Contraceptive Access and Fertility: The Impact of Supply-Side Interventions

By Nava Ashraf, Erica Field and Jessica Leight*

Declining fertility in both the developed and developing world has led to large and potentially welfare-enhancing changes in women's labor supply, education and investment in children in recent decades. However, it has been widely noted that the pace of this decline has stalled even while access to contraception has continued to expand, raising the question of whether increasing access to contraception is sufficient to lead to declining fertility. This paper provides evidence about the relationship between contraceptive access and fertility from a randomized controlled trial in Lusaka, Zambia, in which women of child-bearing age were provided with a voucher for free and immediate access to long-acting forms of contraception; this voucher was provided either to the woman individually, or the woman jointly with her spouse. Results show that there is a significant increase in contraceptive use, and a particularly large increase in experimentation with new contraceptive methods, but no decline in births in the short- or long-term compared to a control group who did not receive increased access to contraceptives.

Despite the advent of modern contraception, fertility remains high in much of the developing world. While this is often attributed to lack of access to contraceptive technology, rapidly increasing availability of low-cost contraception persists along with large numbers of unwanted births in many countries.[1]. For this reason, a large academic and policy debate has ensued over the last few decades on whether increasing access to contraception leads to a decrease in unwanted births and thus in total fertility. Some analysts have argued that this prediction on the central role of access to contraceptive supply is confirmed by cross-country data (Bongaarts 1994). However, Pritchett (1994) found that 90 percent of cross-country variation in fertility was explained by desired fertility, and thus argued that the primary determinants of changes in fertility were changes in the demand for children, the product of increased education among women and a higher probability of infant survival.

Evidence on the effect of simple supply-side interventions to increase access to contraceptives on fertility remains limited. Cochrane and Gibney (1991) provide

* Ashraf: Harvard Business School, Baker Library 443, Boston, MA, 02163; (nashraf@hbs.edu); Field: Duke University, 319 Social Sciences Building, Durham, NC 27708 (emf23@duke.edu); Leight: Williams College, Schapiro Hall, 24 Hopkins Hall Dr., Williamstown, MA 01267 (jessica.leight@williams.edu). We thank Jully Chilambwe, Christabel Chengo, Tresphored Kabanga, Richard Harrison, Josselyn Neukum, and Cynde Robinson, from the Society for Family Health; Chipata Clinic for hosting this study and especially Nurse Grace Daka for her assistance; Grace Mschilli, Christina Jenq, Katrina Harris, Lauren Gaydosh, and Marie-Helene Cloutier for superb field work, and Mallika Thomas, Marric Buessing, Corinne Low, and Livia Montana for research assistance. The National Science Foundation, the Hewlett Foundation and WAPP, Harvard provided financial support. We also thank Attila Ambrus, Tim Besley, Martin Browning, Claudia Goldin, Larry Katz, Michael Kremer, David Levine, Gerard Padro i Miguel, Duncan Thomas, Chris Udry, Alessandra Voena, and numerous seminar participants for helpful comments.

[1]Using cross-sectional data, a birth is defined as unwanted if ex post the mother reported she did not want to become pregnant. Using panel data, a birth is defined as unwanted if it occurs after a previous survey identified that the mother did not want to become pregnant

an extensive literature review of papers evaluating the causal effect of increased access to contraceptives on *usage* of contraceptives, though the papers examined are largely non-experimental. Bauman (1997) provides a literature review of experimental work on contraceptive adoption.[2] More recent experimental or quasi-experimental studies have evaluated the impact of supply-side interventions on contraceptive uptake as well as other measures of sexual and reproductive health.[3]

However, increasing average use of contraceptives does not necessarily imply changes in fertility. Depending on the characteristics of the individuals or couples who are induced to change their utilization patterns, even a substantial increase in contraceptive use could have no impact on fertility if the new adopters were not at a high risk of an unwanted birth ex ante. None of the studies above directly examine the effect on fertility, rendering it challenging to interpret the implications of any observed change in contraceptive use.

There is a much smaller set of well-identified microeconomic studies, of which only four are experimental, that examine the impact of contraceptive access on fertility.[4] The results are generally heterogeneous. More importantly, these papers have generally evaluated intensive and costly interventions that seek to address both demand-side and supply-side challenges. This raises important questions about the quality of intervention implementation, whether the contraceptive methods provided were used correctly and consistently, and what the channels of any observed impact are.

We fill this gap in the literature by studying, first, the effect of a simple, scalable and directly observable supply-side intervention on contraceptive adoption and use, and, second, the impact of increased access on fertility. In a study with a public family planning clinic in Lusaka, Zambia, 1031 women were randomly chosen to receive a voucher guaranteeing free and immediate access to a range of modern contraceptives through a private appointment with a family planning nurse. A randomized control group of 768 women received nothing. This

[2]These studies evaluate diverse interventions, some designed to increase demand (e.g., home visits or other visits by health promoters) and some to increase supply (e.g., increasing the frequency of provider attendance at a clinic). Thirteen of the sixteen studies find that the intervention did have the intended effect of increasing contraceptive use.

[3]Meuwissen, Gorter and Knottnerus (2006) found that a voucher program increasing access to sexual and reproductive health care for adolescents in Nicaragua increased utilization of contraceptives. Ngo, Alden, Pham and Phan (2010), Hennink and Clements (2005) and Katz, West, Doumbia and Kane (1999) evaluated new methods of delivering family planning services in clinics in Vietnam, Mali and Pakistan and also found positive effects on uptake, while Kambo, Gupta, Kundu, Dhillon and Saxena (1994) found that training traditional medical practitioners in family planning methods was successful. Daniel, Masilamani and Rahman (2008) examined a program seeking to increase contraceptive use and birth spacing in India and found that it increased use and knowledge of contraception.

[4]A review of the literature identified ten microeconomic experimental or quasi-experimental studies that analyze the impact of contraceptive access on fertility, in Bangladesh (Phillips, Stinson, Bhatia, Rahman and Chakraborty 1982, Koenig, Rob, Khan, Chakraborty and Fauveau 1992), Colombia (Miller 2010), Ethiopia (Desai and Tarozzi 2011), Ghana (Debpuur, Phillips, Jackson, Nazzar, Ngom and Binka 2002), Indonesia (Gertler and Molyneaux 1994, Pitt, Rosenzweig and Gibbons 1993), Tanzania (Angeles, Guilkey and Mroz 1998) and Uganda (Lutalo, Kigozi, Kimera, Serwadda, Wawer, Zabin and Gray 2010). Increasing access to contraception is found to have a significant impact on decreasing fertility in four countries: Ghana, Tanzania, Bangladesh and Colombia. No impact is evident in Ethiopia, Indonesia, Uganda and now in Zambia.

amounted to a sudden and unexpected increase in access to long-term and relatively concealable forms of contraception, including injectables and contraceptive implants, for the women who received the vouchers. Given that baseline data indicates 63 percent of respondents had ever used pills (28 percent were currently using) and 41 percent had ever used injectables (21 percent currently using), the sample of voucher recipients benefiting from this increased access included some with strong demand for contraception.[5]

We find that a change in price through a voucher is sufficient to induce a significant increase in contraceptive takeup and protection against births. Unlike many health technologies where usage can be difficult to track, takeup of the injectable technology via the voucher that was redeemed in the clinic meant immediate protection for a 4-month period. There is, however, no significant decline in fertility among voucher recipients in the year following the intervention compared to the control group who received nothing, suggesting that a short-term positive supply shock to contraceptive availability is not sufficient to lower fertility.

This result, however, masks some heterogeneity. In a sub-randomization that was done in the second stage of the larger experiment, of the 1031 women who received the voucher for increased access, 528 women received the voucher jointly with their husband (the "Couples" treatment arm), while 503 women received the voucher in private without their husband's knowledge (the "Individuals" treatment arm). There is no difference in contraceptive utilization across the Couples and Individuals arms, but couples where the wife received the voucher alone do show evidence of fewer births in the short term compared to couples who received the voucher jointly, as analyzed further in Ashraf, Field and Lee (2014). There is, however, no significant change in fertility relative to women who received no voucher.

Further exploration of the characteristics of women who reported accessing new contraceptive methods at follow-up suggests that women in the treatment arms who used new modern contraceptive methods were significantly more likely to have used traditional contraceptive methods at baseline, compared to their counterparts in the control arm. These results suggest that increasing short-term access to contraceptives may make birth control more convenient for couples already effectively controlling their fertility and enable them to better optimize birth timing, but may not have a large influence on preventing unwanted births.

Thus our results reveal that even when increasing access and lowering price induces significant take-up of a new technology, it may not be sufficient to impact fertility. Indeed, what is important is not just inducing adoption, but inducing adoption among the "right" people. The "right" people may not be easily targeted, but how supply is increased can itself select on underlying drivers of demand, the marginal group that would have greatest impact from a policy per-

[5]On the other hand, one may consider this rate of contraceptive use to be relatively high, especially in the sub-Saharan context. We address this point further in relation to the external validity of the experiment in the Discussion section.

spective. The remainder of the paper proceeds as follows: Section I describes the experimental design, while Section II presents the empirical results. Section III discusses potential channels for the impact observed and questions of external validity, while Section IV concludes.

I. Experimental Design

A. Context

Our study took place in Lusaka, Zambia, a setting in which contraceptives are readily available from public and private providers, but excess fertility is nonetheless high. According to the 2001/2002 Zambia DHS (ZDHS), 51 percent of currently pregnant women report that the pregnancy was not wanted at the time of conception. Contraceptives are available in Lusaka in public clinics, private clinics and pharmacies, and this includes pills, condoms and injectables. In principle, all three methods, along with contraceptive implants and intra-uterine devices (IUDs), are available for free through public clinics, although severe public resource constraints result in frequent stockouts of many methods. Previously compiled evidence indicates that more than half of clinics and hospitals in Zambia were stocked out of injectables during a three-month period in 2007, and the average length of the stockout was nearly two months; while stockouts for pills were less common, and generally shorter in duration, nearly a third of health facilities also reported stock-outs of contraceptive pills (Ali, Bwembya, Collins, Papworth and Ronnow 2008). The clinic where this study was conducted likewise reported being out of stock of injectables more than half of the time in the year preceding this intervention.[6]

Other barriers to access are also high: wait times at clinics are typically several hours, and for certain methods such as contraceptive implants, women are required to supply some of the materials necessary for the procedure such as surgical gloves and disinfectant. Legally, spousal consent is no longer required for women to obtain contraceptives in public clinics in Zambia, but there are anecdotal reports that health care providers may still seek husbands' consent before providing them, particularly for long-lasting methods. In sum, it is a setting in which the price of contraceptives is continuously in flux and costly to verify prior to seeking services.

At the same time, there is evidence that demand for contraceptives is substantial. Baseline evidence collected in our sample (described in more detail below) suggests that 20 percent of women are relying on either injectables or pills at baseline, primarily injectables, and 37 percent of women state that they hope to use injectables in the future, even given the barriers to access that we have already described. This suggests that the high, and highly variable, price of contraceptives has the potential to be a binding constraint for a substantial proportion of

[6]This is based on communication from clinic staff.

the sample.

B. Sample Recruitment and Baseline Survey

Subjects for this study were drawn from the catchment area of Chipata clinic, a government clinic serving a low-income area of Lusaka. Married women of childbearing age (18-40) were eligible to participate if they met certain criteria: particularly, they were not currently pregnant but had a relatively recent birth, had not been sterilized or had a hysterectomy, were not known to have health conditions for which hormonal contraception is contraindicated, and agreed to participate with their husbands in an informational session about family planning. More details about the sample recruitment can be found in Ashraf, Field and Lee (2010).

Our baseline survey and intervention took place between March and June 2007. Among all those recruited for the study, a baseline survey visit ("First Visit", Figure 1) was made by a team of one survey enumerator and one CHW. Women were screened again to ensure that they were eligible and provided their consent to participate. The 1799 eligible women who consented were then administered a survey including questions about household decision-making, marriage and childbearing, contraceptive use, and fertility preferences. This survey was administered in private, without their husbands' knowledge or participation. In this visit, CHWs also provided health information about the prevention of sexually transmitted diseases (STDs) and condom use and distributed a three-pack of condoms.

C. Experimental Intervention

Prior to the first visit, recruited women were randomized into treatment (N=1031) and control (N=768) groups.[7] The key experimental manipulation took place during a second visit made to all those women assigned to the treatment group, in which they and their husbands were visited concurrently. There was no second visit made to the women assigned to the control group.

On that occasion, all couples in which the wife was assigned to the treatment group received a voucher that could be redeemed for free and immediate access to a menu of modern contraceptives through an appointment with a dedicated family planning nurse at Chipata clinic. This voucher guaranteed a maximum wait time of one hour and access to two methods - injectable contraceptives and contraceptive implants - that had been regularly out of stock at the clinic prior to our study. According to clinic personnel, in 2006 injectable contraceptives were out of stock more than half of the time and contraceptive implants were almost

[7]Randomization was done using the minmax t statistic method, with treatment assignment balanced on the following variables collected at the time of recruitment: compound, community health worker, number of children, whether currently using any family planning method, whether currently using the pill, whether currently using injectables, and months since last birth.

never available.[8] Although patients could purchase these outside of the clinic and bring them in to be administered, according to nurses at Chipata, average wait times for family planning visits were typically more than two hours.

The objective of this intervention was to provide wait-free appointments with guaranteed access. A dedicated nurse was hired who provided care only to voucher recipients, and sufficient stocks of injectable contraceptives (Depo-Provera) and contraceptive implants (Jadelle) to treat all women in the sample for at least one year were made available.[9] These stocks were also set aside solely for voucher recipients. The voucher thus meaningfully reduced barriers to contraceptive access, particularly for long-lasting hormonal methods.

The period of validity of the voucher was one month, and CHWs clearly wrote the expiration date on the voucher on the day of the second visit. In addition, enumerators wrote the wife's name and national ID numbers on the voucher. Voucher recipients were required to bring their ID cards to the clinic at the time of the visit for the nurse to verify their identity.

An additional experimental manipulation involved varying the manner in which the voucher was distributed, either privately to the wife alone (Individual) or both spouses (Couples). The experimental protocol was as follows: when the field team arrived at the couple's home for the second visit, the couple was told that the team would be conducting short surveys of each spouse. Spouses were surveyed separately to ensure confidentiality. The wife's survey asked her whether she had visited a clinic since the previous visit, and if she had any information about the voucher, while the husband's survey included questions on fertility preferences and income. Re-surveying wives in this visit allowed the CHWs to speak independently to women so that those assigned to the Individual condition could be given the information session and voucher privately.

The survey team observed the treatment assignment when they opened the survey instrument at the start of each home visit. The visit protocol required that first, the enumerators surveyed the husband alone; second, the voucher was given out; and third, the wife was surveyed alone. In the Couples arm, the husband and wife received the voucher together, with the voucher given to the husband, whereas in the Individuals arm, the wife was given the voucher in private.[10]

While the experimental intervention effectively lowered both the explicit price and the transactional costs of accessing contraceptives for several months following the distribution of the vouchers, the entire sample experienced a large, unexpected shock to contraceptive availability later that year. Between December 2007 and March 2008, injectable contraceptives were pulled from the shelves of all public and private clinics in Zambia, an action triggered when a box of

[8] Interview, Nurse Grace Daka, Chipata Clinic, July 2009.

[9] Sufficient stocks of condoms, pills, and IUDs were already available at the clinic. To keep waiting lines short we spaced the intervention over 4 months, distributing approximately 50 vouchers per week.

[10] In the Couples treatment arm, the husband's NRC number is required on the voucher and it is given directly to him. In the Individual treatment arm, the voucher is given to her, it only requires her NRC number on it, and she can simply take it and redeem it.

Depo-Provera reportedly tested positive for HIV at Lusaka international airport. Although the test conducted was invalid, the news was quickly broadcasted in the media, and on January 27, 2008, the Ministry of Health imposed a national ban on the distribution of injectable contraceptives until further tests could be conducted. After local investigations and international pressure to remove the ban, on March 16 the Zambian government officially instructed its healthcare providers to resume distribution of injectable contraceptives, after which injectables gradually returned to clinics.

While the goal of the intervention was to reduce the relative price of modern contraceptive methods, this policy shock effectively increased the relative price of injectables to be nearly infinite (though it did not affect the relative price of other contraceptive technologies). For this reason, analysis of the short-term impact of the intervention will focus on fertility 9-13 months after the provision of the voucher, nine months after the period in which voucher recipients who took up injectables were protected from unwanted pregnancies.

D. Intent-to-treat Analysis

The initial baseline sample for the study comprised 503 women assigned to the Couples voucher intervention, 528 women assigned to the Individuals voucher intervention, and 768 women assigned to the control group. Tables 1a and 1b present summary statistics on a wide range of variables available in the baseline broken down by treatment assignment; a Chi-squared test of joint significance indicates that the sample is balanced. To minimize the influence of any potential imbalance on unobservables, we present all results with a large set of controls.

Not all 1031 treatment women who were administered a baseline survey participated in the intervention.[11] 749 women ultimately participated and received the voucher; non-participation, primarily driven by resource constraints in data collection, was balanced across the Individuals and Couples arms. More details are provided in Ashraf, Field and Lee (2014). Because there was no drop-out in the experimental stage among women in the control group (who were visited only at baseline), estimates of the impact of the intervention include all subjects who completed the baseline survey in an intent-to-treat analysis.

Approximately two years later, we conducted a follow-up survey using the strategy described in Thomas, Frankenberg and Smith (2001) to track movers. In total we re-interviewed 92.5 percent of individuals, leaving a final sample of 1664. Of those 7.5 percent that could not be interviewed, 4 percent had passed away, 2 percent refused, and only slightly more than 1 percent could not be found; there were no significant differences in attrition comparing across the treatment and control arms.

[11] On-the-spot randomization at the time of the second visit would have circumvented this problem, but our choice to balance treatment assignment on baseline characteristics prevented us from randomizing on the spot. The control group faced no analogous attrition since they were visited only once.

II. Results

A. *Primary Specification*

To evaluate the impact of an increase in contraceptive access on contraceptive use and fertility, we examine differences between the treatment and control arms in two main outcomes of interest: use of modern contraceptive methods and fertility. Outcome data employed was collected in a follow-up survey of women conducted two years after the intervention. In the follow-up survey, data was collected on respondents' reproductive histories over the past two years, in addition to extensive qualitative data on factors influencing a respondent's decision to redeem the voucher and choose a particular contraceptive method, intended to shed light on mechanisms underlying differences in use of the voucher across treatment arms. Additional data on contraceptive use collected at the clinic as women redeem their vouchers is not employed here, because it was not collected from women in the control group, but is analyzed in Ashraf, Field and Lee (2014).

From these data we construct several measures of family planning behavior. To capture contraceptive use, we employ dummy variables for whether the woman experimented with a new method of modern contraceptives in the previous two years, used injectables for the first time over the previous two years, or used the pill for the first time over the previous two years. We also employ dummy variables for reported use at follow-up of any modern method, injectables or the pill over the previous two years. To measure fertility behavior, we use dummy variables for whether the woman reports a birth 9-13 months after the baseline.

The primary specification of interest can thus be written as follows, where Y_i is the outcome variable of interest and $I_{voucher}$ is an indicator for assignment to the voucher treatment group.

$$Y_i = \alpha + \beta_1 I_{Voucher} + \omega X_i + \epsilon_i \tag{1}$$

X_i is a vector of controls from both the husband's and wife's baseline surveys, including: husband's and wife's age, husband's and wife's education, husband's and wife's income, husband's and wife's existing and ideal number of children, whether wife was using contraception at baseline, whether wife was over 40, whether wife desires to become pregnant within the next two years, whether wife was aware of most fertile period of the month, and dummy indicators for compound of residence within the catchment area.[12] Observations are weighted to account for a varying probability of assignment to the control group over the period of sample recruitment.

[12] In regressions that include the control group, for whom husband survey data are unavailable, husband characteristics are taken from the wife survey.

B. Results: Contraceptive utilization and fertility

Table 2 shows the results from estimating equation (1) for the primary outcomes of interest of contraceptive utilization and fertility. It is evident that the provision of the voucher had a significant impact on contraceptive experimentation and long-term contraceptive use. The probability of experimenting with a new modern method increased by 18 percentage points on a base probability of only 7 percent, while the probability of using injectables for the first time increased by 10 percentage points on a base probability of 4 percent. For both measures, reported experimentation more than triples in the intervention arms compared to the control arm.

Examining reported use irrespective of baseline use, the probability of using any modern method over the reporting period of two years also increases by 4 percentage points on a base probability of 87 percent. The increase in injectable use is larger, 7 percentage points on a base probability of 48 percent for a proportional increase of 15 percent. However, columns (5) and (6) show that despite the large increase in contraceptive utilization, there is no detectable effect on fertility. This is true both in the full sample of women, and among those who reported at baseline that they wished to postpone a further birth for at least two years.

C. Results: Individuals and couples treatments

Table 3 shows the results from estimating a secondary specification, equation (2), that separately identifies the effects of assignment to the Individuals and Couple arms. The specification of interest can be written as follows, where I_{Ind} is an indicator for assignment to the individuals treatment group.

$$Y_i = \alpha + \beta_1 I_{Voucher} + \beta_2 I_{Voucher} \times I_{Ind} + \omega X_i + \epsilon_i \tag{2}$$

Columns (1) through (4) present the estimated coefficients for the impact of treatment on contraceptive utilization, and no heterogeneity in these estimated effects across the Couples and Individuals arms can be detected. This suggests that overall, there is no difference on average in the impact of contraceptive access on use when the woman receives the voucher alone rather than jointly with her husband.

Columns (5) and (6) present the fertility results. There is no significant effect of voucher provision on the probability that a woman in sample gives birth between 9 and 13 months after voucher provision, evident in Column (5). Column (6) restricts the births of interest to births defined as unwanted, where the woman stated at baseline that she wished to postpone a further birth for at least two years. Here, there is evidence of an actual increase in unwanted births in the Couples arm 9-13 months after the distribution of the voucher, relative to women who received no voucher. This suggests that men who received the voucher jointly

with their wives may have in fact increased their monitoring of their wives' contraceptive use, leading to a short-term increase in fertility.

The coefficient on the Individuals term is negative and significant, indicating that fertility is significantly lower in the Individuals arm compared to the Couples arm; this effect is examined in greater detail in Ashraf, Field and Lee (2010). However, the decline in fertility is not significant relative to the couples who received no voucher at all. It should be noted that the mean probability of a birth in this period is quite low (around 4 percent for the full sample), rendering it challenging to detect any significant impact on fertility.

III. Discussion

The experimental results here suggest that even a short-term shock to contraceptive access in this context can increase utilization in the medium-term, leading to significantly higher reported rates of contraceptive use at follow-up two years later. Increased access is particularly effective in stimulating experimentation with new contraceptive methods. However, there is no effect of increased access on fertility, even in the short term.

It is useful to note that use or past use of contraceptives is fairly common at baseline in this population; 63 percent of respondents had previously used or were currently using pills and 41 percent had previously used or were currently using injectables.[13] Given this level of intermediate access to modern contraceptives, even if at a high cost and with intermittent access, couples with a strong preference for managing their fertility may already have succeeded in doing so. This is also relevant to the external validity of the experiment: these results are most applicable to settings where access to contraception is significant, but the price is both high and variable.

The characteristics of women who benefited from increased access to contraceptives as a result of the intervention can be further explored by analyzing baseline data on contraceptive use. Here, we define women in either the treatment or control arms as "responders" if they report at follow-up use of a new modern method of contraception, or use of injectable contraceptives for the first time. 86 women are identified as responders in the control arm, and 172 in the pooled treatment arms. Table 4 presents a series of simple t-tests between responders assigned to the control arm and the pooled treatment arms, employing the definition of new modern users in Panel A and new injectable users in Panel B.

It is evident that responders in the treatment arms are significantly more likely to be using a contraceptive method at baseline, and the difference is driven en-

[13] Whether the sample's contraceptive use should be considered high or low is relative. Although the level of contraceptive use in the sample is higher than Zambia's population average (as shown on Online Appendix Table A.2), it is comparable to the rate of contraceptive use among married women in Zambia (with 41.5% of them reporting to have ever used pills and 24.9% ever using injectables). Similar levels of contraceptive use is observed in DHS findings from other sub-Saharan African countries, such as Kenya (2008-09) and Malawi (2010).

tirely by use of traditional contraceptives.[14] This suggests that women who are utilizing new methods as a result of increased access had exhibited demand for contraception even at baseline. There is, moreover, no difference in baseline contraceptive use between responders in the Individuals and Couples arms, consistent with the absence of any significant difference in take-up following the provision of the voucher between these arms.

This raises the question, however, of why there is a difference in fertility comparing the Individuals and Couples treatment arms. It does not seem to be the case that women using new methods of contraception in the Individuals arm are disproportionately women who were never seeking to manage their fertility, and thus who might be expected to show a decline in births after they receive the voucher. Alternatively, women in the Individuals arm - who are able to utilize contraceptives in private - may differ from their counterparts in the Couples arm in the extent to which their preferences align with their husbands' preferences. In particular, the provision of a voucher to the woman alone will presumably enable an increase in contraceptive access in couples where preferences around fertility are discordant.

Table 5 shows a series of t-tests comparing the responders in the two treatment arms (Individuals and Couples) across a number of baseline measures of discordant preferences and intrahousehold conflict. Here, responders in the Individuals arm are significantly more likely to report conflict or preferences differing from their husband at baseline; in particular, there is an extremely large difference in the proportion of responders reporting a difference in the ideal number of children. Among women using a new contraceptive method at follow-up, 44% in the Individuals treatment arm report this difference at baseline, and only 8% in the Couples treatment arm. Among those using injectables for the first time at follow-up, 40% in the Individuals treatment arm report discordant fertility preferences at baseline and only 15% in the Couples treatment arm, a difference that is not quite significant given the smaller cell size.

If women who have different fertility preferences from their husbands disproportionately access new contraceptives in the Individuals arm, this would be consistent with a decline in fertility among these women compared to their counterparts who have received contraceptives jointly with their husbands. Similarly, the absence of any difference in intrahousehold fertility dynamics comparing the control arm and the pooled treatment arms is consistent with the absence of any fertility difference between the two.[15] While this evidence cannot be considered causal, it is suggestive of the pathways through which increased contraceptive access may impact fertility.

[14]The differences are more imprecisely estimated for the sample of new injectable users, a pattern presumably driven partly by the smaller cell size.

[15]Tabulations available on request.

IV. Conclusions

The question of whether expanding access to contraceptives is sufficient to lower fertility is clearly of major policy relevance, and has been the focus of extensive research over the last decade. Despite this, there remains no real consensus in the literature. In addition, previous randomized controlled trials in this area have generally analyzed complex interventions that simultaneously target both the supply and the demand size, rendering the channels of any observed impact unclear.

This paper presents results from a randomized controlled trial in Lusaka, Zambia that provided some women with free, guaranteed access to a range of modern contraceptives either individually, without their husband's knowledge, or jointly with their spouses. Compared to previous work, this paper analyzes an intervention that is simple, scalable and entails the provision of a directly observable form of contraception.

The results show that there is a significant increase in contraceptive utilization in both treatment arms, and a particularly large increase in contraceptive experimentation. There is no significant heterogeneity in the take-up of contraceptives comparing across the Individuals and Couples sub-arms. Despite this increased use of contraceptives, however, the provision of vouchers has no significant impact on short-run fertility.

This suggests that in this context, underlying preferences around fertility are the primary determinant of fertility outcomes, and altering access to contraception without changing those preferences may not be sufficient to change the observed pattern of births. Instead, women may substitute away from other methods of contraception - methods that are more costly, less reliable, or less desirable along other unobservable dimensions - and toward the subsidized methods, without any meaningful changes in their fertility.

V. Figures and Tables

Table 1a: Summary Statistics for Recruited Sample

	Control		Couples			Individuals		
	Mean	Obs.	Mean	Obs.	P-value	Mean	Obs.	P-value
Highest schooling attained	6.21	681	6.52	460	.096	6.67	472	.011
Husband's highest schooling attained (reported by wife)	9.3	694	9.41	455	.547	9.62	475	.04
Ideal number of children	3.92	766	3.96	503	.618	3.94	528	.826
Age	27.12	763	27.51	499	.27	27.47	528	.299
Husband's age (reported by wife)	33.49	662	34.26	442	.077	34.31	461	.05
Husband's ideal number of children (reported by wife)	4.33	708	4.24	464	.409	4.23	490	.334
Has ever used a modern contraceptive method	.78	768	.78	503	.968	.81	528	.22
Wife has monthly income	.34	768	.39	503	.042	.35	528	.727
Wife knows when she is most fertile	.14	713	.12	460	.542	.16	482	.298
Wife wants to become pregnant in following 2 years	.25	768	.26	503	.539	.25	528	.896
Age wife married	19.11	755	19.15	497	.859	19.42	521	.156
Catholic	.22	768	.23	503	.552	.23	528	.526
Comparison of happiness with other women in region (1=very poor, 5=excellent)	3.52	768	3.56	503	.485	3.58	528	.307
Comparison of health with other women in region (1=very poor, 5=excellent)	3.61	768	3.65	502	.402	3.62	528	.909
Number of years respondent lived in Lusaka	18.88	763	18.06	501	.178	18.24	528	.289
Couple has electricity	.38	768	.39	503	.839	.38	528	.914
Formally married	.85	764	.88	503	.15	.87	527	.357
Number of days in past 7 years couple has sex	2.12	765	2	501	.271	2.02	523	.313
Number of days in past month couple has sex	8.37	752	7.89	496	.162	7.93	523	.17
Number of children husband has with other women	.29	768	.31	503	.31	.33	528	.075
Frequency at which couple has talked about contraception in last year	1.72	764	1.68	503	.575	1.72	528	.953
Couple has ever disagreed on number of children	.15	765	.14	503	.397	.14	528	.372
Couple has disagreed on contraceptive use	.1	763	.13	503	.098	.12	527	.170
Have used contraceptive method without husband's knowledge	.12	758	.15	501	.079	.16	526	.029
Husband drinks at least 2 to 3 times a week	.40	768	.42	503	.525	.43	528	.335
Husband has ever threatened physical violence	.56	765	.56	503	.812	.54	528	.376
Wife ever pressured to have sex	.59	768	.54	503	.092	.55	527	.122
Husband does budgeting	.14	763	.14	502	.727	.14	527	.886
Husband decides major purchases	.6	767	.65	503	.117	.65	525	.105

Notes: This table presents summary statistics for the recruited sample in the control arm and each treatment arm; the p-values correspond to tests of equality in means between the control arm and the treatment arm of interest.

Table 1b: Summary Statistics for Recruited Sample

	Control		Couples			Individuals		
	Mean	Obs.	Mean	Obs.	P-value	Mean	Obs.	P-value
Using any method at baseline	.86	756	.86	498	.784	.84	527	.404
Number of living children	2.77	756	2.9	497	.178	2.92	527	.111
Using injectable at baseline	.19	756	.22	498	.273	.19	527	.985
Using pill at baseline	.30	756	.28	498	.384	.29	527	.681
Using a hormonal contraceptive at baseline	.49	756	.51	498	.678	.49	527	.804
Has ever used an injectable contraceptive method	.41	768	.42	503	.865	.41	528	.825
Months since last birth (at recruitment)	15.5	756	15.3	498	.579	15.46	527	.922
Husband's age (reported by husband)			34.21	375		33.89	380	
Husband's highest schooling attained (reported by husband)			8.7	375		8.81	382	
Husband's ideal number of children (reported by husband)			4.43	372		4.2	378	
Husband's average monthly income (1,000 USD) (reported by husband)			.15	375		.13	382	
Wife earned money in previous month	.41	766	.45	498	.251	.4	525	.604
Husband works 40+ hours	.62	722	.55	473	.03	.59	505	.297
Wife ever pressured violently to have sex	.14	767	.15	501	.642	.14	524	.89
Husband decides savings	.65	766	.63	500	.379	.62	528	.194
Husband holds the money	.13	761	.17	499	.087	.16	521	.183
Chi-squared test for joint significance					**0.126**			**0.229**

Notes: This table presents summary statistics for the recruited sample in the control arm and each treatment arm; the p-values correspond to tests of equality in means between the control arm and the treatment arm of interest. The chi-squared test for joint significant tests for balance across all covariates reported in Table 1a and 1b.

Table 2: Contraceptive utilization and fertility: Pooled treatment effect

	New user over previous two years		User over previous 2 years		Birth	Unwanted
	Modern	Injectables	Modern	Injectables	9-13 months	birth
	(1)	(2)	(3)	(4)	(5)	(6)
Voucher	.183	.105	.035	.073	-.002	.009
	(.013)***	(.010)***	(.017)**	(.024)***	(.013)	(.014)
Mean	.071	.040	.876	.480	.043	.036
Sample	Full	Full	Full	Full	Full	Full
Obs.	1664	1664	1659	1649	1664	1239

Notes: The dependent variables in Columns (1) to (3) are dummy variables for whether a woman reports that she used a new modern method or used injectables or oral contraceptive for the first time over the preceding two years. The dependent variables in Columns (4) to (6) are dummy variables for whether a woman ever used a modern method of contraception, injectables or oral contraceptives over the preceding two years. The dependent variables in Columns (7) and (8) are a dummy variable for whether a woman gave birth in the period 9-13 months after she received a voucher. In Column (8), the sample is restricted to women who reported at baseline they did not want to give birth in the next two years. Voucher is equal to one for any woman assigned to the Individuals or Couples treatment arm. All specifications include as baseline controls all variables reported in Tables 1a and 1b, excluding the husband-reported variables that are not available for the control group. Asterisks indicate significance at the ten, five and one percent level.

Table 3: Contraceptive utilization and fertility: Separate treatment effects

	New user over previous two years		User over previous 2 years		Birth	Unwanted
	Modern	Injectables	Modern	Injectables	9-13 months	birth
	(1)	(2)	(3)	(4)	(5)	(6)
Voucher	.185	.101	.039	.069	.011	.031
	(.018)***	(.014)***	(.020)**	(.029)**	(.016)	(.018)*
Voucher x Individual	-.005	.008	-.009	.008	-.025	-.042
	(.025)	(.020)	(.020)	(.032)	(.016)	(.019)**
Mean	.071	.040	.876	.480	.043	.036
Sample	Full	Full	Full	Full	Full	Full
Obs.	1664	1664	1659	1649	1664	1239

Notes: The dependent variables in Columns (1) to (3) are dummy variables for whether a woman reports that she used a new modern method or used injectables or oral contraceptive for the first time over the preceding two years. The dependent variables in Columns (4) to (6) are dummy variables for whether a woman ever used a modern method of contraception, injectables or oral contraceptives over the preceding two years. The dependent variables in Columns (7) and (8) are a dummy variable for whether a woman gave birth in the period 9-13 months after she received a voucher. In Column (8), the sample is restricted to women who reported at baseline they did not want to give birth in the next two years. Voucher is equal to one for any woman assigned to the Individuals or Couples treatment arm, and the interaction term is equal to one for any woman assigned to receive the voucher separately from her husband. All specifications include as baseline controls all variables reported in Tables 1a and 1b, excluding the husband-reported variables that are not available for the control group. Asterisks indicate significance at the ten, five and one percent level.

Table 4: Summary Statistics for Recruited Sample - Contraceptive Use

	Control		Voucher Treatment		
	Mean	Obs.	Mean	Obs.	P-value
Panel A: New Modern Users					
Using any method at baseline	.76	86	.92	172	.000
Using any modern method at baseline	.40	86	.4	172	.929
Using condom at baseline	.16	86	.2	172	.499
Using traditional method at baseline	.29	86	.42	172	.046
Index: Contraceptive use	.4	86	.49	172	.001
Chi-squared test of joint significance					.012
Panel B: New Injectable Users					
Using any method at baseline	.71	34	.89	98	.012
Using any modern method at baseline	.35	34	.37	98	.882
Using condom at baseline	.15	34	.23	98	.285
Using traditional method at baseline	.26	34	.39	98	.200
Index: Contraceptive use	.37	34	.47	98	.013
Chi-squared test of joint significance					.182

Notes: This table presents summary statistics for the recruited sample in each treatment arm who have reported the use of any new modern method (IUD, pill, implants, and injectables) for the first time over the preceding two years. The voucher treatment arm includes both the Couples and Individuals treatments. All measures summarized here are reported by the wife at the baseline. The p-values correspond to tests of equality in means between Controls and the pooled treatment arms. The index on contraceptive use is the mean of all dummy variables. The chi-squared test for joint significant tests for balance across all covariates reported here.

Table 5: Summary Statistics for Recruited Sample - Intra-household conflict

	Voucher Delivery Type				
	Couples		Individuals		
	Mean	Obs.	Mean	Obs.	P-value
Panel A: New Modern Users					
Difference in ideal numbers of children	.08	85	.44	87	.025
Disagreed about number of children	.12	85	.13	87	.861
Disagreed about contraceptive use	.14	85	.09	87	.317
Used contraception without husband's knowledge	.11	85	.17	87	.210
Wife ever pressured to have sex	.42	85	.52	87	.221
Wife ever pressured violently to have sex	.12	85	.10	86	.788
Would hide money from husband	.19	85	.34	87	.020
Husband would hide money	.24	72	.36	76	.114
Index: Intra-household conflict	.19	85	.25	87	.044
Chi-squared test of joint significance					.047
Panel B:New Injectable Users					
Difference in ideal numbers of children	.15	46	.40	52	.270
Disagreed about number of children	.11	46	.13	52	.700
Disagreed about contraceptive use	.20	46	.08	52	.085
Used contraception without husband's knowledge	.15	46	.19	52	.605
Wife ever pressured to have sex	.28	46	.46	52	.069
Wife ever pressured violently to have sex	.07	46	.12	51	.379
Would hide money from husband	.17	46	.29	52	.185
Husband would hide money	.23	40	.38	48	.132
Index: Intra-household conflict	.18	46	.24	52	.143
Chi-squared test of joint significance					.226

Notes: This table presents summary statistics for the recruited sample in each treatment arm who have reported the use of the injectable method for the first time over the preceding two years. All measures summarized here are reported by the wife at the baseline. The p-values correspond to tests of equality in means between the Couple and the Individual treatment arms. The index on intra-household conflict is the mean of all variables reported here, except the *difference in ideal numbers of children* is turned into a dummy variable that equals 1 if husband wants more children than wife. The chi-squared test for joint significant tests for balance across all covariates reported here, except for the indexes.

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