Family Planning, Now and Later: Infertility Fear and Contraception Take-Up

Natalie Bau* David Henning† Corinne Low‡ Bryce Millett Steinberg§

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Abstract

Early fertility is thought to be one of the key barriers to female human capital attainment in sub-Saharan Africa, yet contraception take-up remains puzzlingly low, even among highly-educated populations with healthcare access. We study a barrier to hormonal and long-acting contraceptive uptake that has not yet been examined in the economic literature: the persistent (incorrect) belief that these contraceptives may cause later infertility. This belief creates a perceived tradeoff between current and future reproductive control. We use a randomized controlled trial with female undergraduates at the flagship university in Zambia – a highly-skilled population where education is likely to have particularly high returns – to test two potential interventions to increase contraception use. Despite high rates of sexual activity and low rates of condom-use, only 5% of this population uses hormonal contraception at baseline. Providing a non-coercive conditional cash transfer to visit a local clinic temporarily increases contraceptive use. However, pairing this transfer with information addressing fears that contraceptives cause infertility persistently increases take-up over 6 months. The latter treatment moves beliefs about the infertility effects of contraceptives and leads to the take-up of longer-lasting contraceptives like injections. Compliers are more likely to cite fear of infertility as the reason for not using contraceptives at baseline. IV estimates indicate that eliminating the belief that contraceptives cause infertility would triple contraceptive use.

*UCLA, NBER, & BREAD. Contact: nbau@ucla.edu
†UCLA. Contact: djhenning@ucla.edu
‡UPenn & NBER. Contact: corlow@wharton.upenn.edu
§Brown & NBER. Contact: bryce_steinberg@brown.edu

1 Introduction

Early fertility is common in sub-Saharan Africa (SSA). Across the continent, 60% of women have given birth before age 20 (Ahinkorah et al., 2021). In the United States, the introduction of hormonal contraceptives was instrumental in allowing women to delay their first birth, complete their education, and join the labor force (Goldin and Katz, 2002; Bailey, 2006; Miller, 2010). However, despite increases in access across the region, use of modern contraceptives in SSA remains uniquely low, particularly in nulliparous women. Thus far the literature in economics has typically focused on two explanations for this low take-up: high demand for children and high costs or barriers to access (Pritchett, 1994; Ashraf et al., 2014; Zipfel, 2023). In this paper, we propose a third explanation that, while frequently discussed in the qualitative literature, has not been tested quantitatively or evaluated causally: the (incorrect) pervasive belief that hormonal and long-acting contraceptives make women permanently infertile.

To test this hypothesis, we evaluate a randomized controlled trial designed to increase access to contraceptives and to directly address the fear that hormonal contraception causes later-life infertility. The RCT variation allows us to both identify a relatively cheap intervention that targets the take-up of contraceptives among young women with a particularly high return and to quantify the importance of fear of infertility as a barrier to take-up. We study a population – female college students at the flagship university in Zambia – where take-up of hormonal contraceptives is low despite low self-reported desire for pregnancy, easy access to family planning services, relatively little stigma, and increased access to information. We test two light-touch interventions against an active control group: (1) a non-coercive CCT that pays women a small sum to visit a clinic that provides family planning services and (2) a combined intervention that consists of both the CCT and a presentation that includes both facts about return of fertility after hormonal contraception and personal stories about the return of fertility. The delivery of this information session is designed to facilitate experiential learning. We evaluate the effect of these two interventions on the take-up of hormonal contraceptives and other family planning services using both administrative data from our partner clinic and data on self-reported usage over six months from a high-frequency mobile survey. While both treatments successfully get women "in the door," only the treatment that addresses fear of infertility causes lasting increases in the use of hormonal contraceptives six months later.[1]

Qualitative studies document that fear of infertility is widespread in SSA and that it may hinder the take-up of hormonal contraceptives (Boivin et al., 2020b; Engelbert Bain et al., 2021). Mistrust of Western medicine is common in many low-income countries and can derive from both historical and day-to-day experience. In sub-Saharan Africa, traditional beliefs can often conflict with modern medical advice (Ashraf

[1]Throughout this paper, we define hormonal contraceptives as the pill, injection, IUD, and implant. This is with some abuse of terminology since we include the copper IUD as a hormonal contraceptive even though it is not hormonal.

et al., 2017; Lowes and Montero, 2021).[2] Fear of contraceptives may be particularly salient, as SSA was subject to forced sterilization campaigns and the distribution of harmful early contraceptive devices such as the Dalkon Shield, which *did* cause infertility, miscarriages, and even death (Connelly, 2010). In addition, secondary infertility in SSA is extremely high, likely due to a variety of factors, such as maternal morbidity and untreated sexually transmitted infections. If unprotected sex is correlated with both contraception use and STI infections, there could be a misattribution of later fertility problems to contraception use when, in reality, untreated STIs are to blame. Lastly, a large literature outside of economics shows that infertility can be particularly costly in SSA. In addition to well-documented psychological costs,[3] infertility can disrupt marriages through divorce, extramarital affairs, or polygyny (Dierickx et al., 2018; Araoye, 2003). If women rely on husbands for economic support, and men value having children, then limited future fertility could harm women not just personally, but also economically.[4] Thus, Zambian women may believe that there is a tradeoff between controlling their fertility now (by reducing unwanted pregnancies) and the ability to control their fertility in the future (to achieve a desired pregnancy).

We study the relationship between fear of infertility and hormonal contraceptive use in a particularly interesting population: female undergraduates at the University of Zambia (UNZA), Zambia's largest and oldest university. The experiences of these students challenge the standard explanations for low contraceptive use in SSA. Their use of hormonal contraceptives is extremely low, despite the lack of traditional barriers to take up or the lack of desire for pregnancy. At baseline, 5% of women in our sample are using a hormonal contraceptive. This is not because of a lack of sex; at baseline, 60% of our sample is sexually active, and 18% have had sex in the previous two weeks. Women are also not substituting barrier methods for hormonal contraceptives: 39% of sex over the course of our study is reported as condomless, and 6% of our sample report having ever been pregnant. It is also not due to a desire to become pregnant now, as women report a low desire to become pregnant across a variety of measures in our survey. No women report not using contraceptives because they would be ok with becoming pregnant right now. When those who had had sex in the last two weeks were asked why they were not using contraceptives, 50% reported fear of side effects or infertility, while only 8% reported cost or access as a barrier to usage. In our control group, 65% of respondents believe at least one form of hormonal birth control causes infertility. Because of these women's high levels of education and the availability of quality medical care in the capital, we expect, if anything, that they are less susceptible to (incorrect) fears about the infertility effects of contraceptives than most young women in SSA.

[2] Ashraf et al. (2020) addresses another traditional belief around childbearing in Zambia–that maternal mortality is caused by promiscuity–and finds that targeted informational treatments impact fertility.

[3] See, e.g, Alhassan et al., 2014, Olarinoye and Ajiboye, 2019, Naab et al., 2019, and Donkor et al., 2017.

[4] The literature in developed countries has shown that fertility can be thought of as "reproductive capital," which has economic value (Low, forthcoming-a; Low, forthcoming-b)).

We partner with UNZA and a local public clinic to test the two interventions relative to an active control. All three arms, including the control, attended a workshop led by the same two young, Zambian women where participants received information about the partner clinic and its services, as well as a "guaranteed no wait" card that could be used there. In addition, the "non-coercive CCT," or "voucher" treatment, paid women a small fee to visit the local, off-campus partner clinic. This treatment is designed to reduce access and informational costs and to address common behavioral biases that might limit the take-up of preventative health-care, such as procrastination. The "fertility" treatment, which also includes the CCT, is designed to provide information persuasively through a variety of techniques – facts, experiential learning, and personal testimonies – with the goal of reducing the perceived infertility risk of contraceptive use. The personal testimonies in particular may help disrupt an equilibrium where no young women use contraceptives, and therefore, young women never observe women using contraception and successfully conceiving, allowing incorrect beliefs to persist.[5]

To measure the effects of the treatments, we collect two complementary data sets. The first was collected in collaboration with our partner clinic and provides us with administrative information on visits to the clinic and take-up of services, including hormonal contraception. The second is a mobile phone survey that is sent to participants every two weeks for up to 6 months following the intervention. These data allow us to measure contraceptive usage over time, as well as sexual activity, condom usage, partner characteristics, and pregnancies. Thus, while the clinic data ensures we can measure take-up at the clinic with no attrition, the survey data allow us to identify both persistent effects and unintended consequences of the treatments.

Both the CCT and fertility workshop encourage students to visit our partner clinic at roughly the same rate (53.2 vs. 50.0 p.p. more than control). However, what students request and how they behave after visiting the clinic are dramatically different between the two groups. In the CCT-only treatment, use of hormonal contraceptives increases in the initial survey, but the effect fades out one month after treatment. In the fertility treatment, even though the treatment is relatively light touch, the effects are remarkably persistent. There is a 3.3 p.p. (37.5%) increase in hormonal contraceptive usage throughout the 6 months after the intervention. Across time, the fertility effect is largely driven by students taking up hormonal injections and oral contraceptives, and the effect does not significantly decline over six months. Thus, the fertility effect cannot be explained by participants simply taking up a hormonal injection initially; for effects to persist, participants would have to receive another shot. Finally, we do not find any evidence of unintended negative consequences. There are no effects on actual condom usage in encounters, number of sexual partners, or likelihood of having sex, suggesting that "risky" sexual behavior did not change as a

[5]See Bursztyn et al. (2020) for another example of incorrect beliefs with important consequences for decision-making persisting in equilibrium.

consequence of the interventions.

Several additional pieces of evidence support our interpretation that the effect of the fertility treatment is driven by changing the expected costs of taking up contraceptives due to changing the perceived threat of infertility. First, in our survey data, women in the fertility group are substantially less likely to believe contraceptives cause infertility, indicating that the intervention did successfully change beliefs. Second, compliers in the fertility information treatment are significantly more likely to cite fear of infertility/side effects as a reason for not using contraceptives at baseline. Third, a complementary follow-up randomized experiment provides suggestive evidence that informing participants that STIs cause infertility also increases the take-up of STI testing, further underscoring the importance of fear of infertility for healthcare decision-making.

Finally, we use the RCT variation to quantify the importance of fear of infertility as a barrier to contraceptive use in SSA. We use the fertility treatment as an instrument for the belief that contraceptives cause infertility and estimate the effect of this belief on take-up. Even in the population of women at UNZA, who are likely more informed about and have better access to information than the general population, fear of infertility is a very significant barrier to take-up. Eliminating the belief that hormonal contraceptives cause infertility entirely would increase contraceptive use by 18 percentage points, nearly tripling the usage in the control group. This effect is all the more sizable given that a large fraction of our study population is not sexually active. In line with the qualitative literature, fear of infertility is a major barrier to contraceptive take-up in SSA.

This paper contributes to three literatures. First, it adds to the literature on the determinants of contraceptive use and fertility in SSA. Most studies on contraceptive take-up in low-income countries have focused on married women who already have children (Phiri et al., 2015; Scott et al., 2015; Barham et al., 2021; Ashraf et al., 2014; Glennerster et al., 2022). Even the smaller literature that focuses on young women typically considers barriers related to access and often finds little effect of removing these barriers on use (Rivera et al., 2001; Bankole and Malarcher, 2010; Shah et al., 2022). In this paper, we draw on insights from the growing literature on the importance of traditional beliefs (Ashraf et al., 2020) and medical distrust (Lowes and Montero, 2021; Alsan and Wanamaker, 2018; Blair et al., 2017) to better understand the puzzle of low contraceptive take-up in a setting where access is unlikely to be a barrier and shed light on why interventions that have focused exclusively on making access cheap or free have often been ineffective. While qualitative and descriptive work have pointed to the importance of fear of infertility as a barrier to take-up (Boivin et al., 2020a), to our knowledge, we provide the first causal evidence that this is the case and show that the effects of fear of infertility on take-up are quantitatively meaningful.[6] Critically, we also show that

[6] Glennerster et al. (2022), test the effect of radio messaging about contraception on usage in Burkina Faso. Their messaging

these beliefs can be changed, leading to a lasting, meaningful increase in contraceptive usage.

Second, it speaks to the growing literature on the economic value of fertility as "reproductive capital," as women in this context are willing to risk an unwanted pregnancy now in order to (in their perception) preserve their ability to have children in the future (Gershoni and Low, 2021a; Buckles, 2007; Abramowitz, 2017; Gershoni and Low, 2021b).

Third, this paper adds to the larger literature on the design of demand-side interventions to increase the take-up of healthcare in the low-income countries. Much of this literature has focused on subsidies, which have been used to increase the take-up of vaccines, bed nets, and HIV testing (Banerjee et al., 2010; Cohen et al., 2015; Thornton, 2008), but such policies can also be expensive and distortionary if they lead to take-up by those with low benefits.[7] Information, on the other hand, could increase take-up efficiently specifically among those who are "making mistakes." A growing body of work has shown the promise for well-targeted informational interventions to change beliefs and behavior in other contexts (see Jensen (2010) on education, Bursztyn et al. (2020) on female labor force participation, and Ashraf et al. (2020) on pregnancy). On the other hand, changing beliefs is often difficult, limiting the success of such interventions. Intriguingly, we show that fears of infertility can be addressed and that doing so, as opposed to subsidies or other distortionary policies, provides a way to efficiently increase take-up, increasing it specifically among young women for whom the benefits of take-up outweigh the true costs. In turn, these findings point to tools that could be used to increase the efficient take-up of other health care, like vaccines, where incorrect beliefs about side effects are an important barrier to take-up.

Our results are also of direct interest to policymakers. Evidence from the rollout of modern contraceptives to young, nulliparous women in the US indicates that birth control can play a key role in delaying fertility and increasing women's educational attainment and labor force participation (Goldin and Katz, 2002; Bailey, 2006; Bailey et al., 2012; Miller, 2010). Thus, increasing contraceptive take-up during the critical period of early adulthood can help set young women on a better life trajectory – delaying childbearing and marriage, increasing education, and facilitating entry into the labor force. This is not just true for tertiary education; pregnancy is also the leading driver of female dropout in secondary school in sub-Saharan Africa. Yet, little is known about how to increase contraceptive usage among young women in this critical period because NGOs and policymakers typically focus on easier-to-reach older women who already have children. This paper addresses this question by studying which barriers to take-up are important among young women seeking to continue their education. To the extent that the college-going population we study is better-educated than

includes information about the effects of contraceptives on fertility, but this messaging is bundled with many other pieces of information, and thus it's impossible to discern the separate effect of the fear of infertility in their setting.

[7]More recently, other demand side interventions have shown the promise of non-pecuniary incentives, such as social signalling, to increase the use of preventative healthcare (Karing, 2023).

the secondary school population, fears of infertility are likely to be a *smaller* barrier to contraceptive usage for this group. Thus, the estimates of the effect of the fertility intervention are likely to be a lower bound for the secondary school population, which is difficult to directly study for ethics reasons.

The paper proceeds as follows. Section 2 describes the context of the study, including the socioeconomic status, degree of under-utilization, and infertility fears in our study population. Section 3 discusses the experimental design, while Section 4 describes the data used to evaluate our interventions. Section 5 presents our empirical strategy, Section 6 describes the results, Section 7 discusses threats to the validity or interpretation of the results, Section 8 provides evidence on mechanisms, Section 9 quantifies the importance of fear of infertility as a barrier to contraception take-up, and Section 10 concludes.

2 Context

2.1 Sample Characteristics

SSA has experienced a rapid increase in tertiary enrollment, with the share of women enrolled almost doubling from 5% in 2007 to 9% in 2020. Thus, this is an increasingly important population throughout the continent. The University of Zambia (our study setting) does not collect information on dropout due to pregnancy or even dropout more generally. Instead, we draw on our survey data (see Section 4 for more details on the data collection) to paint a richer picture of the lives of female, Zambian college students. Table 1 reports summary statistics from our survey. While college students in SSA are often viewed as elites, our survey suggests that financial disadvantage is common, consistent with the growing share of the college population. Sixty-seven percent of students receive financial aid from the government, and while 40% are from the relatively wealthy capital city of Lusaka (where the university is located), 60% are from other regions. Thirty-two percent are first generation college students, and 14% would have to resort to taking out a loan if they needed 1,000 Zambian Kwacha (52 USD) rather than relying on family help, employment income, or savings. Altogether, while some college students are from an urban, highly-educated background, many others are socioeconomically vulnerable.

Table 1 shows that most women in our sample are sexually active. At baseline, we ask women both whether they have ever had sex and whether they have had sex in the previous two weeks. Then, over the course of the survey, we ask every two weeks whether they have had sex in the previous two weeks. At baseline, 60% of women had had sex, and 18% had had sex in the past two weeks. For a subsample that we follow for 6 months, 53% report having sex at least once during the survey period.[8]

[8]This number differs from Panel B of Table 1 because Panel B includes the full sample, some of whom we observe for a shorter period.

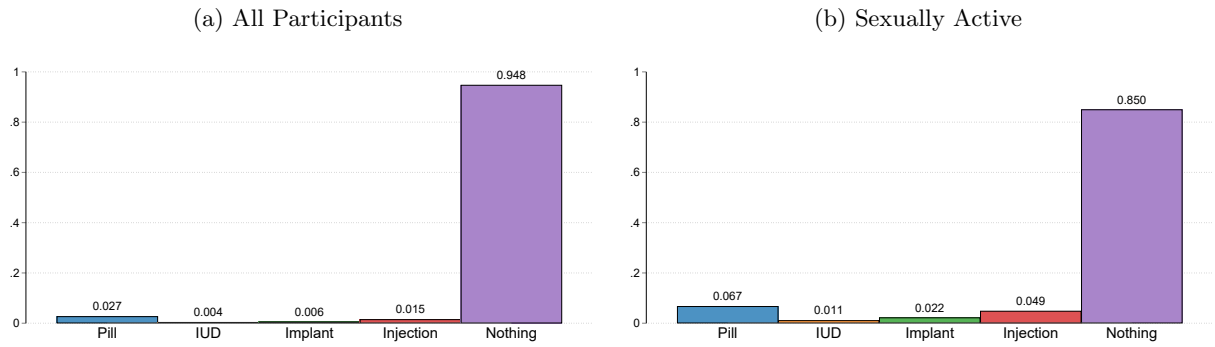
Table 1
Summary Statistics From the Survey Data

	Mean (1)	Std. dev. (2)	N (3)
Panel A- At Baseline			
First generation college student	0.319	0.466	1489
Desired level of education: Undergraduate degree	0.166	0.372	1494
Desired level of education: Postgraduate degree	0.831	0.375	1494
From Lusaka	0.398	0.490	1456
Has family in Lusaka	0.939	0.239	1487
On government bursary	0.666	0.472	1495
Would take out a loan if they needed a 1,000 kwacha	0.141	0.348	1487
Ever had sex	0.597	0.491	1482
Does not use any contraception	0.563	0.496	885
Had sex in the last two weeks	0.178	0.383	1492
Number of partners in the last two weeks	1.033	0.200	269
Ever been pregnant	0.062	0.241	1492
Uses a hormonal contraceptive	0.053	0.224	1492
Does not use a hormonal contraceptive due to fear of infertility/side effects	0.247	0.432	1396
Does not use a hormonal contraceptive because using condoms	0.180	0.384	1396
Does not use a hormonal contraceptive because ok with pregnancy	0.001	0.038	1396
Knows about the pill	0.802	0.399	1491
Believes the pill causes infertility	0.547	0.498	1191
Knows about the injection	0.479	0.500	1491
Believes the injection causes infertility	0.462	0.499	705
Knows about the IUD	0.359	0.480	1491
Believes the IUD causes infertility	0.340	0.474	529
Knows about the implant	0.441	0.497	1491
Believes the implant causes infertility	0.419	0.494	647
Panel B- Over Study Period			
Had sex	0.538	0.499	1495
Age gap between partner and student	4.025	3.058	792
Share of sex that was condomless	0.385	0.405	800
Had condomless sex at least once	0.309	0.462	1491
Had sex without any contraception at least once	0.262	0.440	1491
Number of unique partners	0.762	0.983	1491

Notes: This table reports summary statistics from mobile surveys of participants. Panel A reports statistics from the baseline survey, and Panel B reports statistics from all the subsequent surveys, which occurred every two weeks. 'Had sex,' 'Had condomless sex at least once,' and 'Had sex without contraception' are individual-level indicator variables that equal 1 if a participant reported engaging in these behaviors at least once across the surveys. 'Number of unique partners' counts the total number of unique partners a woman reports across the surveys. The variables 'Share of sex that was condomless' and 'Age gap between partner and student' are the individual-level averages over data collected on all encounters over the study period.

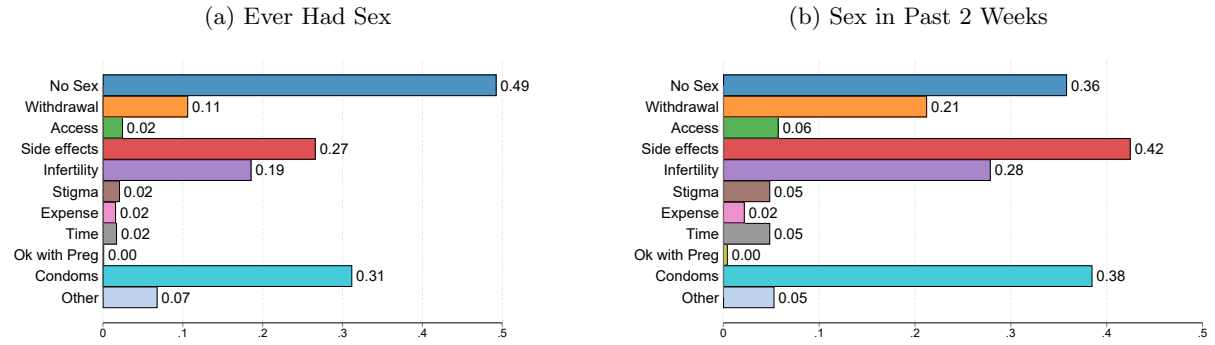
Despite high rates of sexual activity, very few women use hormonal contraceptives. In Figure 1, we report the percent of women using each type of hormonal contraceptive: IUD, shot (such as Depo-provera), oral contraceptive pills, and the contraceptive implant (such as Jadelle), both for all women and women who have ever had sex. In the full sample, 2.7% are using the pill and 1.5% are using the injection. Very few participants report using the implant or IUD (0.4% and 0.6%, respectively). The percent of women using hormonal contraception is higher among those who have had sex, at 9% but still relatively low given their risk of pregnancy.

Figure 1
Baseline Hormonal Contraceptive Use



Notes: This figure shows the percent of students using a hormonal contraceptive (IUD, shot, pill, or implant) in the baseline survey data. Panel A reports results for all participants (N = 1492), and Panel B reports results for all participants who had ever had sex at baseline (N = 891).

Figure 2
Self-Reported Reasons for the Non-Use of Hormonal Contraceptives at Baseline



Notes: This figure shows reported reasons given by participants for not using hormonal contraceptives in the baseline survey data. This question was asked of all participants who did not report currently using a modern contraceptive (IUD, shot, pill, or implant) at baseline. Reasons were not mutually exclusive; participants could choose more than one option. Panel A reports results for participants who had ever had sex at baseline (N = 891), and Panel B reports results for all participants who have had sex in the past two weeks at baseline (N = 265). "Condoms" indicates participants don't use hormonal contraceptives because they use condoms, and "no sex" indicates that participants self-report that they do not use hormonal contraceptives because they don't have sex.

One possibility is that women do not use modern contraceptives because they are using barrier methods,

which have the advantage of also protecting against HIV and other STIs.[9] However, in Figure 2, we display the reported reasons for the non-use of hormonal contraceptives among those who did not use hormonal contraceptives at baseline. Only 31% of sexually active women report using male or female condoms as a reason for non-use (38% of those who have had sex in the last two weeks). Of these, only 44% actually consistently use condoms in all of the sexual encounters reported in our survey. Furthermore, 13% of sexually active women report using a traditional method for pregnancy prevention, such as withdrawal or timing. While these methods can be somewhat effective in preventing pregnancy, they are less effective than hormonal contraceptives and – like condoms – rely on partner cooperation. Indeed, one reason for the relatively low rate of condom use in this population may be that women have limited bargaining power with partners who are often older and provide financial support.[10] In Appendix Figure A1, we show that condom use is indeed lower with older partners, consistent with the literature (Dupas, 2011).

Finally, we consider whether low contraceptive use in this population could be due to a high desire for children, as has been hypothesized in SSA more broadly (Pritchett, 1994). We ask women in a variety of ways about their desire to have children, both now and in the future. Women do report a desire for children in the future. When asked out of 100 how important it is to have children, more than a quarter of respondents inputted 100, and the 50th percentile was 78. Only 6.9% of women report not being sure if they want children at all.

However, across a variety of questions, almost no women report a desire to get pregnant now. In Figure 2, no women report that they are not currently using contraceptives because they are OK with becoming pregnant right now. We also ask women whether they want to become pregnant right now. In response, 94% report they "somewhat don't want," "don't want," or "don't want at all." In response to questions about the "ideal timing of motherhood," 92% of women report that they want to wait until graduation (or later) to have children. Taken together, these questions demonstrate that women in our sample *do* desire children at some point, but they are not interested in becoming pregnant during their studies.

The descriptive statistics above suggest that women would like to delay pregnancy, but at the same time, take-up of hormonal contraceptives (and even condoms) is low. Perhaps the strongest evidence that women are not adequately preventing pregnancies is that many pregnancies occur in this population. At baseline, 6% of women report ever having been pregnant. Over the course of our survey, among the women we follow for 6 months, 34 (3%) report any positive pregnancy test. This is a (very high) hazard rate of pregnancy of about 0.5% per month in the full population and 1% among those who are sexually active.

Appendix Figure A5 reports the outcomes for each of the 34 self-reported pregnancies. In line with a

[9] This may be particularly relevant in Zambia, where HIV prevalence among women 15–49 is 13% (CDC, 2022).

[10] On average, partners are 4.03 years older than respondents, and 64.67% have provided cash or paid school or housing fees.

low desire for children right now, more than one-third are reported as ending in abortions, while another one-third are self-reported miscarriages or "false positives" (which may capture both actual abortions and chemical miscarriages that occur early after a positive pregnancy test). In the remainder of cases, women either remained pregnant throughout the rest of the data collection period or gave birth. Thus, unplanned pregnancies either result in early births, which are likely to derail young women's educational trajectories, or abortions, which are psychologically costly and expose young women to medical complications (Qureshi et al., 2021).[11]

2.2 Fear of Infertility

Having established that young women appear to underutilize contraceptives at UNZA and that this underutilization is costly, we provide motivating evidence that fear of infertility may play an important role in explaining this puzzle. As seen in Figure 2, 28% of women who have had sex in the last two weeks at baseline and are not using modern contraceptives report fear of infertility as their reason for not doing so (19% of those who have ever had sex). Another 42% of women report "side effects" as a reason for non-use (27% of those who have ever had sex). In our qualitative work, we found that typically when women say that they fear side effects, they are primarily referring to damage to their reproductive system, not things like weight gain or mood swings. Consistent with this, Table 1 reports the baseline probabilities that women believe that various contraceptive methods cause infertility (conditional on knowing about these methods). The percentages are similar across methods, and range from 34% for the IUD to 55% for the pill.[12]

To capture whether participants believe infertility will lead to other negative consequences, at onboarding, we randomly asked half the participants how many married couples out of 10 would still be married in 2 years. We asked the other half of the participants how many couples who could not conceive would be together in 10 years. We asked these questions to different (randomly selected) samples to avoid priming respondents to think fertility matters. On average, respondents believed that 61% of couples would be together when no information was provided on fertility outcomes but that only 48% would be together in cases where the couple could not conceive (these are highly statistically significantly different responses with a t-stat of 11). In Table A1, we estimate the association between these beliefs and reporting not taking up contraceptives due to fear of infertility/side effects.[13] The belief that infertility has negative socioeconomic consequences

[11] While abortion is nominally legal in Zambia, the interpretation of the law is ambiguous (Haaland et al., 2019), some providers will not provide abortions, and historically, there have been hurdles and costs (such as buying one's own anesthesia) to acquiring a legal abortion in a hospital (Castle et al., 1990). The rate of unsafe abortions is estimated to be relatively high at 7% annually. Even among abortions performed at hospitals, the rate of complications as measured by abortion-related near-misses and mortality in Zambian hospitals is high, even relative to other restrictive contexts (Owolabi et al., 2017).

[12] The smaller share for the IUD may reflect the fact that a smaller percent of our sample knew about the IUD, so respondents to this question are particularly well-informed.

[13] In line with our focus groups, we pool women who report not taking up contraceptives due to fear of side effects with those who report not taking them up due to fear of infertility.

correlates with choosing not to use contraceptives due to fear of infertility. Among those that were asked about the number of couples staying together if no child was conceived, reporting 1 fewer couples staying together is associated with a statistically significant 1.5 percentage point (6%) increase in the likelihood of reporting not using contraceptives due to fear of infertility or side effects. In contrast, in the sample where there was no information on conceiving, there is no relationship between expectations about couples staying together and not taking up contraceptives due to fear of infertility. This is consistent with students who expect infertility to have more negative consequences later in life choosing not to take up contraceptives, which they believe cause infertility, today.

Observational evidence suggest these students' fears of infertility causing marital discord, which can in turn have substantial economic consequences, are indeed reasonable. Based on focus groups showing that women who became infertile often received lower support from their spouses, we fielded a survey between 2014 and 2016 to measure the connection between infertility and marital outcomes with a sample of married women in Lusaka, ranging from 17 to 44. (The survey questions were added to the baseline survey for Ashraf et al. (2020)). The survey measured whether women had been diagnosed with infertility or experienced medical events tied to infertility, such as hysterectomy, and then measured the quality of their relationships with their husbands, as well as how they paid for daily living expenditures. Table 2 reports the results. All regressions control for age and age-squared, since infertility increases with age, as well as a own overall health, to avoid confounding from negative factors associated with poor health generally, as opposed to reproductive health specifically. The table shows that infertility is associated with a large increase in divorce fear, threats of violence and violence, and marital unhappiness. Women who are infertile experience around 45% more divorce worry and 0.07 sd greater marital unhappiness, 30% more threats of violence, and 70% more actual violence. Turning to expenditures, women reporting signs of infertility are more likely to rely on their own funds, familial support, or borrowing for basic expenditures, like children's food, children's clothes, and shelter. All coefficients are positive, and an index summarizing the coefficients is significant with a coefficient of 0.156 sd and a p-value of 0.037. Respondents experiencing infertility are 35% more likely to use own sources of money for children's food, 65% for children's clothes, and 26% for shelter. With the caveat that these regressions are descriptive, infertility is associated with substantially worse marital outcomes, and in turn less economic support from spouses.

3 Experimental Design

In this section, we discuss the design and timing of the workshops, as well as our subsequent data collection and key outcome variables.

Table 2
Marital Outcomes & Infertility

Panel A —Marital outcomes

	Worries husband will divorce (1)	Husband threatens violence (2)	Husband uses violence (3)	Marital unhappiness (4)
Infertility	0.09**	0.10**	0.08*	0.07**
	(0.04)	(0.05)	(0.05)	(0.03)
N	885	902	901	888
R-squared	0.02	0.01	0.01	0.01
Control mean	0.15	0.31	0.29	0.07

Panel B —Money provision outcomes

	Uses own money, family's money, or borrows for...							
	Health-care (1)	Child healthcare (2)	Child education (3)	Child food (4)	Child clothes (5)	Shelter (6)	Parental support (7)	Summary index (8)
Infertility	0.01	0.01	0.01	0.06***	0.05**	0.04***	0.02	0.16**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.03)	(0.07)
N	892	892	892	892	892	892	892	892
R-squared	0.01	0.01	0.01	0.02	0.02	0.02	0.04	0.03
Control mean	0.05	0.03	0.04	0.02	0.05	0.01	0.08	0.00

Notes: Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$. All columns include controls for age; the square of age; and a four-valued self-health variable ranging from 1 ("Poor") to 4 ("Excellent"). The sample consists of married women between the ages of 17 and 44 from the surrounding areas of Lusaka, Zambia. Data were collected between 2014 and 2016. For more information on data collection, see Ashraf et al. (2022). The infertility indicator is constructed from medical variables correlated with infertility which include early menopause, a hysterectomy, sterilization, an obstetric fistula, or being told by a healthcare worker that you are infertile. Women who report any of the medical signs of infertility are given "treatment value" of 1, which applies to 12% of the sample. "Control" women report no medical signs of infertility and receive value 0. Marital unhappiness is measured from the question, "How happy are you with your marriage?" Responses are on a five-point scale ranging from being very happy and content to very unhappy and discontent in one's marriage, which we use to create a binary measure valued 1 if the respondent answers "somewhat unhappy" or "very unhappy or discontent". For the expenditure question, women are asked where they get money for various expenditures. Options include their own money, asking their family for money, borrowing, or using their husband's, husband's family's, or housekeeping money. Responses are coded as 1 if she uses her own money, her family's money, or borrows.The summary index is created following the procedures developed in Kling et al. (2007) – see p.90 and Footnote 11 – and represents an average measure over the seven money provider variables shown individually in the table. The summary index is the equally weighted average of the z-scores of each of the money provider variables, which are computed by subtracting the control group mean and dividing by the control group standard deviation. For observations with at least one response to the set of money provider variables, missing responses for other variables in the set are replaced with the observation's group (control or treatment) mean.

3.1 Recruitment, Randomization, and Timeline

We conducted a randomized controlled trial with female, full-time undergraduate students between the ages of 18 and 25 at the University of Zambia (UNZA) in Lusaka, the capital city of Zambia. We contacted 2,615 potential participants at UNZA between August 2022 and April 2023 and invited them to participate in the study. Invitees were recruited using a variety of different strategies, ranging from e-mails to in-person recruitment.[14] During recruitment, students were asked whether they were interested in attending a workshop (all study arms attended on-campus workshops) to learn about women's health. Students were informed that the workshop was part of an academic study and that they would receive airtime for their participation in the workshop and subsequent data collection.

If students expressed interest and passed our exclusion criteria (they were enrolled at UNZA and between 18–25 years old), they were provided with a link to sign up for an on-campus workshop. Workshops took place for all treatment arms, but the content of the workshop depended on the treatment. The link randomly assigned them – using Qualtrics internal randomization – to one of three groups: Control, CCT, or CCT & fertility information. Once students clicked the link and entered their information, they could not sign up again. They also could not see what workshop times were available before entering their information, making it impossible to coordinate workshop attendance with friends. Upon randomization, the workshop times for a student's treatment group were displayed, and students were free to pick any available workshop.[15] If none of the times worked for the participant, she received a text message when new workshops were available. Similarly, if a student signed up but missed her workshop, she was invited to sign up for other workshops via text message and then follow-up phone calls. Students' identities were verified with student IDs when they arrived at workshops, so students could not attend a different treatment than they had been assigned to or attend multiple workshops.

To be included in the study, invitees had to attend their assigned workshop during which students provided informed consent and baseline data were collected. Out of the 2,615 invitees, 1508 ultimately attended a workshop and consented to participate in the study: 508 Control, 486 CCT, and 514 CCT & fertility information. While students were informed that different workshops might have different content and that workshop assignment was completely random, they did not know their assignment until they arrived at the workshop. The experimental design and timeline of the study are shown in Figure 3.

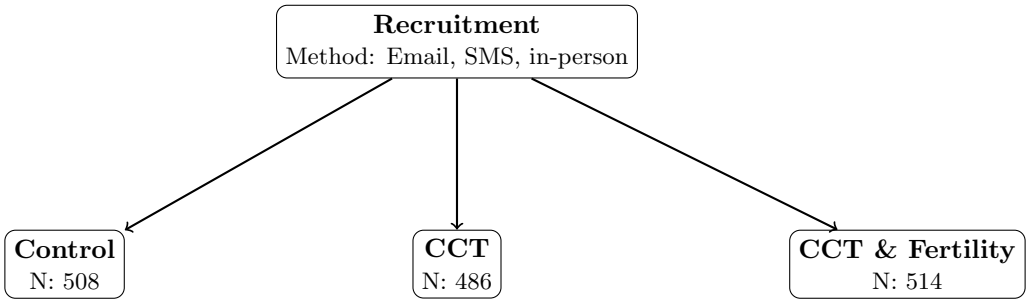
There were two recruitment drives whose dates align with two terms of the academic calender. The first was from July to November 2022, and the second was from February to April 2023. Two drives were

[14] From August to September, participants were recruited via e-mail, text message, and calls. Afterwards, we switched to an in-person recruitment strategy on UNZA campus. From late February onwards, we also recruited participants by visiting on-campus dormitories.

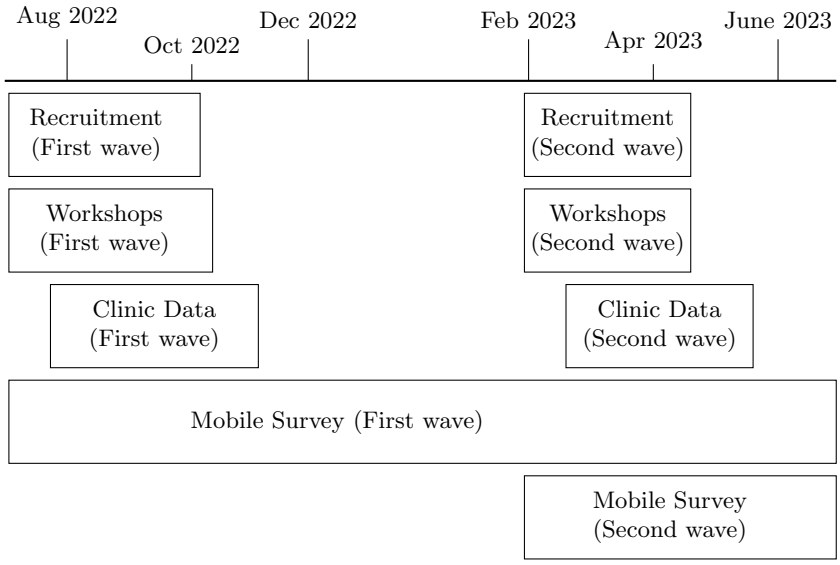
[15] We limited each workshop to 40 sign-ups, but in practice, this was non-binding.

Figure 3
Experimental design and Timeline

Panel A: Experimental design



Panel B: Timeline



Notes: This figure provides details on the number of participants in each treatment group and the timeline of the study.

necessary to achieve the desired sample size of ∼1,500, which was based on initial power calculations. During the first term (July to November 2022), we recruited 1,170 participants. For this first wave sample, we have six months of follow-up survey data (details below). During the second term (February to April 2023), we recruited an additional 338 women to hit our target of 1,500. For budgetary reasons, data collection ended for this group at the same time as in the initial sample. Hence, while we have complete clinic data (described below) for the the second wave sample, we only have survey data for these 338 students for 1.5 months after the workshop.

3.2 Balance

Table 3 reports average values of baseline observable characteristics for the control group, as well as the coefficients from regressions of those characteristics on the treatment variables (relative to the control). The majority of the baseline variables are balanced, but two characteristics are significantly different at the 5 percent level. First, students in the CCT group are 2 percentage points less likely to be married than students in the control group. This difference is small in magnitude and also reflects a small number of observations since marriage is extremely rare in this sample. Second, students in the fertility treatment are 6.7 percentage points less likely to have had sex at baseline. Given that we are running 24 regressions – 12 for each treatment arm – these statistically significant differences are likely to occur by chance. Consistent with this, the p-value for a joint test of whether the covariates predict whether a student is in the CCT group relative to the control is 0.593, and the same F-test for the fertility group has a p-value of 0.402. Nonetheless, to the extent that students who are sexually active and unmarried are more likely to be interested in contraceptives, this is likely to bias our treatment effect downwards.

Table 3
Summary Statistics and Balance

	Control		CCT vs Control		Fertility vs Control	
	Mean	Std. dev.	Coeff	Std. err.	Coeff	Std. err.
	(1)	(2)	(3)	(4)	(5)	(3)
General						
Age	21.238	(1.732)	−0.127	(0.109)	−0.141	(0.106)
Year at UNZA	2.219	(1.051)	−0.077	(0.065)	−0.032	(0.065)
Are you married?	0.024	(0.152)	−0.020***	(0.007)	−0.000	(0.009)
Sex and Pregnancy						
Number of pregnancies	0.101	(0.408)	−0.037*	(0.022)	−0.031	(0.024)
Number of children	0.045	(0.235)	−0.016	(0.013)	−0.008	(0.015)
Ever had sex	0.620	(0.486)	−0.003	(0.031)	−0.067**	(0.031)
Sex in past two weeks	0.183	(0.387)	0.003	(0.025)	−0.020	(0.024)
Contraceptive usage						
Using any modern contraceptive	0.065	(0.247)	−0.024*	(0.014)	−0.014	(0.015)
Using the pill	0.030	(0.169)	−0.007	(0.010)	−0.000	(0.011)
Using IUD	0.004	(0.063)	−0.002	(0.003)	0.002	(0.004)
Using an implant	0.008	(0.088)	−0.002	(0.005)	−0.004	(0.005)
Using an injection	0.024	(0.152)	−0.013	(0.008)	−0.012	(0.008)
P-value (joint F-test)				0.593		0.402

Notes: This table reports summary statistics for students in the control group, in addition to the estimated difference between each of the treatment arms and the control group. To arrive at the values in Columns 3–6, the row name characteristic (collected in the baseline survey) is regressed on an indicator for whether the student is in the relevant treatment group using a sample that only includes the relevant treatment group and the control. The final row regresses an indicator variable for whether the student is part of the indicated treatment arm on all the baseline characteristics displayed here and reports the p-value of a joint test of significance on all the covariates. Standard errors are robust.

3.3 Treatment Arms

We describe each of the treatment arms below. Every treatment group attended an on-campus workshop during which participants consented and baseline data were collected. All workshops were run by the same team of facilitators, who were employees of our program, and enumerators. *After* baseline data were collected, the facilitators delivered one of the three intervention workshops. The full protocol for all three workshops can be found in of Appendix A.

Control Group. Workshop facilitators informed participants that they could access free contraceptives at our off-campus partner clinic, Kalingalinga clinic, which is a 25 minute walk from UNZA.[16] During the workshop, participants were given a small cardboard card that included the opening hours of the clinic, a map with directions, and their study ID. The card is shown in Figure B1 of Appendix B. Students were also told that if they brought the card to the clinic, they would be seen first by a dedicated nurse, skipping the usually long waiting times at public clinics in Zambia. Students were given a four week deadline to use their card at the clinic.[17]

Skipping the line is valuable in and of itself, and along with information about the clinic, may have led to contraceptive uptake on its own. Importantly for our study, these aspects of the control (which are also held constant in the other two interventions) provided even control students with an incentive to visit and bring their study card to Kalingalinga clinic specifically, which aided in collecting administrative data on take-up, as we describe below. Therefore, the treatment effects we estimate are the differential effect of the interventions above and beyond any positive effects of providing information on the partner clinic and allowing students to skip the line.

Non-Coercive Conditional Cash Transfer (CCT). Students in the CCT intervention received the same workshop and information card, allowing them to skip the line just like the control students, but were also offered a 80 ZMW (about $4.3) conditional cash transfer, labelled as a transportation voucher, for visiting the partner clinic. Despite the labelling, most students walked to the clinic and did not have any transportation costs. To redeem the voucher, participants had to go to the clinic and have their voucher stamped by the nurse, which required a one-on-one meeting with the nurse behind closed doors. This was to address the concern that students might come to the clinic with their friends, making it challenging to request services that are stigmatized. Requiring a one-on-one interaction allowed students to ask questions and request services without being judged by their friends.[18] Once the student saw the nurse, she could decide whether to get family planning information, take-up contraceptives, or simply get her voucher stamped and leave immediately. After the voucher was stamped, she could redeem it for payment from an employee of our program stationed at the clinic. Figure B2 of Appendix B shows the voucher.

CCT & Fertility Information. The CCT and fertility treatment also received the same information card and voucher as the other two groups, but in addition, we provided them with information intended to counter the incorrect belief that hormonal contraceptives cause permanent infertility. The informational

[16] While there is also a university-run clinic on campus where students can access free contraceptives, we partnered with an off-campus location to allow students to access contraceptives more privately.

[17] This was not enforced, apart from for the students who attended the last workshops.

[18] Participants often showed up in groups rather than walk 25 minutes alone.

portion of the workshop was based on extensive piloting; it was designed to make information salient and relatable and to provide direct evidence that women could bear children after using contraceptives. This portion of the workshop was divided into two parts. In the first part, the trained facilitators explained how hormonal contraceptives work, emphasizing that while hormonal contraceptives stop ovulation, it is temporary. To illustrate this, the facilitator would ask for a volunteer and blindfold her at the front of the room. The facilitator would then take out an orange and ask the volunteer what she smelled. After the volunteer identified the orange, the facilitator held up mint oil between the volunteer's nose and the orange. Asked what she smelled, the volunteer would say "mint," though the audience could see that the orange was still there. Finally, the facilitator removed the mint oil and asked the woman what she could smell, which again was the orange. The facilitators then removed the blindfold and explained to the volunteer and the other participants that like the mint oil blocked the orange's smell, hormonal contraceptives block fertility for a short time, but it's always there in the background and returns soon after removal.

During the second part, the two facilitators told their personal stories. Both facilitators were selected because they were young women who had used hormonal contraceptives and became pregnant afterwards and were from a similar educational background to the UNZA students. The facilitators emphasized how the usage of contraceptives allowed them to space out the births of their children and that it did not prevent them from getting pregnant once they stopped using them. To make their stories salient, they also showed pictures of their children. Normally, since contraceptive use is very uncommon among young women (and is stigmatized so that even women who use contraceptives are unlikely to publicly admit to using them), women rarely witness direct evidence that contraceptives do not hamper infertility. In contrast, this treatment provides exactly this evidence.

4 Data

In this section, we describe our two data sources. The first data set was collected in partnership with Kalingalinga clinic by an enumerator based at the clinic. The second data set comes from smartphone surveys completed by participants every two weeks after the intervention.

4.1 Clinic Data

The clinic data were collected at the partner clinic and contain information on the services received at that clinic. As can be seen in Panel b) of Figure B1 in Appendix B, the back of the clinic card included codes for the services that were provided to the students. Figure B3 reports the translations for the different codes used on the back of the clinic card. We collected information not only on whether students requested

any contraceptive services but also which type they requested. We also collected information on whether they took up any other health care related services, such as sexually transmitted infection (STI) tests and pregnancy tests. When seeing the nurse, students brought their clinic card with them, gave it to the nurse, and the nurse used it to indicate which services had been provided once the student left the room.[19] The codes used on the clinic card were not known to students. Throughout the day, a study employee collected all the clinic cards and recorded the information electronically.

The clinic data were used to measure two main outcomes: 1) whether students attended the clinic, and 2) take-up of different types of contraceptives. Importantly, the data are not subject to either social desirability bias or attrition issues that could impact self-reported data. An additional benefit of the clinic data is that they can be used to independently verify our self-reported survey data (described below).

However, the clinic data do have some shortcomings. One concern is that students in the control group are less incentivized to visit the partner clinic specifically, as opposed to another health provider, given that they did not receive a cash transfer. This concern does not affect the comparison between the CCT and fertility treatments, as both these groups were equally incentivized by the cash payment to visit the partner clinic. A similar, broader concern is that the CCT simply led participants to substitute to taking up contraceptives from the partner clinic instead of their usual providers. We address both of these concerns by collecting the same outcomes in survey data.

4.2 Mobile Survey

In addition to the clinic data, we collected survey data using mobile phone surveys for up to six months, starting with an onboarding survey at the intervention workshop. The first of these mobile surveys, which served as a baseline, was conducted at the workshop for all participants. Participants were sent the survey link to their mobile phones and asked to complete the survey upon receipt. This allowed the facilitators to ensure that all participants were receiving the links, solve any technical issues, and answer any questions about the survey. In addition, having all participants fill out the survey at the first workshop meant that all participants had to spend some time in a workshop in order to participate, helping to avoid potentially differential attrition from treatment groups.

Following the workshop, participants were sent a new survey link using their mobile phone every two weeks on Friday evenings.[20] Each survey had a maximum length of fifteen minutes. Participants who did not fill out the survey by Monday evening received a follow-up SMS from the field team, which reminded them

[19] If a student forgot to bring their clinic card, we provided them with a spare one at the clinic and recorded their study ID on it before seeing the nurse. This helps address the concern that students in the control group may be less incentivized to bring the clinic cards.

[20] Piloting has shown that many women respond quickly when they are not in class or engaged in other activities.

to complete the survey. If the survey was still not filled out by Wednesday, students received a phone call from the field team reminding them again and helping to troubleshoot any technical issues. Upon completion of each survey, participants received 10 ZMW (about $0.5) of additional airtime as compensation for their time.

Every survey asked about contraceptive use, sexual encounters in the last two weeks, partner information, pregnancy, and clinic visits, forming a panel of data on these key outcomes. In addition, different survey rounds included rotating questions on beliefs, attitudes and fears around contraceptives, child-bearing and marriage, enabling us to explore additional outcomes and the mechanisms underlying the responses we observe. The survey has several key advantages. First, it allows us to trace out the dynamic response to the workshop over 6 months for our main outcomes of interest. Second, it allows us to test for unintended consequences (such as reduced condom use or increased sexual activity). Third, it allows us to account for contraceptives taken up through other providers than the partner clinic. Finally, the fact that the survey was administered online via Qualtrics and could be completed using a smartphone helped ensure that data collection was confidential and that young women could answer sensitive questions freely, in the privacy of their home, without interacting with an enumerator. In scoping work, we found that participants reported being the most honest in mobile surveys, as opposed to traditional surveys or interviews with in-person surveyors. This is consistent with work on sensitive topics in the US (Kranzler et al., 2004; Kiene et al., 2008; Gibbs et al., 2019). While mobile surveys often have high levels of non-response and attrition, the response rate to our survey was very high. We discuss non-response and attrition in Section 6.

5 Empirical Strategy

Using the clinic and survey data, we test whether the CCT and fertility treatments affected young women's usage of contraceptives. We report standard regression equations for outcomes we observe once (e.g., take-up in the clinic data) and graph dynamic estimates for outcomes we observe over time (e.g., contraceptive use in the survey data). Our main estimating equation for outcomes that were only observed once per individual takes the following form:

$$y_i = \beta_0 + \beta^v V_i + \beta^f F_i + \Gamma \mathbf{X}_i + \varepsilon_i \tag{1}$$

where y_i is the outcome of interest, V_i is an indicator variable for whether student i is part of the voucher (CCT) group, and F_i is an indicator variable for the fertility group. $\mathbf{X}_i$ is a vector of controls that will, unless otherwise indicated, only include indicator variables for use of each type of hormonal contraceptive

at baseline (IUD, implant, pill, shot, or none) and an indicator variable for the students' recruitment wave. We include controls for baseline use of hormonal contraceptives in all regressions because in our primary specification, it is the outcome of interest, and thus including baseline usage can improve statistical power. We keep this control in specifications with other outcomes, so that our specifications are consistent across outcomes. (Duflo et al., 2007).

For cases where we observe participants' outcomes over multiple survey rounds, we investigate how treatment effects evolve over time. Our dynamic estimating equation takes the following form:

$$y_{it} = \lambda_0 + \tau_k^v \sum_{k=1}^{12} V_i \times \mathbb{1}\{k = t\} + \tau_k^f \sum_{k=1}^{12} F_i \times \mathbb{1}\{k = t\} + \delta_t + \Gamma \mathbf{X}_i + \varepsilon_{it}, \tag{2}$$

where t denotes a survey round, $\mathbb{1}\{k = t\}$ is an indicator variable for when $k = t$, and δ_t is a vector of survey round fixed effects. In addition to the dynamic equation, we also estimate an aggregate version of equation (2) in order to estimate averge treatment effects throughout the data collection period:

$$y_{it} = \lambda_0 + \phi^v V_i + \phi^f F_i + \delta_t + \Gamma \mathbf{X}_i + \varepsilon_{it}. \tag{3}$$

Following standard practice, our standard errors are heteroskedasticity robust when we observe students once in a regression and clustered at the student-level when we observe students multiple times.

6 Results

6.1 Clinic Data: Visits and Take-Up

Panel A of Table 4 reports the effects of the two treatments on clinic attendance and the take-up of contraceptives in the clinic data. Column 1 reports the impacts of each treatment on whether students visited our partner clinic. Both the CCT and fertility treatments were extremely effective at encouraging students to attend our partner clinic; students in the CCT and fertility groups are 53.2 p.p. (284.5%) and 50.0 p.p. (267.4%) more likely to visit the clinic than students in the control group. Columns 2 and 3 report the effect of treatment on the take-up of contraceptives, including both hormonal and non-hormonal methods. Students in the CCT and fertility groups are 7.4 p.p. (139.6%) and 9.9 p.p. (186.8%) more likely to take-up some form of contraceptive than students in the control group. While the coefficient for fertility is somewhat larger than the coefficient for CCT when the outcome is taking up any contraceptive or number of contraceptives taken up (Columns 2 and 3), the effects are not statistically significantly different.

The effects of the two treatments begins to diverge, however, when we focus on the types of contracep-

Table 4
Effect on Clinic Attendance and Contraceptive Take-Up (Clinic Data)

Panel A—Effect on Clinic Attendance and Contraceptive Take-Up (Clinic Data)

	Attends Clinic (1)	Number of Contraceptives (2)	Take-up Contraceptives (3)	Take-up Hormonal Contraceptives (4)
CCT	0.532***	0.082***	0.074***	0.026**
	(0.027)	(0.020)	(0.018)	(0.010)
Fertility	0.500***	0.111***	0.099***	0.053***
	(0.027)	(0.021)	(0.019)	(0.012)
N	1505	1505	1505	1505
R-squared	0.240	0.020	0.020	0.025
Control mean	0.187	0.057	0.053	0.016
P-value of $\beta_v = \beta_f$	0.261	0.247	0.250	0.055

Panel B—Effect on Contraceptive Take-Up, by Type (Clinic Data)

	Condoms (1)	Injection (2)	Jadelle (3)	Emergency Contraceptives (4)	Oral Pills (5)
CCT	0.044***	0.003	0.003	0.012	0.019**
	(0.013)	(0.004)	(0.005)	(0.010)	(0.008)
Fertility	0.044***	0.016**	0.001	0.012	0.038***
	(0.013)	(0.006)	(0.005)	(0.010)	(0.010)
N	1505	1505	1505	1505	1505
R-squared	0.015	0.020	0.015	0.007	0.016
Control mean	0.024	0.004	0.006	0.018	0.006
P-value of $\beta_v = \beta_f$	0.992	0.068	0.682	0.972	0.102

Notes: Panel A reports the effects of each of the treatments on attending the partner clinic and contraceptive uptake. The estimates are from running equation (1) on the clinic data. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student was in the second wave as controls. *Take-up hormonal contraceptives* is an indicator variable for whether a student requested any of the following: injection/shot, jadelle/implant, IUD, or oral contraceptive pills. *Take-up contraceptives* is defined similarly to *Take-up hormonal contraceptives*, but also includes condoms and emergency contraceptives. Standard errors are robust. Panel B reports the effect of each treatment on contraceptive uptake, broken down by type. It is estimated with equation (1) in the clinic data. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student was in the second wave as controls. Standard errors are robust.

tives that students take-up. In Column 4, we report the effect of treatment on the take-up of hormonal contraceptives, defined as the injection/shot, jadelle/implant, IUD, and oral contraceptive pills. These are the contraceptives that students typically fear cause infertility, and we include the copper IUD in this group, even though it is not hormonal, because it is long-acting and associated with fears of infertility.[21] Students in the CCT group are 2.6 p.p. (162.5%) more likely to take up hormonal contraceptives at the partner clinic than students in the control group. These are already substantial treatment effects, more than doubling the share of girls taking up hormonal contraceptives at the clinic. However, the effects are twice as large in the fertility group. Students in the fertility information group are 5.3 p.p. (331.3%) more likely to take-up hormonal contraceptives (a doubling relative to self-reported baseline rates of hormonal contraceptive usage). We can reject that $\beta_v = \beta_f$ at the 10% significance level ($p = 0.055$).

We next estimate equation (1) for each type of contraceptive separately. We omit the IUD since there is zero take-up in the clinic data. The results are reported in Panel B of Table 4. The difference in the take-up of hormonal contraceptives between the CCT and fertility groups is driven by injections and oral pills (Columns 2 and 5), while both groups take up more condoms than the control. This is consistent with the fact that take-up of the implant in the clinic data is negligible. Thus, both the CCT and fertility treatments encourage students to attend the clinic and take-up contraceptives while there. However, the fertility treatment has twice as large an effect on students taking up hormonal contraceptives compared to the CCT.

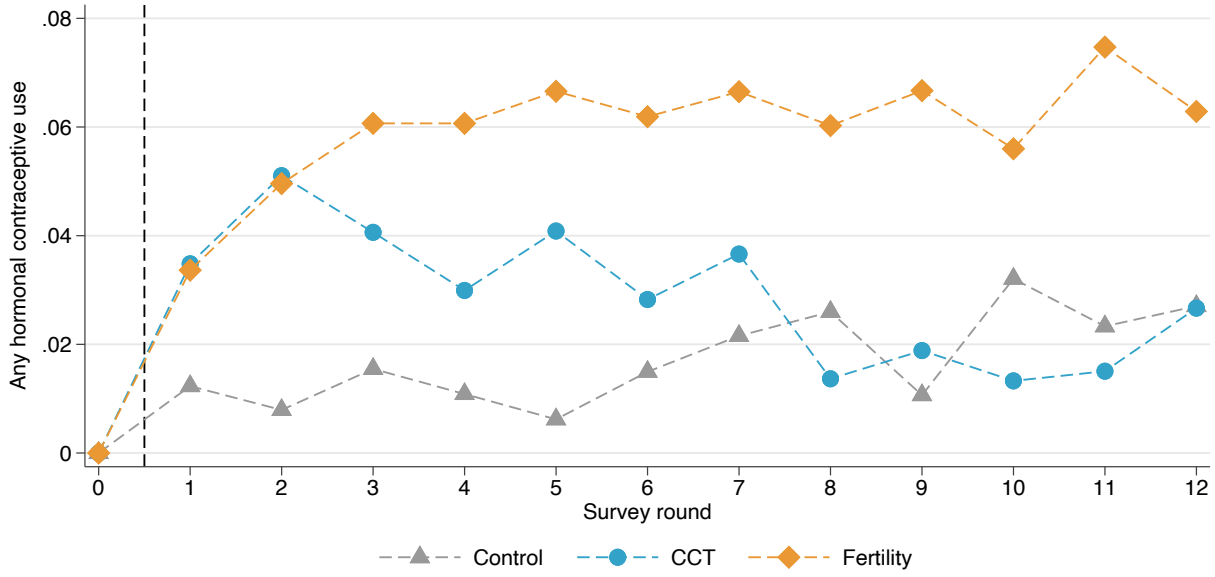
6.2 Survey Data: Contraceptive Usage Over Time

We next investigate the dynamic effect of the interventions on contraceptive usage. Measures of contraceptive usage are coded based on a question asked in every survey about what method (if any) students were currently using. Figure 4 shows the percent of participants in each treatment group who report using a hormonal birth control method, normalized to the baseline level of usage in each group. In the first two surveys after the workshop (at two and four weeks), both the CCT and fertility information group see an increase in usage of 3.5 percentage points (in week 2) and 5 percentage points (in week 4). After this point, the usage rates begin to diverge. In the CCT group, usage declines, and by the second half of the survey period, usage is only 2-3 percentage points higher than baseline and indistinguishable from control. For the fertility information group, however, usage rates increase and remain about 6 percentage points higher than baseline for the remainder of the survey. Usage in the control group increases slightly over time as well, indicating that our active control protocol, which informed participants of the services at Kalingalinga clinic and gave them a

[21] In fact, its inclusion in the measure of the take-up of hormonal contraceptives is irrelevant since no students take up IUDs at the clinic.

no-wait card, may have had an effect, or perhaps that there were some spillovers across groups over time.

Figure 4
Hormonal Contraceptive Use by Survey Round and Treatment Group

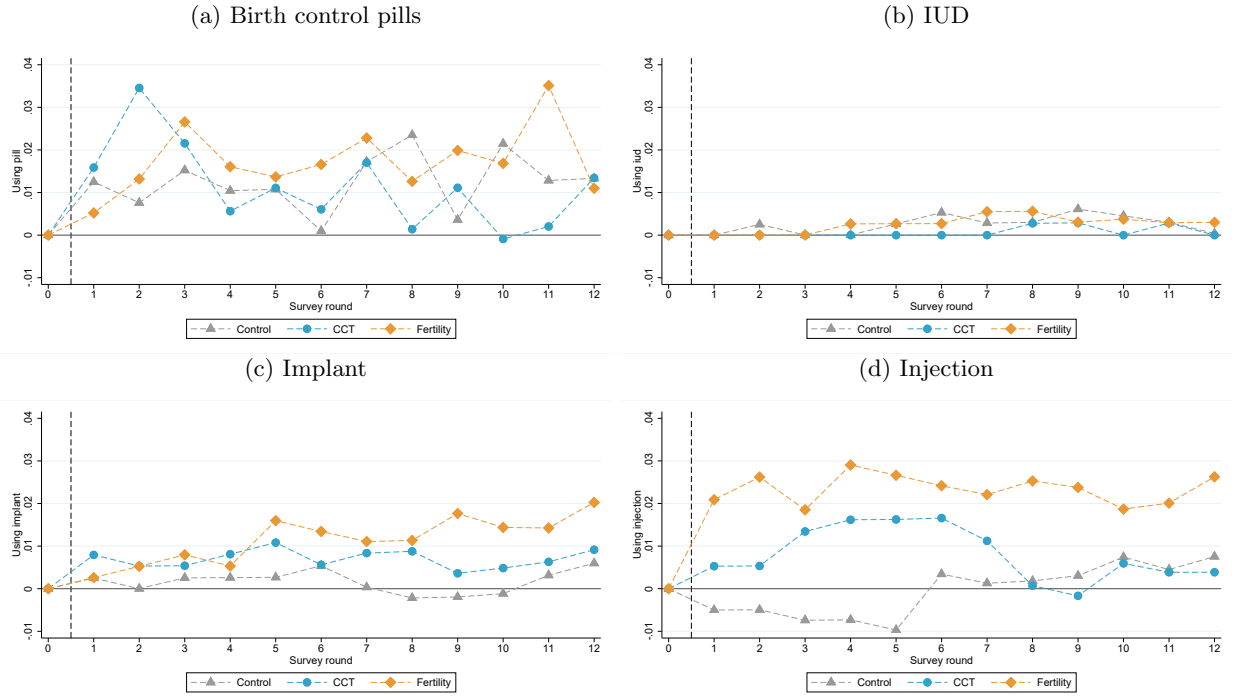


Notes: This figure plots the average use of hormonal contraceptives reported in the mobile survey by treatment group and survey round. Usage rates are normalized to baseline usage in each group. Hormonal contraceptives include the pill, shot, implant, and IUD. Survey rounds occur every two weeks. To explore the effect over time we restrict to the first recruitment wave.

To complement the raw data in Figure 4, in Appendix Figure A3, we show the figure that estimates equation (2) using hormonal contraceptives as an outcome variable and report confidence intervals around the estimates of the treatment effects. In this figure, the CCT group is only statistically different than control at the 10% level in the second survey (week 4), while the fertility group is distinguishable from control in the majority of the twelve surveys.

In Figure 5, we show raw usage over time separately by type of contraceptive. While the study is not powered to distinguish between type of contraceptives in each week, these figures suggest that the differences in usage between the fertility group and the other two arms are primarily driven by injections and implants, particularly later in the sample. Appendix Figure A4 shows the coefficients of equation (2) separately by type, and though coefficients for the fertility group are consistently positive, particularly for the implant and injection, they are for the most part not statistically significant.

Figure 5
Use of Hormonal Contraceptives by Type and Survey Round



Notes: This figure plots the average use of hormonal contraceptives reported in the mobile survey by treatment group and survey round, separately for each type of hormonal contraception. To explore the effect over time we restrict to the first recruitment wave. Usage rates are normalized to baseline usage in each group. Survey rounds occur every two weeks.

In Table 5, we use equation (3) to estimate the average difference in usage over the course of the survey. These estimates paint a very similar picture. Column 1 shows that students in the CCT group are not more likely to have used contraceptives than students in the control group on average over the entire data collection period (up to 6 months for the first wave). The coefficient is small (0.4 p.p.) and not statistically significant. However, students in the fertility group are 3.3 p.p. (37.5%) more likely to be using hormonal contraceptives. This is statistically significant and statistically distinguishable from the CCT effect at the 5% level. The lower effect in percent terms than the clinic data reflects the fact that average contraceptive usage in the control group is substantially higher than take-up at the clinic in the clinic data (8.8% vs 1.6%), consistent both with the fact that young women may access contraceptives in other ways than visiting the partner clinic and that women may have taken up contraceptives after the four week period for visiting the clinic.

Table 5
Effect on Average Contraceptive Use Over the Survey Data Collection Period

	Any hormonal	Pills	IUD	Implant	Injection
	(1)	(2)	(3)	(4)	(5)
CCT	0.004	−0.005	−0.002	0.008	0.004
	(0.012)	(0.009)	(0.003)	(0.005)	(0.006)
Fertility	0.033**	0.006	0.000	0.008	0.018**
	(0.014)	(0.010)	(0.003)	(0.005)	(0.007)
N	14192	14204	14204	14204	14204
R-squared	0.181	0.054	0.349	0.298	0.207
Control mean	0.088	0.044	0.007	0.009	0.026
P-value of $\beta_v = \beta_f$	0.031	0.227	0.179	0.886	0.066

Notes: This table reports the effect of each of the treatments on contraceptive usage throughout the survey period. For the first wave, this is up to 6 months after the workshop, and for the second wave, this is 1.5 months after the workshop. The outcomes are indicator variables for whether a student used any hormonal contraception or any of each type of contraceptive during the survey period. Estimates are produced by running equation (3) with the survey data. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student was in the second wave as controls. Standard errors are robust and clustered at the student level.

Columns 2 – 5 report treatment effects separately for each contraceptive type. An increase in injections (Column 5) plays an important role in driving the increase in the take-up of hormonal contraceptives for the fertility group. Students in the fertility group are 1.8 p.p. (69.2%) more likely to use injections than students in the control group. These estimates are *not* inconsistent with the estimates in the clinic data, where the take-up of the pill is relatively more important. The clinic data only tells us about initial take-up, while these estimates report average usage over the subsequent 6 months and may reflect the fact that some pill users desisted using the pill while others switched to other, longer-acting forms of contraceptives.

The results from the survey data highlight the importance of pairing the clinic data with a longer-term survey. The CCT treatment did not significantly change the longer-term behavior of students, though the shorter-term clinic data would have led us to conclude it increased take-up. While CCT participants are more likely to visit our partner clinic and pick up contraceptives there, such effects are short-lived, and their contraceptive usage throughout the post-workshop period is not significantly different from the control group. On the other hand, the fertility treatment *did* have persistent effects, and fertility students are more likely to take up long-lasting contraceptives, such as injections and perhaps even implants. This led to greater usage of hormonal contraceptives overall in the fertility group, but we would have missed these differential effects if we had exclusively relied on the clinic data.

Did the Treatments Have Unintended Consequences? We next explore whether increased usage of hormonal consequences had negative unintended consequences. Hormonal contraceptive use could have crowded out condom usage, even though condoms also protect against STIs. Alternatively, by reducing the expected costs of sex, the treatments might encourage students to have more sex or to have sex with more partners. In Table 6, we test for the presence of unintended consequences using the survey data on sexual activity. An observation here is at the individual-by-survey level. In Column 1 of Table 6, we show that neither treatment has a positive effect on the likelihood a participant had sex in a given survey round. Additionally, effects on survey-level condomless sex (Column 2) are close to zero, and the point estimates for number of sexual partners are negative and close to zero (Column 3). Another form of "risky" sex is sex with older partners. Older partners are statistically more likely to have HIV and might also be more likely to exert pressure for students to have sex without condoms (Dupas, 2011). In Column 4 of Table 6, we show that the average age of sexual partners does not change significantly for either treatment.

Table 6
Unintended Consequences: Sexual Behavior, Condoms, and Partners

	Any sex	Any condomless sex	Number of partners	Avg partner age
	(1)	(2)	(3)	(4)
CCT	−0.001	0.001	−0.014	−0.409
	(0.017)	(0.011)	(0.024)	(0.330)
Fertility	−0.007	0.011	−0.008	0.038
	(0.017)	(0.012)	(0.024)	(0.369)
N	14204	14144	14154	2971
R-squared	0.030	0.025	0.018	0.053
Control mean	0.220	0.089	0.250	25.741
P-value of $\beta_v = \beta_f$	0.727	0.389	0.753	0.166

Notes: This table reports the effect of each of the treatments on sexual behavior throughout the survey period. For the first wave, this is up to 6 months after the workshop, for the second wave, this is 1.5 months after the workshop. The estimates are produced by running equation (3) on the survey data. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student is part of the second wave as controls. Standard errors are robust and clustered at the student level.

7 Threats to Identification and Interpretation

7.1 Substitution Across Clinics

The administrative clinic data only measure take-up of services at our partner clinic. It's possible that women in the two treatment groups were induced to substitute to visiting Kalingalinga clinic as opposed to

other health care providers. In this case, the increase in clinic visits in the clinic data would only capture a substitution effect as opposed to a net increse in visiting health care providers. Table 7 reports the results from equation (1) when the outcomes are indicator variables equal to 1 if students report attending different types of clinics for family planning or to take-up contraceptives at any point during our survey period. Both the CCT and fertility treatments were effective at encouraging students to attend our partner clinic, and there was no crowd out of visiting other clinics. Column 1 shows that students in the CCT and fertility treatments were 7.2 and 7.4 p.p. more likely to visit any clinic for family planning purposes. Column 2 shows that this is entirely driven by an increase in visiting Kalingalinga clinic: students in the CCT group and fertility group are 8.8 p.p. (64.2%) and 9.4 p.p. (68.6%) more likely to attend the clinic than students in the control group. The lower coefficients for visiting Kalingalinga clinic relative to those in the clinic data likely reflect the fact that the survey asked respondents specifically if they visited the clinic for family planning services.[22] To the extent that students visited the clinic for any other reason – such as getting their voucher stamped – they would have answered no to this question. In Columns 3 – 4, there is no evidence that there was a reduction in visits to either the UNZA clinic or other clinics. The coefficients in these columns are small in magnitude, not systematically negative, and not statistically significant.

Table 7
Effect on Clinic Visits in the Survey Data

	Any clinic	Kalingalinga	UNZA	Other
	(1)	(2)	(3)	(4)
CCT	0.072***	0.088***	0.020	−0.024
	(0.028)	(0.024)	(0.018)	(0.015)
Fertility	0.074***	0.094***	0.003	0.001
	(0.027)	(0.024)	(0.016)	(0.016)
N	1492	1492	1492	1492
R-squared	0.055	0.031	0.027	0.053
Control mean	0.233	0.137	0.076	0.078
P-value of $\beta_v = \beta_f$	0.938	0.839	0.346	0.100

Notes: This table reports the effect of each of the treatments on indicator variables for ever visiting a clinic (any or different types) in the survey data by the end of the data collection period. It is estimated with equation (1) in the survey data. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student is part of the second wave as controls. *Any Clinic* is an indicator variable for whether a student attended any clinic. *Kalingalinga* is an indicator variable for whether a student attended our partner clinic, *UNZA* is an indicator variable for whether student attended the clinic that is on UNZA campus, and *Other* is an indicator variable for whether the student attended any other clinic. Standard errors are robust.

[22]The exact phrasing of the question was: "In the last two weeks, did you go to a clinic for family planning/contraceptives?"

7.2 Accuracy of Self-Reported Data

The survey data are self-reported, without a surveyor present. It's possible that at least some women either answer questions randomly to get through the survey quickly, or answer falsely due to self-stigma or social desirability bias. Because we can link the clinic take-up data to the survey data, we can use this linkage to validate some of the survey answers. For example, if a participant took up condoms or the pill at the clinic, it is possible that she then decided not to use them, so that the clinic take-up and usage data may not agree. However, for injections and implants, take-up at the clinic should imply usage. Once a woman has gotten a single shot (administered at the clinic), she will be covered by that contraceptive for 3 months. Thus, we can check whether women who received shots and implants in our clinic data also reported using these methods in subsequent surveys. Indeed, we find this is the case. Of the women who were coded as receiving the injection at the clinic, all but one reported consistent use of the injection throughout the survey. Similarly, of the women who received the implant at the clinic, all but one reported using this method in the survey (and in this case, the one who did not report implant use instead reported using an IUD).

7.3 Attrition

While attrition is a natural concern for phone surveys over an extended period, attrition from the surveys was low. Figure 6 reports the attrition rate separately for students recruited in the first and second recruitment drive. Non-completion monotonically increases over time because individuals could not move on to the next survey until they had completed the previous survey. That is, students could not skip surveys but could complete surveys late. For students in our first recruitment drive, 94.2% of the sample completed at least 75% of the surveys, and typically non-completion is associated with randomly missing a few surveys (and becoming behind) due to technical issues or being busy rather than permanently dropping out of the sample. In the first wave sample, only 3% of participants stopped filling out any surveys after the first month. Similarly, in our second recruitment drive, 96.2% of the sample completed two out of three surveys.

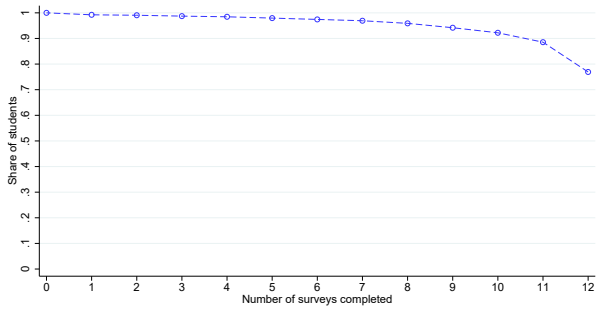
8 Mechanisms

8.1 Fear of Infertility

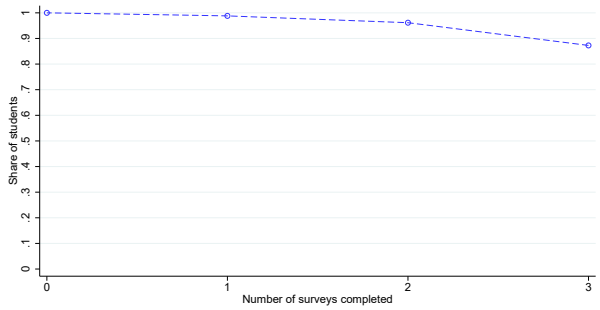
In this subsection, we provide evidence that the effects on the fertility group were in fact driven by a reduction of fear of infertility. We first document that the intervention *did* change beliefs about the infertility side effects of contraceptives. We then estimate the characteristics of the compliers and show that they are more likely to report not using contraceptives due to fear of infertility at baseline. Finally, we provide suggestive

Figure 6
Attrition From the Survey Data

(a) First Wave



(b) Second Wave



Notes: This figures shows the attrition rate from the survey data for students in the first (a) and second (b) waves. Each graph reports the share of students in the sample who completed each survey round. Survey 0 indicates the baseline survey.

evidence that fear of infertility affects health care take-up on a different dimension – STI testing – using an add-on experiment, underscoring the importance of these fears for health care decision-making.

8.1.1 Changes in Beliefs and Self-Reported Preferences

Table 8 uses post-treatment survey data on beliefs about the infertility effects of different contraceptives to test whether the fertility intervention changed beliefs both immediately after the treatment (week 4) and over the long-term (week 22)[23]. To fix the sample throughout this analysis, we only examine the first wave. In week 4, the fertility treatment reduced the likelihood that respondents believed any hormonal contraceptives cause infertility by 11.4 p.p. or 19% (Table 8, Panel A, Block 1). Columns 2 – 5 break this result down by contraceptive type. We find the largest reduction in infertility fears for implants (Column 4) and injections (Column 5). Recall that injections and implants are the two types of contraceptives for which there appear to be more persistent effects on take-up, in line with the change in fertility fears driving take-up.

In contrast, the CCT has no effect on the belief that any contraceptive caused infertility, though it did significantly affect fear that the implant caused infertility. This may be because the CCT treatment caused students to visit our partner clinic and meet the nurse, who could have provided them with additional information about different contraceptives.

In the latter 5 columns (Panel A, Block 2) of Table 8, we test whether the treatment also changed the (correct) belief that contraceptives cause weight gain. This placebo would capture cases where the students became more positive about contraceptives in general or reported fewer side effects due to social desirability bias. Reassuringly, we do not see any changes in beliefs about whether contraceptives cause weight gain. All

[23]There is some noise in the exact timeing, since students could fall behind on the surveys and fill them out in a different week. However, 82.25% of all surveys were completed in the correct period.

the coefficients in Block 2 are small and statistically insignificant.

Panel B of Table 8 shows that the fertility treatment's effect on beliefs was persistent. In week 22, those in the fertility treatment were 12.6 p.p. (19%) less likely to report that at least one of the hormonal contraceptives caused infertility. There is *no* fadeout of the treatment effect. As before, the CCT has no effect on the belief that at least one of the contraceptives causes infertility, and beliefs about weight gain remain unaffected.

Table 8
Effects on Beliefs About Infertility & Contraceptives (Survey Data —Weeks 4 & 22)

Panel A —Week 4

	Block 1: Cause infertility					Block 2: Cause weight gain				
	(1) Any	(2) Pill	(3) IUD	(4) Implant	(5) Injection	(6) Any	(7) Pill	(8) IUD	(9) Implant	(10) Injection
CCT	-0.022	0.000	0.007	-0.063**	-0.025	-0.024	-0.003	0.010	0.008	-0.003
	(0.035)	(0.034)	(0.026)	(0.031)	(0.033)	(0.023)	(0.035)	(0.022)	(0.034)	(0.036)
Fertility	-0.114***	-0.035	-0.007	-0.118***	-0.088***	-0.016	-0.012	-0.005	0.022	-0.003
	(0.035)	(0.033)	(0.025)	(0.030)	(0.031)	(0.023)	(0.035)	(0.021)	(0.034)	(0.036)
N	1155	1155	1155	1155	1155	1155	1155	1155	1155	1155
R-squared	0.015	0.006	0.003	0.016	0.009	0.006	0.007	0.003	0.003	0.005
Control mean	0.614	0.328	0.145	0.286	0.296	0.892	0.607	0.098	0.311	0.454
P-value of $\beta_v = \beta_f$	0.011	0.304	0.601	0.055	0.044	0.746	0.802	0.507	0.686	0.992

Panel B —Week 22

	Block 1: Cause infertility					Block 2: Cause weight gain				
	(1) Any	(2) Pill	(3) IUD	(4) Implant	(5) Injection	(6) Any	(7) Pill	(8) IUD	(9) Implant	(10) Injection
CCT	0.002	-0.009	-0.047	-0.076**	-0.005	-0.028	-0.041	0.026	-0.013	0.000
	(0.035)	(0.036)	(0.030)	(0.036)	(0.035)	(0.020)	(0.035)	(0.025)	(0.036)	(0.037)
Fertility	-0.126***	-0.051	-0.047	-0.116***	-0.082**	-0.029	-0.027	0.006	-0.021	-0.017
	(0.036)	(0.035)	(0.030)	(0.035)	(0.033)	(0.020)	(0.035)	(0.024)	(0.036)	(0.037)
N	1084	1084	1084	1084	1084	1084	1084	1084	1084	1084
R-squared	0.030	0.008	0.006	0.020	0.009	0.017	0.021	0.005	0.002	0.007
Control mean	0.664	0.373	0.229	0.395	0.320	0.933	0.680	0.112	0.384	0.483
P-value of $\beta_v = \beta_f$	0.000	0.237	0.994	0.241	0.022	0.954	0.680	0.437	0.815	0.638

Notes: This table reports the effect of each of the treatments on whether the student believes each type of contraceptive causes infertility – in Block 1 – or weight gain – in Block 2. Panel A shows the Week 4 survey results, and Panel B the Week 22 results. It is estimated with equation (1) in the survey data. Column 1 is an indicator for whether the student believed one or more of the hormonal contraceptives shown here cause infertility. In Columns 2 – 5, the outcomes are indicator variables for each contraceptive separately. Block 2 repeats the analysis for weight gain. All regressions control for indicator variables for baseline hormonal contraceptive usage and an indicator variable for whether a student was part of the second wave. Standard errors are robust.

In Appendix Table A2, we further explore whether the fertility treatment had persistent effects on stated preferences over contraceptives near the end of the survey period. As in Table 8, we limit our analysis to the first wave so that we can test whether stated preferences were different a substantial period (22 weeks) after the intervention. The fertility treatment more than doubled interest in the implant, increasing it by 15 percentage points, and marginally significantly reduced interest in the pill. Thus, not only did beliefs change, but this appears to have led stated preferences for longer-lasting methods, about which girls may

have more concerns but which are ultimately more effective, to increase. This is also consistent with Figure A4, which provides suggestive evidence that, by the end of the sample period, the fertility group had started switching to the implant.

8.1.2 Evidence on Compliers

To further understand which students were most affected by the treatments, we estimate the average characteristics of the compliers (where taking up a hormonal contraceptive at the clinic is the outcome of interest) separately for the fertility and CCT groups using the methodology in Pinotti (2017). To estimate the characteristics of the compliers for the fertility treatment, we run a two-stage least squares regression whose first and second stage are given by

$$h_i = \lambda^F F_i + \lambda^V V_i + \gamma X_i + \epsilon_i,$$

and

$$h_i \times k_i = \theta^F h_i + \phi^V V_i + \xi X_i + \nu_i,$$

where h_i is an indicator variable equal to 1 if i took up any hormonal contraception, X_i is a control for belonging to the second wave, and k_i is the characteristic of interest. The characteristics of the compliers with the fertility treatment are given by θ^F. To estimate the characteristics of the compliers with the CCT treatment, we simply switch V_i and F_i in the estimating equations.

Table 9 reports the average characteristics of the compliers with each treatment, as well as the average characteristics of the sample and p-values for tests of the differences between the complier and sample averages. Consistent with the fact that the fertility treatment addressed fears of infertility, compliers with the fertility treatment are much more likely to report that they do not use contraceptives due to fear of infertility/side effects (43% of fertility compliers vs. 25% for both CCT compliers and the sample). Interestingly, fertility compliers are also much more likely to be sexually active at baseline (84% vs. 67% for CCT compliers and 60% overall). Hence, the fertility treatment seems to target individuals with particularly high returns to using contraception.

Table 9
Characteristics of Compliers

	Fertility	p-value	CCT	p-value	Sample
	(1)	(2)	(3)	(4)	(5)
Fear of Infertility/Side Effects	0.432	0.085	0.254	0.957	0.247
Sexually Active	0.835	0.003	0.665	0.682	0.597
Use Hormonal Contraception	0.011	0.783	-0.416	0.138	0.053
Use Condoms	0.242	0.506	0.317	0.310	0.180
SES Index	-0.023	0.934	-0.338	0.544	-0.000
Father Years Education	12.544	0.877	11.836	0.826	12.345
Mother Years Education	10.612	0.967	11.604	0.641	10.648
Age	21.475	0.424	20.991	0.878	21.146
Year	2.138	0.861	1.618	0.241	2.184
Had Blesser Relationship	0.148	0.285	0.107	0.660	0.058

Notes: This table reports the average characteristics of compliers (for taking up any hormonal contraceptive at the clinic) for the fertility (Column 1) and CCT (Column 3) treatments, as well as the average characteristics of the sample (Column 5). The even columns report the p-values for tests of whether the characteristics of the fertility compliers (Column 2) or CCT compliers (Column 4) are statistically significantly different from the sample average. All variables are measured at baseline. The SES Index is the first predicted component from a pca of indicator variables for being from Lusaka (the capital), sharing a bedroom growing up, being on government bursary, growing up in a place where the clinic was more than 30 minutes walking distance away, and having undergone an initiation ritual. "Fear of Infertility/Side Effects" indicates the respondent does not use hormonal contraceptives for these reasons, while "Use Condoms" indicates that she reports not using hormonal contraceptives at baseline because she uses condoms. Standard errors are robust.

In contrast to the fertility treatment, none of the CCT compliers' characteristics statistically significantly differ from the sample average. There is some suggestive evidence that CCT compliers are poorer (they score 0.3 sd worse on the SES index), perhaps consistent with the fact that financial incentives motivated poorer girls to visit the clinic more. Unlike the fertility treatment, the CCT treatment does not seem to specifically target a population with especially high returns to take-up. This difference between the treatments may help to explain the persistent effects of the fertility treatment – it permanently changes the perceived costs of take-up for a group that also had large benefits from take-up.

8.1.3 Extension: STI Experiment

In a follow-up experiment, we further test whether fear of infertility motivates health-seeking behavior. We randomly sampled 1,015 of the sexually active participants in the original experiment for a follow-up experiment. All students in this sample were offered another 40 Kwacha (∼2 USD) voucher to visit the partner clinic for STI testing. Half (the treatment) also received a text message highlighting that untreated STIs are a leading cause of infertility. As before, the cash transfer is a non-coercive conditional cash transfer. Participants receive the money for visiting the clinic rather than for taking up health care. The exact wording

of each message can be found Appendix C.

Table 10 reports the estimated effect of this new treatment, controlling for the fertility and voucher treatments (which are independent). We first observe that there is no effect on visiting the clinic. The voucher is marginally significantly associated with visiting (and the sign for fertility is similar), perhaps consistent with the fact that receiving vouchers in the past engendered trust in the program. The coefficient for treatment on taking up a STI test is positive (a 2.6 p.p. or 14% increase), but we do not have the precision to reject a zero effect. However, conditional on visiting the clinic, the information had a marginally statistically significant and sizable effect on taking up a STI test (a 9.7 p.p. or 13% effect). Thus, the point estimates are consistent with this very light-touch text message informational treatment having meaningful effects. We take this as suggestive evidence that fear of infertility also affects other health-seeking behavior.

Table 10
Extension: Fear of Infertility & Testing for Sexually Transmitted Diseases

	Clinic Visit	Any STI Test	Any STI Test | Clinic Visit
	(1)	(2)	(3)
STI: Information treatment	0.003	0.025	0.095*
	(0.027)	(0.024)	(0.055)
CCT	0.055*	0.041	0.001
	(0.032)	(0.029)	(0.068)
Fertility	0.042	0.022	−0.041
	(0.032)	(0.029)	(0.069)
N	1013	1013	242
Adj. R-squared	0.020	0.006	0.004
Mean Dep. Var	0.239	0.182	0.760

Notes: This table reports the effect of the STI information treatment, which gave information on the infertility effects of STIs, on visiting the clinic and STI testing, controlling for treatment status in the original contraceptives experiment. The outcomes are an indicator variable for visiting the clinic (Column 1) and an indicator variable for taking an STI test (Columns 2-3). Column 3 conditions the sample on visiting the clinic. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student is part of the second wave as controls. Standard errors are robust.

8.2 Alternative Explanations: Role Models & Stigma

One possible alternative explanation for the lasting impact of the fertility treatment on hormonal contraceptive take-up and usage is that this workshop provided participants with older role models who had used contraceptives in the past. While the same two facilitators ran all of the workshops (control, CCT, and fertility), they only shared personal stories about using contraceptives themselves in the fertility workshop. These stories were intended to help convey to the participants that it is common for women to become

pregnant after stopping contraceptive use in particularly salient way, but it is possible that sharing them also helped destigmatize the use of hormonal contraceptives.

We evaluate the scope for this mechanism in a few ways. First, it is worth noting at baseline that stigma was not an important driver of contraceptive non-use in self reports. In Figure 2, we report the reasons women give for not using hormonal contraceptives at baseline. One option was, "I am afraid of stigma from my partner or family." This option was only selected by 2% of the women who had ever had sex, and 5% of those who had had sex in the past 2 weeks (as opposed to fear of infertility, which was reported by 19% and 28%, respectively, and fear of side effects which was even higher).

Second, we directly test whether the fertility treatment affected proxies for stigma related to contraceptive use in our data. Appendix Table A3 reports the results. In the second and eleventh surveys, we asked participants how frequently they had conversations with their friends about contraceptives. To examine the effect over time, we restrict to the first recruitment wave. If the fertility treatment destigmatized contraceptive use, we might expect open discussion of contraceptive use to increase. Column 1 shows that, if anything, conversations about contraceptive use declined right after the workshops in the fertility and voucher group, perhaps because the participants substituted to accessing information via the clinic. Column 2 shows that there were no differences in frequency of conversations about contraceptives by the end of the study for the fertility treatment, and a statistically significant increase in the CCT group. The remaining columns examine the effect of the treatments on whether respondents report that they approve of unmarried women using modern contraceptives to prevent pregnancy during premarital sex (Column 3) or whether their mother would approve (Column 4).[24] In either case, the fertility treatment has no significant effect on approval. Interestingly, the voucher statistically significantly increases the probability a young woman approves but reduces the probability she reports her mother would approve. Given that the voucher did not have any long-run effects however, these changes in perceived stigma do not appear to persistently affect contraceptive take-up. Overall, the results are inconsistent with the fertility treatment increasing take-up by differentially reducing stigma.

9 Quantifying the Importance of Fear of Infertility

Table 8 shows that the fertility treatment reduced participants' belief that hormonal contraceptives cause infertility, and Tables 4 and 5 show that the fertility treatment led to an increase in the take-up and usage of hormonal contraception. We next exploit our RCT to quantify the importance of fear of infertility as a

[24]These questions were asked in the week 2 survey of the original sample (first wave) but were only asked in the baseline (pre-treatment) survey during the second wave. Since we are interested in the effect of the treatment on stigma, we restrict the sample to the first wave for these regressions.

barrier to the take-up of contraceptives in SSA. To do so, we use a two-stage least squares approach where we instrument for beliefs using assignment to the fertility treatment. Because the fertility treatment group also got information about the clinic and a CCT, we control separately for the CCT effect using assignment to *either* of the two treatment groups (relative to control).

For this exercise to give us the true causal effect of fear of infertility, we need to make a few additional assumptions. First, we assume that the effect of treatment on contraceptive take-up is monotonic. That is, there are no participants who would have used contraceptives in the control group but are pushed out of doing so by being assigned to either of the two treatment groups (and similarly, that no one who would not have used contraceptives in the fertility information treatment would do so in the CCT-only treatment). Second, we assume that the two treatments are additively separable. That is, there is no complementarity of the voucher program with the CCT. If this is not entirely true, our estimates can still be seen as valid for a setting in which access is not a barrier. Lastly, we assume that the exclusion restriction holds; that is, the only difference between the fear of infertility treatment and the CCT treatment is the former's effect on the belief that contraceptives cause infertility.

In Table 11, we report the results from the 2SLS estimation. In Column 3, we estimate that moving from a belief that contraceptives cause infertility to a belief that they do not would cause a 29.4 percentage point increase in the take-up of hormonal contraceptives in the clinic data. Similarly, this change in beliefs would cause the use of contraceptives to increase by 29 percentage points on average across the surveys. Since 61.4% of control participants believe that at least one contraceptive causes infertility, these estimates imply that eliminating these beliefs entirely would increase take-up and usage by 18 percentage points.

These are very large effects, especially given that (a) the sample of college students is likely to be better-informed than most women in Sub-Saharan Africa, and (b) only 60% of the sample were sexually active at baseline. If we assume the entire treatment effect is on the sexually active, the increase in usage among the group that actually benefits from contraceptive use would be 30 percentage points. Thus, fear of infertility appears to be a major barrier to the take-up of contraception among young women in Sub-Saharan Africa.

10 Conclusion

We evaluate the effect of a treatment designed to reduce fears that contraceptives cause infertility on the take-up of contraceptives among college students in Zambia. This is a population where baseline contraceptive take-up is low, and take-up is likely to have especially high returns: 47% are sexually active over the study period, 90% want to delay child-bearing until they complete their studies, and 18% had engaged in unprotected sex in the last 2 weeks at baseline.

Table 11
Quantifying Importance of Infertility as a Barrier to Take-Up

	Clinic Data: Any Hormonal			Survey Data: Any Hormonal		
	Reduced Form	First Stage	2SLS	Reduced Form	First Stage	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Fertility	0.027**	-0.093***		0.029**	-0.098***	
	(0.012)	(0.031)		(0.013)	(0.034)	
Infertility Beliefs			-0.294*			-0.290*
			(0.169)			(0.161)
N	1492	1478	1478	14192	14184	14172
R-Squared	0.025	0.020	-0.526	0.181	0.018	-0.256
Control Mean	0.191	0.191	0.191	0.088	0.088	0.088
F Stat			8.761			8.511

Notes: This table reports 2SLS estimates of the impact of belief that hormonal contraceptives cause infertility on the take-up and usage of hormonal contraceptives. The dependent variable in Columns 1-3 is whether a participant took up a hormonal contraceptive in the administrative clinic data, and an observation is a participant. The dependent variable in Columns 4-6 is whether a participant reports using hormonal contraceptives in a given survey, and an observation is a student-survey. Columns 1 and 4 report the reduced form impact of being in the fertility treatment. Columns 2 and 5 report the first stage effect of assignment to the fertility treatment on beliefs that any hormonal contraceptive causes infertility, as measured in the week 2 survey. Columns 3 and 6 report 2SLS estimates of the effect of this belief on take-up and usage, respectively, instrumenting for beliefs with assignment to the fertility treatment. All regressions include indicator variables for baseline hormonal contraceptive usage and an indicator for whether a student is part of the second wave as controls.

At first glance, low take-up in this population is puzzling. Urban college students can access contraceptives relatively easily and cheaply at local clinics and are likely to have high returns to doing so since contraceptive use can prevent unplanned pregnancies that lead either to dropout or potentially unsafe abortions. Because take-up remains low despite easy access and interventions to increase access have little effect, researchers have sometimes argued that women must see little benefit to preventing or delaying pregnancy (Pritchett, 1994). Rather, they suggest that contraceptive use is low because desired fertility is high.

We show that the story is more complicated. Our RCT is designed to measure the effect of one important, stubborn barrier to contraceptive adoption that may be particularly important in the sub-Saharan African context: medical distrust and the fear that contraceptives cause infertility. Our results establish that fear of infertility – which is widespread in SSA (Boivin et al., 2020a) – causally reduces the take-up of contraceptives, and this effect is large. The importance of these fears is likely compounded by the fact that considerable importance is placed on having children in SSA. Several studies have suggested that infertility may result in divorce, husbands' infidelity, and poverty (see van Balen and Bos (2009) for a review). Indeed, our participants who believe that couples that cannot have to children will be more likely to divorce are also more likely to not use contraceptives due to fear of infertility.

While it is relatively cheap to simply get young women into a clinic and even increase short-term contraceptive use (as seen in the CCT), addressing incorrect beliefs about the infertility costs of contraceptive use is critical to having longer-term effects on take-up and usage. Moreover, while changing beliefs can be challenging, we find that a carefully-designed – but relatively cheap – intervention *can* lead to persistent change.

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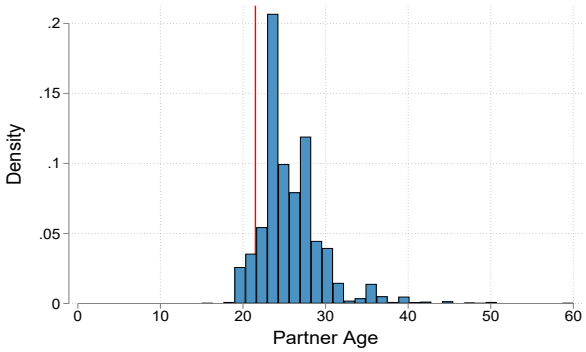
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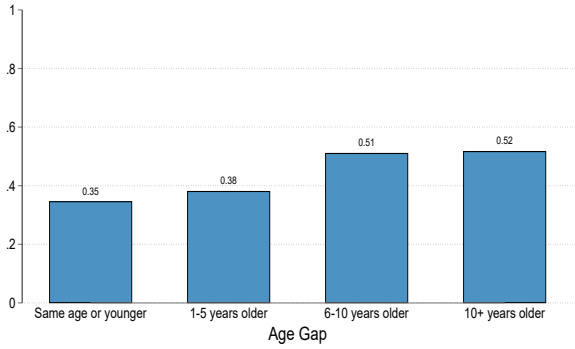
Appendix Figures

Figure A1
Partner Age and Condom Use

(a) Number of Encounters by Partner Age

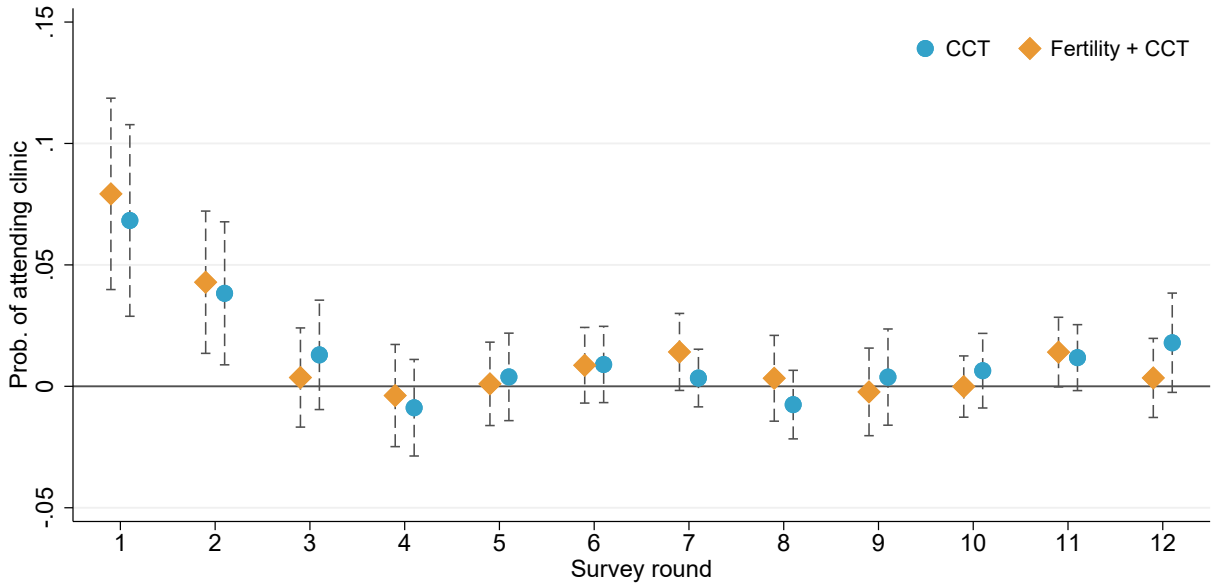


(b) Share Condomless Encounters by Partner Age Gap



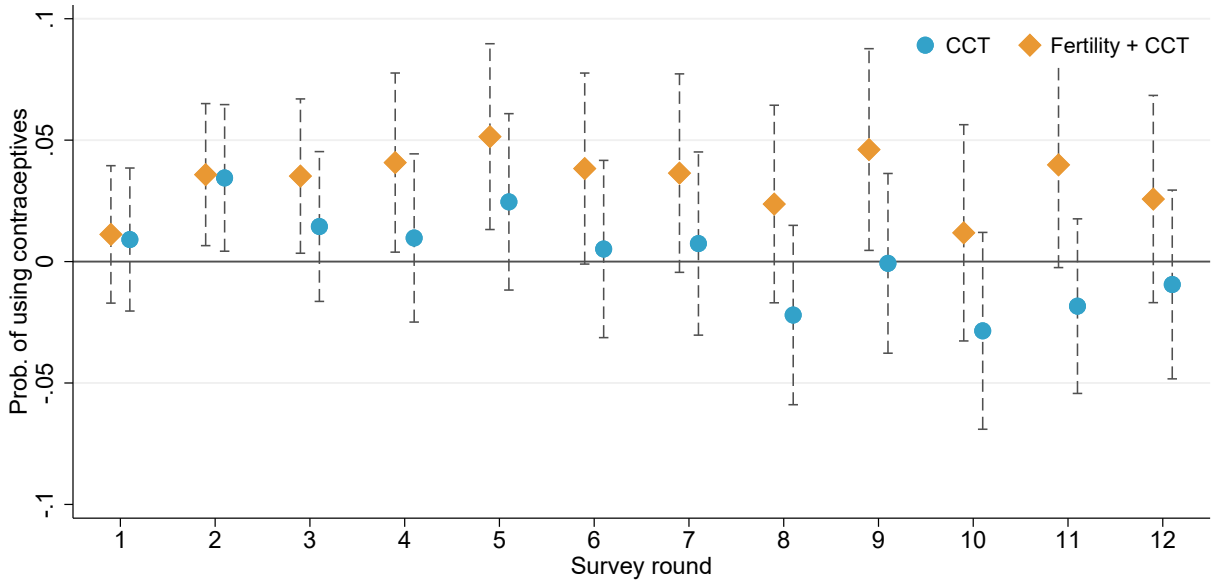
Notes: This figure reports summary statistics on women's sexual encounters. Panel (a) plots a histogram of number of encounters by partner age, and Panel (b) plots the share of encounters that are condomless by the age gap between participants and partners. Encounter-level data on condomless sex and partner age were collected every two weeks through the mobile phone survey.

Figure A2
Clinic Attendance by Survey Round



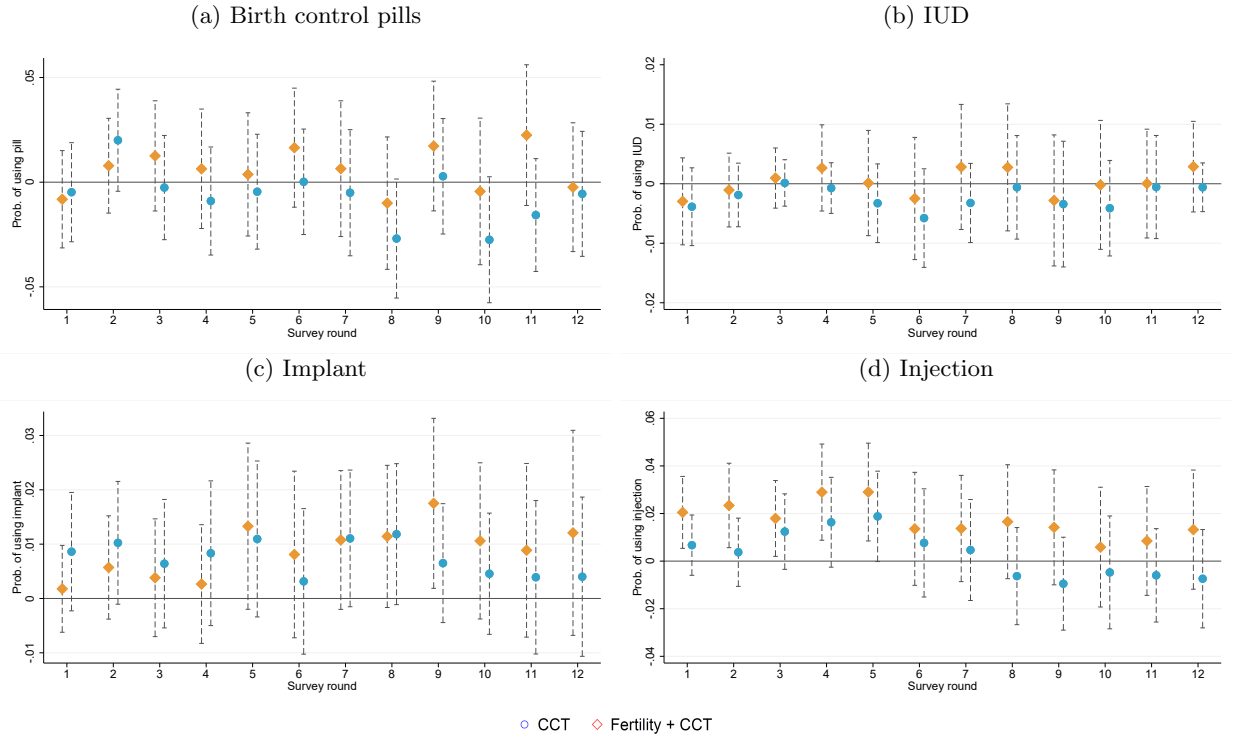
Notes: This figure plots the coefficients in equation (2), where the outcome is an indicator variable for whether a student reported attending our partner clinic for family planning or contraceptives in the two weeks preceding the survey in question. Survey rounds occur every two weeks. The regressions include controls for baseline hormonal contraceptive usage and whether a student was part of the second recruitment wave. Standard errors are robust and clustered at the student level.

Figure A3
Use of Hormonal Contraceptives by Survey Round



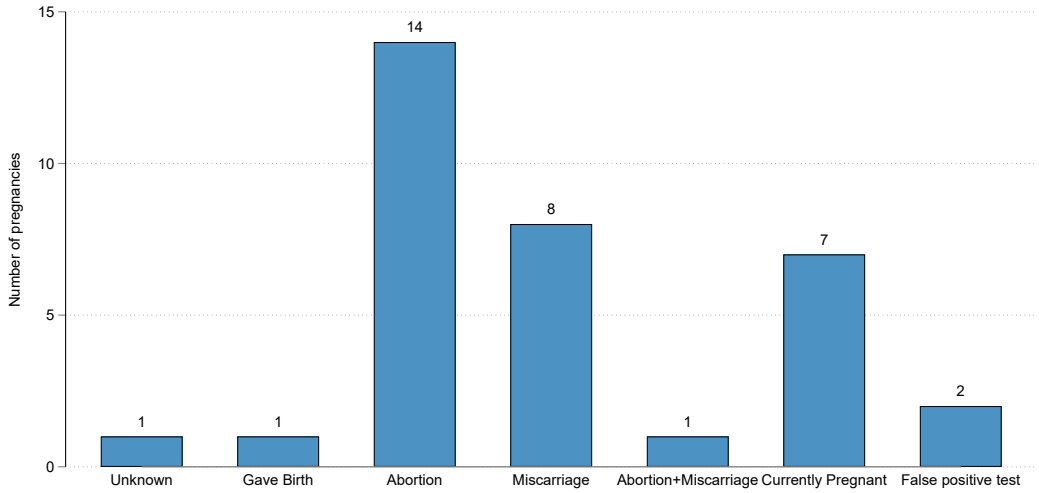
Notes: This figure plots the coefficients in equation (2), where the outcome is whether a student reported using hormonal contraceptives in the two weeks preceding each survey. Hormonal contraceptives include the pill, shot, implant, and IUD. Survey rounds occur every two weeks. The regressions include controls for baseline hormonal contraceptive usage and whether a student was part of the second recruitment wave. Standard errors are robust and clustered at the student level.

Figure A4
Use of Hormonal Contraceptives by Type and Survey Round



Notes: This figure plots the coefficients in equation (2), where the outcome is whether a student reported using a specific type of hormonal contraceptive in the two weeks preceding the survey. Survey rounds occur every two weeks. The regressions include controls for baseline hormonal contraceptive usage and whether a student was part of the second recruitment wave. Standard errors are robust and clustered at the student level.

Figure A5
Pregnancies Observed During the Data Collection Period



Notes: This figure shows the outcomes of all 34 pregnancies that occurred over the course of our data collection based on self-reports in the mobile survey. We limit the sample to pregnancies that were "consistently reported" (that is, were reported across multiple surveys).

Appendix Tables

Table A1
Beliefs About Costs of Infertility & Non-use due to Fear of Infertility

	Does Not Take-Up due to Fear of Infertility/Side Effects	
	(1)	(2)
Separations, Cannot Conceive	-0.015**	
	(0.007)	
Separations		0.004
		(0.007)
N	695	695
Adjusted R-squared	0.004	-0.001
Mean Dep. Var	0.255	0.240

Notes: This table reports the association between the number of couples a respondent expects to stay together out of 10, with and without being informed that the couples cannot conceive, and reporting not taking up hormonal contraception due to fear of infertility/side effects. "Together" is the number of couples out of 10 the respondent expects to be together in 2 years. "Together, Cannot Conceive" is the number of couples who cannot conceive that a respondent expects to be together in 10 years. These two questions were asked to distinct, randomly chosen subsamples on the baseline survey. Standard errors are robust.

Table A2
Preferences Over Contraceptives at End of the Study Period

	Interested in Taking Up After 6 Months (Non-Expanded Only)			
	(1) Pill	(2) IUD	(3) Implant	(4) Injection
Fertility	-0.066*	-0.006	0.146***	0.002
	(0.036)	(0.024)	(0.030)	(0.033)
CCT	-0.009	0.021	0.028	-0.004
	(0.037)	(0.025)	(0.027)	(0.033)
N	1084	1084	1084	1084
Adjusted R-squared	0.017	0.017	0.027	0.012
Control mean	0.419	0.125	0.139	0.285

Notes: This table uses the first wave sample to analyze whether the treatments persistently affected stated preferences over contraceptives at the end of the data collection period. The outcome variables are indicator variables for whether participants expressed an interest in taking up each type of contraceptive on their 11th round survey (approximately 6 months after baseline). All regression include baseline hormonal contraceptive usage as controls. Standard errors are robust.

Table A3
Evidence on Alternative Explanations: Role Models & Stigma

	Conversations ≥ 1 Week 4 (Survey 2)	Conversations ≥ 1 Week 22 (Survey 11)	Approve	Mother Approve
	(1)	(2)	(3)	(4)
Fertility	-0.069**	0.012	0.040	-0.005
	(0.035)	(0.032)	(0.034)	(0.035)
CCT	-0.043	0.065*	0.070**	-0.068**
	(0.035)	(0.033)	(0.034)	(0.034)
N	1157	1087	1158	1157
Adjusted R-squared	0.002	0.002	0.002	0.002
Control mean	0.412	0.243	0.614	0.368
P-value $\beta_v = \beta_f$	0.459	0.117	0.382	0.064

Notes: This table uses the first wave to estimate the effect of the treatments on proxies for stigma. The dependent variables are an indicator variable for talking to friends about contraceptives at least once a week in the last month in survey 2 (Column 1) and survey 11 (Column 2) and an indicator variable for whether the girl reports she approves of an unmarried woman using modern contraceptives to prevent pregnancy (Column 3) or believes her mother would approve (Column 4). In columns 1 and 2 we restrict to the first recruitment wave to observe the effect over time. Columns 3 and 4 restrict to the first wave since the approval questions were asked in the baseline survey for the second wave. All regression include baseline hormonal contraceptive usage as controls. Standard errors are heteroskedasticity robust.

A Intervention Protocol

[Baseline Message]

Thank you for joining us today. Welcome to Empower Women's Health. This is a pilot program where we test different ways to empower women. We will start by reading some information about the program, and ask for your consent to join.

[Read the consent form and ask everyone to sign.]

Now, you will take your first survey, so we can see how much you already know about women's health. Please scan the QR code or type in the link to access the survey. Please fill in the information and begin the survey, we will come around to help you if you face any difficulties.

[Let everyone finish]

[instructor self-introductions, both Facilitator 1 and Facilitator 2]

Facilitator 1 Intro: Hi my name is [Facilitator 1], and I'm with the Empower Women's Health project, based in Lusaka. I am here to share some information on women's health with you, but I am not a nurse or a health worker, so if you have any questions I cannot answer, at the end of the session I will tell you how you can get more information from the Clinic. My partner will also introduce herself.

Facilitator 2 Intro: My name is [Facilitator 2] and, like [Facilitator 1], I work with Empower Women's Health.

Great! Now we are going to talk a bit as a group about how to access family planning.

Can someone define family planning for me?

Can you tell me what family planning options are there?

The commonly used contraceptive methods include condoms, morning after pills, oral pills, injectables, implants and IUD.

I would also like to talk a little about HIV. HIV is spread through exchange of particular body fluids with a person who has HIV. These fluids are blood, semen, pre-seminal fluids, rectal fluids, vaginal fluids, and breast milk. Having unprotected sex is one main way that HIV gets spread. I would like to emphasise that condoms are highly effective in preventing HIV if used correctly. They are also effective at preventing sexually transmitted diseases (STDs) that are transmitted through bodily fluids, such as gonorrhea and chlamydia. Non-condom contraceptives protect against pregnancy, but do not protect against the transmission of HIV or STDs.

[Fertility group only]

We will now share some information about how different modern family planning methods work. Different methods lasts for a different lengths of time. However, whenever you stop using the family planning, after a period of time, you will be able to get pregnant again. To understand why, we need to understand some biology. Your body releases an egg each month, which is called ovulation. If you have sex and the sperm meets the egg, that is when you can

become pregnant. Methods such as the pill, implant, and injectable are called "hormonal contraception." The hormones in these methods stop your body from ovulating, so there is no egg released, and thus you cannot become pregnant. When you stop the method, after some time, the hormones will leave your body, you will begin ovulating, and as a result,can become pregnant again. That is why if someone misses their dose of the pill, they can become pregnant—the hormones leave their body. Similarly, if you stop the shot or remove the implant, the hormones will leave your body, and you will begin to ovulate and be able to become pregnant again.

To make this more clear, let's play a game together. Anyone want to volunteer? [pick an audience member]

In this game, we are going to use an example to show how contraceptives can stop you from becoming pregnant.

[hold a strong mint underneath their nose, and hold an orange nearby, ask them if they could smell the orange]

[then have them take a few deep cleansing breaths without the mint smell and smell the orange]

The hormones in the pill, shot, or implant work like this. They block your body from releasing eggs for a little while, but after you stop using them, your body will naturally return to normal.

The longer the contraceptive works for, it's like holding the mint smell under your nose for longer. But, no matter how long, once it wears off or is removed, you will be able to smell the orange again.

Different forms of family planning last different amounts of time. A condom or female condom only works if you use it every time. The pill needs to be taken every day, but then wears off quickly when you stop taking it. Injections can last for months, and then may take some time to leave your system, but, and this is important, then you will be fertile again. Implants and IUDs last until you take them out, but you can always have them removed early if you decide you want to become pregnant, and your body will return to normal.

And finally, [name] will share her experience on using [method of long term contraceptive].

[Facilitator who has used either injectables or implants and subsequently become pregnant shares her experience, including what method she used, how long she used it, and how long it took for her to become pregnant after]

Facilitator 1 personal story:

I would like to share my personal story. I have two handsome sons, one is 8 years and my second is 5 years. Before I had my first kid, I first used condoms and later tried birth control pills. I could not keep up with taking them daily. Then I had my first born. I guess as a result of not being consistent. So, after my first kid, I started using depo-provera (an injection). It was easier for me to be consistent with this because I did not need to take it as often. Then, when I decided to have my second child, I stopped. In a few months, I conceived my second child. After my second child I decided that I should concentrate on my career and my business, so I went on a long term method, which is the implant. I have had this for 4 years

now, with no complications. The insertion was very small and left me with a very small scar. [show the arm] When I just had it, I only had some spotting, small bleeding for only two weeks, and everything went back to normal. And it hasn't moved. It's just there. And whenever I want to have the next baby, I will just remove it, any time. Thank you for listening to my story.

Facilitator 2 personal story:

I have three beautiful kids, two girls and a boy. They are aged 13, 9 and 4 years. So, between my first and my second, I used Depo Provera, the shot. I didn't think it was the right method for me because I had to make a fresh arrangement to see the doctor every three months for a shot. So, after my second child, I asked myself what am I going to use that will be long-lasting and not require me to visit a health care provider every three months. So, I settled with Jadelle, the implant. After I put in the Jadelle, I had minor headaches. I only needed paracetamol, and they went away over time. My periods were also not as heavy as before. My periods were actually reduced to only 3 or 4 days. I had it implanted when my daughter was 4 months old, and I had it taken out when she was five years. Within 6 months, I conceived my son. And that's my story.

There are many ways to access family planning. For example, there is a clinic here on UNZA's campus that has family planning. Today, I want to tell you about another option to access family planning that might be especially convenient for students. At Kalingalinga clinic, you can get all types of family planning methods for free.

[Voucher/Fertility group]

In your packet you have a voucher that you can redeem for an 80 Kwacha transport refund if you decide to go to Kalingalinga clinic. To receive the refund, you only need to go to the clinic, bring your id, and have your voucher stamped by a nurse.

Does everyone know where Kalingalinga clinic is? In your packet you have a card that has a map and walking instructions. You can easily walk to the clinic following these directions. If you visit the clinic, make sure to bring this card with you—you will be guaranteed fast and completely free service with this card within the next 4 weeks. [Instructions: show the card to participant]. This card is only for you, so make sure to bring it with you, and do not give it to someone else.

The Kalingalinga clinic operates from Monday to Friday, 9 – 15 hours and on Saturday, 9 – 12 hours. The family planning consultation and family planning options including condoms, oral pills, the morning after pill and injectables are offered every day. You can also access implants (also known as Jadelle), but these are only offered on Tuesdays, Thursdays, and Saturdays. We want to emphasize that if you bring this card, you will not be charged for *any* contraception method.

[Voucher/Fertility group]

To claim your refund, make sure to hand your voucher to the nurse at the beginning of your appointment, and give it to the "Empower Women's Health" representative afterwards. The representative will be sitting in the waiting area. The voucher can only be redeemed by you. To verify that it is you who is coming to the clinic, you must bring your student id, or another

form of id. Without it, you will not be allowed to claim the voucher. Because this is a pilot program, women at some workshops may not get a voucher.

Over the next 6 months, as part of this program, we will ask you to complete a short mobile survey every two weeks. For every survey you complete we will send you 10K of airtime. In addition, to ensure you do not incur any costs for completing the surveys, we will send you 50K of airtime every month until the end of the program. If you stop filling out the surveys, we will stop sending the monthly bundle. The first 50K bundle of airtime will be in your accounts within the next 1-2 days. If you change your phone numbers, please let us know! You can either email us, through the email address we sent you the invitation from, or text us, using the number quoted in the reminder message.

Thank you for coming through, we hope we'll see you at Kalingalinga clinic within the next 4 weeks.

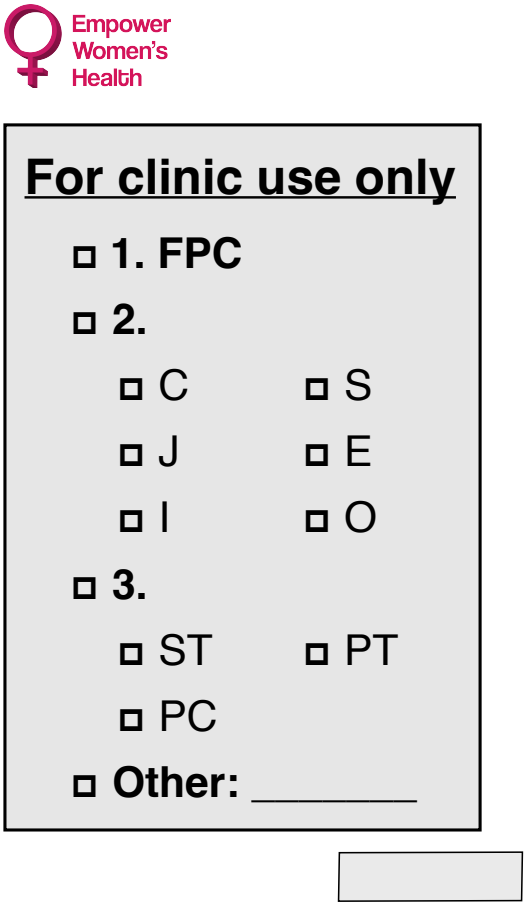
B Intervention Documents

Figure B1
Clinic Information Card

(a) Front

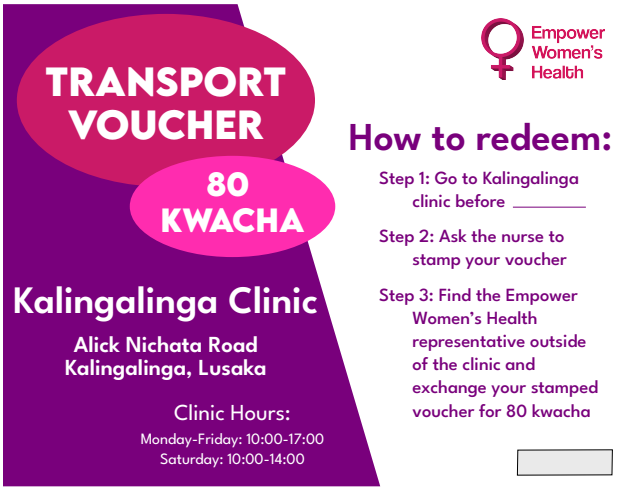


(b) Back



Notes: This figure shows the front and back of the clinic information card given to participants in all experimental arms during the workshop.

Figure B2
CCT & Fertility Treatment: Travel Voucher



Notes: This figure shows the travel voucher given to participants in the CCT and fertility arms of the experiment. Partipants could have the voucher stampe by a nurse at the clinic and then redeem it for 80 Kwacha from a study employee stationed at the clinic.

Figure B3
Explanation of Codes on the Back of the Information Card



Notes: This figure explains the codes used by the nurses to record what treatments participants received on the back of the clinic card.

C Extension Experiment on STI-Testing: Text Messages for Treatment & Control

Text messages to the control and treatment groups for the extension experiment on the take-up of STI testing are shown below. Additional text in the treatment messages that did not appear in the control messages is in bold.

Control:

1. *Empower Women's Health is sponsoring Free STI testing at Kalingalinga Clinic from 23 May to 6 June, Monday to Friday, 9am to 3pm.*
2. *Many women in your age group have STIs but show no symptoms.*
3. *Show your student ID and this text message at the clinic to receive a 40 K transport refund. You do not need to take up any health care to receive this refund.*

Treatment:

1. *Empower Women's Health is sponsoring Free STI testing at Kalingalinga Clinic from 23 May to 6 June, Monday to Friday, 9am to 3pm. A simple test can protect your ability to have children in the future!*
2. *Many women in your age group have STIs but show no symptoms.* ***Untreated STIs can lead to scarring that prevents pregnancy, which causes 85% of infertility in Sub-Saharan Africa.***
3. *Show your student ID and this text message at the clinic to receive a 40 K transport refund. You do not need to take up any health care to receive this refund.*