HFIAS represent lower food security while higher HDDS shows higher food diversity. Thus, negative coefficients represent improvements in food security for HFIAS and HFIAS, while positive signs represent improvements in HDDS.

But can we interpret these results as causal? There are a few sensible reasons to think not. First, we assumed that a fair comparison could be made between those with new OIBM accounts and those without by correcting only for observable characteristics. Yet there are plausible cases where unobservables may matter more for making comparisons, such as ability. It could be true that households with high ability select into new OIBM savings, and that their ability could be driving observed changes more than savings. The higher levels of literacy and education observed for new OIBM savers could provide some indication that this might be so. Another case is appetite for risk. Households that open OIBM accounts may be more willing to try something new. This might not only increase their likelihood of taking up a new OIBM account but also be responsible for riskier but higher return production decisions that in turn increase food security. Failing to take account of these possibilities, it is difficult to make firm arguments of attribution in favor of savings.

Second, the drastic drop in tobacco prices, which coincides with our study and also disproportionately affects households that take up OIBM services, may violate our assumption about parallel trends. In other words, it might not be true that those with new OIBM accounts—which are disproportionately tobacco growers—and those without accounts would have followed parallel trends in the absence of savings. This possibility could mask any potentially positive impacts of savings, and makes attribution of impact difficult.

D. DO SAVINGS AFFECT THE FOOD SECURITY OF THOSE THAT WOULD NOT HAVE SAVED OTHERWISE WITH OIBM?

The previous section identifies the impact of savings by controlling for differences in observable characteristics between households with new OIBM accounts and those without. However it fails to account for the potentially large role that unobservables, such as ability or appetite for risk, could play both in adopting OIBM services and also in driving food security outcomes. The previous section also treats all new OIBM clients the same. It fails to distinguish between those that adopt OIBM savings accounts with encouragement and those that do so without any encouragement.

This section addresses both issues by distinguishing between three groups of households, and then focusing its analysis on one group only. The three groups are: never takers, always takers, and compliers. Never takers are households that will never take OIBM services, with or without encouragement. Always takers are households that will always take OIBM

services, whether they are encouraged to do so or not. Compliers are households whose decision to take OIBM services can be influenced by encouragement.

We focus our analysis on compliers for two reasons. The first reason is analytical. By concentrating on households whose behavior can be influenced by encouragement, we are eliminating any bias from unobservables that may have contaminated previous causal estimates. We do this, in essence, by eliminating from causal consideration those types of households that would have selected into OIBM services even without encouragement—that is, we eliminate selection bias by limiting the scope of our study to compliers.

The second reason is that these estimates are potentially the most policy-relevant. Policy-makers certainly care about the impacts of programs they might promote. But they perhaps care most about the impact of programs on households whose behavior may change as a program is promoted. Policy will not change the behavior of never takers or always takers. Policy-makers, in other words, may be most interested in the impact on compliers.

The analysis does so through estimating the local average treatment effect (LATE)—a treatment effect for those households whose take-up behavior could potentially be affected by the intense information campaign. This involves two steps. In the first, we compute the probability of OIBM take-up based on whether or not the household received an informational encouragement to do so. In the second, we estimate the food security effect of savings for those households whose probability of OIBM take-up was affected by the information campaign.

The validity of this approach relies on three assumptions. First, encouragement is randomly assigned. This, fortunately, as stated earlier, is not an assumption but rather a verifiable component of this study's design. Several randomly selected clusters were provided with an information campaign while others were not.

Second, encouragement does not affect outcomes except through the channel of savings. This is also true since the encouragement in this study simply consisted of information about the terms and conditions of a bank account. There is no reason to believe that this information itself would change a household's food security status, except only insofar as it affects the probability of a household's taking up banking services.

Third, encouragement increases the probability of taking up OIBM's services, or at least does not decrease it. This assumption is not unreasonable. For potential clients, information will raise the probability of uptake. For never takers, information will have no effect. There does not appear to be a case where information decreases the probability of uptake.

Using two-staged least squares (2SLS), we estimate the LATE of savings on food security outcomes. Results in table 8 indicate that we cannot reject the hypothesis that food security changes for compliers are no different than changes for others. In other words, savings simply seems not to have affected household food security of any dimension—frequency, severity or diversity—in a statistically significant way.

Table 9: Impacts of Savings on Food Security for Compliers: Local Average Effects using 2SLS

Dependent variable: Percentage Change in Food Security Measures			
Independent Variable:	Frequency (HFIAS) (1)	Severity (HFIAP) (2)	Diversity (HDDS) (3)
Opening a new OIBM account (Dummy)	-0.51 (2.77)	-0.125 (0.839)	0.267 (0.86)
Intercept	0.520*** (0.128)	0.0862* (0.0382)	0.0985** (0.0368)
N	1,984	2,005	1,989
r ²	.	0.0005	.
chi ²	0.0339	0.0222	0.0966

Note: Clustered standard errors are given in parentheses; ***, ** and * represents significance at the 0.1%, 1% and 5% levels, respectively. The dummy variable for new OIBM adoption is instrumented by the dummy variable for intense information. Higher levels of HFIAP and HFIAS represent lower food security while higher HDDS shows higher food diversity. Thus, negative coefficients represent improvements in food security for HFIAS and HFIAS, while positive signs represent improvements in HDDS.

CONCLUSION

What, then, are the food security impacts of savings? This study presents initial evidence that there is no discernable impact of opening a saving account with OIBM on household food security outcomes. Using a cutting edge randomized encouragement experimental research design, a large panel data collected over a period of two years, three dimensions of food security, and appropriate rigorous estimation techniques to adequately capture impacts, this study shows that opening a savings account with OIBM likely, does not, by itself, result in any decrease in the frequency and severity of food insecurity issues, or in any increase in the dietary diversity.

But, does this suggest that opening up access to savings services may have modest or no impacts on improving household-level food security outcomes? Is it possible that improving access to savings could affect households' actions that are linked to food security? For example, households could use formal savings account to facilitate consumption smoothing—that is, saving after the harvest to have funds for food during the hungry season. Or is it possible that improving access to savings could affect household savings behavior that, in turn, affects food security-altering actions—even if it does not directly affect food security within a period of two years? For instance, households could engage in behavioral changes resulting in growing more crops or using more fertilizer thanks to savings and that could occur without for as much translating into differences in food security during the short temporal window of this study. A follow-up paper will examine these issues in detail.

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ANNEX 2: DESIGN OF THE INTENSE INFORMATION CAMPAIGN

We designed content for an intense information campaign based on discussions with the communities and OIBM. The intense information is designed to function as an encouragement to enroll and use OIBM and formal services, and as an instrument to identify causal effects.

The intense information campaign was designed to be carried out by Field-Based Promotional Assistants (FBPA). The FBPA's were hired, trained, and paid by OIBM. They visited their assigned villages on different days and at different times each week, so as to increase contact with potential clients (some villagers may have regular schedules that would make them unavailable/busy at certain times during the week). The FBPA's carried supporting materials and OIBM literature (pamphlets) to provide detailed information marketing OIBM products and services in that village.

Each FBPA was also supported by two Village-Based Volunteers (VBVs) in each village, who were also provided with similar educational and promotional materials. They were not remunerated by OIBM nor were trained by OIBM. Participation was entirely voluntary. Care was taken to ensure gender balance within the pair of VBVs in each village. The VBVs were educated and respectable members of the community that villagers were comfortable approaching for information. Care was also taken to avoid reference from the village headman for recruiting VBVs; in many villages not everyone felt comfortable approaching close friends of the headman. The VBVs were expected to be available to answer questions from village residents. The VBVs were not required to report or provide feedback to OIBM on the FBPA's work in the area⁹.

IRIS and OIBM teams designed the promotional materials that included the following:

- *T-Shirts*: OIBM T-shirt, worn by the FBPA and the VBVs.
- *Posters*: Three types of colorful posters in local language – given to each of the VBVs, to be posted on the outer wall of their home and in public places in the village (each VBV received one copy of each of the 3 posters). The first type of posters included information on terms and conditions and promotions for the latest savings product, the second type included information on terms and conditions of the latest loan product, and the third poster included information on major products and services offered by OIBM, Malswitch card – a biometric card - that can be used at Automated Teller Machines (ATMs), and the minimal identification requirement to open account with OIBM.
- *Fliers*: Fliers to give to each of the potential clients (every FBPA had over 1,000 of these fliers). The fliers – folded into 4 sections and printed on both sides - contained information in local language on all the products and services provided by OIBM, marketing promotions for becoming clients of OIBM, information on Malswitch card, identification requirements for opening an account, and also location and times of operation for the mobile van.
- *Referral Card*: This is the card that villagers hand in to the mobile bank, with the FBPA's name on it, so that s/he gets credit for that new customer. The referral card was not used until the last few months of the campaign in 2009.

While no strict target was fixed, an incentive scheme for the FBPA's was designed that included a MK 500 bonus (US\$3.6) to the fixed monthly salary of US\$42 per month for exceeding average new client registration per month in the three districts. The FBPA's were

⁹ While many villages agreed to provide VBVs, only a few villages finally had them in place at the start of the study.

also made aware that good performance might lead to advancement opportunities at OIBM as it grows.

FBPAs were required to meet with mobile bank branch managers (their immediate supervisors) weekly. The meeting was intended to provide the crucial communication link with OIBM, to ensure quality control of information flow, assist with any questions the FBPA had trouble with and other trouble-shooting issues in their assigned areas.

The 17 FBPAs were hired and trained by OIBM in March of 2008. The FBPAs were then placed in about 58 randomly selected enumeration areas (EAs) (“treatment areas/treatment EAs”) covering 280 villages. The FBPA’s were put in charge of a group of two to five EAs which could be easily reached by bike, by minibus, or by bus-bike combination, from the FBPA’s home. Each FBPA was given a monthly bus/bicycle allowance of MK 2,000 (US\$ 14) to help them cover the cost of purchasing/using a bicycle or minibus to reach the villages where they work. They were limited to only visit and work in their assigned EAs that were part of the intensive campaign EAs. In other words, the FBPAs were not allowed to visit any EA outside their assigned area. The VBVs were asked to only operate in their own village. The FBPAs started visiting their assigned areas from April 20, 2008 at least once per week. The campaign lasted until March of 2010.

In order to avoid contamination from control villages, FBPAs were advised to say that while everyone could access services from OIBM and information through mass media and OIBM officials at branches, the intense information campaign could only be carried out in certain areas for now due to resource capacity reasons. Faith leaders were requested to announce the same message to their congregations, since a single church or mosque could have members from both control and intense campaign villages. It was expected that people from control villages would understand why their village was not visited by the FBPA, and why their own village does not have a VBV.¹⁰ Large EA-wide OIBM introduction meetings were avoided to limit information diffusion to control areas. Meetings held by FBPAs were limited only to the treatment villages.¹¹

¹⁰ No major grievances related to absence of intense campaign were reported from control areas during the study period.

¹¹ Indeed, there is the chance that a few people from control villages would have attended these village-level meetings. We expect that such chances were lower, and the numbers should be fewer, due to elements built into the study design.