# Research Proposal

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**Title:** Examining the Impact of Family Planning on Fertility, Maternal and Child Health, and Economic Well-Being: Evidence from a Field Experiment in Urban Burundi

## Background

In spite of declining birth rates and improvements to maternal health care, the total fertility rate, or the average number of births per woman, remains high in Sub-Saharan Africa. In 2012, the average total fertility rate in Sub-Saharan Africa was 4.9 births per woman, which was almost twice the average total fertility rate of 2.7 births per woman in South Asia and more than twice the average total fertility rate of 2.2 births per woman in Latin America and the Caribbean [1]. In addition, many women in Sub-Saharan Africa begin to have children at a young age; estimates from Demographic and Health Surveys (DHS) indicate that in most Sub-Saharan African countries, between 25 to 40 percent of unmarried women have at least one birth by the age of 19, and many of these births are unplanned [2,3].

A high total fertility rate and large numbers of unintended pregnancies[1] and unwanted births are causes for social concern because they contribute to high rates of induced abortion, increased maternal morbidity and mortality, and poor child health outcomes, which in turn place substantial health and economic burdens on women, their children, and their families [5–7]. Women who experience unintended pregnancies are more likely to face short- and long-term health risks associated with unsafe abortions, will complete fewer years of schooling, and may experience social stigma and ostracism from their communities [8–10]. Women who have children at a young age are also at higher risk of pregnancy-related complications, including pregnancy-induced hypertension and preterm birth [11,12]. Moreover, children that are the result of these unplanned pregnancies may face poor health outcomes, including low birth weight, stunted growth, and poor nutrition, as well as lower educational attainment [8,13,14]. In addition, women, their partners, and their families are forced to bear the financial burden associated with childrearing, which result in loss of household earnings and increases the risk of falling into poverty [4,15].

Improving access to family planning (FP) may help African women and couples to meet their desired fertility and to avert unintended pregnancies and unwanted births [16,17]. The average contraceptive prevalence rate in Sub-Saharan Africa is 22 percent, which is less than half that of South Asia (51 percent) and less than a third that of East Asia (78 percent) [1,18]. It is estimated that one in three deaths related to pregnancy and childbirth could be avoided if women had access to modern contraceptive services [18]. Reducing fertility, preventing unintended pregnancies, and delaying childbirth among young women may also increase their chances of attending and completing school and eventually obtaining employment [19,20]. Previous studies have shown that

[1] Unintended pregnancies refer to pregnancies that are either unwanted or mistimed at the time of conception [4]



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young women from disadvantaged backgrounds form one of the largest groups that lack access to reproductive health services and have an unmet need for modern family planning—that is, they are sexually active and want to delay or stop childbearing but are not using a modern contraceptive method [21–23]. Young women in developing countries do not have access to basic information about sexuality, contraception, and sexually transmitted infections, and among those women who report awareness, many tend to harbor misperceptions or possess only superficial information about these issues [2,24].

Interventions that aim to influence demand (sexual and reproductive health behavior change, informing women and couples about the benefits of family planning) and supply (improving access to contraceptives and services) of family planning have become increasingly common in developing countries. These interventions have targeted key populations in a variety of ways, from education and awareness programs in schools to multicomponent, community-based campaigns [25,26]. More recently, the number of family planning interventions that have undergone more rigorous impact evaluation has increased, and more studies have begun to utilize experimental and quasi-experimental methods to assess the effects of family planning on fertility, health behavior, and health outcomes. Findings from community-level social programs such as the MCH-FP Extensions project in Matlab, Bangladesh and the Navrongo experiment in Ghana have significantly contributed to the development of strategies for family planning and reproductive health services, and the health impacts of these strategies have been examined [27–30].

Nevertheless, there is a need for more impact evaluations of family planning interventions using randomized control trials, particularly in Sub-Saharan Africa where rigorous experimental evidence is scarce. Determining causal impact in evaluations that utilize quasi-experimental or observational methods is difficult because both program placement and participation in the program may be endogenous to factors that drive fertility and health outcomes – therefore, any cross-section analysis of program effectiveness would yield biased results [31]. In the case of family planning, most programs target high-fertility areas and may therefore be used by particular types of individuals, making it difficult to distinguish intervention effects from other context-specific determinants [25,32]. Moreover, in impact evaluation studies where the treatment (family planning) has been randomly assigned, such as was the case in the Navrongo experiment, randomization has primarily occurred at either the community or village levels [27,29,33]. Finally, most family planning impact evaluations that are based on randomized control trials have tended to be relatively small-scale, low-powered studies over brief periods of time (less than two years), particularly in Africa. While impact evaluations that are completed in a one- to two-year time frame may be useful in examining first-order effects, such as contraceptive use or changes in family planning knowledge, they are not particularly well-suited to identify longer-term changes in fertility (a second-order effect of the intervention), particularly if intervention components are time-dependent [25,26][2].

[2] For example, interventions that may offer women or couples the option to limit or space births over a longer period of time.

Few randomized control trials have been conducted[3] to assess the causal impact of family planning in low-income countries, and even fewer impact evaluations have been conducted to determine the extent to which such family planning interventions may affect downstream health and economic development outcomes. To date, not many impact evaluations have sought to identify family planning and reproductive health (FP/RH) program effectiveness at the individual or household level, and apart from the frequently cited Matlab project and a recent study by Ashraf et al [35], no randomized control trial to my knowledge has attempted to causally identify the impact of family planning and contraceptive adoption on both immediate and longer term health and economic outcomes in Sub-Saharan Africa.

**Study Objectives**

To address these gaps in the evidence base, I propose to conduct a field experiment that seeks to identify the causal impact of family planning on fertility, maternal and child health (MCH) outcomes, and measures of economic well-being. The proposed trial will be conducted in Bujumbura, Burundi, where total fertility is high, contraceptive prevalence is low, and access to family planning services is poor. As part of the trial, women in the study will be randomly assigned to one of two possible treatment arms, one control group and one treatment group. Women who are assigned to the treatment group will receive three complementary intervention components, each of which are implemented jointly to encourage use of family planning and that aim to overcome several key barriers[4] that women face to accessing family planning in Burundi. These intervention components include:

1. Comprehensive and detailed family planning information sessions and counseling, with a focus on the use of family planning as a means to healthily time and space pregnancies;
2. A free transportation service from the woman's home to the family planning clinic; and
3. Free counseling services, referrals, and financial reimbursements for the treatment of contraceptive-induced side effects.

Results from this study will help to fill the current knowledge gaps on the effectiveness of family planning interventions by directly identifying the impact of an increase in access to family planning on fertility and health outcomes. More generally, findings from this study may also provide evidence to suggest that the benefits of improving access to family planning are likely to extend beyond the health domain by also improving economic well-being and contributing to poverty alleviation.

**Theoretical Foundations**

My experiment is grounded in the causal premise that increases in family planning services[5] will lead to decreases in fertility, which in turn will contribute to improvements in maternal and child health,

[3] Even the most widely recognized family planning program evaluation, the Matlab MCH-FP projects, did not randomly assign participating villages, and no report was found documenting the mechanism used to assign villages to regional clusters for program treatment [34].

[4] These barriers have been identified in the preliminary qualitative work in the country and will be discussed in greater detail in the following sections.

[5] Family planning consists of a compilation of goods and services that enable individuals and couples to safely and effectively meet their reproductive goals by attaining their desired number of children by spacing, timing, and limiting

socioeconomic development, and long-term economic well-being. However, whether or not family planning reduces fertility and improves health and economic outcomes is ultimately an empirical question. Before turning to the empirical strategy, I first present some theoretical insights into how and why access to family planning might have these immediate and downstream effects. To do so, I decompose the causal pathway mentioned above into its two primary components, first by addressing the relationship between family planning and fertility and then proceeding to assess the theoretical impact of fertility on downstream economic outcomes.

*The Relationship between Family Planning and Fertility*

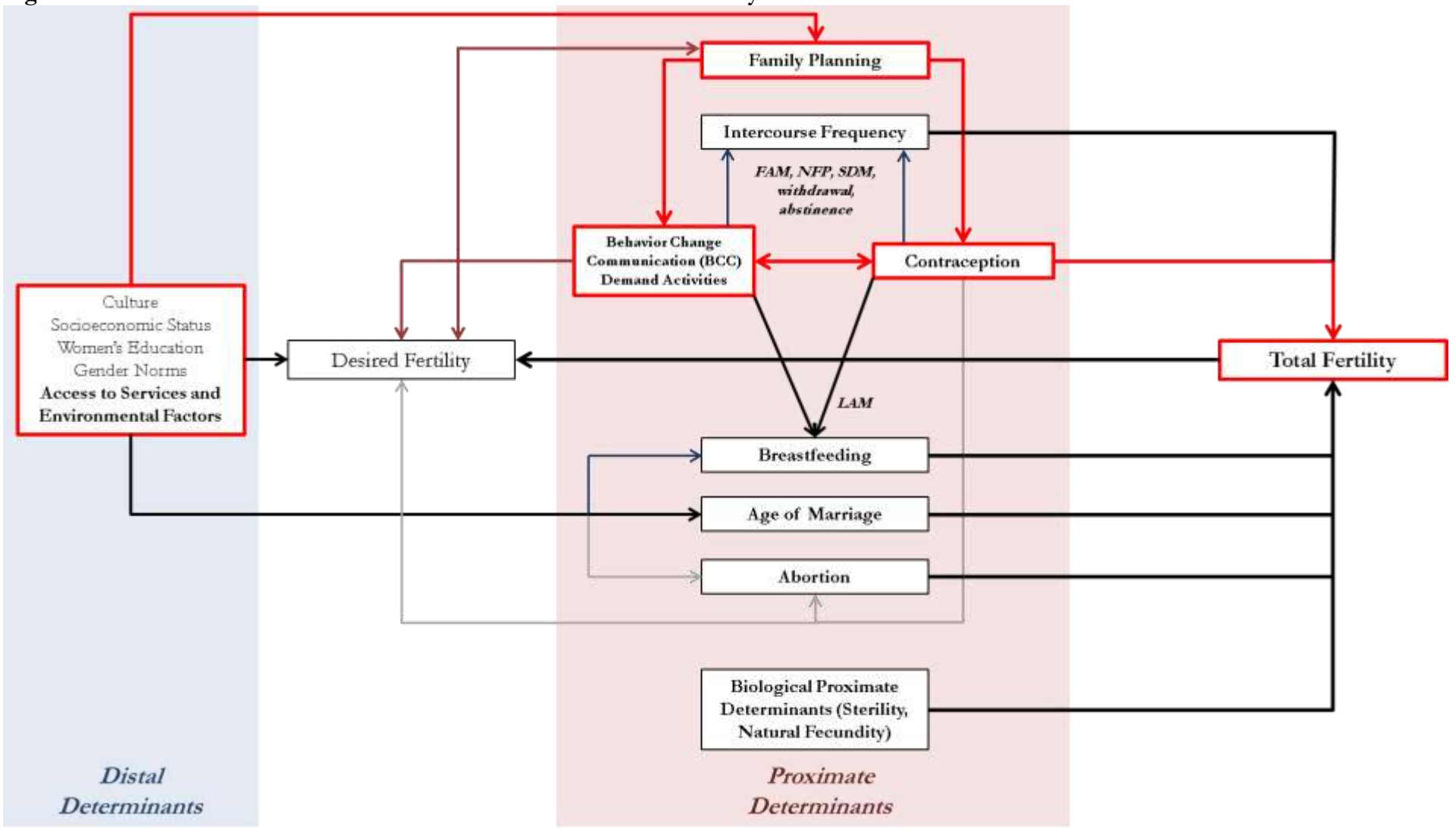
The role of family planning on fertility can be delineated using both classical demographic and economic models of fertility change. In beginning with a demographic perspective, I extend the proximate determinants framework as proposed by Bongaarts (1978) and later modified by Stover (1998) as shown in Figure 1. In this framework, identified determinants of fertility are either classified to be proximate (e.g. contraception, breastfeeding, abortion) or distal (e.g. socioeconomic status, education) based on whether the factor in question directly affects fertility through a biological or behavioral channel (proximate) or whether the factor can only act on fertility indirectly through other, more proximate factors (distal). The proximate determinants in the Bongaarts-Stover model are presented in bold in Figure 1.Given the clear demarcation between determinant types, this framework proposes that differences in fertility among populations and trends in fertility over time can be traced back to variations in one or more of the identified proximate determinants. Under this framework, family planning interventions have the potential to reduce fertility by:

1. Increasing contraceptive use through supply-side and demand-side interventions.
2. Increasing the timing and spacing of intercourse through induced behavior change.
3. Promoting lactational infecundability through exclusive postpartum breastfeeding.
4. Reducing the need for abortive services by meeting contraceptive demand while simultaneously improving access to safe abortions.

The key pathways through which family planning specifically affect fertility are highlighted in red in Figure 1. For the sake of clarity, some arrows indicating secondary pathways and feedback mechanisms have been omitted from the diagram.

births. Services include both supply-side services (provision of and access to contraceptive methods) as well as demand-side services (information, counseling, and behavior change communications, among others).

**Figure 1: Extended Framework of the Proximate Determinants of Fertility**



In most economic models of fertility, the trade-off in having another child depends on the marginal cost of having another child relative to the marginal benefit that each child brings to parents, in which a child is valued as a means of old-age security, a source of labor, or another means of support [38,39]. In contrast to the demographic theory on fertility, most of the economic frameworks used to conceptualize the family planning-fertility relationship may be categorized into two types, namely household demand models as presented by Becker, Duesenberry, & Okun (1960), Becker & Lewis (1973) and Pollak (2003), and synthesis models as presented by Easterlin (1978), Easterlin, Pollak, & Wachter (1980), and Easterlin (1975). In household demand models, in which child quality and quantity are explicitly accounted for as arguments of the household utility function, the provision of family planning decreases the cost of a couple's ability to control their fertility, which in turn raises the price of having children relative to child quality (i.e. the "quality-quantity trade-off"). On the other hand, synthesis models combine demographic and economic theories of endogenous fertility choice by incorporating the supply of births as an argument. Unlike household models, synthesis models do not explicitly account for child quality but instead introduce utility gained from frequency of intercourse and disutility gained from contraceptive use and from infant mortality. Here, family planning interventions are perceived as technological innovations that reduce the disutility associated with contraception while allowing for more frequent intercourse for a given fertility rate [46]. Despite their differences, both economic models are consistent with the demographic framework in arguing that limiting and spacing births is costly, and improving access to family planning might reduce fertility by mitigating these costs.

Additional refinements to the economic models of fertility, particularly in the context of incomplete markets and uncertainty, have been suggested by Schultz (1997), among others. While these sophistications do provide additional insights into the demand for children[6], they do not significantly alter the theoretical role of family planning in reducing fertility. However, the extent to which family planning interventions are able to reduce the cost of controlling fertility relative to the cost of children remains central to the debate as to their effectiveness. The precise size of these effects and the channels through which interventions are most effective are poorly understood; however, there is reason to believe that the costs associated with controlling fertility is large in the absence of family planning programs. Prior work in HIV/AIDS and other sexually transmitted infections suggest that individuals are not likely to deviate from their desired sexual behaviors, even when the costs of these behaviors are substantial [48–51]. Intra-household dynamics between husbands and wives, in which women tend to have less bargaining power relative to their husbands over decision-making, particularly with regards to fertility and family size, add complications to the model predictions [35,52,53]. These asymmetrical intra-couple relationships are likely to increase the relative cost of contraception if husbands: 1) prefer to have more children than their wives, 2) are more able to exercise their fertility preferences, and 3) are opposed to family planning for reasons that are orthogonal to access (e.g. perceptions of side effects, stigma, etc.).

*The Relationship between Fertility, Health, and Economic Outcomes*

[6] Many of these refinements often examine the role of children as a measure of security against uncertainty (for example, household income shocks, illness, or crop failure), in which demand for larger families increase as households are exposed to more unstable environments.

While the role that family planning plays in impacting fertility is relatively well defined in economic and demographic theory, the pathways through which changes in fertility lead to changes in longer-term measures of social and economic development are more difficult to ascertain. Most current models of fertility change propose that the effect of family planning in lowering fertility: 1) enables households to reallocate more resources to each member, thereby increasing per capita consumption and investment; 2) allows women to better space and limit births, enabling them to better substitute childrearing for other productive activities; and 3) leads to better child health and educational attainment, given that lower fertility mechanically raises the amount of resources available per child. I briefly discuss each of these three channels separately.

In accordance with the economic models of the household, a reduction in fertility may contribute to an increase in the amount of resources that are available to each household member, which in turn allows for previously unattainable levels of per capita consumption and investment as a household's feasible production set expands (Becker & Lewis, 1973; Bloom, Canning, Fink, & Finlay, 2010). In non-unitary models, changes in a household's production frontier may not only depend on individual preferences for resources (including children), but also on intra-household bargaining dynamics. The extent to which changes in fertility impact household resource allocation decisions is defined by 1) how the household production function determines the trade-off in welfare from having fewer children, and 2) the manner in which resources are distributed within the household.

As fertility declines and fewer household resources are needed to support children, women are freer to substitute time and resources away from childrearing and invest in other activities that increase their human capital and labor market productivity. This argument may not necessarily be true if the amount of resources invested in each child increases or if a woman's relative level of investment in her children increases as fertility declines [46]. In general, however, the empirical evidence from developing countries has suggested that the ability to optimally space births and control family size enables a woman to obtain more schooling and to invest more in productive labor market activities. Furthermore, in environments where maternal mortality is high, declines in fertility may also raise the lifetime return to education by improving maternal health outcomes through healthy birth spacing and through increasing life expectancy, thereby allowing women to reap greater rewards over the course of a longer time horizon.

Finally, it is also likely that lower fertility through family planning may lead to improvements in child health and well-being. In following the Becker model of the household, a reduction in the number of children decreases the level of competition for resources between siblings, which in turn leads to an increase in the amount of available resources per child as parents are more able to optimally time and space births. Such increases in lifetime resources may lead to improved health outcomes and improved downstream economic opportunities for both children and their parents.

**Review of Existing Interventions: The Need for Experimental Evidence**

In recent years, family planning programs have varied widely in their emphasis on demand-generation and supply-side activities, which include increasing contraceptive method choice and varying service delivery approaches. Both demand-side and supply-side interventions have led to improvements in knowledge and discussion of and attitudes toward family planning, and have

increased intentions to use family planning [25,26]. Nevertheless, the results are less consistent in terms of effects of such programs on fertility, health, and socioeconomic outcomes. Several factors contribute to the lack of consensus on the effectiveness of family planning, with the most recognized one being a lack of evaluation using experimental means, particularly in African settings where evidence is minimal.

Demand for experimental evaluations of family planning is high, given that most evaluations that investigate the impact of family planning programs face the concern that both program placement and individual participation in the program are endogenous to fertility choices [31]. Consequently, avoiding these identification concerns by means of a true experimental design is preferred; that said, very few family planning programs to date have employed experimental methods to assess programmatic impact. Even the most widely recognized family planning program evaluation, the Matlab MCH-FP Extensions project in Bangladesh, did not randomly assign participating villages, although the study had a strong comparative advantage over other similar studies in being able to use a rich longitudinal data set to assess program impact [25,29,34].

Experimental evaluations of family planning interventions, particularly in Africa, are rare, and most family planning evaluations that have been undertaken in experimental settings have tended to examine small-scale, low-powered interventions over brief periods of time (less than two years). While short-term interventions are useful in examining first-tier program effects, such as contraceptive use or changes in family planning knowledge, they are not particularly well-suited to identify intermediate or longer-term changes in fertility, particularly if intervention components are time-dependent[7], and are definitely not suited in assessing downstream outcomes. To date, the strongest evidence that demonstrates achievement of long-term fertility goals and socioeconomic improvement comes from longitudinal studies such as the Matlab MCH-FP Extensions project [28,30,55] and the Navrongo project in Ghana [27,29] as well as from Demographic Surveillance Systems sites.

In assessing the impact of previous family planning programs, the findings have not been consistent across locations or target groups. For example, the study by Meuwissen et al. (2006), which evaluated the voucher program in urban Nicaragua, identified differential program effects among young people attending school compared to young people who participated at community-based sites. Similarly, Hennink & Clements (2005) reported differential changes in unmet need as a result of introducing family planning clinics in two culturally distinct provinces in Pakistan, while Debpuur et al. (2002) and Phillips et al. (2006) found a significant increase in contraceptive use and decrease in fertility upon examining the combined effect of two different community-based outreach interventions relative to the effects of the interventions individually.

Based on the previous evidence, it is clear that several gaps and directions for future research have also been identified. Given the relatively short lifespan of a family planning intervention, Matlab and Navrongo notwithstanding, little evidence exists to inform decisions about scaling up family planning programs or replicating efforts in other contexts, particularly for programs that examine the longer-term behavioral and socioeconomic effects of the interventions. It is clear that a single

[7] For example, interventions that may offer women or couples the option to space births over a longer period of time.

case study in Matlab or in Navrongo, both which seek to assess the long-run consequences of family planning on fertility, is insufficient to make generalizations about what similar programs are likely to achieve in other contexts [34]. There is a real need for research that assesses intermediate and long-term changes in fertility-related outcomes, and it is with this need in mind that I choose to conduct my field experiment.

**Pilot Study and Pre-Trial Preparations**

In preparation for the trial, I conducted a pilot study in Bujumbura, Burundi in collaboration with my local partner organization, Health Systems and Development Consult (HSD Consult), who will also undertake the survey work and will oversee the logistics, data collection, and local administration of the field experiment. The objectives of the pilot study were:

a) To examine the barriers to access and the reasons that women use, do not use, and discontinue family planning.
b) To assess the interactions between family planning providers and users in urban Burundi.

To meet these objectives, the pilot study consists of:

1) Semi-structured private interviews with a small sample of urban women.
2) Structured interviews with clinics and family planning service providers.
3) Pilot testing of the experimental baseline survey using a small sample of women

I collected results from the pilot study over a span of four months (February 2014 to May 2014), and my findings from the pilot have served to inform the study design and implementation of the trial. In addition, I have compiled key descriptive statistics from the 2010 Burundi DHS, which add to the pilot study findings and provide additional context of the family planning environment.

*Descriptive Results from the Quantitative Survey*

I first present some descriptive findings from the pilot quantitative survey. Of the 15 women who were surveyed using the pilot questionnaire, the mean age among the sample was 27.6 years, and slightly more than half (8) have received more than a primary school level of education. Polygamy, particularly among Muslims, is relatively common in Burundi; 4 out of 15 women are in a polygamous relationship where their husband/partner has another wife.

In terms of fertility, the average number of children per woman in the quantitative survey sample was 2.7, Six of the 15 women have already given birth to 2 children, while an equal number of women in the sample have given birth to either 3 or 4 children. The maximum number of children born to a woman in the sample was 6. Two of the 15 women were pregnant at the time of interview, and of those 2 women, one wanted to be pregnant at the time, while the other would have liked to delay her pregnancy if she were able to do so.

When assessing women's knowledge of family planning and use of contraceptive methods, I find that of the 14 methods of contraception that were asked about in the survey, women in the sample, on average, had heard about 8 of them (8.33). Of the 13 women who were not pregnant at the time of interview, 9 were using a method of family planning, while the remaining 4 were not. The table below describes the contraceptive method mix among the 9 women who were using family planning:

| Name of Method | Number of Women Using | Percentage |
|---|---|---|
| IUD | 2 | 22.2 |
| Injectables (Depo-Provera) | 4 | 44.4 |
| Oral contraceptives | 1 | 11.1 |
| Rhythm method | 2 | 22.2 |
| **Total** | **9** | |

Among women who had ever used family planning within the past 5 years, the average amount of time taken to walk to the clinic was 13.2 minutes, which is relatively reasonable given that one of the sample selection criteria was that women had to live within 2 km of the ABUBEF Buyenzi family planning clinic. However, 2 of 9 women still reported having to travel more than 30 minutes to receive family planning services. It is likely that these two women did not go to the provider nearest them to receive services, which may be because of fear of being seen at a family planning establishment in their neighborhood or that the family planning clinic nearest them did not have their preferred method in stock. Of the 2 women who traveled more than 30 minutes to visit a family planning provider the last time they sought services, 1 of them paid 1,000 BIF ($0.67 USD) in transport costs. Most strikingly, waiting times at family planning clinics are long – 7 of 9 women had to wait 1 hour or more before a facility staff member came to receive them for services.

When examining women's preferences for children, I find that the majority of women (11 out of 15) want between 3 to 5 children, which is reflective of the preferences of women in Bujumbura based on DHS statistics, but is lower than the fertility preferences of the country as a whole. Of the 4 women who were pregnant at the time of the survey, 3 wanted to have another child, and of the 11 women who were not pregnant, 8 wanted to have another child. When asked about their husband/partner's preferences, 7 of 15 said that their partner wanted the same number of children, while 3 of 15 said that he wanted more. The remaining number of women did not know their partner's preferences. Finally, most women (6 out of 9) agreed that the decision to have children should be jointly determined; of those 3 that didn't agree, 2 said that their partner's decision as to how many children they should have.

*Identifying Barriers to Accessing FP: Clinic and Private Interview Findings*

Ten clinics and family planning service providers around the Bujumbura Mairie (urban Bujumbura) municipality were mostly randomly selected[8] from a list of 29 public sector facilities that were located in the capital and that were known to provide family planning services, and structured interviews were administered to facility managers in each clinic.

To complement the findings from the clinic interviews, I also present preliminary descriptive results from the 15 semi-structured private interviews and 15 quantitative pilot surveys that were administered to women living near the Buterere I and ABUBEF Buyenzi clinics, respectively.

[8] While 9 of the 10 clinics were randomly selected, we made sure to select the ABUBEF Buyenzi clinic, which is the largest family planning clinic in Bujumbura and provides the most extensive range of services, apart from higher-tiered hospitals.

Both clinic and private interviewees identified five key themes related to the use of family planning and the general reproductive health environment in Bujumbura. These themes include:

1. a lack of institutional resources for family planning, inadequate staff training at clinics, and other related operational barriers;
2. a lack of family planning knowledge and awareness, both among staff and among clients, and a (related) fear of contraceptive-related side effects among clients, particularly for modern methods;
3. a lack of access to family planning services, both in terms of availability (i.e. limited method choice at clinics) and transport (cost of transport, time needed to travel to a facility);
4. a fear of disclosure by women due to disapproval from their husbands, religious opposition to family planning, and community disapproval;
5. Pro-natalist social preferences and cultural attitudes, in which the number of children is regarded as a sign of wealth and prosperity

Each of these themes is addressed in greater detail below.

*Lack of Institutional Resources*

Family planning facilities and their clients face many structural barriers to providing and to accessing care in Bujumbura. One of the most commonly mentioned barriers from providers' perspectives was that their clinics did not have enough skilled health professionals to provide the full range of family planning services, and of their current staff, many lacked training to provide family planning methods, particularly long-acting and permanent methods. Moreover, training received for particular methods was often incomplete; for example, staff members in one clinic were trained to insert implants into women but were never trained to remove them. Several clinic managers also revealed that none of their staff who had received training previously had been re-trained within the past two years.

Other cited concerns by facility managers interviewed included a lack of private rooms for contraceptive service provision, and a lack of materials and physical space to provide services, particularly for methods requiring clinical services. One clinic manager noted that even though some of his clinic staff was trained to offer male sterilization services, "there is no space, no tools [to perform a vasectomy]; we fill the consent form and accompany them [to another clinic that does offer the service]."

From the perspectives of women, the lack of institutional resources and financial support for family planning can be most clearly inferred in 1) women's choice of service provider, and 2) the time that women spend waiting to receive services at their provider of choice. While contraceptive stockouts were rarely reported in most clinics (almost all managers confirmed that any stockouts for methods were short lived and, if at all, were mostly reported for resupply methods like pills), not all methods were offered. In fact, no clinic that was interviewed reported offering the full range of modern, traditional, and natural family planning methods. As a result, women who prefer a particular method would need to travel farther away to a clinic or health center. Most health centers in Bujumbura are small and do not have separate waiting areas for women seeking family planning. Hence, women who come for family planning must wait in line with clients who come for other types of care, many

of whom may be visibly sick and are therefore more likely to receive care sooner. In concordance with the survey findings, most service providers and women both agreed that family planning clients would need to wait at least one hour, on average, before receiving services.

*Lack of FP Knowledge and Fear of Side Effects*

In general, women in Bujumbura are better informed about modern contraceptives than women living in rural areas; however, a lack of awareness and knowledge about contraceptive use, fertility, and family planning continues to exist in urban communities, even among the more educated and privileged. Women hear many rumors and receive mixed messages about family planning – that contraceptives cause sterility and cancer – a fatal disease, since no treatments are available. One service provider mentioned: "There were rumors, a lot of rumors, you know, and [for counselors in clinics] to combat these rumors, it took a lot of time. Women did not accept the methods, and they said that these methods are medicine for dogs. Dogs. Others said that it will make them barren forever. Others said that it will cause the cancer. Others said that it will cause the fibroids. They say that if you take [contraceptives] when you go to breastfeed, you will deliver four children. That if you take them when you give birth, then you will give birth to morons."

One of the biggest barriers to using family planning in Bujumbura is a fear of method-related side effects, in which women believe that contraceptives, particularly hormonal methods, cause heavy bleeding, headaches, menstruation problems, weight gain, and general feeling of illness. In Burundi, women who have neither used family planning themselves nor have sought information from knowledgeable professionals rely on information from others, and when this information is either negative or vague, it leaves the recipient feeling confused and hesitant. A fear of side effects also includes a fear of having to pay for treatment for side effects, which is classified by service providers to be a medical cost, as opposed to a family planning cost, and is therefore no longer reimbursed under the Ministry of Health family planning program, which provides services for free. As one service provider noted: "This is the same customer who will pay for it. [Even in the case of] serious side effects, [the customer] may pay. Sometimes the case must be transferred to a specialist doctor."

*Lack of Access*

Lack of transport services to clinics and long waiting times in clinics were also observed in responses given by women who participated in the private semi-structured interviews. While some women traveled to their nearest clinic, the Buterere I clinic, several other women in these interviews reported that they often travel farther to receive family planning services, particularly if the closest provider did not have their preferred contraceptive method. One woman, who would either walk or travel by bus to her preferred provider, mentioned: "It takes an hour when I travel by bus. I leave [my house] at 6 AM and I get there at 7 AM. When I walk, it takes 2 hours or one and a half hours." Another woman mentioned: "It takes a lot of time because you have to take a bus, and then you take a bicycle taxi, so it's a lot of time."

Among these women who traveled out to receive services, most said that it would take them anywhere between 30 minutes to 1 hour, even when using a non-pedestrian mode of transport, to reach their provider of choice. Furthermore, even if women know where to receive their preferred

method and were willing to spend the time to travel to their provider of choice, they would still need to pay for transportation, which is not an insignificant matter, particularly for the urban poor. Of the women who reported using some transport service (bus, taxi, bicycle taxi, etc.) to travel to a clinic or hospital, most reported spending between 350 BIF up to 1,000 BIF for a roundtrip fare to reach their provider of choice. These findings are consistent with the quantitative survey results described above. Moreover, some women who traveled to receive services also reported using two or more non-pedestrian modes of transport.

*Fear of Disclosure*

Given the level of religious opposition to and spousal disapproval of family planning in Burundi, it is often the case that women in Bujumbura choose to receive services in secret. In these cases, disclosure of use of family planning is a major fear for women, who are often ashamed or afraid of being seen by others when seeking family planning services. These women risk social isolation and rejection by friends and neighbors, and many, particularly poorer women, also risk of losing the help and support that they need to cope with continuing poverty. Women also fear disclosure from breach of patient confidentiality by health care providers, many of whom disapprove of contraception themselves. As a result, women fear that staff will report their use of contraception and As one service provider reports: "You know in the community, family planning is a secret thing, often the staff here ...she lives in hiding and goes to [another clinic]…she goes elsewhere so that we do not know that she uses the contraceptive method." Another provider mentioned that "…there are those [service providers] who, their church does not allow it, and those who understand."

*Pronatalist Social and Cultural Preferences*

Cultural beliefs about ideal family size in Burundi play a significant role in determining contraceptive use and adoption of family planning. In Burundian culture, having large families is encouraged because children represent wealth and status, provide household labor, and are a form of social security to parents in their old age. As one service provider said: "There is the pro-natalist culture – the child is an asset [to the family] even when it can be a cost. [Even after] just having the 8th child, the couple is planning to have the $10^{th}$, which impacts the future of all their children. There are other problems associated with [method] failures and counting since illiteracy is also a problem. There are rumors on how [family planning providers] want to prevent people from bearing children, when it is not the objective. It's just the goal of birth spacing – it is not policy to limit but to space."

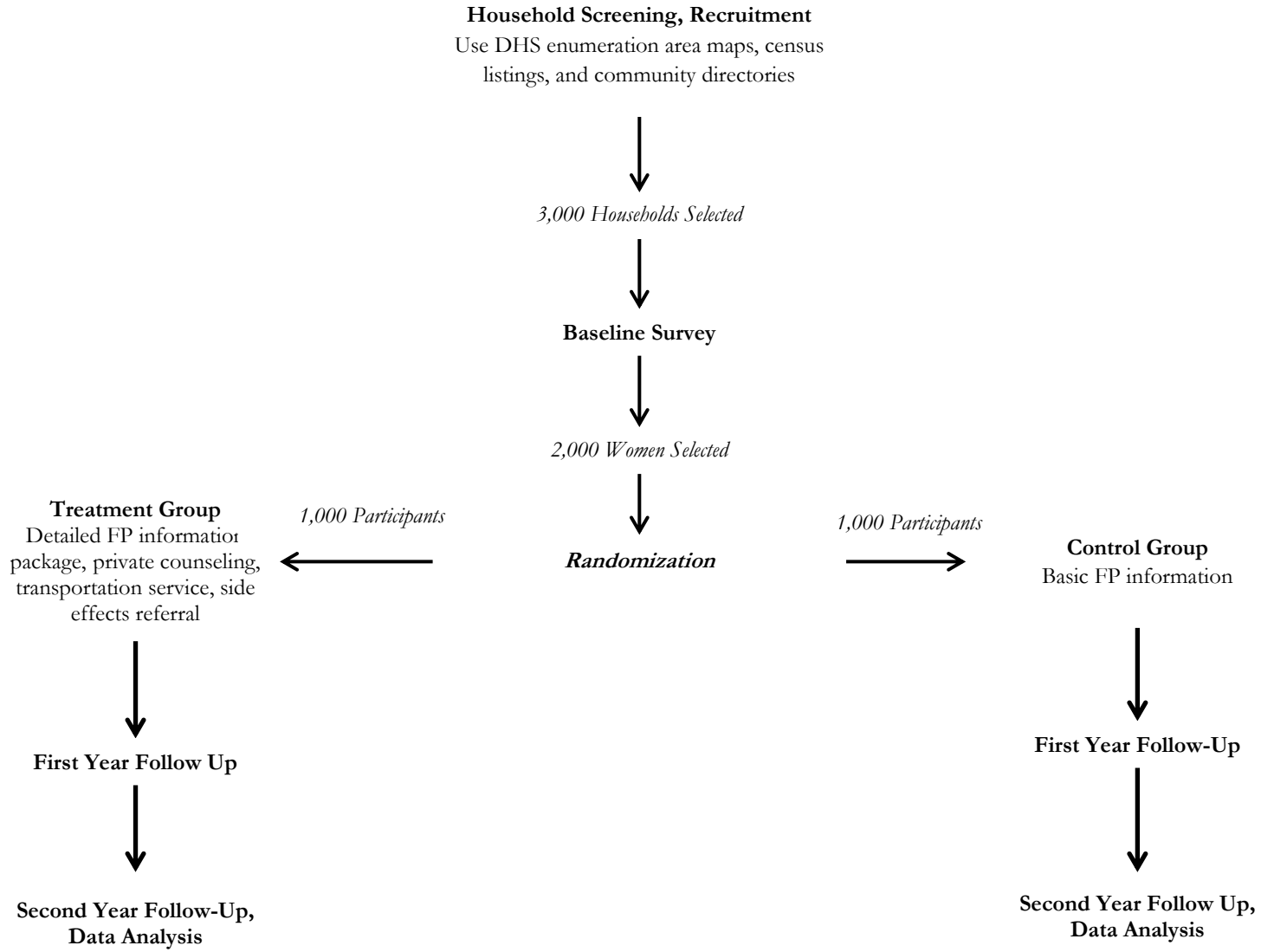
*Conclusions from the Pilot Studies and Next Steps*

Findings from the qualitative and quantitative pilot studies have identified multiple social, cultural and economic barriers that impede contraceptive uptake and inhibit access to family planning in urban Burundi. In particular, I find that 1) women in Burundi are often ill-informed about family planning and harbor many misperceptions and incorrect preconceived notions about the use of contraception; 2) women who seek family planning are faced with many structural and institutional barriers, including transport barriers and long waiting times at clinics; and 3) there exists a climate of fear, particularly for contraceptive-related side effects, This fear of side effects, combined with the potential financial risk for having to pay out of pocket for side-which prevent women from even seeking family planning in the first place. In my intervention study, I aim to tailor my intervention to directly address each of these three key barriers, which in turn will allow me to more effectively assess the impact of a comprehensive improvement in access to family planning.

## Experimental Design and Methods

Figure 2 outlines the general framework of the entire field experiment.

**Figure 2: Experimental Framework**






Version Date: 15 February 2015

**Experimental Timeline**

The timeline for the study is shown in Table 1.

The experiment will span a total of 42 months. Months 1 to 9 will consist of finalizing local and Harvard IRB approvals, finalizing the electronic version of the survey instrument, preparing the information packages and other counseling materials, hiring surveyors, other field staff (field managers), and intervention staff (counselors, driver) and working with local partners and the Burundi Statistical Institute to identify the enumeration areas in Bujumbura and to finalize the sampling strategy. Training of intervention staff, field staff, and surveyors will begin in month 8 and continuing until month 9, and household screening and recruitment of women will begin in month 10 and will continue until enough women have been selected to power the study. Baseline surveys will be administered to eligible women starting in month 11. From months 11 to 14, women will be randomized to either the control or the treatment arm once baseline surveys have been completed. Women who are eligible for study enrollment and who are randomized into the treatment arm will begin receiving the family planning intervention no more than one month after randomization. The intervention will commence in month 13 and will run until month 25, thus allowing for 12 months to randomize and to treat subjects with a minimum of 22 months total follow-up. Detailed follow-up surveys will be conducted 12 months and 24 months following rollout of the intervention. Study findings will be analyzed in months 37 to 42.

Based on the study timeline, the study activities above will begin by the end of August 2014 and will be completed by the end of November 2017, and the findings from the study will be analyzed by the end of March 2018. The estimated time to study completion is March 2018.

**Table 1: Study Timeline**

| | Months | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-3 | 4-6 | 7-9 | 10-12 | 13-15 | 16-18 | 19-21 | 22-24 | 25-27 | 28-30 | 31-33 | 34-36 | 37-39 | 40-42 |
| Prepare survey instrument; hire study staff and interventionists; obtain IRB, partner, and local approvals; identify and finalize sampling strategy | | | | | | | | | | | | | | |
| Training of local staff, lay interventionists, enumerators | | | | | | | | | | | | | | |
| HH Screening, Recruitment | | | | | | | | | | | | | | |
| Baseline survey administration, treatment randomization, intervention administration | | | | | | | | | | | | | | |
| INTERVENTION PERIOD | | | | | | | | | | | | | | |
| First-year follow-up, analysis | | | | | | | | | | | | | | |
| Intervention close-out, second-year follow-up, analysis | | | | | | | | | | | | | | |
| Final reports, publications, dissemination | | | | | | | | | | | | | | |

*Definition of the Sample*

The sample size of this study has been powered to primarily identify the effect of family planning use on fertility; however, I will also examine the effects of the intervention on other maternal and child health outcomes of interest, in addition to key social and economic measures of well-being. Based on preliminary power calculations, total of 2,000 women will need to be enrolled into the study. Of the women who will be enrolled, the family planning intervention, baseline survey, and two follow-up surveys will be administered to 1,000 women (the treatment group), while a basic family planning information package, the baseline survey, and two follow-up surveys will be administered to the other 1,000 women (the control group).

*Eligibility*

For the main part of this study, I will recruit women who:

1. Are married
2. Are either currently pregnant or have gave birth within 6 months from the time of the initial screening
3. Are between the ages of 18 to 35
4. Live in the city of Bujumbura

Women who successfully meet these criteria and who consent to participate in the main part of this study will be recruited. In addition, no two eligible women will be enrolled from the same household. If multiple women from the same household are potentially eligible to be recruited into this part of the study based on the four criteria inclusion above, the youngest eligible woman from the household shall be chosen to participate. In addition, I shall also ensure that eligible women who are selected for the study are sufficiently distant (at least 5 households apart) from each other, which will serve to minimize spillover effects.

In addition, one member from the recruited woman's household will be identified and selected to respond to sections in the baseline and follow-up surveys that inquire about household expenditures, assets, and consumption. The household member whom I select for this part of the study:

1. Will be over 18 years old.
2. Will be a resident of the same household from which the woman respondent described above is selected.
3. Will claim to be knowledgeable about the household's financial status, consumption, and expenditure

The household member who successfully meets these inclusion criteria and who consents to participate in this part of the study will be recruited to participate. It is possible that this respondent and the woman who is recruited from the household for the main part of the study are the same person, in which case the respondent must satisfy both sets of eligibility criteria and must consent to participating in each part of the study.

Finally, I will collect child anthropometric data (height, weight, and anemia status) at baseline and at the two follow-ups. The children who will be selected from the household for this part of the study:

1. Will be under the age of 6.

2. Will be identified as the biological or adopted children of the woman who is recruited for the main part of the study.
3. Will reside in the same household as the eligible woman.

Children who successfully meet these inclusion criteria and whose mothers consent to them participating in this part of the study will be recruited to participate.

*Sample Selection*

Using the most recent Demographic and Health Survey (DHS) maps of Bujumbura's enumeration areas and listings of households and neighborhoods, which will be provided to us by ISTEEBU, PNSR, and the MOH, we will employ a two-stage sample selection procedure that is based on the sampling strategy used by the DHS. In the first stage, we will randomly select DHS enumeration areas to be screened until we have selected enough enumeration areas to contain at least 11,000 households in total. In the second stage, our surveyors will proceed door-to-door to screen households in each selected enumeration area for potentially eligible women. Surveyors will continue to screen households until they identify 2,000 women for the study in accordance with the inclusion and exclusion criteria listed in sections 4.4 and 4.5 above, and these eligible women will be recruited in accordance with the recruitment protocols outlined in section 6 below. We shall ensure that eligible women who are selected for the study are sufficiently distant (at least 5 households apart) from each other. Based on our knowledge of participation refusal rates and the estimated number of eligible women in Bujumbura, we will need to screen an estimated 3,000 households in order to obtain a desired sample size of 2,000 women. We require a study sample of at least 2,000 women to achieve sufficient power for measuring our outcomes of interest. Recruitment from the selected enumeration areas will cease once 2,000 women have been found who meet the eligibility conditions and who consent to participate in the study.

Since receipt of the family planning intervention will be randomized at the individual level, we shall ensure that no two eligible women will be chosen from the same household. If multiple women from the same household are eligible to be selected into the study, we shall choose the youngest eligible woman from the household to participate.

*Power Calculations*

The target baseline sample will consist of 2,000 women who will have met the eligible criteria and who will have consented to participate in the study. Prior research studies in Accra, Ghana have found that 32 percent of initially screened women either did not meet the eligibility criteria or refused to participate [58–60]. Therefore, in order to meet our target sample size of 2,000, we will need to screen 3,000 households if we conservatively assume a combined ineligibility/refusal rate of 50 percent from the screening. Of the 2,000 women who will be recruited into the study at baseline following the initial screening process, 1,000 of these women will be randomly assigned to the intervention arm and the remaining 1,000 women will be assigned to the control arm. Based on prior study findings from Zambia [35], we can expect an attrition rate of 27 percent in the sample over a two year period, which will leave us with a sample size of 730 women in each treatment arm (1,460 in total) at the end of the two year study period.

We have powered our study to detect effects in three key outcomes in our sample over the study period, namely 1) the modern contraceptive prevalence rate, measured by the proportion of women using modern contraception at the 12 month and 24 month follow-up periods; 2) fertility outcomes, measured by the proportion of women who have had a subsequent birth event (pregnancies and/or births) within 12 months and 24 months of being recruited; and 3) female labor supply at 24 months, measured by the proportion of women who have worked in the past year.

**Contraceptive Prevalence:** Using modern contraceptive prevalence estimates for Bujumbura from the 2010 Burundi DHS, we expect a modern contraceptive prevalence rate of 22 percent in the control arm at the end of 12 months and 21.5 percent at the end of 24 months. To infer a potential effect size for our intervention, we look to evidence from: 1) the Navrongo study in Ghana, which found that a family planning intervention with a comprehensive outreach and contraceptive delivery component increased contraceptive use by 6 to 8 percentage points (an increase of 2.4 times) over a 4 year study period; 2) the Matlab study in Bangladesh, which found far larger effects (an increase by 3.4 times) of contraceptive uptake among women in the intervention areas over a longer study period; and 3) evidence from Zambia, which found that the modern contraceptive prevalence rate increased 1.5 times over the study period [27,35,61]. Assuming an attrition-adjusted sample of 1,460 women (730 women in each arm) as described above, we wish to know if we have sufficient power to detect a 1.5 times increase in the modern contraceptive prevalence rate in the intervention arm, from 22 percent to 33.5 percent ($\alpha = 0.05$) in the 12 month follow-up and from 21.5 percent to 32.7 percent ($\alpha = 0.05$) in the 24 month follow-up.

Tables 2 and 3 present the minimum detectable effect sizes that will be needed for various levels of power $1 - \beta$ for modern contraceptive prevalence (i.e. the difference in the modern contraceptive prevalence rate between the intervention and control arms) at midline and endline, respectively, assuming: 1) a control arm contraceptive prevalence rate of 22 percent at 12 months and 21.5 percent at 24 months; and 2) a fixed sample size of 1,460 women (730 in each arm). A one-tailed test is used for all calculations. Cells that are shaded in gray indicate that there is sufficient power to detect the desirable effect given the sample size.

**Table 2: Power Calculations – Modern Contraceptive Prevalence Rate, 12 Months**

| **CUTOFF: 0.335** | | **Minimum Detectable Effect Size with Power…** | | | |
|---|---|---|---|---|---|
| **Sample Size per Arm** | **Control MCPR** | **0.7** | **0.8** | **0.9** | **0.99** |
| **730** | **0.220** | 0.269 | 0.276 | 0.287 | 0.312 |
| **800** | **0.220** | 0.267 | 0.274 | 0.283 | 0.307 |
| **850** | **0.220** | 0.265 | 0.272 | 0.282 | 0.305 |
| **900** | **0.220** | 0.264 | 0.270 | 0.280 | 0.302 |

**Table 3: Power Calculations – Modern Contraceptive Prevalence Rate, 24 Months**

| CUTOFF: 0.327 | | Minimum Detectable Effect Size with Power… | | | |
|---|---|---|---|---|---|
| **Sample Size per Arm** | **Control MCPR** | **0.7** | **0.8** | **0.9** | **0.99** |
| **730** | **0.215** | 0.263 | 0.271 | 0.281 | 0.306 |
| **800** | **0.215** | 0.261 | 0.268 | 0.278 | 0.301 |
| **850** | **0.215** | 0.260 | 0.266 | 0.276 | 0.299 |
| **900** | **0.215** | 0.258 | 0.265 | 0.274 | 0.296 |

**Fertility (Proportion of women who had a subsequent birth event):** We use estimates for Bujumbura from the 2010 Burundi DHS to assume that 17.9 percent of women who were eligible to be in the study sample at baseline and who are in the control arm will have a birth event (i.e. will either become pregnant again or will deliver another child) within 12 months. Similarly, we infer that 49.8 percent of eligible recruited women will have a birth event (i.e. will either become pregnant again or will deliver another child) within 24 months. To infer a potential effect size, we again look to evidence from the Navrongo and Matlab studies, both of which found a fertility reduction equivalent to a 15 percent decrease from their respective baseline fertility among women in their respective intervention arms over their respective study periods [27,28]. If we again assume an attrition-adjusted sample of 1,460 women (730 women in each arm) as described above, we wish to know if we have sufficient power to detect a 15 percent decrease in birth events in the intervention arm, from 17.9 percent to 15.2 percent ($\alpha = 0.05$) in the 12 month follow-up and from 49.8 percent to 42.3 percent ($\alpha = 0.05$) in the 24 month follow-up..

Tables 4 and 5 present the minimum detectable effect sizes that will be needed for various levels of power $1 - \beta$ for fertility (i.e. the difference in birth events between the intervention and control arms) at midline and endline, respectively, assuming: 1) a control arm birth event proportion of 17.9 percent at 12 months and 49.8 percent at 24 months; and 2) a fixed sample size of 1,460 women (730 in each arm). A one-tailed test is used for all calculations. Cells that are shaded in gray indicate that there is sufficient power to detect the desirable effect given the sample size.

**Table 4: Power Calculations – Birth or Pregnancy in the Past 12 Months**

| CUTOFF: 0.152 | | Minimum Detectable Effect Size with Power… | | | |
|---|---|---|---|---|---|
| **Sample Size per Arm** | **Control MCPR** | **0.7** | **0.8** | **0.9** | **0.99** |
| **730** | **0.179** | 0.138 | 0.132 | 0.124 | 0.107 |
| **800** | **0.179** | 0.139 | 0.134 | 0.127 | 0.110 |
| **850** | **0.179** | 0.141 | 0.135 | 0.128 | 0.111 |
| **900** | **0.179** | 0.142 | 0.136 | 0.129 | 0.113 |

**Table 5: Power Calculations – Birth or Pregnancy in the Past 24 Months**

| CUTOFF: 0.423 | | Minimum Detectable Effect Size with Power… | | | |
|---|---|---|---|---|---|
| **Sample Size per Arm** | **Control MCPR** | **0.7** | **0.8** | **0.9** | **0.99** |
| **730** | **0.498** | 0.442 | 0.433 | 0.422 | 0.395 |
| **800** | **0.498** | 0.444 | 0.436 | 0.425 | 0.400 |
| **850** | **0.498** | 0.446 | 0.438 | 0.427 | 0.403 |
| **900** | **0.498** | 0.447 | 0.440 | 0.429 | 0.405 |

**Labor supply (Proportion of women who worked in the past year):** We use estimates for Bujumbura from the 2010 Burundi DHS and from the pilot work to assume that 73.9 percent of women who were eligible to be in the study sample at baseline and who are in the control arm will have worked within the past 12 months at endline. To infer a potential effect size, we look to evidence from prior studies by Angrist and Evans (1998) and Ashraf et al. (2013) , who found a 2 percentage point lifetime increase in female labor supply due to a one-child reduction in fertility [62,63]. In contrast, a multi-country study by Bloom et al (2009) found that women's time in the workforce decreased by 1.9 years (7.5 percent) for each additional child [19]. Perhaps the best evidence of the fertility-labor supply relationship in middle-income countries is presented in the study by Cruces & Galiani (2007), who duplicate the twin births instrumental variables design in Argentina and in Mexico and find comparable effects to the US-based study by Angrist & Evans (1998) [64]. Similarly, Chun & Oh (2002) utilize cross-sectional data from Korea and instrument fertility decisions using the sex of the first child – they find that having an additional child reduces women's labor force participation by almost 28 percent [65]. Investigations by Kim & Aassve (2006) in Indonesia and by Assaad & Zouari (2003) in Morocco use women's education and age of marriage as instruments for fertility and find similar results [66,68]. If we again assume an attrition-adjusted sample of 1,460 women (730 women in each arm) as described above, we wish to know if we have sufficient power to detect a conservative 5 percentage point increase in longer term labor supply in the intervention arm, from 73.9 percent to 78.9 percent ($\alpha = 0.05$) in the 24 month follow-up.

Table 6 presents the minimum detectable effect sizes that will be needed for various levels of power $1-\beta$ for fertility (i.e. the difference in birth events between the intervention and control arms) at endline, assuming: 1) a control arm proportion of 73.9 percent at 24 months; and 2) a fixed sample size of 1,460 women (730 in each arm). A one-tailed test is used for all calculations. Cells that are shaded in gray indicate that there is power to detect the desirable effect given the sample size.

**Table 6: Power Calculations – Women who worked in the past year, 24 Months**

| CUTOFF: 0.789 | | Minimum Detectable Effect Size with Power… | | | |
|---|---|---|---|---|---|
| **Sample Size per Arm** | **Control MCPR** | **0.7** | **0.8** | **0.9** | **0.99** |
| **730** | **0.739** | 0.787 | 0.794 | 0.803 | 0.825 |
| **800** | **0.739** | 0.785 | 0.792 | 0.801 | 0.821 |
| **850** | **0.739** | 0.784 | 0.790 | 0.799 | 0.819 |
| **900** | **0.739** | 0.783 | 0.789 | 0.797 | 0.817 |

*Baseline Survey*

Women, their children, and financially knowledgeable respondents who are identified as eligible from the household screening and who consent to participate in the study will then be subjected to a comprehensive baseline survey. To measure anemia in eligible children, a rapid anemia blood test will be administered using the Hemocue Hb 201+ Analyzer system.

The baseline survey instrument will be comprised of modules from the household and women's questionnaires of the Demographic and Health Survey (DHS), which include information on marriage, fertility, family planning, reproductive health, and child health [69], and modules on employment, household expenditures, and time use from the World Bank's Living Standards Measurement Study (LSMS) and the ISSER-Ghana Time Use and Health Study (TUHS).

The Household section of the survey will be administered to the financially knowledgeable member of the household and contains information on the following topics:

- **Household listing**, which collects information on every household member's age, sex, relationship to the head of the household, and parental survivorship and residence.
- **Household characteristics,** which asks about the dwelling and household assets.
- **Household Expenditures**, which collects data on expenditures on durable goods, rent and utilities, education and health, food, and other items purchased over the past 12 months for the household.

The Women's Questionnaire section of the survey will be administered to each eligible woman and contains information on the following topics:

- **Background characteristics:** the woman's age, marital status, and place of residence
- **Reproductive behavior and intentions,** which cover birth histories, pregnancies that did not end in a live birth, fertility preferences, and future childbearing intentions.

- **Contraception,** which covers knowledge and use of family planning, source of methods, and unmet need for family planning. For women not using contraception, questions are included on intentions about future use.
- **Antenatal, delivery, and postpartum care:** The questionnaire collects information on antenatal and postpartum care, place of delivery, and complications for recent births.
- **Women's height, weight, and anemia status**, the last of which will be assessed by a measurement of blood hemoglobin using the Hemocue Analyzer system.

In order to assess the broader long-term economic consequences of family planning, we will append survey modules from the LSMS[9] and from the TUHS, which will collect detailed information on:

- **Employment:** This section is designed to gather information on employment and the different sources of income earned for the woman and her spouse.
- **Time use:** This section asks the woman to recall her activities and how she spent her time in the 24 hours prior to the time of the interview.

Finally, the Child Anthropometry section of the survey will be administered to all of the eligible woman's children who are born after the start of the intervention and will contain information on the following topics:

- **Child height, child weight, and anemia status**, the last of which will be assessed by a measurement of blood hemoglobin using the Hemocue Analyzer system.

*Randomization*

A key feature the experimental study design lies in the randomization of women at the individual level. Following the baseline survey, women who have consented to participate in the study will be randomized into one of two experimental arms: a treatment arm or a control arm. A woman who is assigned to the treatment arm will receive a family planning intervention that includes 1) a detailed family planning information package and private counseling, 2) free transportation to a family planning clinic with low waiting times, and 3) free medical consultation and a referral service from a doctor to seek care in the event that she experiences side effects. Each of these intervention components has been designed to address a key barrier (i.e. information constraints, transport, and side effects management) that was identified in the pilot phase. Women assigned to the control arm will receive a basic family planning information package. In accordance with Bruhn and Mackenzie (2009) [72], women will be randomized to treatment and control groups using the minimum maximum t-statistics method, in which treatment assignment will be balanced according to the following baseline characteristics: neighborhood/household cluster, distance to the nearest family planning clinic, number of living children, months since last live birth, current use of family planning, age of marriage, educational attainment, and household wealth.

*The Intervention*

**Intervention Arm:** Women assigned to the intervention arm will be offered the following three intervention components over a one year period (months 13 to 25 in Table 1):

[9] Refer to Grosh (2000a, 2000b, 2000c), World Bank (2013) for details on the Living Standards Measurement Study

1. *Transportation Component*: Women will be offered a free transportation service from their homes to the ABUBEF Buyenzi or ABUBEF Jabe family planning clinics. The transportation service will be provided by a driver who will be hired and trained by HSD Consult. Women will receive the driver's phone number and will be instructed to contact the driver to transport them to the ABUBEF clinic during the ABUBEF clinic's working hours, which are between 7:30 AM and 3:30 PM from Monday to Friday. The driver will maintain a daily schedule of the women who request his services, and women will be instructed to notify the driver at least one day before they wish to go to the clinic to make sure that the driver will be able to transport them. The driver will also provide one day's advanced notice to the ABUBEF clinic to inform them of how many women from the study can be expected to attend the clinic on the following day. The ABUBEF clinic will also ensure that women in the intervention arm who come for services will not have to wait more than 1 hour before being seen by a medical professional. The driver will be accompanied at all times by one of the two women field managers; the presence of another woman in the vehicle will also act to minimize potential stigma associated with a woman traveling alone in the company of a man and may also provide comfort to the participant.
2. *Information Component*: Women who are assigned to the intervention arm will also be offered free, private family planning counseling, which will include a risk assessment for clinical methods and detailed information on methods switching, side effects associated with each method, and the benefits of contraception, birth spacing, and dual protection. Additional discussion will aim to promote informed choice by discussing common misperceptions that surround family planning and use of modern contraceptives. Women will receive additional detailed information and literature (flyers, brochures, and inserts) on birth spacing and side effects and will also receive counseling on fertility-awareness methods (Standard Days Method, CycleBeads). Strategies on how to communicate family planning messages with partners and on how to increase partner awareness will also be conveyed. All counseling sessions will last no more than one hour per session and will be administered in a private room by a counselor who is trained to provide family planning and reproductive health services. Counselors will be hired and trained by HSD Consult, and we will enlist the support of the Institute for Reproductive Health (IRH) and K4Health to help us develop training materials, brochures and flyers, and other counseling resources. We will also collaborate with the IRH Rwanda office to assist with the counselor training. Women in the intervention arm will receive a total of four counseling sessions, one comprehensive 90 minute session just after administration of the baseline (within one month) and three shorter 45-minute follow-up sessions that will be spaced out over the one year intervention period. The first session will introduce women to the range of available family planning methods and will counsel women on side effects. At this first session, counselors will also inform women in the intervention arm of the transport service (described above) and side effects management service (described below) that are available to them and will provide women with the necessary information on how to access these services. Counselors will also provide their phone numbers to women and will be on call over the course of the study period to respond to any questions and concerns.
3. *Side Effects Management Component*: In addition to being offered counseling about the risk of experiencing adverse side effects when using various contraceptive methods, women who are assigned to the intervention arm and who experience any side effects due to contraceptive use over the course of the one year intervention period will receive a series of services for the treatment of side effects. Women in the intervention arm will receive a free initial consultation

with a medical doctor, a free referral to a clinic or hospital for any necessary treatment of side effects, and will be financially reimbursed up to an amount of 150,000 BIF ($100.00 USD) for any costs that they may incur as part of their treatment, provided that they can provide a receipt of the expense. More specifically, in the event that a woman in the intervention arm experiences a side effect or contraindication, she may contact a doctor who will be on call via telephone and will receive advice on how she can best seek care. The doctor will conduct a preliminary telephone consultation and will refer the woman over the phone to seek care at their nearest public clinic, public hospital, or the ABUBEF Buyenzi/Jabe Clinics; the doctor on call will not directly provide clinical care (i.e. directly treat) to any woman who approaches them. If a woman is referred by the doctor to seek medical care at a clinic or a hospital, she will be reminded that all costs that she incurs for the treatment of any diagnosed side effects or contraindications at the health facility will be reimbursed up to an amount of 150,000 BIF. Following the referral, the doctor will contact one of the field managers, who will be on-call, to accompany the woman to the clinic using the transport service driver that is hired (see above) and to cover any reimbursable costs that the woman incurs over the course of the clinic visit. Costs for which the woman will be reimbursed include costs of medications and lab tests, costs of additional consultations at the health facility, and costs of switching or discontinuing methods. The maximum reimbursement amount that a woman is eligible to receive for the treatment of any side effects or contraindications is 150,000 BIF over the entire 1 year intervention period. The reimbursement will apply to covering the cost for treatment for side effects for all family planning methods used by the woman and regardless of where the method was procured, provided that 1) the woman is diagnosed by a medical professional at a clinic who can confirm to the field manager that the symptoms that the woman is experiencing are indeed due to contraceptive-related side effects; and 2) the field manager receives receipts, either from the woman or from the clinic personnel, that describe the costs incurred for the side-effects related treatments that are provided.

Finally, all women in the intervention arm will receive a one-time unconditional payment of "emergency travel money" and phone credit in the amount of 15,000 BIF ($10.00 USD) during the first counseling visit from the counselor (see above). This amount is given to all women in the intervention arm, regardless of whether they experience a side effect or not, and is not a part of the 150,000 BIF total reimbursement amount mentioned above. The counselor will suggest that, in addition to the other side effects management services mentioned above, the woman may use the emergency travel money that she is given to cover any transport costs incurred to travel to a health facility where she can receive treatment for her contraceptive-related side effects. In the event of an emergency, in which the woman is unable to wait for the field manager and transport service to take her to the hospital, the woman will be instructed by the doctor to go immediately to the nearest health facility using the emergency travel money given to her and the most available form of transport. The woman will be asked to keep receipts of any costs she incurs at the health facility so that she can be reimbursed later. The field manager who is on call will then follow the woman directly to the clinic. The field manager on call will then be informed of the situation and will follow the woman to the clinic as soon as possible. Upon arriving at the clinic, the field manager will inquire about the woman's status, verify that the woman is indeed receiving treatment for contraceptive-related side effects, pay the clinic for any side effect-related costs of treatment, and reimburse the woman for any additional transport

costs above the emergency travel money amount that she incurred to get to the clinic. The reimbursements for cost of treatment and additional transport costs will be deducted from the 150,000 BIF total reimbursement amount for the woman over the one year intervention period. Receipts and records of all activities and financial transactions will be maintained by the field manager, who will present a full report of the incident to the study team.

All reimbursements for an incurred cost will be distributed as closely as possible to the time that the reimbursable cost was incurred. In the case of an emergency visit to a health facility, any reimbursements may be delayed by a short while (until the field manager can reach the health facility), while in the case of a non-emergency visit, the field manager will be present in the health facility along with the woman who is experiencing the side effect and can therefore allocate the reimbursements immediately and directly.

**Control Arm:**
Women who are assigned to the control arm will receive a package of publicly available literature and information on the benefits of family planning as well as information about their nearest family planning clinic. This information package will be delivered to all women at the time of the baseline interview. Women in the control arm will only be re-contacted by the research team at follow-up.

*Follow-Up*

At the designated one-year and two year follow-up periods (months 25 and 37, respectively), the entire study sample of 2,000 women will be resurveyed with the same survey questionnaire that was initially administered at baseline. Resurveying participants in this manner will enable me to create a panel of individual women in which each woman and household is observed over three time periods. The same protocols regarding data security and confidentiality that were enforced at baseline will be implemented once again for each follow-up survey round.

In each follow-up round, I will collect survey data on short-term, intermediate, and longer-term outcomes of interest, including:
**Attitude/Knowledge of Family Planning**, including: knowledge of family planning; knowledge of birth spacing and timing; and perceptions toward contraception (including intentions to use).
**Contraceptive Use**, including: changes in contraceptive prevalence; changes in method mix; and adherence to methods (compliance, discontinuation).
**Pregnancy and Fertility Outcomes**, including: pregnancy status; parity; delivery in a facility; months since last birth; wantedness of last birth; and intentions to become pregnant in future.
**Child Anthropometric Outcomes**, including child height, weight, and anemia status for all children born after the start of the intervention.
**Women's Anthropometric Outcomes**, including height, weight, and anemia status.
**Women's and Children's Educational Attainment**, including time spent in school; type of school (public or private) attended, and the highest educational qualification achieved
**Weeks Worked, Income, and Women's Employment**, including women's time use (time spent on childcare versus household and income-generating activities) and sources of household income.
**Household Assets and Wealth,** including changes in asset ownership over time.
**Expenditures**, in particular changes in food expenditures and durable expenditures over time.

Outcomes will be collected according to the schedule outlined in Table 7.

**Table 7: Outcome Measures and Instruments**

| **Outcome/Instrument** | Baseline | Follow-Up Year 1 | Follow-Up Year 2 |
|---|---|---|---|
| Attitude/Knowledge of FP | **X** | **X** | **X** |
| Contraceptive Use | **X** | **X** | **X** |
| Pregnancy and Fertility Outcomes | **X** | **X** | **X** |
| Women's Anthropometry (Height, Weight, Anemia) | **X** | | **X** |
| Child Anthropometry (Height, Weight, Anemia) | | **X** | **X** |
| Educational Attainment | **X** | **X** | **X** |
| Formal, Informal Employment | **X** | **X** | **X** |
| Women's Time Use (primary, secondary activities) | **X** | **X** | **X** |
| HH Expenditure, Consumption | **X** | | **X** |
| Household Assets | **X** | **X** | **X** |
| Baseline Survey | **X** | | |
| Year 1 Follow-Up Survey | | **X** | |
| Year 2 Follow-Up Survey | | | **X** |

**Ethical Approvals and Project Funding**

We have received the necessary human subjects approval from the Harvard IRB, the Burundi National Ethics Committee, and the Burundi Ministry of the Interior to conduct the field experiment. Preparations for conducting the baseline survey and for implementing the intervention following the survey will commence in February 2015.

Funding for administering the field experiment over a two year study period has been provided by the Hewlett Foundation, Grant No. 262999. If needed, I will apply to other sources (e.g. Weatherhead Center for International Affairs, Center for African Studies, Harvard Global Health Institute, etc.) for additional funding to cover travel costs and other research-related activity expenses (unanticipated field administration expenses, etc.).

**Dissertation Research Questions**

My doctoral dissertation will examine the following four research questions:

1) The impact of the family planning intervention on immediate outcomes related to family planning, including changes in contraceptive use, method mix, and knowledge.
2) The effects of family planning on fertility outcomes, particularly parity and birth spacing

3) The impact of family planning on intermediate and longer-term maternal and child health outcomes
4) The impact of family planning on economic outcomes, including female labor supply, time use, and household expenditure

All four research questions will be rigorously addressed through findings from this proposed field experiment. To answer these research questions, my dissertation will be comprised of the following three papers:

**Paper 1: The effect of the family planning intervention on contraceptive use**

The first paper will explore the first stage causal effects of the family planning intervention by investigating how improved access to family planning through the intervention impacts individual contraceptive behavior. For the analysis, this paper will use the baseline and the year 1 follow-up surveys to identify these effects. I will determine the level of uptake of the intervention by women in the treatment group by collecting information about women's clinic attendance and any family planning services that women received during their most recent visit. I will also record any reimbursement claims that are made by women for the purposes of treating side effects. Key outcomes of interest include contraceptive adoption and use (particularly for longer term methods), discontinuation rates, method mix, and method switching. In addition, changes in contraceptive knowledge and attitudes towards family planning will be evaluated at the first year follow-up to determine uptake of the information component of the intervention. Findings from this paper will serve as a platform for the other two papers of my dissertation and will help to fill some of the knowledge gaps regarding the role of family planning on use and on uptake in an urban Sub-Saharan African context.

**Paper 2: The effect of the family planning intervention on fertility and health outcomes**

In this paper, I will use data from the baseline and both follow-up surveys to investigate the impact of the intervention on fertility and health. I will assess differences in pregnancy, parity, and birth spacing outcomes between treatment and control groups. Given existing pronatalist attitudes and strong cultural preferences for children in Burundi, I suspect that I might not observe differences in pregnancy rates or changes in parity between treated and control women, particularly over such a short study period; nevertheless, I expect that women in the treatment group will be able to more effectively time and space births, which would impact key maternal and child health outcomes of interest. To identify these health effects, I will record objective measures of child health, including child height, weight, and anemia status, at baseline and at each follow-up survey, and I will also assess changes in maternal health outcomes, as captured by maternal nutritional status. Results from this paper will add to the evidence base by complementing previous experimental and quasi-experimental findings from the Matlab and Navrongo studies.

**Paper 3: The effect of the family planning intervention on economic development outcomes**

My final paper will use data from the baseline and both follow-up surveys to investigate the impact of the intervention on women's labor market outcomes, time use, and longer-term measures of social and economic well-being. I will first examine how women in the treatment and control groups differ in: 1) their employment status, particularly in their employment into formal sectors of the labor market; 2) the time that they allocate to work and income-generating activities relative to childcare; and 3) the overall number of hours that they devote to labor, formal or otherwise. In

addition, I will assess changes in household wealth, consumption, and expenditures on education, health, and other goods and services over time as a means of inferring the effect of the intervention on measures of economic well-being. Findings from this study will: 1) serve to empirically reinforce (or refute) the predominant economic theories of the household, which have described the relationships between fertility, female labor supply, and economic development; and 2) contribute rigorous experimental evidence to the continuing demographic-economic discourse in Sub-Saharan Africa.

**Identification Strategy, Sub-Group Analyses, and Robustness Checks**

The main econometric specification for estimating the intent-to-treat (ITT) effect of our family planning intervention is defined as follows:

$$Y_{it} = \beta_0 + \beta_T FP_{it} + \mathbf{X}_{it}\boldsymbol{\zeta} + \eta_i + \varepsilon_{it}$$

where $Y_{it}$ is the outcome variable of interest for woman $i$ in time period $t = 0,1,2$ for baseline, 1-year follow-up and two-year follow-up respectively, $FP_{it}$ is an indicator of assignment to the treatment arm, $\mathbf{X}_{it}$ is a vector of individual-level covariates that are controlled for in the analysis, $\eta_i$ is the individual-specific fixed effect, and $\varepsilon_{it}$ is the error term. Here, outcome variables of interest include immediate, intermediate, and long-term outcomes mentioned in the previous sections.

I can decompose the reduced regression above into the two stages of the causal chain, instrumenting fertility in the second stage with the family planning intervention treatment arms. I define fertility, as measured by number of births and time since the last birth, as $F_{it}$, and I estimate

$$F_{it} = \gamma_0 + FP_{it}\gamma + \mathbf{X}_{it}\boldsymbol{\zeta} + \eta_i + \nu_{it}$$

which examines the direct effect of family planning on fertility. Provided that there is sufficient variation in fertility outcomes[10], I can estimate the second stage

$$Y_{it} = \delta_0 + \delta_F F_{it} + \mathbf{X}_{it}\boldsymbol{\zeta} + \eta_i + \psi_{it}$$

instrumenting fertility with assignment to the family planning intervention and running a 2SLS model in which predicted fertility from the first stage, $\widehat{F_{it}}$, is used in the second stage.

I will conduct several sub-group analyses in order to examine how the family planning intervention effects vary across particular subpopulations. Subgroups of interest include: pregnant women, new mothers, women who have previously used of family planning, women who expressed a desire to space or limit births at baseline, poorer women, and women with low educational attainment. In addition, I will estimate heterogeneous treatment effects for girls, older children, and high parity households. I will also compare the effectiveness of the voucher intervention relative to the

[10] Fertility in terms of the number of births may not change if women prefer to space rather than limit. I therefore consider both spacing and number of births as our fertility outcomes.

information intervention, and I shall run additional analyses to examine differences in outcomes between these two treatments.

Finally, robustness checks (5 percent and 10 percent sample truncations, coarsening of independent variables) and falsification tests, which include placebo regression, simulation, and resampling methods, will be conducted to ascertain the strength and significance of my estimates.

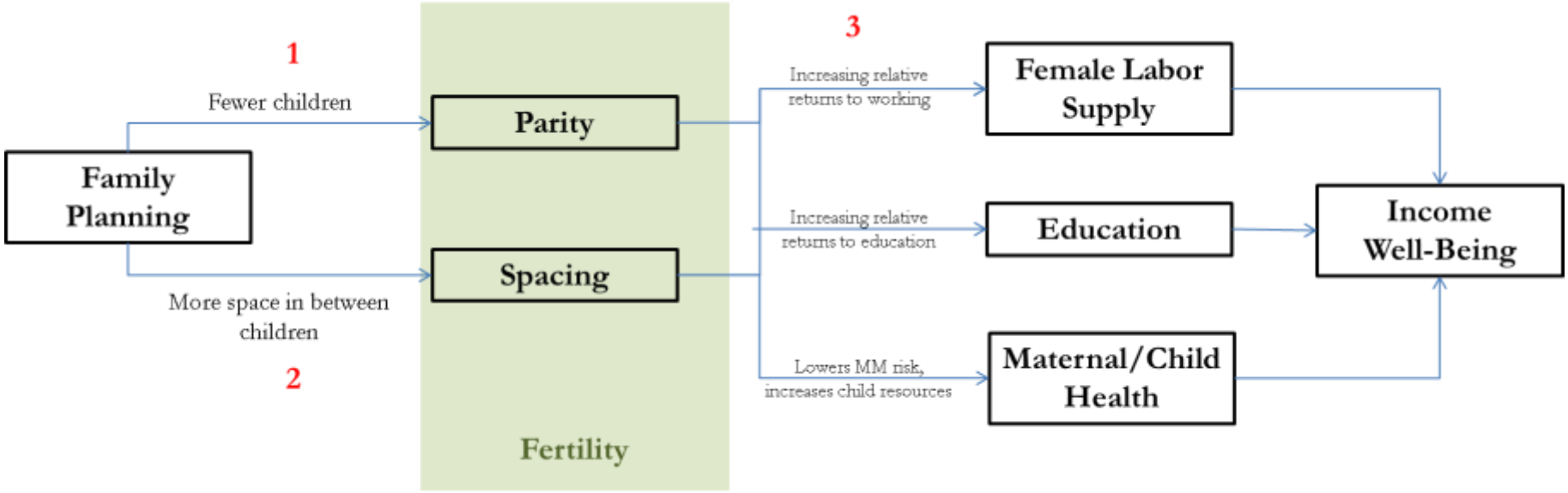
## *V. Potential Findings and Validity Concerns*

*Experimental Predictions*

Based on the theory and model specifications that were outlined previously, I expect to observe one of four outcome paths when assessing the impact of the family planning intervention. For three of these outcome paths, I can use the reduced-form framework (see Figure 3) to provide some key explanations as to why each outcome path below is plausible. The four expected outcomes are:

1. **Outcome Path 1-to-3: Family planning reduces fertility, which leads to increases in female labor supply and educational attainment and improvements in health.** This outcome reflects the standard theoretic predictions of the household models that are outlined above, where parity declines as a result of family planning.
2. **Outcome Path 2-to-3: Family planning does not change parity, but leads to increases in birth spacing, which in turn impacts female labor supply and other downstream outcomes.** This outcome reflects the expectation that parity does not change but birth spacing and age at first birth increases, which in turn affect female labor supply, improve employment outcomes, and contribute to longer-term welfare.
3. **Family planning reduces fertility but does not affect female labor market outcomes, employment, or educational attainment.** Here, it is likely that we do not have the capacity within our study to measure these downstream effects. Alternatively, it may be that women face other barriers to entering the labor market that are orthogonal to family planning and fertility.
4. **Family planning affects neither fertility nor female labor supply, or affects these outcomes in a countertheoretic manner.** In this case, further examination of both the empirical and theoretical predictions need to be undertaken before any reasonable explanations for these observed outcomes are proposed.

**Figure 3: Theoretical Framework Diagram**



*Internal Validity Concerns*

As was described above, a strategic sampling approach will be used to ensure that sufficient physical distance is maintained between women who are selected for the study, which in turn will minimize spillovers that may otherwise attenuate our estimated effect sizes. However, since I only adjust for spillovers across this one specific determinant of proximity (and that too, not perfectly), we may not be able to prevent spillovers that are generated by other unobserved factors[11] that define how information, particularly about family planning and reproductive health, is diffused through social groups in Burundi. To identify the level of discourse around family planning across women in Bujumbura, we shall use results from our pilot study to see if and how women receive reproductive health information from their peers, and we will attempt to incorporate these other social spillovers in our baseline survey by controlling for a woman's sources of information. This adjustment is probably the best that I can do without explicitly mapping out the entire social network, which would be a costly and tedious undertaking.

In recent years, the international community has put family planning back on the map as a key priority area for health funding, and several countries in East Africa, including Burundi, have pledged to improve access to family planning and invest in maternal and child health interventions over the next decade[12]. Although Burundi was identified as a country of interest, no specific commitments have, to date, been made to improve the family planning environment. Nevertheless, the likelihood that such programs will be implemented by other organizations, both governmental and non-governmental alike, in the next few years is high. These external efforts to improve access to family planning may directly compete with the intervention, given that the control group may benefit from these services. Hence, I predict that any treatment effects that I would observe will be attenuated as more external family planning opportunities are made available to the population of interest. That said, the estimated treatment effects will still be internally valid so long as both control and treatment groups are not differentially targeted by these external programs. To control for these competing treatments, I will include survey questions on women's exposure to other programs and will try to adjust for differential exposure in the estimating equations.

Furthermore, low uptake of family planning may lead to difficulty in detecting a difference in outcomes between treatment and control groups. It is possible that other competing factors that I have not accounted for in the causal theory of change might lead to countertheoretic outcomes; for example, I may find that women who are exposed to our intervention have higher fertility rates if they are left with a negative perception of family planning. Additionally, unobserved costs associated with the procurement of family planning as well as skepticism toward the quality of services that are provided by our partner clinic may deter women from taking up the treatment. Unreliable transportation service (e.g. if the driver is delayed or is unresponsive), scheduling conflicts, persistently long waiting times at the clinic, and other implementation failures may also result in low

[11] In particular, factors that capture social distance, network density, and information flows etc.

[12] Commitments amassing to over $2.6 billion were made by governments, donors, and other key stakeholders at the Family Planning 2020 (FP2020) initiative, which was launched in 2012 at the London Summit on Family Planning with the aim of expanding access to family planning information, services and supplies to an additional 120 million women and girls in the world's 69 poorest countries by the year 2020. The 2012 London Summit signaled a renewed interest in reproductive health and family planning, particularly in Sub-Saharan Africa.

take-up, high attrition, and eventual attenuation of the treatment effect size. Finally, there may be several behavioral explanations[13] as to why take-up of and adherence to family planning may be erratic or low over the study period. Most of these behavioral channels are not accounted for in the study design and require a more thorough examination as part of future research.

*External Validity Concerns*

There are several factors that are unique to this study and that may limit the extent to which the study findings can be generalized to other contexts. In choosing Burundi, our study assumes a poor enough reproductive health environment at baseline such that health and development outcomes are likely to be improved with the implementation of our proposed intervention. I must acknowledge that the reproductive health environment in Burundi is unusual in that fertility is relatively high across many key social and economic dimensions of the population, including place of residence (urban versus rural households) and household socioeconomic status. Bujumbura's high total fertility rate, low contraceptive prevalence rate, and high rate of unmet need lead me to believe that I am likely to observe large effect sizes when comparing outcomes between treatment and control groups. This belief is supported by the fact that the three treatment components together would offer the most intensive elements of a comprehensive family planning program. Given these particularities, all estimated effects from this study should be interpreted as upper bounds because a less intensive family planning intervention is likely to be less effective in less extreme environments. The use of DHS and LSMS survey instruments also allows me to better define the bounds of my estimates because I can compare our findings from our Bujumburan study sample to a more nationally representative DHS and LSMS sample; however, any inferences beyond the Burundian context will have to be made with caution.

It is difficult to estimate how relevant the intervention will be for informing family planning programs in other developing countries, given the intensity of the treatment arms and the isolated environments under which our treatments are offered. In many countries, family planning is improved through large-scale, community-based programs that vary by quality and that are often non-differentially implemented by country governments, which limits opportunities for randomized trial evaluation. Moreover, the extent to which such an intensive intervention is capable of being scaled up and sustained over time is questionable, particularly in resource-poor settings. Locally, communities may not feel a sense of ownership over the new program, particularly one that is funded by an outside group, and therefore may be reluctant to use services. To ensure that the intervention will have positive effects, I will need to work closely with local communities to determine the demand for family planning and reproductive health services, which will help to estimate the extent to which services will be used.

[13] For example, information framing effects, procrastination to seek family planning services, cognitive biases that skew women's perceptions of how likely they are to become pregnant or experience side effects, among others.

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