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Abstract

While men and women make joint decisions about fertility, the fact that women typically give birth may produce gendered spheres of learning about a non-trivial cost of childbearing in many settings: maternal health risk. Within couples in Zambia, husbands have lower awareness of maternal risk factors and higher demand for children. We develop an experiment to show how differential knowledge of risk can lead to persistent conflict in the household when information frictions prevent communication between spouses. Our experiment varies whether the husband or wife receives information about maternal health risk. One year post-intervention, husbands taught about such risk exhibit significant gains in knowledge, report lower demand for children, and communicate this information to their wives, who also update beliefs. Both disagreement over fertility and pregnancy fall significantly in this arm. Meanwhile, when women are taught about risk, they update beliefs but are unable to transmit the information to their husbands, so household disagreement over fertility persists. While pregnancy falls also among these couples, such a decline comes at the cost of a significant reduction in transfers to the wife and lower reported well-being. To understand the mechanisms underlying our findings, we develop a model in which information asymmetries over maternal health risk can persist in equilibrium and generate disagreement over fertility that cannot be resolved with transfers. These findings suggest that childbearing costs, particularly those borne by one party, cannot be easily communicated within the household, but appropriate targeting of information can overcome asymmetries and improve household well-being.

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One of the most important economic decisions a household can make is how many children to have. While fertility decisions are typically the joint domain of romantic partners, men and women often have different information about the costs of childbearing because they participate in different spheres of activity. There is no more gendered sphere of activity than childbirth. In most countries in the world, men do not accompany their wives into the labor ward or attend obstetric appointments, and most policies providing education about childbirth and maternal health are directed to women.[1] This circumscribes direct information on childbearing risk - a potential determinant of fertility and birth spacing, particularly in high-risk settings (Jayachandran and Lleras-Muney, 2009) - to women alone.[2] While such information can, in theory, be communicated from a woman to her partner, in this paper we show that, when spouses have diverging interests, credible communication can break down, which has important implications for the efficiency of intra-household decision-making over fertility, and ultimately women's well-being.

Our study investigates spouses' knowledge of maternal mortality in a high-risk setting, how it spreads between partners, and how it influences household fertility preferences and outcomes. To do so, we conduct a field experiment that delivers information on maternal mortality risk factors to low-income couples in Zambia within the context of a family planning workshop at a public clinic, and randomly vary which spouse receives that information. Our investigation utilizes novel data collected from men and women on beliefs about maternal health costs, which reveal significant gender differences at baseline in maternal mortality and morbidity risk awareness. Specifically, men in our setting have more limited knowledge than their wives of the risk factors that influence childbirth outcomes, which can be attributed to the gendered spheres of direct and indirect knowledge accumulation of maternal labor and delivery outcomes that typifies much of the developing world. A large fraction of Zambian men also have higher demand for children than their wives and lower demand for birth spacing, consistent with gendered patterns of fertility demand observed throughout the region (Westoff, 2010; Westoff and Bankole, 2002).

Delivering maternal mortality information not only succeeds in altering beliefs about maternal mortality risk factors – including low birth spacing – but also leads to a significant reduction in

[1] Even countries where norms have changed have only done so relatively recently. In the United Kingdom, for example, male partners' attendance during childbirth was still a minority in the 1960s, and was still considered controversial even as late as the 1970s (King, 2016).

[2] As focus group participants of reproductive age in Zambia told us, "The men aren't in the labor ward with us, they don't know what we go through; "We can explain to our husbands what's going on with complications, and that we're scared, but they won't understand because they don't experience the same things;" "I think that women need to look out for their own health, because if I die in the labor ward, my husband can't die with me."

fertility over the following year, indicating that couples were encouraged by the intervention to delay childbirth. To our knowledge, this is the first study to show that increasing awareness of maternal mortality risk can promote higher birth spacing. The sizable impact of a simple information intervention is particularly striking in a setting in which fertility has remained persistently high despite numerous public health interventions aimed at increasing the supply of family planning services, and suggests that demand-based interventions may be a cost-effective mean of reducing excess fertility, even if targeted to men.[3] The fact that men respond as strongly as women to maternal mortality information indicates a substantial proclivity among men to internalize health costs borne by their wives when given credible information.

Yet, despite the fact that men appear to value the information, we also find that they are unable to learn about it from their wives. In particular, we find that the intervention had a differential spillover effect on untreated spouses depending on the gender of the individual who was targeted, which is reflected in both stated beliefs and reported communication between spouses post-intervention. When men were presented with maternal mortality information directly, they not only updated their beliefs about maternal risk factors but also reported transmitting this newly-acquired knowledge to their wives, who also updated their beliefs. Treated men also report lower fertility goals, indicating spousal convergence in demand for children, which is reflected in greater reported agreement on family planning. In contrast, when women are treated, they update their own beliefs but fail to transmit any of the new knowledge to their husbands. Men whose wives are treated experience no change in beliefs about risk or demand for children, and hence these couples are no more likely to report agreement on family planning.

These findings provide novel evidence that differences in beliefs about maternal mortality risk contribute to gender differences in fertility demand in high-risk settings such as Zambia. While gender differences in fertility preferences have been extensively documented, there is little understanding of the factors contributing to this pattern. Our findings also reveal that barriers to the flow of information about childbearing costs drive a further wedge between male and female fertility demand. That is, the results imply that, as women accumulate information on risk - for instance, through birth experience or interaction with health care providers - their demand for children will fall, while that of their husband stays constant. If men were able to learn about risk at the same rate, their demand for children would fall symmetrically with that of their wives.

[3]Fertility rates across sub-Saharan Africa remain the highest in the world, even in the face of growing economic development. In Zambia, around the time of our study, the overall urban fertility rate was about 3.7 children per woman (ZDHS 2013-14), higher than most similar middle-income countries around the world.

While spousal differences in preferences and costs have been shown to be a core source of friction in intra-household bargaining over fertility (Ashraf, Field and Lee, 2014; Doepke and Kindermann, 2019), our study is the first to show that information asymmetries about childbearing costs are a source of gender differences in the demand for children. From a policy perspective, our results reveal that maternal mortality information campaigns have greater potential to influence household fertility if they target men rather than women.

In light of these shifts in the degree of discordance in spousal fertility preferences, alongside pregnancy, we also look at the transfers a woman receives from her husband in the year following the intervention, a key outcome of household bargaining over fertility. Importantly, convergence in spousal beliefs about childbearing risk, which only occurs when husbands are treated, is associated with realized fertility that is significantly lower - and therefore more closely aligned with the wife's ideal fertility - without any change in transfers to the wife. In contrast, changing women's beliefs without influencing those of their husbands, which occurs when wives are treated, leads to lower realized fertility but at a cost to women, who experience a compensating reduction in transfers and support from their husbands. In other words, when a woman's demand for children falls but her husband's does not, she has fewer children but has to give up transfers in order to achieve that. When the same information reaches the husband and, through him, the wife, fertility falls in conjunction with lower demand from *both* spouses, so there is no consequence for transfer allocations. This pattern of realized outcomes is important because it indicates that information frictions may generate intra-household bargaining outcomes that depart from the joint optimum.

To provide a framework for understanding the mechanisms behind these empirical patterns, we develop a theoretical model in which gendered spheres lead both to specialized knowledge accumulation and diverging preferences, affecting the possibility of informative communication from the wife to the husband. Without such information asymmetries, spousal cooperation would ensure efficient levels of fertility as long as there is potential to make intra-household transfers. However, gendered spheres of activity - in particular, women's responsibility in bearing children, which exposes them directly to information about risk - and asymmetric access to resources - in particular, men's ability to use transfers to implement their preferred fertility outcomes - generate barriers that impede women from effectively communicating about maternal health costs to their husbands. Fundamentally, an informed wife has an underlying interest in manipulating information about risk in order to reach her preferred fertility outcome and transfers from the husband; knowing this, the less informed husband discounts the information communicated to him (Crawford and

Sobel, 1982). This phenomenon prevents convergence in beliefs within couples, which is likely to be made even harder by the stigma surrounding maternal mortality that is prevalent in our context (Ashraf et al., 2017), which further inhibits communication between spouses.

The purpose of the model is to illustrate how information asymmetries on childbearing costs may generate a persistent wedge between male and female demand for children that, due to information frictions among couples, is not resolved with transfers. In particular, when women are better informed than men about costs, couples may be unable to implement optimal contracts over fertility. Because they cannot agree on the true risk of maternal mortality, they cannot achieve a fertility outcome that he would have been willing to compensate and she would have been willing to implement. This leads to a reduction in transfers from husbands to wives and sub-optimal fertility outcomes.

The central predictions of our theoretical model of communication barriers correspond to the empirical patterns observed in our field experiment, providing evidence that strategic communication concerns limit the transmission of knowledge from women to men, even in a context that is considered a woman's domain of expertise (maternal health). Indeed, we find that male subjects exhibit no reluctance to update beliefs based on maternal mortality information delivered by a female facilitator, and yet still fail to update when their wife possesses the same knowledge.

This paper contributes to an emerging body of work that has begun to explore the transmission of information within the household (Ziparo, 2020; Apedo-Amah, Djebbari and Ziparo, 2020; Conlon et al., 2022). The vast literature on household decision-making presumes that household members have access to the same information, and that new information spreads seamlessly within the family (Chiappori, 1992; Lundberg and Pollak, 1996). A smaller body of literature has examined the degree to which asymmetric information between spouses affects household decision-making (see Ashraf (2009); Stern and Friedberg (2010); Chen (2013); Baseler (2020)), furthering the evidence of inefficient outcomes in household decisions (Udry, 1996; Duflo and Udry, 2004; Schaner, 2015). However, very little is understood about *how* and *why* information does or does not spread. Our paper illuminates how roles taken in the household lead to gendered spheres of knowledge accumulation, and shows just how significant the implications of this can be for important economic outcomes such as fertility.

Measuring information spillovers and diffusion within the household also contributes to our understanding of motivations for information sharing and influencing joint decisions in group settings. While the effect of preference misalignment on communication has been studied in the lab, our empirical application provides the first field experimental evidence that directly tests models of strategic communication, wherein persistent differences in preferences and conflict of interest impede communication and beliefs updating (Crawford and Sobel, 1982; Mailath, 1987; Crawford, 1998, 2019).[4] Data from our field experiment also allow us to measure the welfare implications of communication failures. We find that the inability to transmit information to husbands implies that women who respond to risk information by delaying pregnancy are penalized in the form of lower transfers, and experience a decrease in well-being. Although marital separation is rare in our sample, the inability to come to an agreement on risk also in expectation leads some couples who have potential surplus from marriage to forego or abandon it.

By examining the role of beliefs about maternal mortality risk, our study also contributes to the literature on decision-making over fertility when spouses have different preferences and incentives. While the sociology and demography literature studying spouses' interactions on fertility decisions is well established, few studies in economics have emphasized the role of intra-household interactions (Rasul (2008); Ashraf, Field and Lee (2014); Doepke and Kindermann (2019); De Paula, Shapira and Todd (2014) and Rossi (2019)) and culture (Fernandez and Fogli, 2009) in this process.[5] We emphasize that initial differences in ideal fertility between men and women, which are large across sub-Saharan Africa and in Zambia (see Figure A1), can generate persistent disagreement over demand for children because of fundamental information asymmetries that cannot readily be addressed with communication and transfers.

In terms of policy, we show that information asymmetries within households may persist as equilibrium outcomes, and thereby reduce the effectiveness of public health campaigns at changing household outcomes when they only target women.[6] More generally, by documenting that giving

[4]See, for instance, Dickhaut, McCabe and Mukherji (1995) and Cai and Wang (2006) test the model of Crawford and Sobel (1982) in a laboratory setup, while Dickson, Hafer and Landa (2008) show responsiveness of communication to strategic incentives in a committee voting laboratory experience.

[5]Outside of economics, see studies about fertility and contraceptives use from a theoretical perspective (Blanc, 2001; Miller, Severy and Pasta, 2004; Brehm and Schneider, 2019), in developed countries (Bauer and Kneip, 2012; Stein, Willen and Pavetic, 2014), and in Sub-Saharan Africa (Ezeh, 1993; Bond and Dover, 1997; Dodoo, 1998; DeRose et al., 2004; Pulerwitz et al., 2010; Gottert et al., 2018).

[6]Our paper also contributes more generally to understanding the role of information for economic behavior. A rich body of evidence has shown that information can have a substantial impact, through a process of beliefs updating or by enhancing salience, on education (Jensen, 2010; Dizon-Ross, 2019) and health outcomes (see, among others, Thornton (2008); Dupas (2011); De Paula, Shapira and Todd (2014); Delavande and Kohler (2016); Bennett, Naqvi and Schmidt (2018)). We contribute to this literature by highlighting that, if information flows between spouses are constrained, targeting particular household members will affect household behavioral responses to new information, just as in the case of cash transfers (Lundberg, Pollak and Wales, 1997). Björkman Nyqvist and Jayachandran (2017) find that educating mothers about child health in Uganda leads to greater adoption of health-promoting behaviors. In our setting, there is a strong policy argument for targeting men with information related to reproductive health since they can more readily transmit information to their spouses and lead to behavior change that is not associated with reductions in transfers and intra-household cooperation.

men information about maternal mortality risk has a sizable effect on household behavior and results in beliefs updating and a decline in fertility, we provide new evidence on the critical role of men in shaping fertility outcomes in the household and on the factors that influence this role. While several studies have highlighted men's central role in reproductive decision-making (Vouking, Evina and Tadenfok, 2014), studies often find conflicting effects of male-targeted family planning campaigns.[7] Maternal mortality risk is one area in which men have little ability to gain direct knowledge; we show that they respond readily to this knowledge, ruling out that they are simply inattentive or place little weight on a cost that falls disproportionately on women.

The manuscript is organized as follows. Section 1 describes the study context and documents men's and women's knowledge and beliefs about maternal mortality and morbidity in Lusaka. Section 2 describes our model and its predictions. Section 3 presents the experimental design and section 4 the implementation of the experiment. The empirical findings are reported in section 5. Section 6 concludes.

1 Context

We conducted this study in Lusaka, the capital city of Zambia. High fertility rates in Lusaka, coupled with rapid rural-to-urban migration, has led to the establishment of informal settlements (or compounds) in which a growing proportion of the city's population resides, and where our study takes place.[8] In this section, we describe the reproductive health challenges in Zambia more generally and in our sample from the compounds of Lusaka.

1.1 Knowledge, beliefs and communication about maternal risk

According to the 2014 DHS, the maternal mortality ratio in Zambia is equal to 398 deaths per 100,000 live births. This ratio implies that, at the time of our study, in expectation 1 in 59 Zambian women died giving birth (Central Statistical Office, 2014). The primary causes

[7] Although some randomized public health studies found that providing contraceptive education to husbands increases take-up of modern contraceptives (Wang et al., 1998; Terefe and Larson, 1983; Fisek and Sumbuloglu, 1978), one particularly large study found no effect (Freedman and Takeshita, 1969), while Ashraf, Field and Lee (2014) find a negative one. Recent evidence from rural Malawi, Tanzania, and Mozambique suggests that promoting contraceptive use among men may have the potential to substantially increase take-up (Shattuck et al., 2011; McCarthy, 2019; Miller, De Paula and Valente, 2020).

[8] According to the World Bank, 43% of the Zambian population in 2017 resided in urban cities. Data available at https://data.worldbank.org/indicator/sp.urb.totl.in.zs, last accessed May 2019.

of maternal death in Zambia are obstructed labor, hemorrhage, blood pressure disorders, and sepsis (Banda, 2015). The high incidence of maternal mortality also implies a correspondingly high incidence of maternal morbidity in the general population, which is typically believed to be orders of magnitude larger than maternal mortality.[9] Data on maternal morbidity, however, is not systematically available for Zambia nor in comparable contexts.[10]

Our baseline survey, collected in the Fall of 2014 from 715 couples in peri-urban Lusaka, provides unique insights into men's and women's experience with and knowledge of maternal mortality and morbidity risk. First, there are notable gender differences in awareness of maternal health events within the community. When asked about the wife's direct experience with complications and difficulties at birth, men and women have a very similar propensity to report experiencing birth complications (Table 1 Panel A, 11.4% of men and 11.3% of women).[11] Likewise, reported maternal mortality episodes among family members is similar for women and men. However, the reported incidence of maternal mortality differs substantially across male and female respondents as social distance increases: only 6.8% of men report knowing a close friend whose wife has died giving birth, while 11.0% of women know a close friend who has died giving birth. An even greater gap is observed for distant friends: 10.8% of women and only 5% of men know of maternal mortality episodes among distant friends. Similarly, women are 4 percentage points more likely to have heard of someone experiencing complications in the past year, and over 10 percentage points more likely to have heard of someone who died in childbirth over the same period. Consistent with this gender gap in awareness across members of the same household, 53.4% of women and only 27.6% of men report having attempted to discuss maternal mortality and morbidity risk with their spouse at baseline. Likewise, survey data indicate that health providers are not filling the knowledge gap: only 47.4% of women and only 19.4% of men report discussing reproductive health with a healthcare provider.

These patterns indicate gendered spheres of learning about maternal mortality risk in which

[9]Maternal morbidity is defined as unexpected outcomes of labor and delivery that result in significant consequences to a woman's health. According to the WHO, for every woman who dies in childbirth, 20 or 30 experience acute or chronic morbidity. Across Sub-Saharan Africa, for example, the range of instances of severe morbidity over 1,000 births is estimated between 109 for Nigeria and 9 for Tanzania, hence tens of times higher than mortality (see Geller et al. (2018)).

[10]The exception is the Global Network Maternal and Newborn Health (MNH) Registry Data from 2014 and 2016, which places the ratio of extremely severe morbidity ("near miss") to mortality at 19:1 (Goldenberg et al., 2017). Such an incidence would place the lifetime risk of death or near miss at over 40%.

[11]In fact, men are more likely than women to report that any complication occurred (17.5% of men and 13.8% of women, Table 1, panel A). However, this is only because men are substantially more likely to report miscarriages and stillbirths as maternal health complications. Without these events, the rates are almost identical (11.4% as reported by men and 11.3% as reported by women. Adverse events reported by men and women in our sample are primarily hemorrhages, c-sections, breech presentations, obstructed or prolonged labor, and tearing.

women are systematically better informed about maternal health risks. Men are also more likely than women to fail to identify high parity and advanced maternal age as individual risk factors for birth complications (Table 1 Panel B). Similarly, in a sequence of questions in which respondents are asked to report the likelihood, on a scale from 0 to 10, that a hypothetical woman with a given set of characteristics (age, parity, most recent birth) experiences complications at birth, men report significantly lower levels of risk for six out of seven hypothetical cases.[12]

As documented in Ashraf et al. (2017), in Zambia, common perceptions of the causes of maternal mortality are influenced by deeply-rooted traditional beliefs that are widespread in Sub-Saharan Africa. In particular, marital infidelity by either spouse is considered a primary cause of maternal health complications, (Nsemukila et al., 1999; Umoiyoho et al., 2005; Gennaro et al., 1998), often discouraging women from seeking medical help when complications arise (Phiri et al., 2014). Indeed, 55.5% of men and 42.0% of women report (without being prompted) infidelity as a leading cause of maternal labor and delivery complications, assigning to it greater weight as a root cause of maternal mortality than lack of appropriate healthcare and poor health status combined.[13] The stigma arising from this belief may be highly relevant to information transmission within the household on maternal risk, because it potentially reduces women's willingness to raise concerns about birth complications with their spouses.

Overall, our data indicate that, while maternal health is a relevant source of concern for the couples in this setting, there exist significant gender gaps in exposure to information and knowledge of maternal mortality and morbidity risk within households in our context, which motivate our intervention to raise awareness of maternal risk and also observe the transmission across spouses of new information on maternal risk.

1.2 Fertility, desired fertility and contraceptive use

Zambian fertility rates are high. Data from the 2014 DHS indicate that the total fertility rate in Zambia is 5.3 children per woman aged 15-49. Urban areas have a somewhat lower rate than rural areas, at 3.7 children per woman.

High fertility in Zambia is associated with a high unmet need for family planning services:

[12]See Appendix D1 for the wording of the relevant question. The gender differences in beliefs over risk with advanced maternal age are particularly stark and become more apparent when examining the distribution of responses to the ladder-scale question (See Figure A3). This is particularly relevant for our sample as 15% of women in our study are of advanced maternal age at baseline (over 35).

[13]To elicit the weight that respondents attribute to different causes, we gave respondents 30 buttons and asked them to allocate between causes. See the Appendix for the wording of the questions.

Table 1: Fertility Outcomes, Preferences, Beliefs and Attitudes at Baseline

	Women	Men	Diff. SE	p-value
Panel A: Maternal Health Experience and Communication				
Past maternal and birth complications or difficulties	0.138	0.175	(0.019)	[0.055]
Past maternal complications or difficulties	0.113	0.114	(0.017)	[0.918]
Immediate family member died from complications	0.039	0.032	(0.010)	[0.470]
Close relative died from complications	0.067	0.049	(0.012)	[0.147]
Close friend died from complications	0.110	0.068	(0.015)	[0.006]
Distant friend died from complications	0.108	0.050	(0.014)	[0.000]
Heard someone experienced complications last year	0.363	0.324	(0.025)	[0.123]
Heard someone died in childbirth last year	0.352	0.246	(0.024)	[0.000]
Discussed family planning with healthcare provider	0.474	0.194	(0.024)	[0.000]
Communicated info about future possibility of complications	0.534	0.276	(0.025)	[0.000]
Panel B: Maternal Mortality and Morbidity				
Ideal space between children (m)	41.142	36.636	(0.955)	[0.000]
Months woman should give body to recover post-birthing	27.058	26.132	(0.975)	[0.343]
Women with more kids at same or lower risk of complications	0.223	0.280	(0.023)	[0.013]
Older women at same or lower risk of complications	0.154	0.257	(0.021)	[0.000]
Likelihood of complications if immediately pregnant	8.000	7.880	(0.127)	[0.343]
Likelihood of complications if pregnant 12 months after delivery	4.722	4.686	(0.137)	[0.793]
Likelihood of complications if pregnant 24 months after delivery	2.400	2.155	(0.124)	[0.048]
Likelihood of complications if less than 4 kids	3.076	2.933	(0.121)	[0.238]
Likelihood of complications if more than 4 kids	5.805	6.014	(0.136)	[0.123]
Likelihood of complications if younger than 40	3.721	3.261	(0.130)	[0.000]
Likelihood of complications if older than 40	7.930	7.451	(0.118)	[0.000]
Reports that infidelity increases risk of complications	0.420	0.555	(0.026)	[0.000]
Relative infidelity weight	0.304	0.328	(0.009)	[0.009]
Total observations	715	715		

Notes: Baseline survey collected in the Fall of 2014. "Likelihood of complications..." variables is the reported likelihood on a scale from 0 to 10. "Relative infidelity weight" is the percentage of points assigned to infidelity as a cause for maternal mortality as opposed to health problems or lack of healthcare. The wording of all questions is in Supplemental Materials.

14% of married women report having an unmet need for spacing births and an additional 7% report an unmet need for limiting them. Nevertheless, desired fertility is also high and it differs significantly between married men and married women: in the 2014 DHS, the ideal number of children is 5.1 for married women and 5.7 for married men nationwide. Appendix Figure A2 highlights the discrepancy in the desire for additional children as a function of the current number of living children in that sample (Panel A).

From our baseline survey, similar patterns emerge. Ours is a prime-age urban sample, and the average age of women is 28. Still, women in the sample have on average 2.6 children (Appendix Table A1) and unmet need for family planning is high.[14] Overall, 32% of the women in our sample

[14]Women aged 35 and above (16% of our sample), and hence closer to completed fertility, have on average

report not using modern contraceptives at baseline. Of the 33% of women in our sample who want no more children, 27% are not using any modern contraceptive (8% of the overall sample). Similarly, of the 52% of women in our sample who wish to delay giving birth by at least one year, 23% are not using any modern contraceptive (12% of the overall sample).

As is observed in the nationally-representative sample from the DHS, men in our sample also have higher desired fertility on average than their wives: 4.43 for men, 4.19 for women (Appendix Table A1). Indeed, the distribution of men's reported ideal fertility first-order stochastically dominates that of women (see Appendix FigureA4, panel b). In 35.7% of couples, there is no gap between husband and wife in the ideal number of children. In 36.6% of couples, the husband wants more children than the wife (on average 1.9 more children). In the remaining 27.7%, the wife wants more children than the husband (on average 1.6 more children). Although the spousal gap in demand for children is somewhat lower in our sample than in nationally representative samples, that is likely due to the fact that the inclusion criteria for our experiment selected couples who were willing to participate jointly in the information session; hence, we likely exclude those with the highest levels of disagreement and cooperation. As such, the patterns we uncover are likely to be even starker in the general population.

Men and women in our sample also exhibit substantial differences in their attitudes toward family planning and contraception. For instance, 38.3% of men report thinking that contraceptives are bad for a woman's health, compared with 17.2% of women (Appendix Table A1). Similarly, 31.0% of men report thinking that contraceptives reduce a woman's future ability to conceive versus only 17.0% of women. In addition, 57.9% of men and only 37.6% of women report thinking that contraceptives encourage women to be unfaithful.

These numbers suggest that, when communicating over fertility decisions and maternal health risk, spouses' incentives may not be aligned: women tend to want smaller family sizes on average, but desired fertility varies. This environment is, hence, quite different from related studies of information transmission in the household, such as Conlon et al. (2022), in which spouses' incentives are aligned and hence communication is not hindered by partners' strategic incentives to misreport.

Indeed, baseline data indicate that misaligned fertility goals, captured by whether the man reports wanting a child as soon as possible, influence effective communication between spouses over maternal health, as does male awareness of maternal mortality risk, captured by whether the man knew a woman who has died in childbirth. Both variables have a very strong correlation with communication and beliefs about maternal health risk within the household (Appendix Table A2):

3.9 children.

both men and women in our survey report that communication on maternal health is significantly more likely to occur and to not break down when a man knows someone who died in childbirth, and significantly less likely to occur when he wants a child as soon as possible. These correlations suggest there may be important heterogeneity in the degree of transmission between spouses that results from providing new information about maternal risk according to these two dimensions of spousal discord, which our empirical analysis explores.

2 The experiment

To study and compare the effect of providing information about maternal mortality to men and women, we designed and implemented a randomized field experiment among couples.

2.1 Design

Both spouses in all couples were invited to participate in a group meeting in which general information about family planning was provided. Our intervention experimentally varied the additional provision of information about maternal mortality and morbidity risk to either the husband or the wife of each household. Hence, each household was randomly assigned to one of three study arms (see Table 2 for notation):

i) The husband was exposed to both a maternal mortality curriculum and a family planning curriculum and the wife was exposed to the family planning curriculum.

ii) The wife was exposed to both the maternal mortality curriculum and the family planning curriculum and the husband was exposed to the family planning curriculum.

iii) Both spouses received the family planning curriculum only.

In order to identify gender differences in responsiveness to information separately from potential gender differences in take-up, as further discussed below, only couples in which both spouses were present could attend the meetings.

2.2 Identification and empirical specification

The primary goal of our experimental design is to identify the direct and indirect spillover effects of providing information on maternal mortality to men and women. In the experiment, maternal health information (MM) is always delivered alongside information about family planning (FP),

Table 2: Experimental design

		Husband	Wife
Husband treated	$[FP{+}MM^h]$	$(FP{+}MM)$	FP
Wife treated	$[FP{+}MM^w]$	FP	$(FP{+}MM)$
Control	$[FP]$	FP	FP

which is also provided to the control group. This design ensures that *all* participants attend a reproductive health group meeting, addressing the concern that a direct effect or an experimenter demand effect generated by the group meetings may confound estimates of the effect of maternal health information. One shortcoming of this design is that the control group may be influenced by the family planning information itself, making some effects potentially harder to detect, however, it ensures that we can unambiguously isolate the incremental effects of maternal mortality information.

Our experiment focuses on two sets of empirical objects. First, we are interested in separately estimating the average treatment effects of delivering both maternal health and family planning information ($(FP+MM)^j$) to each spouse $j \in \{h,w\}$ compared to delivering family planning information alone ($(FP)^j$) on a hypothetical outcome of interest Y, measured at either the household level (e.g. take-up of family planning and fertility) or the individual level (e.g. knowledge of maternal health, attitudes towards family planning), for either the treated spouse (direct effect) or the untreated spouse (spillover effect). The second object we are interested in estimating is the comparison of the direct and spillover effects of providing information about maternal mortality to men compared to women on household-level and individual-level outcomes.

The main challenge associated with estimating these objects is that participants choose whether to attend the community meeting, which could give rise to differential take-up selection across comparison groups.This challenge is partially addressed by a standard double-blind approach: surveyors who invite couples to the meetings do not know what type of meeting each individual is invited to, and the invitation cards contained no information to participants on the meeting type they have been randomized into, ensuring that selection into participation in the workshop is the same across meeting types *within* genders.[15] Hence, we can safely estimate a treatment-on-the-treated effect TOT^j for men and women separately.

However, even with double-blind invitations, we are still left with the concern that women

[15] Participants were invited to attend a "health-related meeting", and neither family planning nor maternal health were mentioned in the invitation.

and men who decide to attend may come from different types of couples, which would happen if the characteristics that govern the selection of a household into participation when a man is invited differ from those governing selection when a woman is invited.[16] To address this issue, we chose to invite both spouses to attend workshops together: invited couples were required to show up at the same time and were then directed to separate, gender-specific meetings. Hence, we have a three-arm design in which men and women in *all* study couples receive information on family planning, while the treated spouse receives maternal health information as well. Considering only couples in which both spouses have attended a workshop ensures that we are estimating the gender difference in the treatment-on-the-treated effects on directly comparable samples of men and women.[17] This setup can then allow us to study both the direct effects of the intervention on treated respondents and the indirect effects on the respondents' spouses.

Our estimating equations follow straightforwardly from our design. When considering outcome Y for household i, we estimate the following specification on the sample of treated couples:

$$Y_i = \alpha + \beta_H HusbandTreated_i + \beta_W WifeTreated_i + \theta X_i + \epsilon_i \quad (1)$$

Variables $Husband\,Treated_i = \mathbb{1}\left[FP+MM^h\right]_i$ and $Wife\,Treated_i = \mathbb{1}\left[FP+MM^w\right]_i$ are indicators for assignment to either the husband's or the wife's treatment arm. Hence, β_H and β_W identify the average treatment-on-the-treated effects for men and women respectively, while their difference captures the difference in the effect of treating a given spouse. In the tables, we report the p-value of this F-test ($\beta_H = \beta_W$). The vector of baseline control variables X_i includes the wife's age, husband's age, wife's education, husband's education, number of children, age of last child born before the group meeting, number of people who attended the group meeting, modern contraceptive use at baseline, quadratic weekly income plus the stratification variables.[18] As a robustness check,

[16]Suppose, for example, that women from more conservative couples are unable to attend a meeting on their own, while their husbands would be willing to participate. If conservative couples have different treatment effects from the rest of the sample, we may detect a difference between treatment effects across arms that depends on take-up and not on differential effects across genders.

[17]The treatment-on-the-treated effect that can be estimated in this case is equal to:

$$\Delta TOT = E[\left(Y(FP+MM^h) - Y(FP+MM^w)\right) | p^h = 1, p^w = 1].$$

[18]Stratification variables are primarily variables likely to affect the relevance of maternal health information for fertility decisions: i) a dummy for whether wife over 35; ii) a dummy for whether the couple is childless; iii) a dummy for whether the wife thinks that the husband wants another child later and for whether the wife thinks the husband does not want another child; iv) a dummy for whether the husband does not know any woman who died at childbirth; v) a dummy for whether the wife is actively trying to get pregnant; vi) block size; vii) availability of baseline data.

in the Appendix, we also perform post double selection LASSO to select the control variables.

We also consider specifications in which the outcome variable is measured at the individual, rather than household, level for spouse $j \in \{h,w\}$ in household i (e.g. beliefs). Our design allows us to compare the direct effect of treating a subject with the spillover (indirect treatment) effect on his or her partner, by estimating

$$
\begin{aligned}
Y_i^j = & \delta_H^h Husband,\ informed\ directly_{i,j} + \delta_W^h Husband,\ spouse\ informed_{i,j} \\
& + \delta_H^w Wife,\ spouse\ informed_{i,j} + \delta_W^w Wife,\ informed\ directly_{i,j} \\
& + \zeta X_i + \eta X_i \times HusbandRespondent_i + \upsilon_{i,j}. \qquad (2)
\end{aligned}
$$

The coefficients δ_i^j capture the direct and spillover effects of providing information to the husband or the wife:

i) δ_H^h represents the (direct) effect of treating the husband on the husband's outcome variable Y_i^h;

ii) δ_W^h represent the (spillover) effect of treating the wife on the husband's outcome Y_i^h;

iii) δ_W^w represent the (direct) effect of treating the wife on the wife's outcome Y_i^w;

iv) δ_H^w represents the (spillover) effect of treating the husband on the wife's outcome variable Y_i^w.

We report the p-values of the following F-tests:

i) the difference between direct and spillover effects on the husband, i.e. between the effect of treating the husband himself or his wife on the husband's answer ($\delta_H^h = \delta_W^h$), denoted in the tables as *Direct vs. spillover effect on husband*;

ii) the difference between direct and spillover effects on the wife, i.e. between the effect of treating the wife herself or her husband on the wife's answer ($\delta_W^w = \delta_H^w$), denoted as *Direct vs. spillover effect on wife*;

iii) the difference between spillover effects, i.e. between the effect of treating the husband on the wife's answer and treating the wife on the husband's answer ($\delta_H^w = \delta_W^h$), denoted as *Symmetry of intra-household spillover effects*;

iv) the difference between direct effects, i.e. between the effect of treating the husband on his answer and treating the wife on her answer ($\delta_H^h = \delta_W^w$), denoted as *Direct treatment effects.*

3 Implementation and data collection

The study involved two waves of a panel couple survey, administered separately to both the husband and the wife of each couple, and a randomized controlled trial.

3.1 Sample

Couples were recruited from the catchment area of Chipata and Chaisa Clinics, located in the poor suburbs of Lusaka. Eligibility for the study followed exclusion criteria meant either to protect women that may face adverse consequences if using hormonal contraception or to exclude women that could not adjust their fertility behavior to the information provided in the intervention.[19] We also eliminated couples that participated in the Ashraf, Field and Lee (2014) study.

3.2 Data collection and intervention

A baseline survey was (separately) administered to both the husband and wife during the first visit, which occurred between August and December 2014. In total, 715 eligible couples were interviewed at this stage, all of whom were monogamous.[20] The sample was re-screened for inclusion criteria prior to the start of the intervention in November 2015. Post-screening, treatment assignment was randomized at the couple level stratifying on the following characteristics: (i) whether the couple had a child; (ii) whether the wife was older or younger than 35; (iii) whether the couple wanted another child at baseline; (iv) size of the block in which the couple lived; (v) whether the wife believed that the husband wanted another child; (vi) whether the wife believed that the husband wanted another child right away; (vii) whether the husband knew someone who had died during childbirth.

The intervention was rolled out between November 2015 and May 2016, during which time

[19] Any couple in which the wife was aged between 18 and 40 and lived in the catchment area of the Chipata and Chaisa clinic was eligible to be recruited. A random-address generator was used to recruit couples. The following exclusion criteria were agreed upon with the competent Research Ethics Committees: (i) couples in which the wife had diabetes, heart disease, or high blood pressure at baseline; (ii) couples in which the wife was younger than 18 years of age or older than 40 at baseline; (iii) couples in which the wife was less than 8 weeks postpartum; (iv) couples in which the wife has been sterilized or had a hysterectomy; (v) men or women who were not currently married; (vi) couples in which the wife was pregnant at recruitment or the intervention phase; (vii) couples in which the spouses were actively trying to have a baby when invited for the intervention; (viii) couples in which the wife was on long-term contraceptives when invited for the intervention (IUDs, implants). Exclusion criteria (iv) to (vii) relate to our study objectives, but are not medically motivated. According to the 2014 DHS (Central Statistical Office, 2014), IUDs are used by 1% of married women in Zambia, and implants by 8%.

[20] Monogamy was not an inclusion criterion, but polygyny is rare in Lusaka at around 2% of marriages (Central Statistical Office, 2014).

all couples were invited in weekly batches to attend a one-time community meeting in which they would receive information on maternal health and family planning. All meetings took place at the local public health clinic. To avoid contamination across treatment arms, the two different types of meetings took place at different time slots.

The lag between the baseline data collection and the intervention led to a strong reduction in eligibility in the baseline sample, with 273 of the 715 original sample couples no longer meeting the inclusion criteria at re-screening, mostly due to pregnancy and moving to houses outside of the catchment area of our partner clinics. Hence, between October 2015 and February 2016, 442 new couples were added to the sample. For these couples, a subset of baseline questions was asked to the wife for stratification and analysis purposes, but a full baseline survey was not conducted and no data from men were collected because of time limitations.[21] Thus, the final sample eligible for the intervention consists of 772 couples. Given the high rate of change in eligibility over the recruitment period, it is important to note that all drop-out occurred *before* treatment assignment, and hence is orthogonal to it, and meeting recruitment was double-blind.

At all community meetings, participants were asked to show up for the meetings together with their spouse, and were separated into different rooms for parallel, gender-specific sessions.[22] Each session involved approximately 20 participants and was led by two trained local facilitators, one man, and one woman. All facilitators rotated between male and female meetings across weeks in order to ensure that facilitator composition was balanced across treatment arms. In the FP curriculum, facilitators discussed the types of modern contraceptives available at the clinic, dispelled common misconceptions surrounding family planning, and referred participants to the public clinic for further information. In the FP+MM curriculum, facilitators delivered this same information but also added a module of information content about maternal health risk. The material focused on the absolute levels of maternal mortality risk in Zambia compared to other neighboring countries, the primary medical causes of maternal mortality and morbidity, and individual risk factors that included low birth spacing, high parity, and advanced age.

The trained facilitators followed a scripted curriculum, helped by visual material designed for the study. The scripts were developed over two years of design and piloting, and benefited from the support and the advice of a large set of experts from the Zambian Government, the partner clinics,

[21] These additional couples were enrolled in the study if they satisfied the same eligibility criteria as the original sample and consented to participate. The recruitment procedure was also held constant: we first recruited the couples, then returned on a second visit to invite them to community meetings.

[22] Participants were not told the content of their partner's session.

and Zambian NGOs.[23] These features allowed our team to extensively monitor the information presented and ensure consistency across groups. All scripts are included in the Supplemental Materials. Illustrated materials, designed by a local artist for the study and organized in flipcharts, supported the group meeting.

We tested and implemented a number of steps to maximize participants' attendance at the community workshops. First, workshops were held on weekends at one of the two time slots determined to be the most convenient for study participants based on focus group discussions and a small survey. The assignment of workshop time slots to study arms was randomized. Second, couples who missed their first community workshop were re-invited again several additional times. Third, each spouse received 25 Zambian Kwacha (approximately 5 USD at the time of the intervention) as transport reimbursement, an amount comparable to the amounts couples receive in Lusaka for attending this type of event. Lastly, a raffle for a small electric cooking stove was held at each workshop session, and only couples in which both spouses attended the workshop received a raffle ticket. In the end, a total of 562 couples attended a workshop out of 772 that were invited to attend (73%). Appendix Tables A3-A6 report balance tests for a wide array of baseline variables among couples who participated in the intervention between treatment arms.

Between October 2016 and March 2017, we collected endline data from couples that attended the intervention, with an attrition rate of 10%. The endline survey re-collected measures of maternal health knowledge, use of and attitudes toward contraception, balance of power within the couple, fertility demand, and realized fertility. Attrition rates are statistically similar across treatment arms.

4 Empirical findings

In this section, we report empirical findings from the experiment. We begin by examining changes in knowledge about maternal mortality risk and the flow of maternal risk information within the couple, as measured by reported communication between spouses about maternal risk. We then study how providing maternal health information affects individual demand for children and spousal agreement over whether to use contraception. Finally, we look at the outcomes of household bargaining over short-run fertility, including whether a woman becomes pregnant in the year following the

[23] In particular, we regularly shared our materials for feedback with officials from the Ministry of Health, especially through its Technical Working Group on Family Planning, officials from the Ministry of Community Development, Maternal and Child Health, and experts at organizations like Planned Parenthood Association of Zambia and the Society for Family Health.

intervention, alongside the tangible transfers and emotional support she receives from her husband.

4.1 Knowledge and beliefs about maternal health

We first examine whether the intervention was effective in altering knowledge and beliefs about maternal mortality and morbidity risk, the "first stage" outcome necessary for the information treatment to have induced changes in household fertility preferences and behavior.[24] Our measures of maternal mortality risk are summarized by an index that combines two sets of questions on beliefs about specific risk factors for maternal complications that were emphasized in the workshop curriculum. The first set of questions asks respondents to identify specific risk factors for birth complications, including advanced maternal age, high parity, and low birth spacing.[25] This index is purely a measure of *relative* rather than absolute risk because respondents score higher if they correctly identify sources of individual risk rather than levels of risk. The second set of questions comprises seven ladder scale questions in which respondents are asked to report, on a scale from 0 to 10, the likelihood that a woman with fixed characteristics would experience birth complications, and map into the same risk factors. Additionally, the index contains the respondent's perception of the wife's (or own) likelihood of experiencing complications in childbirth. In contrast to the first index, the second index measures respondents' perceptions of *absolute* maternal mortality risk. For the analysis, we build an index averaging the six (standardized) knowledge questions about risk factors and the seven (standardized) ladder scale questions about perceived risk and also look at the risk factor and ladder questions as separate indices.

Table 3 presents experimental results on the aggregate index alongside the sub-indices for men and women in the two separate treatment groups. Among both men and women, we observe a statistically significant increase in maternal health risk awareness among those who receive the information directly. However, in contrast to the direct effects, household spillover patterns are strongly gendered (column 1). Whereas women also exhibit an increase in risk awareness (albeit smaller and noisier than the direct effect) when their husbands receive the information, when

[24] At the one-year mark, survey responses also take into account whether changes in beliefs persisted over the year. Hence, we may be underestimating short-run changes in beliefs that resulted from the intervention, which influenced observed fertility outcomes.

[25] Specifically, respondents are asked the open-ended question, "What factors make women more at risk for complications during pregnancy and childbirth?", and three dummies are created that correspond to whether she answered maternal age, parity, or birth spacing. In addition, respondents are given two vignettes and asked in each to identify which woman is more likely to experience complications, which is coded according to whether they answered correctly on maternal age and parity. Finally, respondents are asked the minimum number of months that a woman's body needs to fully recover from pregnancy.

wives are given the information, there is no evidence of intra-household transmission of knowledge from women to men. This pattern is consistent with the absence of transmission of knowledge of community health events from women to men which is evident in our baseline survey data. In fact, men with treated wives appear to *decrease* their ability to correctly predict maternal risk factors, which - as we discuss in more detail later - could reflect a reaction, either emotional (reduction in empathy) or logical (increased suspicion), to treated women's greater reluctance to become pregnant that results from their change in beliefs about childbirth risk.

When we examine the risk indices one at a time, we detect even clearer patterns with respect to knowledge gains and gender-specific spillovers across domains of learning. In particular, when looking only at the index of relative risk awareness, we observe a very stark and statistically significant increase in awareness of maternal risk factors by both husbands and wives when the information is delivered directly to them (Table 3, column 2).[26] We also find clearer evidence of gendered patterns of spillovers effect of the treatment on knowledge of risk factors: while wives of treated husbands exhibit a statistically significant increase in awareness of maternal risk factors, we find no spillover effects flowing from treated wives to their husbands. Statistically speaking, we can firmly rule out that treating the wife and treating the husband have the same impact on men's knowledge of risk factors (p-value less than 0.001), while no such difference is detected in women's updating. As a result, we can rule out that spillover effects are symmetric within the household (p-value equal to 0.097). Appendix TableA7, reports the effect of treatment on each of the components of the risk factors index, revealing that learning is observed across several curriculum components, but shows up most strongly in updating beliefs about advanced maternal age (column 2) and low birth spacing (column 4) as risk factors for birth complications.

[26] Although men appear to update slightly more than women about risk factors, one key reason is that they have substantially lower levels of knowledge to begin with, such that the workshops generate convergence across spouses in the knowledge of risk factors.

Table 3: Beliefs about maternal risk and communication with partner about risk

	(1) Beliefs index	(2) Risk factors index	(3) Ladder index	(4) Spousal comm. index
Effects on men				
Husband, informed directly (δ_H^h)	0.074	0.143	0.014	0.213
	(0.038)	(0.053)	(0.052)	(0.082)
	[0.055]	[0.008]	[0.783]	[0.011]
Husband, spouse informed (δ_W^h)	-0.072	-0.039	-0.101	-0.057
	(0.037)	(0.052)	(0.053)	(0.095)
	[0.057]	[0.459]	[0.059]	[0.551]
Effects on women				
Wife, informed directly (δ_W^w)	0.094	0.100	0.083	0.000
	(0.043)	(0.052)	(0.054)	(0.083)
	[0.034]	[0.057]	[0.124]	[0.999]
Wife, spouse informed (δ_H^w)	0.054	0.083	0.030	-0.049
	(0.039)	(0.050)	(0.047)	(0.091)
	[0.169]	[0.100]	[0.527]	[0.594]
Stratification variables	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
H respondent interactions	Yes	Yes	Yes	Yes
F-test p-values:				
Direct vs. spillover effect on husband (δ_H^h=δ_W^h)	0.000	0.000	0.030	0.001
Direct vs. spillover effect on wife (δ_W^w=δ_H^w)	0.387	0.758	0.338	0.550
Symmetry of intra-hh spillover effects (δ_H^w=δ_W^h)	0.022	0.097	0.060	0.946
Direct treatment effects (δ_H^h=δ_W^w)	0.729	0.561	0.350	0.036
Observations	1050	1050	1050	1049

Notes: SE clustered at the meeting level in parentheses. P-values in brackets. Index variable in column 1 is the mean of all standardized variables in Appendix Tables A7 (risk factors) and A8 (likelihood scales), with the index for each table appearing in columns 2 and 3 respectively. Index variable in column 4 is the mean of all standardized variables in Appendix Table A9. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income. Each control variable and the constant are also interacted with a dummy for the husband being the respondent.

In contrast, there is much weaker evidence of the impact of treatment on beliefs about absolute levels of risk (Table 3, column 3). While answers to the ladder scale questions bear qualitatively similar results to the patterns observed in the index of relative risk knowledge, they are substantially noisier, and we do not find statistically significant increases in perceptions of absolute risk among any subgroup. Nonetheless, the gendered patterns are still evident in comparisons of coefficient estimates across subgroups: treating the wife has a significantly different effect than treating the husband on the husband's ladder scale responses (p-value of the direct vs spillover effect on husband is less than 0.030), while no such difference is detected in the wife's answers. Again, we can rule out that spillover effects are symmetric (p-value equal to 0.060).

Interestingly, in looking separately at the risk indices we also learn that the negative spillover from women to men is driven by the absolute risk questions rather than the relative risk questions. That is, male respondents married to treated wives actually report a significantly lower perceived likelihood of complications, but do not score worse on knowledge of maternal risk factors. Looking at the components of the absolute risk index (Appendix Table A8), reveals that the negative effect appears to be driven by beliefs about risk levels facing the two lowest-risk groups - women with fewer than four children (column 3) and women who become pregnant after adequate spacing (column 5). Since these two groups also represent the majority of women in our sample, this pattern is consistent with husbands' increased skepticism about their wives' individual maternal mortality risk, which could occur if arguments over birth spacing lead to polarization of spousal opinions on the risk involved in having another child.[27]

The absence of a strong direct impact of the intervention on beliefs about absolute risk suggests that risk levels were harder to communicate in the workshops than risk factors, which could occur for a variety of reasons. For instance, it may be harder to effectively communicate probabilities, or for individuals to be convinced that average probabilities apply to them. In contrast, risk *factors* can be more easily reasoned and clearly presented and may be simpler pieces of information for individuals to absorb in a short meeting. Alternatively, emotional responses such as fear or defensiveness may prevent attendees from updating their beliefs about absolute risk, whereas knowledge about risk factors could give individuals a greater sense of control.

Lastly, we consider the spousal communication index that includes answers to questions about

[27]Indeed, the negative effect on ladder scale beliefs that we observe in the overall sample among the husbands of treated women only arises when they do not know anyone who had died in childbirth (Table A10 column 2, coefficient β_W^{h1}). This finding reinforces the hypothesis that the negative spillover effects of treating women may be the result of backlash from a discussion in which men do not have prior experience of maternal mortality.

intra-household communication over reproductive health. We learn that men are more likely to communicate maternal risk when they receive the information directly (Table 3, column 4). However, we do not observe a similar increase in communication when wives receive the information directly. Among those who receive the information indirectly, there is no evidence of an increased likelihood of maternal risk discussion either.

Considering the four indices together, there are three important takeaways regarding the impact of our information intervention on household beliefs about risk. First, the data indicate a strong pattern of greater maternal health risk awareness among both men and women as a result of the intervention. This result in and of itself is important for policy because it indicates that it can be effective in changing not only female but also male beliefs about a traditionally female domain of activity, despite the fact that maternal risk beliefs are thought to be rooted in deeply held superstitions and taboos related to women's sexuality (Ashraf et al., 2017). Given that each group workshop featured a female facilitator who discussed low birth spacing as a risk factor, the results also imply that men do recognize women's expertise in this domain and readily update beliefs based on information provided by women who are not their wife. At followup, treated men are 6.4pp more likely than the control group to correctly identify low birth spacing as risky (Appendix Table A7 column 4), evidence that they are receptive to and trusting of the material covered by the female facilitator. This is important evidence that men in this setting are open to learning from women, such that a more complex explanation is needed to explain husbands' failure to learn from treated wives.

Second, household knowledge spillovers magnify the impact of treatment on household risk awareness, but only when men are targeted to receive the information directly. This spillover pattern is also reflected in men's reports of communication about maternal mortality risk with their partners (Table 3, columns 4): men who were informed directly report significant increases in communication with their wives about maternal mortality risk, presumably driven by an interest in sharing what they learned in the intervention. When women receive the treatment directly, there is no evidence from either partner that the treatment encouraged them to discuss the subject with their spouse, consistent with the absence of an observed change in male beliefs within these couples.[28] Interestingly, women in the same couples do *not* report more discussion with their partners on the topic of maternal risk, which is somewhat puzzling given there are no obvious reasons to expect either spouse

[28]It is important to note that the beliefs of treated individuals are also potentially influenced by spousal communication, since treated men are likely to learn new information about risk factors from discussions with their wives. Consistent with that channel of influence, note that men who received the intervention report not only that they communicate risk to their partners but also that their partners are more likely to communicate risk to them, presumably as part of the same discussion.

to intentionally misreport. However, this inconsistency makes sense when viewed alongside the baseline means of spousal reports of maternal risk discussions. At baseline, wives are significantly more likely to report household discussions about maternal risk than their husbands are, perhaps indicating that their husbands are not actually listening when they raise these concerns. Putting these patterns together, our findings imply that, when men are treated, they become more willing to participate in and acknowledge (or simply hear) their wives' attempts to broach the subject of risk.

Third, it appears that providing women but not men with more information about risk actually leads to greater polarization of opinion across spouses regarding perceptions of maternal mortality risk, a pattern that is not reflected in beliefs about specific risk factors. Husbands' negative updating suggests a reaction against wives who express greater concern about childbirth or reluctance to bear children post-treatment, which might be perceived by men as exaggerating. This reminder could potentially lead men to update even further away from their low-risk prior as their position becomes more entrenched, but would not lead them to mis-characterize the risk factors of maternal mortality, consistent with the lack of a significant negative effect in column 2.

The lack of information transmission from women to men is similar to what has been found in recent lab-in-the field experiments Conlon et al. (2022) in which partners' incentives are aligned. In our setting, the lack of convergence in beliefs is easier to rationalize, as incentives between spouses are frequently not aligned. As we will discuss below, divergent preferences over household outcomes can lead to strategic communication challenges that inhibit information transmission.

4.2 Joint fertility objectives

We next examine how the intervention changed participants' demand for children, beliefs over their partner's demand for children, and agreement on family planning. To study fertility objectives, we use an array of survey measures, summarized in an index demand for children that captures spouses' joint fertility objectives, including whether the participants want another child, whether the participants believe their spouses want another child, and whether the participants try to convince their partners to use contraceptives.

Consistent with their change in beliefs about the cost of childbearing, treated husbands report a negative and statistically significant shift in the demand index (Table 4, column 1), which is not observed when the wife is treated. This pattern is also captured in the simplest measures of demand included in the index: whether the respondent wants another child, and whether the respondent believes that their spouse wants another child. As shown in columns 2 and 3, treated husbands report a lower likelihood of both wanting another child and believing that their wife wants another child. In addition, both treated husbands and wives of treated husbands report greater agreement on family planning (column 4), consistent with the convergence in demand for children, although only the effect on husbands' report is statistically significant at conventional levels.

When women are treated directly, there is no reported change in either male or female demand for children. The absence of an impact on men is consistent with the pattern of beliefs updating in Section 4.1. The absence of a change in female demand for children, either when they are treated directly or when their husbands are treated, is more ambiguous. Although this may appear inconsistent with their changes in perceived risk documented in the previous section, there are many reasons that demand for children may be less responsive to beliefs about maternal health risk for women. First of all, the degree of updating may be lower than men since they were more informed of risk than men at baseline. Second, women may feel that they have less control over fertility outcomes in the household than men, and responses to survey questions eliciting demand may be influenced by household bargaining expectations.[29]

Overall, the patterns provide novel evidence that beliefs about maternal mortality risk influence male demand for children. This indicates that men internalize the childbearing costs to women, either because of direct empathy and altruism or because of their recognition of their importance to household public goods such as child-rearing. Numerous papers in the fertility literature have shown that male demand for children is a more important factor in fertility outcomes than female demand. Nonetheless, few family planning interventions directly target men, and little is known about factors influencing men's desired fertility that might inform potential male-centered policy approaches. The results are also important in that they indicate that closing the gender gap in beliefs about childbearing costs has the potential to close the gender gap in the desired number of children, which sheds light on one origin of gender differences in fertility demand.

4.3 Household bargaining outcomes: Fertility and transfers

We finally examine how updating beliefs on maternal risk and resulting changes in the demand for children translate into household-level bargaining outcomes, including fertility realizations and transfers from the husband to the wife over the 12-month period following the intervention. We consider pregnancy and transfers as the simultaneous outcomes of decision-making by husband

[29]For instance, treated women may predict that their husband will not be persuaded to update risk beliefs and hence feel resigned to bearing children according to their husbands' preferences.

Table 4: Demand for children and spousal agreement on family planning

	(1) Demand index	(2) Want another child	(3) Believes spouse wants another kid	(4) Convince contrac. use
Effects on men				
Husband, informed directly (δ_H^h)	-0.219	-0.073	-0.131	0.072
	(0.072)	(0.039)	(0.035)	(0.033)
	[0.003]	[0.063]	[0.000]	[0.030]
Husband, spouse informed (δ_W^h)	-0.022	0.020	-0.037	0.020
	(0.072)	(0.036)	(0.040)	(0.028)
	[0.758]	[0.574]	[0.358]	[0.475]
Effects on women				
Wife, informed directly (δ_W^w)	0.081	0.033	0.017	0.029
	(0.076)	(0.038)	(0.038)	(0.024)
	[0.291]	[0.380]	[0.662]	[0.227]
Wife, spouse informed (δ_H^w)	-0.014	-0.016	-0.013	0.044
	(0.084)	(0.040)	(0.044)	(0.027)
	[0.867]	[0.685]	[0.760]	[0.104]
Stratification variables	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
H respondent interactions	Yes	Yes	Yes	Yes
F-test p-values:				
Direct vs. spillover effect on husband (δ_H^h=δ_W^h)	0.015	0.011	0.034	0.155
Direct vs. spillover effect on wife (δ_W^w=δ_H^w)	0.291	0.301	0.435	0.590
Symmetry of intra-hh spillover effects (δ_H^w=δ_W^h)	0.939	0.501	0.669	0.556
Direct treatment effects (δ_H^h=δ_W^w)	0.002	0.050	0.001	0.303
Mean of control group for H		0.700	0.730	0.040
Mean of control group for W		0.670	0.750	0.050
Observations	1050	1050	1018	1046

Notes: SE clustered at the meeting level in parentheses. p-values in brackets. Index variable in column 1 is the mean of the variables in column 2 and column 3. The outcome variable in column 2 indicates whether the respondents want more kids. The outcome variable in column 3 indicates whether the respondents believe that their spouses want another kid. The outcome variable in column 4 indicates whether the respondents try to convince their partners to use contraceptives. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

and wife, in which spouses choose whether to try to conceive over the coming year and an amount of transfer from husband to wife.

Because the outcomes are realized at the household level, the analysis of fertility and transfers compares households with treated men to households of treated women, employing specification 1. As seen in the last set of estimates, treatment arms differ post-intervention in the degree of convergence in risk awareness and fertility desires between spouses. In husband-treated households, male and female awareness of fertility risk converge, whereas in female-treated households, risk awareness *diverges* between spouses (Table 3, Column 2). In terms of demand for children, in husband-treated households spousal demand for children also converges, whereas in wife-treated households spousal demand stays constant (Table 4, Column 2).

Because our follow-up survey occurs within one year of treatment, our primary outcome of interest is pregnancy, and we consider that alongside expected future fertility. In particular, we create an index of fertility outcomes over the year comprised of whether the wife reports being pregnant at endline, and her reported likelihood of having more children on a 0-10 ladder scale (Table 5).[30]

Consistent with the patterns of changes in beliefs induced by the information treatment, when the husband is treated, we observe a 5.2pp decrease in the probability of the wife reporting being pregnant at endline (column 2). We observe a similar pattern in the other measures of fertility. While no significant effect is observed when the wife is treated, the information treatment is associated with a large negative point estimate, and we cannot rule out that the effect on fertility of treating wives versus husbands is the same.[31] In Appendix FigureA7, we plot the shift in the distribution of the answer to the question about the likelihood of having another child, a component of the fertility index. We observe a clear negative shift in all respondent groups' answers. The concordance in spouses' answers lends confidence that our findings are unlikely driven by reporting bias caused by having received the maternal mortality information in addition to the family planning curriculum because the effects are the same then the measures are elicited from untreated spouses.

A negative fertility response is consistent with the pattern of beliefs updating observed in Table 3 and the change in demand for children in Table 4. The fertility index variable confirms what emerges from the disaggregated variables: providing maternal health information to husbands leads to a 0.202 decline in the index variable (p-value 0.020) and providing it to wives has a

[30]While birth spacing is also a relevant outcome variable, most of the fertility outcomes 12 months after the intervention are current pregnancies, and accurate information about gestational age is difficult to obtain in this context.

[31]The index contains fertility measures collected from women, as is standard in the fertility literature. Although not all outcomes were asked of husbands, when we consider the husband's reports of pregnancy and the likelihood of having other children, the same patterns arise: reassuringly, men and women provide highly correlated answers about pregnancy status and the probability of a future pregnancy. Regressions using the husbands' answers lead to the same conclusions and are reported in Appendix Table A12.

non-statistically significant effect in the same direction. As documented above, these declines in fertility are associated with increases in maternal health risk awareness.

Household decision-making models of fertility may characterize fertility outcomes are negotiated in conjunction with compensating transfers between spouses, in this case, from husband to wife. Hence, providing information on maternal health costs should differentially affect the transfers received by women within the marriage depending on whether the husband or the wife attended the training, given the differential effect on the demand for children. In particular, the divergence of maternal health risk awareness or an increase in asymmetric information on the cost of childbearing within the household may lead to a breakdown in contracting and a decline in transfers towards the woman when she is treated. We explore this hypothesis by examining the effects of the maternal mortality curriculum on transfers made to the wife by her husband. Overall, the index of transfers shifts in a negative and statistically significant way when the wife is treated but not when their husband is (column 1), and we can rule out that the effect of treating husbands and that of treating wives is the same (p-values equal to 0.001 for the index). Considering the individual index components, men whose wives are treated report being 13pp less likely to have made a gift to the wife in the past month relative to the control group (column 2), and report a decrease in the total value of monthly transfers to their wife relative to the control group (column 3). Other index components capturing the woman's happiness within the marriage, while noisier, also shift in a negative way.

4.4 Robustness checks

In the main specification, we have selected a small set of controls, that are held fixed in all of the analyses. To further limit the discretion in the choice of control, we perform post double selection LASSO to select control variables (Belloni, Chernozhukov and Hansen, 2014). The results of this exercise for all of our main dependent variables are reported in Appendix Tables A13 and A14. The qualitative and quantitative implications of our analysis are broadly unchanged, but coefficients become more precise in some instances.

Table 5: Pregnancy and transfers outcomes

Panel A: Fertility results

	(1) Fertility index	(2) Currently pregnant	(3) Likelihood have more kids
Husband treated (β_H)	-0.202	-0.052	-0.813
	(0.085)	(0.029)	(0.359)
	[0.020]	[0.080]	[0.026]
Wife treated (β_W)	-0.155	-0.040	-0.619
	(0.089)	(0.031)	(0.381)
	[0.086]	[0.191]	[0.107]
Stratification variables	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes
F-test p-value (β_H=β_W)	0.550	0.700	0.564
Mean of control group		0.120	6.450
Observations	534	534	534

Panel B: Transfer results

	(1) Transfers index	(2) Any gift in past month	(3) Value of gifts past month	(4) Emotional support	(5) Wife happy with marriage	(6) Wife satisfied with sex life
Husband treated (β_H)	0.031	0.017	-9.286	0.035	0.079	-0.014
	(0.056)	(0.052)	(16.470)	(0.183)	(0.039)	(0.040)
	[0.579]	[0.754]	[0.574]	[0.849]	[0.045]	[0.724]
Wife treated (β_W)	-0.173	-0.129	-37.914	-0.067	-0.036	-0.094
	(0.059)	(0.058)	(14.915)	(0.188)	(0.046)	(0.049)
	[0.004]	[0.027]	[0.013]	[0.720]	[0.429]	[0.057]
Stratification variables	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
F-test p-value (β_H=β_W)	0.001	0.002	0.024	0.584	0.008	0.127
Mean of control group		0.490	93.830	5.630	0.740	0.800
Observations	502	502	502	497	497	497

Notes: SE clustered at the meeting level in parentheses. *p*-values in brackets. Outcomes in columns 1-3 in panel A are collected from the wife's survey. The fertility index variable in column 1, panel A, is the mean of the variables in column 2 and column 3, panel A. The outcome variable in column 2, panel A, indicates whether the wives are currently pregnant. The outcome variable in column 3, panel A, indicates how likely do the wives want another kid, on a scale from 0 to 10. Mens' answers to fertility outcomes are reported in Appendix Table A12. Outcomes in columns 1-3 in panel B are collected from the husband's survey, and outcomes in columns 4-6 in panel B are collected from the wife's survey. The outcome variable in column 2, panel B, indicates whether the husbands have given gifts to their wife in the past month. The outcome variable in column 3, panel B, indicates the value of the gifts. The outcome variable in column 4, panel B, is derived from the Inclusion of Other in the Self (IOS) scale, ranging from 1 to 7, which indicates emotional support. The outcome variable in column 5, panel B indicates how happy are the wives with marriage. The outcome variable in column 6, panel B, indicates how satisfied are the wives with sex life. Stratifying control variables include if the couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

4.5 Heterogeneity analysis

We next consider heterogeneity by four variables that are likely to influence how households respond to the intervention: (i) the husband's baseline knowledge of maternal mortality; (ii) the husband's short-run fertility demand (iii) the wife's age; and (iv) the wife's history of complications.

Men's baseline level of knowledge of maternal mortality risk (proxied by whether they know at baseline anyone who died at childbirth, as shown in Appendix Table A2, column 1) may influence the degree of updating we should expect from the intervention. Men who want a child immediately may be less open to communicating with their spouse about maternal mortality risk, as we see in Appendix Table A2 (column 2). Finally, we should expect heterogeneity in treatment responses according to whether the wife's characteristics place her in a high-risk category consistent with the curriculum components on risk factors, including whether she is over the age of 35, and whether she has experienced complications in the past.

The first heterogeneity variable we explore is whether the husband knew a woman who died giving birth, a proxy for his pre-intervention level of awareness of maternal mortality risk (Appendix Table A2), a stratification variable.[32] Among households with husbands who are relatively risk-aware, we anticipate that treatment will have less impact on demand for children and fertility. Indeed, as shown in column 1 of Table 6, we find that changes in treated husbands' demand for children and household fertility are concentrated among households in which husbands did not know anyone who died in childbirth (Table 6, Columns 1-2). The difference in demand across subgroups is statistically significant, while the coefficient estimates on fertility responses are twice as large in households with less informed men, but statistically indistinguishable. For households in which the woman was treated, there is no difference in response to treatment according to husbands' baseline level of awareness, consistent with the absence of information transmission across spouses in this arm.

We next look for variation in treatment effects on demand for children and household fertility according to men's demand for children at baseline, proxied by whether they claim to not want to have children within the next year, also a stratification variable. As shown in columns 3 and 4 of Table 6, the decline in demand for children and fertility among households of treated men is concentrated among men who do not want a child as soon as possible. Among households with treated women, fertility effects are also concentrated among the subgroup in which men have lower fertility demand, suggesting that women have an easier time convincing husbands to delay childbearing in

[32] For households for whom baseline data is not available, we elicited this information at the time of enrollment in the study for all of these variables.

these households, or are unconstrained by their husband's preference over birth spacing. Indeed, couples in which the man wants a child as soon as possible are the ones in which the asymmetry of intra-household learning spillovers is most pronounced (Appendix Table A10, columns 3 and 4). Furthermore, the differences in fertility outcomes in these couples (in which the husband wants a child as soon as possible) when the husband or the wife are treated are sizable (-0.051 vs 0.073, Table 6 column 4) but insignificantly different from one another: this reflects husbands' and wives' different ability to transmit information, as it will be shown by our theoretical framework in the next section.

The third set of factors we consider is the wife's individual risk of childbirth complications, proxied by maternal age and individual history of birth complications. Columns 5 and 6 of Table 6 examine patterns of heterogeneity according to a woman's age, measured by a dummy that takes value one if the wife is above 35 (a stratification variable). While treatment effects on fertility and demand for children among households of treated men are present for both older and younger wives, estimated impacts are almost twice as large for households with older wives, consistent with husbands of high-risk women being more responsive to risk awareness campaigns. There is no similar patterns observed among households of treated women.

In columns 7-8 of Table 6, we show similar patterns when considering another proxy measure of maternal risk - whether the woman already experienced complications. The fertility results are consistent with those described above: when men are treated, changes in household fertility are concentrated among men whose wives have previously experienced childbirth complications. This subgroup also experiences stronger declines in fertility when the woman is treated, suggesting that women at higher risk respond the most to the intervention (column 8).

5 Model

The findings from our experiment indicate that providing maternal mortality risk information to one household member leads to asymmetric learning spillovers within the household depending on whether the man or woman is treated, but to comparable declines in fertility. That means that when men receive information, the change in fertility is accompanied by a change in *both spouses'* beliefs. When women receive the information the change in fertility is accompanied by a change in beliefs only among women, especially when the man has a more urgent desire for children. Fertility declines irrespective of who receives the information, but transfers to women from their husband drop only if she is directly treated.

Table 6: Heterogeneity results

	Group: husb. did not know about MM		**Group: husb. want child later or never**		**Group: wife over 35**		**Group: with hist. of comp**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Husband's Demand index	Fertility index	Husband's Demand index	Fertility index	Husband's Demand index	Fertility index	Husband's Demand index	Fertility index
Husband treated × (**group** = yes) (β_H^1)	-0.273	-0.233	-0.351	-0.275	-0.382	-0.323	-0.080	-0.773
	(0.085)	(0.081)	(0.085)	(0.106)	(0.257)	(0.208)	(0.220)	(0.185)
	[0.002]	[0.005]	[0.000]	[0.011]	[0.140]	[0.125]	[0.718]	[0.000]
Husband treated × (**group** = no) (β_H^2)	0.025	-0.144	0.125	-0.051	-0.186	-0.178	-0.245	-0.110
	(0.209)	(0.224)	(0.146)	(0.140)	(0.075)	(0.095)	(0.081)	(0.091)
	[0.906]	[0.522]	[0.394]	[0.720]	[0.015]	[0.065]	[0.003]	[0.233]
Wife treated × (**group** = yes) (β_W^1)	-0.025	-0.129	-0.052	-0.265	-0.152	-0.185	-0.103	-0.569
	(0.081)	(0.094)	(0.083)	(0.116)	(0.249)	(0.184)	(0.210)	(0.216)
	[0.757]	[0.172]	[0.531]	[0.025]	[0.543]	[0.319]	[0.625]	[0.010]
Wife treated × (**group** = no) (β_W^2)	0.026	-0.266	0.003	0.073	0.003	-0.147	-0.016	-0.096
	(0.207)	(0.239)	(0.151)	(0.142)	(0.080)	(0.102)	(0.080)	(0.091)
	[0.900]	[0.269]	[0.982]	[0.609]	[0.969]	[0.154]	[0.838]	[0.296]
Stratification variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test p-values:								
Effect of treating husband vs. wife, **group** = yes (β_H^1=β_W^1)	0.007	0.222	0.001	0.900	0.348	0.397	0.895	0.191
Effect of treating husband vs. wife, **group** = no (β_H^2=β_W^2)	0.994	0.539	0.432	0.422	0.025	0.721	0.012	0.868
Subgroup effect of treating husband (β_H^1=β_H^2)	0.229	0.684	0.008	0.191	0.481	0.540	0.505	0.001
Subgroup effect of treating wife (β_W^1=β_W^2)	0.823	0.587	0.748	0.070	0.572	0.864	0.708	0.032
Observations	509	526	516	534	516	534	513	531

Notes: SE clustered at the meeting level in parentheses. p-values in brackets. The condition corresponds to the bold column title. For example, in the first two columns, "Group = yes" means "Husb. did not know about MM (maternal mortality)" and "Group = no" means "Husb. knew about MM (maternal mortality)". Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

To understand the potential mechanism underlying these patterns of findings, we construct a model of household decision-making over fertility that studies the role played by beliefs and communication about maternal health costs. Given the strategic considerations that arise from communicating in this environment where agents have different preferences and incentives, we draw from the strategic communication literature, especially from the cheap talk model by Crawford and Sobel (1982). Some of the implications of the model for behavior do not hinge on the presence of strategic communication barriers, as we also allow for other forces, such as social norms, superstitions, or barriers to learning from others (Conlon et al., 2022), that may reduce the occurrence or informativeness of communication. We first show that ex-ante asymmetries of information on maternal health cost may break down the spousal agreement over fertility, affecting transfers and well-being. Then, we study how an information intervention may influence communication and realized fertility when informative communication does not occur, and discuss heterogeneity in the expected effects of the intervention.

5.1 Environment

Men and women make fertility decisions, given their preferences for children and the maternal health cost of childbearing. Reconciling standard communication models (Crawford and Sobel, 1982) with models of fertility decisions (e.g., Rossi (2019)), we follow a static framework in which completed fertility is realized only once for each couple.

Preferences Spouses receive utility from fertility and from transfers and have different preferences over the realized number of children. Each spouse prefers to minimize the distance between realized fertility and their net fertility objectives, which are determined by the difference between their ideal fertility (including any costs unrelated to maternal health) and the maternal health cost.[33] Gendered spheres of activity, where women are primarily responsible for raising children, can thus generate a difference in demand for children even when underlying preferences in terms

[33]We chose quadratic preferences in which type enters linearly in quadratic form because they are standard in the cheap-talk literature (since Crawford and Sobel, 1982) as they allow for closed-form solutions of the partition equilibria. This particular functional form has the drawback of implying that the indirect utility of a spouse is increasing in the health cost as soon as the equilibrium number of children is higher than ideal. However, our results do not rely on this specific functional form. Results under alternative functional forms that do not have this implication are discussed in Appendix B.4.

of ideal fertility are the same between spouses. Formally, spouses' preferences are the following:

$$U_j^H(n,t) = -\left(\alpha^H - \delta\theta - n\right)^2 - \gamma t$$

$$U_j^W(n,t) = -\left(\alpha^W - \theta - n\right)^2 + t$$

where all parameters and variables are indexed by couple j, here omitted. The parameters α_j^i denote the desire for children - not taking into account the maternal health cost. The parameter θ_j is the realized maternal health cost. The variable n is the realized number of children in the household, and the variable t is the amount transferred by the man. The parameter γ_j is the man's (finite) disutility of (monetary or in-kind) transfers, and the parameter $0 \leq \delta_j \leq 1$ captures the extent to which the husband internalizes the maternal health cost, and it hence represents the husband's altruism, empathy and attention.[34]

To replicate the empirical distribution of the demand for children net of the maternal health cost (α_j^i), we assume that the average difference in demand between husband and wife is positive and that this difference increases as the demand of the husband increases. To verify this assumption, we look at the empirical distribution of ideal fertility in the data: the assumption reflects the strong positive correlation between the spouses' difference in demand and the demand of the husband observed in our data and in DHS data (Figure A5).[35] This correlation is expected to arise when the distribution of the demand for children of the husband first-order stochastically dominates that of the wife and the two distributions have common support on the lower part of the distribution.

Maternal health cost Maternal health cost is a random variable denoted as θ, distributed in Zambia with probability density function (pdf) $f^Z(\theta)$ on the interval [0,1], with first and second moments equal to θ^Z and σ^Z respectively. Uninformed agents believe that θ is drawn from a global pdf denoted as $f^G(\theta)$ on the same interval, with first and second moments equal to θ^G and

[34] One remark is worth making: since the wife's outside option assures her to minimize her expected utility cost, the husband will always make an offer to make her indifferent between her optimal fertility and transfers. The distance between the wife's optimal fertility and that proposed by the husband is determined by γ_j. Indeed, in a Pareto optimal problem in which the husband maximizes his utility under the constraint that the utility of the wife be higher or equal to 0, the Lagrange multiplier on the wife's utility constraint is equal to γ_j. In this sense, this parameter can also be interpreted as a proxy for the bargaining power of the woman in the couple.

[35] The assumption also allows to express our theoretical predictions with respect to α_j^H, matching our baseline evidence on the role of husband's preferences and hence our stratification variables for heterogeneity. However, all the theoretical results related to communication and transfers are symmetric around $\alpha_j^H - \alpha_j^W = 0$.

σ^G, respectively. They underestimate the maternal health cost, with $\theta^G < (2\theta^Z - 1)$.[36]

In our benchmark case with incomplete information, we assume that spouses are equally uninformed about the realization θ: prior to the intervention, neither the husband nor the wife observe the realization of θ at the moment in which they decide fertility and they both believe that the wife cost is drawn from the distribution $f^G(\theta)$ (with mean θ^G).

To formalize the information asymmetries that can arise from gendered spheres of learning or from our experiment, we then study what happens when we treat one spouse with new information while leaving the other untreated. In these couples, one spouse learns the cost realization θ_j before optimal fertility is chosen, while the other does not observe the realization of the cost and believes the cost to be drawn from a different distribution with mean θ^G. We also discuss what happens when one spouse is *ex-ante* more informed before the intervention: the effect of the intervention in this type of household is described in Theoretical Appendix section B.2.3.

Actions The household chooses how many children to have (n). The husband offers transfers t to the wife, compensating her for fertility levels that depart from her private optimum. As long as transfers occur, optimal fertility is determined by the maximization of the weighted sum of the husband's and wife's fertility objectives, and who has the property right over the fertility decision has no effect on the fertility outcomes, in line with Coase's theorem. If transfers break down – meaning that the husband is not willing to provide the level of transfers the wife requires to adapt to his fertility preferences – the wife is the ultimate decision-maker over fertility if transfers break down (Ashraf, Field and Lee, 2014).

When one of the spouses is treated and households are asymmetrically informed, the informed spouse can, with a positive probability $\pi^i > 0$, send a message $m(\theta_j)$ about the realization of θ_j and try to communicate with the other spouse. However, with probability $1 - \pi^i$ the couple is stuck in a separate sphere equilibrium in which no communication can take place between the two spouses. To reflect the fact that social norms may stigmatize discussing maternal mortality with one's husband, and the fact that men may discount information provided by women for non-strategic reasons (Conlon et al., 2022), we assume $\pi^H \geq \pi^W$. These additional mechanisms

[36] We consider the possibility that agents may underestimate the extent to which the maternal health risk in Zambia may be higher than the global one. Bursztyn and Yang (2022), for example, show that misperceptions about others are both widespread and asymmetric. Allowing for bias in our baseline model allows us to incorporate the evidence from our baseline data, that suggests that men have systematically different beliefs compared to women, on average. In the Appendix B.5, we discuss the case in which uninformed spouses know the real cost distribution in Zambia (with mean θ^Z). In such a case, uninformed agents are not biased. We present the effect of the intervention on intra-household interactions when either the husband or the wife is treated.

are nested in our strategic model whenever $\pi^W \leq 1$.

5.2 Benchmark case: fertility under symmetric information

We start by describing optimal fertility levels when spouses have the same (complete or incomplete) information on maternal health costs. We define $n_j^H = (\alpha_j^H - \delta_j \theta_j)$ and $n_j^W = (\alpha_j^W - \theta_j)$ as spouses' fertility private optima in the case of complete information, and $n_j^H = (\alpha_j^H - \delta_j \theta^G)$ and $n_j^W = (\alpha_j^W - \theta^G)$ as spouses' fertility private optima in the case of incomplete but symmetric information.

5.2.1 Structure of household decision-making

The structure of the decision-making is as follows: the husband chooses the optimal level of transfers t^*, making a take-it-or-leave-it offer to the wife. Then, optimal fertility n^* is realized. We have in mind an efficient contracting environment where the husband can compensate the wife for her utility loss. The model is solved by backward induction.

5.2.2 Equilibrium transfers and number of children

To make the offer, first, the husband computes, given the wife's preferences and beliefs, the optimal mapping from transfers to fertility $n(t)$ so that the utility of the wife remains unchanged. He computes the optimal transfers that would induce a fertility shift in favor of his own preferences. He knows that the wife will implement her optimum n_j^W unless she receives a transfer that compensates her for deviating from that private optimum. Maximizing the husband's utility function with transfers accounting for the wife's reaction, we have: $n_j^{Ht} = \frac{n_j^H + \gamma_j n_j^W}{1+\gamma_j}$. At the optimum, the husband chooses $t^* = (n_j^{Ht} - n_j^W)^2 > 0$. In equilibrium, transfers always occur and the optimal number of children in equilibrium is the optimum for the husband in the presence of such transfers $n_j^* = n_j^{Ht}$.

5.3 Fertility and communication after an information intervention

We now discuss the effect of an informational intervention that credibly communicates θ_j to participants, such as the one in our study. While providing credible information to women more closely mimics reality – as women are those entering the labor ward and directly experiencing the maternity process – , providing information to men allows us to understand how this information affects behavior in the household.

When one of the spouses is treated, they get a perfectly informative signal on the cost realization. This creates an asymmetry of information in the household since now one spouse has perfect knowledge of the cost realization and the other does not. We study the Perfect Bayesian Equilibria of communication game about the cost realization and the fertility outcome in both the case in which the wife is treated and that in which the husband is treated.

Structure of household decision-making The structure of the game is modified as now there is the possibility of a communication stage in which the informed spouse can try to provide information about her health cost realization. The structure of the game is modified as follows:

1. When possible ($\pi^i > 0$), the informed spouse communicates about θ_j and the uninformed one updates θ_j
2. The husband offers $t(n_u^*)$ with commitment
3. The wife accepts or refuses n_u^*
4. The husband pays $t(n_u^*)$ if she had not previously refused.

Again, the model is solved by backward induction. The details of the resolution of the models, and the lemmas and propositions related to them, are in the Theoretical Appendix B.2.

Optimal Fertility and Transfers Given that the one spouse is informed, her privately optimal fertility is equal to the complete information case, while that of the other spouse depends on his beliefs about θ_j. To understand the optimal transfer from husband to wife, we need to study the communication game in the first stage.

Communication when the wife is treated Studying information sharing by the wife and information updating by the husband, we show that perfect communication almost never occurs. First, informative communication can take place only with probability π^W. However, even when communication is possible, information transmission is rare. The failure of communication is linked to the control the wife has on fertility: when transfers do not occur, the wife implements her private optimum, which implies no utility loss. When she has to transmit information, her incentives are such that she tries to push transfers beyond her utility loss, to reach an indirect utility higher than her backup option. Since these incentives are independent of the cost realization, no information can be transmitted and a pooling equilibrium is the only equilibrium possible, unless the ideal fertility preferences of the two spouses are really close.

The lack of information transmission, regardless of whether it is exogenous or endogenous, creates a barrier to the implementation of transfers and an increase in disagreement in the household. Fertility decreases to levels that correspond to the private optimal fertility of the wife.

The details of the proofs are in the Appendix B.3.

Communication when the husband is treated To study information sharing by the husband and information updating by the wife, we have to understand the husband's incentives to truthfully report the maternal health cost θ_j. When men are altruistic (or empathetic - meaning that they internalize the cost experienced by the wife with a sufficiently high δ), transfers are not very costly (meaning that γ is sufficiently low), and communicating is fully possible (meaning that $\pi^H = 1$), the husband always gets the highest level of utility telling the truth, so truthful communication occurs in equilibrium.[37] When γ is very high, the husband has no incentives to tell the truth, and no communication occurs in equilibrium.[38] This is due to the fact that the wife is aware that any information sharing by the husband would aim at minimizing costly transfers, regardless of the realization of θ. For intermediate levels of δ and γ, there is some information updating, without full information transmission. The information updating depends on the difference in ideal fertility between the husband and the wife (see the proof of proposition 2 for details).

As soon as some information transmission occurs, average fertility is affected as well. Transfers increase and fertility decreases among couples in which either α^H or γ are sufficiently low.

The results on information transmission between husband and wife rely on the specificity of the fertility agreement: the husband can implement his optimal fertility through transfers. When the difference in ideal fertility or the cost of transfers is sufficiently low, optimal transfers differ across cost types and this implies a unique separating equilibrium. For higher levels of difference in ideal fertility or transfer cost, partial or no information transmission occur. Standard refinements of equilibria apply.[39]

[37] Note that this condition cannot be met when the wife is transmitting information, so perfect communication is not possible for her.

[38] In this case, the husband would actually try to convince the wife that she is at a lower risk than what she actually is, suggesting a fertility objective coherent with a lower risk realization. However, the wife, being aware of the conflict of interest with the husband, completely discounts the transmitted information.

[39] NITS condition applies for values of parameters not satisfying the monotonicity of the message function defined by the differential equation 4 (Chen, Kartik and Sobel, 2007). When a separating equilibrium exists, the intuitive criteria apply (Cho and Kreps, 1987). See the proof in the Appendix for details.

5.3.1 Altruism and empathy

As already explained, the parameter δ can be seen as the internalization of the health cost of the wife by the husband. This can represent altruism and/or empathy in the couple. The husband's ability to internalize the wife's health cost is key for our intervention to have any impact when treating the husband. In particular, if δ was equal to zero, no informative communication takes place (see proof of proposition 2 for the details), and treating the husband would have no effect on behavior. Thus, the results presented in the previous section suggest that the husband is directly affected by the health status of the wife. Furthermore, for couples in which the health cost is relatively low, a reduction of the ideal fertility of the husband, and thus, of realized fertility, suggests that the intervention had an impact on the level of internalization of the health cost.

5.4 Implications for the experiment

The model has implications for how an information intervention may affect beliefs updating, communication, fertility, and transfers. Proofs of the predictions are in Theoretical Appendix B.3.

The first prediction relates to beliefs updating, examined in Table 3.

Implication 1. ***Beliefs updating.*** *After the intervention, information transmission is more likely to occur (i.e., the preference parameter space is larger) when the husband is treated compared to when the wife is treated.*

The second prediction pertains to fertility, which is reported in Table 5 panel A.

Implication 2. ***Fertility.*** *After the intervention, fertility decreases both when men are treated and when women are treated.*

Fertility is expected to move either when husbands or wives are treated. If beliefs move more often when the husband is treated, the average effect may be higher than when the wife is treated. In the empirical analysis, we fail to reject that the effect of the intervention on fertility is the same.

The third prediction involves another key outcome, the physical and emotional transfers between husband and wife (Table 5 panel b).

Implication 3. ***Transfers.*** *After the intervention, (i) when the wife is treated, transfers to the wife decrease on average; (ii) when the husband is treated, transfers to the wife do not decrease.*

In the intervention, we find a clear decline in transfers to treated wives, but no discernible effect on the transfers to untreated wives of treated husbands. It is likely that, in the data, transfers to women may be correlated with fertility for reasons that go beyond bargaining (e.g., supporting a pregnant woman). If this is the case, and transfers also systematically decrease when pregnancy decreases, the net effect of the intervention on transfers when the husband is treated is ambiguous. Nevertheless, the fact that we can rule out that the impact of the intervention is the same when men are treated and when women are treated remains meaningful.

Finally, the model gives predictions about the heterogeneous effects of the intervention along two dimensions: the fertility preferences of the husband and the idiosyncratic health cost faced by the wife, as reported in Table 6.

Implication 4. ***Heterogeneity by ex ante fertility preferences*** *After the intervention, heterogeneous effects according to the husband's ex ante fertility preferences are as follows: fertility decreases both when the wife is treated and when the husband is treated. (i) When the wife is treated, the effect is concentrated in couples in which α^H is low; (ii) When the husband is treated, fertility decreases for any value of α^H, with the strongest effect when α^H is low.*

The heterogeneous effects with respect to transfers reported in Appendix Table A11 mirror the effects for fertility when α^H is high: they increase only when the husband is treated and the wife is at higher risk (column 3). When α^H is low, transfers decrease when the wife is treated. When the husband is treated the effect is ambiguous, as transfers are expected to increase when the husband wants more children then the wife, and decrease when he wants less children then her as long as δ is lower than 1.

Implication 5. ***Heterogeneity by ex ante health cost of the wife*** *After the intervention, heterogeneous effects according to the* ex ante *health cost of the wife are as follows: (i) when θ_j is low, fertility does not change neither when the husband is treated nor when the wife is treated; (ii) when θ_j is high, fertility decreases both when the husband is treated and when the wife is treated.*

All proofs are in Appendix B.3.

The implications of the model are in line with the empirical findings. The role played by spousal differences in fertility preferences suggests that communication failures are, at least partially, explained by strategic motives. These need not be the only forces at play, as we allow for other frictions to. The model highlights that communication failures, regardless of their origin, can give rise to a decline in transfer to women when they are treated directly. This is because, to incorporate the newly-acquired information, women must make fertility decisions without their husbands agreeing. This decline does not occur when men are treated because, in that case, spousal beliefs converge.

6 Concluding remarks

In an intervention in which men or women in Lusaka (Zambia) receive information about maternal mortality and morbidity risk, we find that information substantially affects behavior, and that the effects on participants' beliefs and on household outcomes differ depending on who receives the information in a household. In particular, treated men and their wives update their beliefs about the risk factors of maternal health complications in response to the intervention. The same happens to treated women, but not to their husband. When men are treated, communication about reproductive health, self-reported spousal closeness, and marital satisfaction all increase. When women are treated, we see no change in these outcomes, and transfers in their favor from their husband decline. Moreover, while pregnancy declines over the following year among all couples, only when women are treated is the fertility reduction accompanied by a significant decline in material transfers from husbands to wives.

These findings are consistent with a model in which the lack of effective communication about maternal mortality and morbidity risk affects household choices. The model can explain what we find in our baseline data: women, in general, have more accurate knowledge of the risk factors for maternal mortality compared to men, even within the same household. Because of conflict of interest, as well as other barriers to communication such as the stigma associated with maternal mortality in many parts of Africa, women face a personal cost in protecting their health by reducing or spacing births. Hence, there may be significant gains to interventions that target men as the recipients of maternal health information campaigns, which are currently rare and typically take place after conception (Tokhi et al., 2018).

In a domain where separate spheres are important, in that women are more likely to learn about a phenomenon than men (or vice versa), it may be difficult for the information to spread within the household, and hence public intervention may be particularly important. Such domains may arise not only with maternal health, but also child health (Björkman Nyqvist and Jayachandran, 2017), investments in children's human capital, and other important household decisions whose costs or benefits, in many contexts, are observed or borne primarily by one household member, but influence the decision making of the entire household.

These findings inform the policy debate on male involvement in family planning. Our results indicate that involving men in reproductive health can be an effective tool to reduce unmet need for family planning, when interventions can fill specific intra-household gaps in communication. Indeed, we find that the reduction in fertility that we experimentally induce by providing information to men is not inferior to the one generated by giving it to women. The effect we document is of the same order of magnitude of other household-level interventions which have been shown to reduce pregnancy such as Ashraf, Field and Lee (2014). However, unlike in the latter study, when a man is treated with the relevant information this fertility effect is not accompanied by a decline of his wife's well-being . As reducing unmet need for family planning in Sub-Saharan Africa becomes an increasingly discussed policy goal, finding strategies to decrease excess male demand for children while enhancing family unity, rather than exacerbating existing conflict within the household, will be critical.

A simple policy intervention is to educate couples together. While our model would predict that similar updating would occur from educating men alone versus a husband and a wife together (because knowledge provided to men spreads more easily to the wife), we cannot assess how much of the effect we see is due to men learning this information on maternal health information together with other men around them, rather than other couples around them (or solely with their wife). We leave this to future research.

More generally, this paper reveals how gender differences can be exacerbated by information frictions, creating greater polarization and enabling further conflict to arise. Overcoming the information frictions breaks this cycle. In our setting, treating men directly leads to updating of information for both spouses, a greater alignment in fertility demand, reduced fertility, and no decline in the support of the wives. In a world in which there is often a strong encouragement from donor organizations for sub-Saharan African country governments, in particular, to promote family planning, our paper describes a "family-centric" approach that does not sacrifice intra-household happiness to advance health policy goals.

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Appendix - For Online Publication

A Appendix Tables and Figures

A.1 Tables

Table A1: Fertility and family planning in the baseline sample

	Women	Men	Diff. SE	p-value
Living children	2.598	2.890	(0.089)	[0.001]
Ideal number of children	4.188	4.426	(0.082)	[0.004]
Fraction contrac. methods believed to be bad for health	0.172	0.383	(0.013)	[0.000]
Fraction contrac. methods believed to lower fecundity	0.170	0.310	(0.013)	[0.000]
Agrees that contrac. help women be unfaithful	0.376	0.579	(0.026)	[0.000]
Total observations	715	715		

Notes: Baseline survey collected in the Fall of 2014. Wording of all questions in Supplemental Materials.

Table A2: Communication, maternal health knowledge and husband's desired fertility in the baseline survey

	Husband knew woman who died in childbirth	Husband wants another child now
Wife ever comm abt comp risk (W)	0.08	-0.11
	(0.04)	(0.06)
Wife ever comm abt comp risk (H)	0.21	-0.12
	(0.04)	(0.04)
Comm broke bc hus not interested (W)	0.03	-0.02
	(0.05)	(0.05)
Hus understand if told abt risks (W)	0.16	-0.22
	(0.06)	(0.10)
Time to recover, months (H)	4.83	-0.59
	(1.43)	(1.75)
Prob of comp if preg immediately (H)	0.76	-0.02
	(0.20)	(0.26)
Prob of comp over age 40 (H)	0.43	0.28
	(0.20)	(0.24)
Prob of comp after 4 kids (H)	0.08	0.30
	(0.24)	(0.27)
Correct on age (H)	0.06	-0.10
	(0.04)	(0.05)
Correct on parity (H)	0.06	-0.08
	(0.04)	(0.05)

Notes: Each cell represents a regression using the column header as the independent variable, and the row title as the dependent variable. "(W)" indicates that the responses are recorded from the wife's survey. "(H)" indicates that the responses are recorded from the husband's survey. Robust standard errors in the parentheses.

Table A3: Balance across treatments: sample that attended intervention, stratification and demographics

	(1) Husb. treat	(2) Wife treat	(3) Control group	(4) Diff. 1 v 3	(5) Diff. 2 v 3	(6) Diff. 1 v 2	(7) Joint test
Panel A: stratification							
Couple has children	0.95	0.95	0.95	0.00	-0.00	0.00	0.95
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	
W over 35	0.15	0.13	0.18	-0.02	-0.05	0.03	0.19
	(0.03)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	
W thinks that H wants another child later	0.55	0.47	0.47	0.08	0.00	0.08	0.06
	(0.04)	(0.04)	(0.04)	(0.06)	(0.06)	(0.06)	
W thinks H does not want another child	0.22	0.21	0.17	0.05	0.04	0.01	0.25
	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	
H knows women who died in childbirth	0.17	0.20	0.16	0.01	0.04	-0.03	0.37
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.04)	
Block size	3.63	3.74	3.48	0.15	0.26	-0.11	0.33
	(0.15)	(0.17)	(0.18)	(0.23)	(0.24)	(0.22)	
Baseline data available	0.63	0.63	0.60	0.03	0.03	-0.00	0.59
	(0.06)	(0.07)	(0.07)	(0.09)	(0.10)	(0.09)	
Panel B: demographics							
W's age	29.51	30.40	30.43	-0.91	-0.03	-0.89	0.05
	(0.41)	(0.44)	(0.57)	(0.70)	(0.72)	(0.60)	
H's age	35.01	35.90	36.05	-1.04	-0.16	-0.89	0.10
	(0.41)	(0.58)	(0.62)	(0.74)	(0.84)	(0.71)	
W's education	7.54	7.01	7.16	0.38	-0.15	0.53	0.06
	(0.22)	(0.27)	(0.23)	(0.32)	(0.36)	(0.35)	
H's education	9.06	9.13	9.17	-0.11	-0.04	-0.07	0.88
	(0.21)	(0.23)	(0.23)	(0.31)	(0.32)	(0.31)	
W is trying to get pregnant	0.05	0.08	0.06	-0.02	0.01	-0.03	0.21
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	
Number of children	2.76	2.82	2.94	-0.18	-0.12	-0.06	0.33
	(0.12)	(0.12)	(0.17)	(0.20)	(0.21)	(0.17)	
Age of last child born before meeting	3.16	3.25	3.28	-0.12	-0.03	-0.09	0.83
	(0.19)	(0.21)	(0.20)	(0.27)	(0.28)	(0.28)	
Contraceptive use	0.76	0.68	0.70	0.06	-0.01	0.08	0.05
	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)	
HH weekly income	497.07	468.60	722.05	-224.98	-253.45	28.47	0.01
	(72.78)	(90.20)	(137.12)	(153.92)	(162.75)	(114.94)	

Notes: SE clustered at the meeting level in parentheses. Column 3, 4 and 5 perform an F-test between the two columns specified by the column header. Column 7 performs an F-test for joint difference across all three treatment arms.

Table A4: Balance across treatments: sample that attended intervention, outcomes (1)

	(1) Husb. treat	(2) Wife treat	(3) Control group	(4) Diff. 1 v 3	(5) Diff. 2 v 3	(6) Diff. 1 v 2	(7) Joint test
Panel C: outcomes							
Currently pregnant	0.01	0.00	0.00	0.01	0.00	0.01	0.44
	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	
Likelihood have more kids	6.13	6.12	6.01	0.12	0.11	0.01	0.93
	(0.28)	(0.34)	(0.32)	(0.42)	(0.46)	(0.44)	
Use contrac.	0.86	0.82	0.91	-0.05	-0.09	0.04	0.28
	(0.03)	(0.05)	(0.03)	(0.04)	(0.05)	(0.06)	
Using inject.	0.37	0.36	0.30	0.07	0.06	0.01	0.34
	(0.04)	(0.04)	(0.05)	(0.06)	(0.06)	(0.06)	
Using implant	0.02	0.00	0.01	0.01	-0.01	0.02	0.13
	(0.01)	(0.00)	(0.01)	(0.02)	(0.01)	(0.01)	
Using pill	0.32	0.27	0.32	-0.00	-0.05	0.05	0.47
	(0.04)	(0.04)	(0.03)	(0.05)	(0.05)	(0.05)	
Using pill correctly (last taken max 1 day ago)	0.88	0.86	0.85	0.04	0.02	0.02	0.92
	(0.05)	(0.07)	(0.08)	(0.10)	(0.11)	(0.09)	
Using pill correctly (last taken max 5 days ago)	0.94	0.95	0.85	0.10	0.11	-0.01	0.32
	(0.04)	(0.04)	(0.08)	(0.09)	(0.09)	(0.06)	
Uses contrac. while partner unaware	0.29	0.28	0.23	0.06	0.05	0.01	0.57
	(0.04)	(0.05)	(0.04)	(0.06)	(0.07)	(0.07)	
Wants another kid	0.74	0.76	0.73	0.01	0.03	-0.02	0.74
	(0.03)	(0.04)	(0.03)	(0.05)	(0.05)	(0.05)	
Wants another kid within 1 year	0.06	0.08	0.10	-0.05	-0.02	-0.02	0.20
	(0.01)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	
Wants another kid after 1 year	0.50	0.53	0.46	0.04	0.07	-0.04	0.33
	(0.03)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	
Believes spouse wants more than self	0.24	0.20	0.26	-0.02	-0.06	0.04	0.44
	(0.04)	(0.02)	(0.03)	(0.05)	(0.04)	(0.04)	
Believes spouse wants less than self	0.16	0.18	0.18	-0.02	0.00	-0.02	0.88
	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	

Notes: SE clustered at the meeting level in parentheses. Column 3, 4 and 5 perform an F-test between the two columns specified by the column header. Column 7 performs an F-test for joint difference across all three treatment arms.

Table A5: Balance across treatments: sample that attended intervention, outcomes (2)

	(1) Husb. treat	(2) Wife treat	(3) Control group	(4) Diff. 1 v 3	(5) Diff. 2 v 3	(6) Diff. 1 v 2	(7) Joint test
Panel C: outcomes							
Partner comm. MM risk	0.45	0.44	0.42	0.03	0.02	0.01	0.79
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	
Agreement on CCT use	0.14	0.10	0.10	0.04	-0.01	0.05	0.35
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	
Tried convince partner CCT use	0.53	0.54	0.53	-0.00	0.01	-0.01	0.96
	(0.02)	(0.03)	(0.03)	(0.04)	(0.05)	(0.04)	
Changed partner mind CCT use	0.93	0.94	0.86	0.07	0.08	-0.01	0.08
	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)	(0.03)	
Partner changed resp's mind CCT use	0.37	0.43	0.36	0.01	0.07	-0.06	0.38
	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	
Prob of comp if older than 40	7.67	7.87	7.88	-0.21	-0.01	-0.20	0.50
	(0.13)	(0.15)	(0.20)	(0.24)	(0.25)	(0.20)	
Prob of comp if younger than 40	3.60	3.36	3.30	0.30	0.05	0.24	0.36
	(0.16)	(0.09)	(0.18)	(0.23)	(0.20)	(0.18)	
Prob of comp if fewer than 4 kids	3.12	3.15	2.98	0.13	0.16	-0.03	0.74
	(0.16)	(0.14)	(0.19)	(0.25)	(0.24)	(0.21)	
Prob of comp if more than 4 kids	5.84	6.12	6.14	-0.30	-0.02	-0.29	0.32
	(0.20)	(0.17)	(0.14)	(0.24)	(0.22)	(0.26)	
Prob of comp if 2-yrs. spacing	2.18	2.42	2.15	0.03	0.27	-0.24	0.42
	(0.13)	(0.15)	(0.22)	(0.25)	(0.26)	(0.19)	
Prob of comp if no spacing	7.71	8.12	8.16	-0.45	-0.04	-0.41	0.08
	(0.22)	(0.14)	(0.13)	(0.25)	(0.19)	(0.26)	

Notes: SE clustered at the meeting level in parentheses. Column 3, 4 and 5 perform an F-test between the two columns specified by the column header. Column 7 performs an F-test for joint difference across all three treatment arms.

Table A6: Balance across treatments: sample that attended intervention, outcomes (3)

	(1) Husb. treat	(2) Wife treat	(3) Control group	(4) Diff. 1 v 3	(5) Diff. 2 v 3	(6) Diff. 1 v 2	(7) Joint test
Panel C: outcomes							
Wife risk scale	4.41	3.71	4.01	0.41	-0.29	0.70	0.08
	(0.26)	(0.22)	(0.29)	(0.38)	(0.36)	(0.34)	
Months to recover	27.36	26.96	29.26	-1.90	-2.30	0.41	0.42
	(1.13)	(1.72)	(1.69)	(2.02)	(2.39)	(2.04)	
Adv. age is risk factor	0.16	0.13	0.16	0.00	-0.03	0.03	0.62
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	
High parity is risk factor	0.05	0.06	0.06	-0.01	0.00	-0.01	0.90
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	
Low spacing is risk factor	0.07	0.11	0.10	-0.03	0.01	-0.04	0.23
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	
Any of the 3 risk factor	0.20	0.20	0.22	-0.02	-0.02	0.00	0.80
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.03)	
IOS scale	6.19	6.10	6.24	-0.04	-0.13	0.09	0.59
	(0.07)	(0.08)	(0.09)	(0.12)	(0.12)	(0.11)	
Happy with marriage	1.76	1.74	1.85	-0.08	-0.10	0.02	0.52
	(0.04)	(0.08)	(0.07)	(0.08)	(0.11)	(0.09)	
Satisfied with sex life	1.89	1.76	1.79	0.10	-0.03	0.13	0.22
	(0.04)	(0.07)	(0.06)	(0.07)	(0.09)	(0.08)	
Any gift in past month	0.50	0.38	0.46	0.05	-0.07	0.12	0.20
	(0.04)	(0.05)	(0.05)	(0.06)	(0.07)	(0.06)	
Value of gifts past month	156.43	135.83	133.14	23.29	2.69	20.60	0.78
	(40.21)	(14.93)	(32.29)	(51.27)	(35.32)	(42.68)	
Husb threatened IPV	0.36	0.38	0.29	0.07	0.09	-0.02	0.13
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.05)	
Husb ever hit wife	0.32	0.30	0.26	0.06	0.03	0.02	0.43
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.05)	
Times hit wife last month	0.61	0.23	0.66	-0.05	-0.43	0.39	0.04
	(0.12)	(0.09)	(0.19)	(0.23)	(0.21)	(0.15)	

Notes: SE clustered at the meeting level in parentheses. Column 3, 4 and 5 perform an F-test between the two columns specified by the column header. Column 7 performs an F-test for joint difference across all three treatment arms.

Table A7: Knowledge of risk factors

	(1) Months to recover	(2) Adv. age is risk factor	(3) High parity is risk factor	(4) Low spacing is risk factor	(5) Correct on age vignette	(6) Correct on parity vignette
Effects on men						
Husband, informed directly (δ_H^h)	1.090	0.086	0.050	0.064	0.050	0.044
	(1.889)	(0.053)	(0.037)	(0.038)	(0.041)	(0.033)
	[0.566]	[0.106]	[0.172]	[0.093]	[0.223]	[0.181]
Husband, spouse informed (δ_W^h)	-3.856	0.040	0.060	0.019	-0.062	-0.069
	(1.674)	(0.052)	(0.035)	(0.034)	(0.038)	(0.043)
	[0.024]	[0.439]	[0.093]	[0.563]	[0.109]	[0.114]
Effects on women						
Wife, informed directly (δ_W^w)	1.352	0.073	0.042	0.084	0.016	0.022
	(1.842)	(0.054)	(0.046)	(0.054)	(0.030)	(0.026)
	[0.465]	[0.179]	[0.359]	[0.125]	[0.590]	[0.407]
Wife, spouse informed (δ_H^w)	7.752	0.030	-0.040	0.039	0.024	0.030
	(3.069)	(0.049)	(0.039)	(0.044)	(0.028)	(0.032)
	[0.013]	[0.542]	[0.298]	[0.385]	[0.387]	[0.345]
Stratification variables	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
H respondent interactions	Yes	Yes	Yes	Yes	Yes	Yes
F-test p-values:						
Direct vs. spillover effect on husband (δ_H^h=δ_W^h)	0.006	0.349	0.772	0.235	0.009	0.009
Direct vs. spillover effect on wife (δ_W^w=δ_H^w)	0.039	0.439	0.061	0.367	0.749	0.789
Symmetry of intra-hh spillover effects (δ_H^w=δ_W^h)	0.001	0.880	0.046	0.746	0.081	0.070
Direct treatment effects (δ_H^h=δ_W^w)	0.921	0.864	0.881	0.778	0.519	0.596
Mean of control group for H	28.850	0.230	0.080	0.090	0.830	0.840
Mean of control group for W	36.220	0.350	0.260	0.300	0.910	0.870
Observations	1050	1049	1049	1049	1050	1050

Notes: SE clustered at the meeting level in parentheses. p-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income. Each control variable and the constant are also interacted with a dummy for the husband being the respondent.

Table A8: Likelihood scale

	(1) Younger than 40	(2) Older than 40	(3) Fewer than 4 kids	(4) More than 4 kids	(5) 2-yrs. spacing	(6) No spacing	(7) Wife risk
Effects on men							
Husband, informed directly (δ_H^h)	-0.195	0.399	-0.164	0.064	0.056	0.085	-0.085
	(0.239)	(0.204)	(0.198)	(0.182)	(0.248)	(0.262)	(0.217)
	[0.416]	[0.053]	[0.409]	[0.726]	[0.823]	[0.747]	[0.695]
Husband, spouse informed (δ_W^h)	-0.188	-0.131	-0.477	-0.215	-0.582	-0.054	0.298
	(0.224)	(0.232)	(0.191)	(0.224)	(0.233)	(0.265)	(0.292)
	[0.403]	[0.573]	[0.014]	[0.340]	[0.014]	[0.840]	[0.310]
Effects on women							
Wife, informed directly (δ_W^w)	-0.015	0.407	0.357	0.295	0.258	0.163	-0.097
	(0.243)	(0.232)	(0.273)	(0.251)	(0.314)	(0.252)	(0.375)
	[0.952]	[0.082]	[0.194]	[0.243]	[0.413]	[0.520]	[0.797]
Wife, spouse informed (δ_H^w)	-0.218	0.465	0.088	-0.101	0.134	0.061	-0.025
	(0.215)	(0.222)	(0.248)	(0.241)	(0.289)	(0.213)	(0.299)
	[0.312]	[0.039]	[0.724]	[0.675]	[0.644]	[0.774]	[0.933]
Stratification variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H respondent interactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test p-values:							
Direct vs. spillover effect on husband (δ_H^h=δ_W^h)	0.976	0.018	0.136	0.188	0.001	0.579	0.194
Direct vs. spillover effect on wife (δ_W^w=δ_H^w)	0.410	0.771	0.272	0.075	0.653	0.662	0.831
Symmetry of intra-hh spillover effects (δ_H^w=δ_W^h)	0.931	0.051	0.086	0.728	0.071	0.733	0.432
Direct treatment effects (δ_H^h=δ_W^w)	0.629	0.979	0.140	0.453	0.628	0.828	0.979
Mean of control group for H	3.760	7.810	3.340	6.440	3.840	7.470	4.360
Mean of control group for W	4.150	7.400	3.950	6.450	3.670	7.770	4.210
Observations	1050	1048	1050	1048	1050	1048	1034

Notes: SE clustered at the meeting level in parentheses. *p*-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income. Each control variable and the constant are also interacted with a dummy for the husband being the respondent.

Table A9: Spousal communication

	(1) Comm. MM risk to partner	(2) Partner comm. MM risk
Effects on men		
Husband, informed directly (δ^h_H)	0.130	0.077
	(0.052)	(0.044)
	[0.015]	[0.084]
Husband, spouse informed (δ^h_W)	-0.031	-0.033
	(0.059)	(0.052)
	[0.603]	[0.529]
Effects on women		
Wife, informed directly (δ^w_W)	-0.020	0.019
	(0.050)	(0.048)
	[0.684]	[0.689]
Wife, spouse informed (δ^w_H)	-0.020	-0.026
	(0.051)	(0.055)
	[0.693]	[0.641]
Stratification variables	Yes	Yes
Demographic controls	Yes	Yes
H respondent interactions	Yes	Yes
F-test p-values:		
Direct vs. spillover effect on husband (δ^h_H=δ^h_W)	0.001	0.016
Direct vs. spillover effect on wife (δ^w_W=δ^w_H)	0.995	0.373
Symmetry of intra-hh spillover effects (δ^w_H=δ^h_W)	0.880	0.923
Direct treatment effects (δ^h_H=δ^w_W)	0.019	0.345
Mean of control group for H	0.420	0.710
Mean of control group for W	0.480	0.460
Observations	1049	1047

Notes: SE clustered at the meeting level in parentheses. P-values in brackets. The outcome variable in column 1 indicates whether the husbands communicate maternal mortality risk to their partners. The outcome variable in column 2 indicates whether the wives communicate maternal mortality risk to their partners. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income. Each control variable and the constant are also interacted with a dummy for the husband being the respondent.

Table A10: Heterogeneity in knowledge spillover effects

	Group: husb. did not know about MM		**Group: husb. want child later or never**		**Group: wife over 35**		**Group: with hist. of comp**	
	(1) Risk factors index (spillover)	(2) Ladder index (spillover)	(3) Risk factors index (spillover)	(4) Ladder index (spillover)	(5) Risk factors index (spillover)	(6) Ladder index (spillover)	(7) Risk factors index (spillover)	(8) Ladder index (spillover)
Wife, spouse informed × (**group** = yes) (β_H^{w1})	0.106	0.011	0.060	-0.014	0.044	0.158	0.036	0.018
	(0.058)	(0.057)	(0.067)	(0.059)	(0.120)	(0.144)	(0.096)	(0.138)
	[0.070]	[0.853]	[0.377]	[0.815]	[0.715]	[0.277]	[0.710]	[0.899]
Wife, spouse informed × (**group** = no) (β_H^{w2})	0.034	0.084	0.166	0.120	0.100	-0.003	0.100	0.024
	(0.128)	(0.107)	(0.114)	(0.108)	(0.059)	(0.047)	(0.057)	(0.049)
	[0.790]	[0.436]	[0.150]	[0.268]	[0.097]	[0.951]	[0.082]	[0.625]
Husband, spouse informed × (**group** = yes) (β_W^{h1})	-0.002	-0.100	0.029	-0.045	-0.393	-0.142	0.174	-0.083
	(0.062)	(0.057)	(0.069)	(0.071)	(0.185)	(0.165)	(0.106)	(0.102)
	[0.973]	[0.082]	[0.678]	[0.531]	[0.037]	[0.392]	[0.104]	[0.416]
Husband, spouse informed × (**group** = no) (β_W^{h2})	-0.176	0.057	-0.173	-0.174	0.023	-0.078	-0.081	-0.078
	(0.154)	(0.128)	(0.094)	(0.093)	(0.054)	(0.053)	(0.059)	(0.057)
	[0.256]	[0.659]	[0.070]	[0.064]	[0.675]	[0.144]	[0.171]	[0.173]
Stratification variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test p-values:								
Spillover effect of treating husband vs, wife, **group** = yes (β_H^1=β_W^1)	0.226	0.166	0.745	0.730	0.050	0.179	0.299	0.445
Spillover effect of treating husband vs. wife, **group** = no (β_H^2=β_W^2)	0.264	0.858	0.016	0.030	0.329	0.267	0.022	0.151
Subgroup spillover effect of treating husband (β_H^1=β_H^2)	0.637	0.585	0.476	0.316	0.702	0.291	0.576	0.966
Subgroup spillover effect of treating wife (β_W^1=β_W^2)	0.333	0.278	0.109	0.306	0.037	0.711	0.036	0.961
Observations	674	674	686	686	686	686	681	681

Notes: This table shows the heterogeneity in the household spillover effects. The coefficient, β_H^w, represents the effect of treating the husband on the wife's outcome. The coefficient, β_W^h, represents the effect of treating the wife on the husband's outcome. The condition corresponds to the bold column title. For example, in the first two columns, "Group = yes" means "Husb. did not know about MM (maternal mortality)" and "Group = no" means "Husb. knew about MM (maternal mortality)". SE clustered at the meeting level in parentheses. *p*-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

Table A11: Heterogeneity results, transfer indices

	Group: husb. did not know about MM	**Group: husb. want child later or never**	**Group: wife over 35**	**Group: with Hist. of comp**
	(1)	(2)	(3)	(4)
	Transfers index	Transfers index	Transfers index	Transfers index
Husband treated × (**group** = yes) (β_H^1)	-0.024	-0.026	-0.318	0.002
	(0.065)	(0.070)	(0.178)	(0.140)
	[0.708]	[0.713]	[0.077]	[0.990]
Husband treated × (**group** = no) (β_H^2)	0.310	0.144	0.101	0.032
	(0.195)	(0.140)	(0.059)	(0.059)
	[0.115]	[0.307]	[0.091]	[0.586]
Wife treated × (**group** = yes) (β_W^1)	-0.197	-0.253	-0.324	-0.127
	(0.060)	(0.075)	(0.189)	(0.134)
	[0.002]	[0.001]	[0.090]	[0.346]
Wife treated × (**group** = no) (β_W^2)	-0.022	-0.009	-0.140	-0.180
	(0.199)	(0.112)	(0.059)	(0.060)
	[0.914]	[0.937]	[0.019]	[0.003]
Stratification variables	Yes	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes	Yes
F-test p-values:				
Effect of treating husband vs. wife, **group** = yes (β_H^1=β_W^1)	0.008	0.002	0.974	0.423
Effect of treating husband vs. wife, **group** = no (β_H^2=β_W^2)	0.026	0.240	0.000	0.000
Subgroup effect of treating husband (β_H^1=β_H^2)	0.126	0.318	0.032	0.839
Subgroup effect of treating wife (β_W^1=β_W^2)	0.410	0.083	0.352	0.708
Observations	495	502	502	500

Notes: SE clustered at the meeting level in parentheses. p-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

Table A12: Fertility outcomes, husband's response

	(1) Fertility index	(2) Currently pregnant	(3) Likelihood have more kids
Husband treated (β_H)	-0.172	-0.053	-0.597
	(0.072)	(0.029)	(0.311)
	[0.020]	[0.070]	[0.058]
Wife treated (β_W)	-0.107	-0.037	-0.359
	(0.079)	(0.032)	(0.295)
	[0.177]	[0.243]	[0.228]
Stratification variables	Yes	Yes	Yes
Demographic controls	Yes	Yes	Yes
F-test p-value (β_H=β_W)	0.392	0.614	0.446
Mean of control group		0.120	5.890
Observations	516	498	516

Notes: SE clustered at the meeting level in parentheses. *p*-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present. Demographic control variables include wife age, husband age, wife education, husband education, number of children, age of last child born before meeting, wife is actively trying to get pregnant, baseline contraceptive use, and household weekly income.

Table A13: LASSO: individual-level indices

	(1) Ladder index	(2) Risk factors index	(3) Beliefs index (1) + (2)	(4) Demand index	(5) Spousal comm. index
Effects on men					
Husband, informed directly (δ^h_H)	0.007	0.120	0.063	-0.213	0.199
	(0.050)	(0.052)	(0.035)	(0.071)	(0.078)
	[0.882]	[0.021]	[0.071]	[0.003]	[0.011]
Husband, spouse informed (δ^h_W)	-0.108	-0.047	-0.078	-0.067	-0.096
	(0.049)	(0.052)	(0.034)	(0.070)	(0.085)
	[0.028]	[0.361]	[0.023]	[0.341]	[0.259]
Effects on women					
Wife, informed directly (δ^w_W)	0.082	0.101	0.098	0.063	-0.016
	(0.053)	(0.050)	(0.039)	(0.075)	(0.079)
	[0.125]	[0.041]	[0.012]	[0.396]	[0.840]
Wife, spouse informed (δ^w_H)	0.008	0.081	0.050	-0.028	-0.081
	(0.043)	(0.049)	(0.033)	(0.083)	(0.087)
	[0.854]	[0.097]	[0.129]	[0.736]	[0.356]
F-test p-values:					
Direct vs. spillover effect on husband (δ^h_H=δ^h_W)	0.017	0.000	0.000	0.063	0.000
Direct vs. spillover effect on wife (δ^w_W=δ^w_H)	0.171	0.706	0.238	0.296	0.431
Symmetry of intra-hh spillover effects (δ^w_H=δ^h_W)	0.072	0.065	0.006	0.703	0.889
Direct treatment effects (δ^h_H=δ^w_W)	0.310	0.794	0.506	0.003	0.025
Observations	1050	1050	1050	1050	1049

Notes: SE clustered at the meeting level in parentheses. *p*-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present.

A.2 Figures

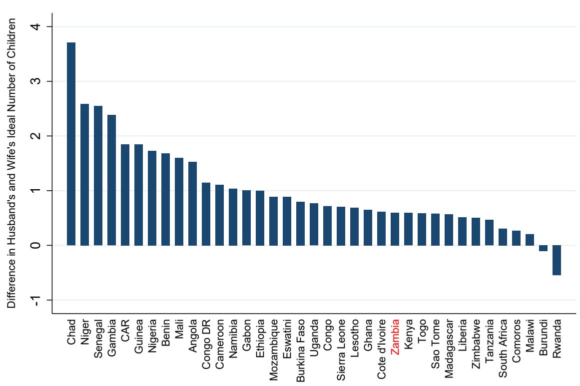
Table A14: LASSO: household-level indices

	(1) Fertility index	(2) Transfers index
Husband treated	-0.138	0.017
(β_H)	(0.083)	(0.063)
	[0.094]	[0.789]
Wife treated	-0.155	-0.183
(β_W)	(0.086)	(0.058)
	[0.072]	[0.002]
F-test p-value (β_H=β_W)	0.827	0.001
Observations	534	502

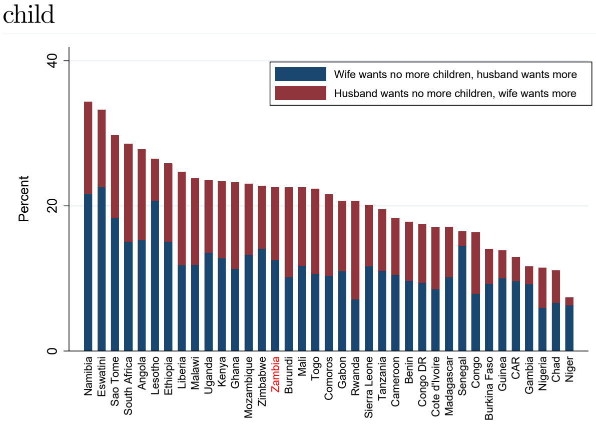
Notes: SE clustered at the meeting level in parentheses. p-values in brackets. Stratifying control variables include if couple has children, wife over 35, wife thinks that husband wants another child later, wife thinks husband does not want another child, husband does not know of women who died at childbirth, block size, and baseline data present.

Figure A1: Spousal disagreement in ideal fertility in sub-saharan Africa

(a) Difference in reported ideal fertility between husband and wife



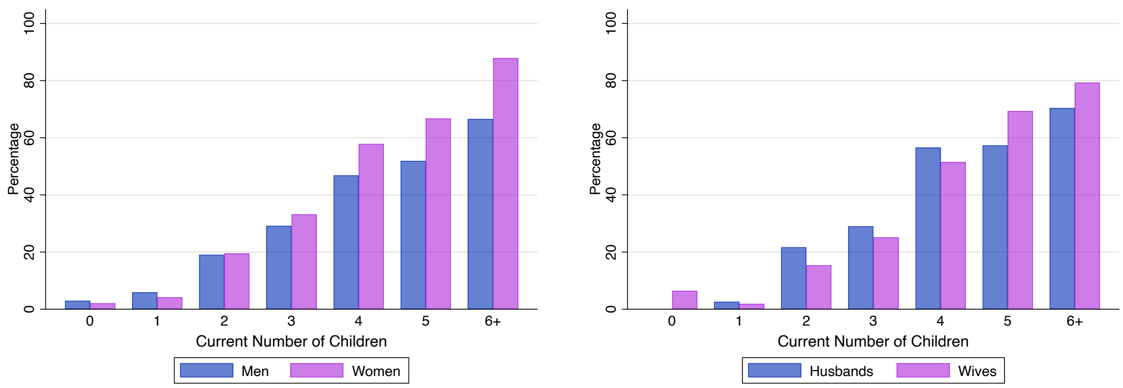
(b) Fraction of couples that disagrees over having another child



Notes: Data from the most recent waves of Demographic and Health Surveys. Polygamous couples are excluded from each sample for which such information is available.

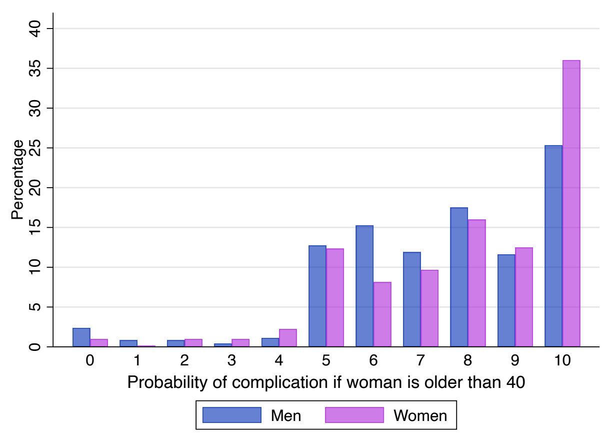
Figure A2: Percent that want no more children by current number of children in the DHS and in the baseline survey

(a) DHS (b) Baseline survey



Notes: Left-hand side bar graph summarizes percentages of men and women for DHS 2013-2014 data; right-hand side bar graph summarizes percentages of husbands and wives in our sample.

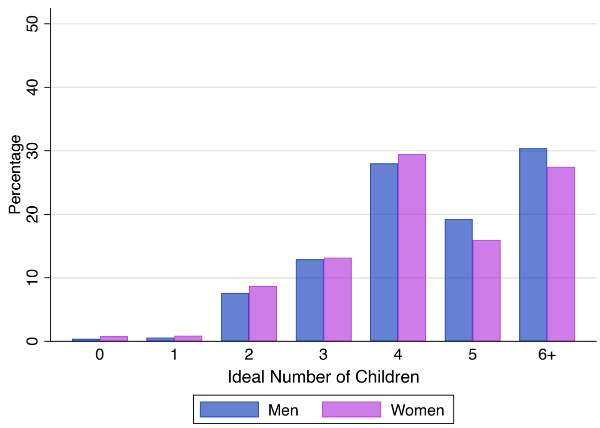
Figure A3: Spousal difference in beliefs about the probability of complication for a woman older than 40 at baseline



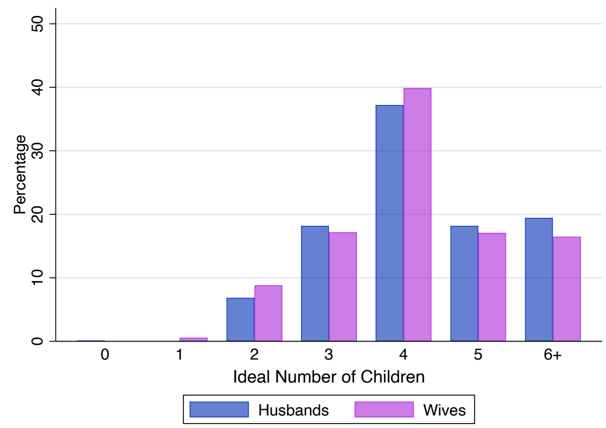
Notes: Data from the responses of husbands and wives in our sample at baseline.

Figure A4: Ideal number of children in the DHS and in the baseline survey

(a) DHS



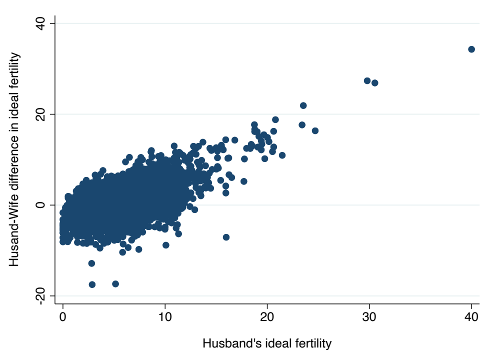
(b) Baseline survey



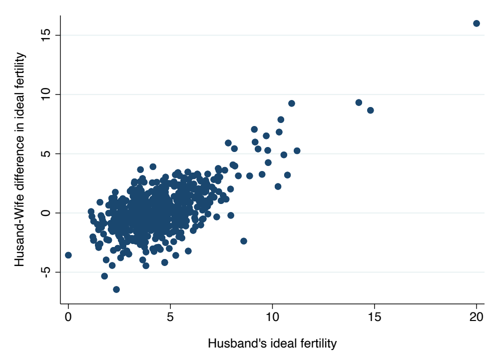
Notes: Left-hand side bar graph summarizes means of men and women for DHS 2013-2014 data; right-hand side bar graph summarizes means of husbands and wives in our sample.

Figure A5: Spousal difference in ideal fertility vs. husband's ideal fertility

(a) Zambia DHS 2014



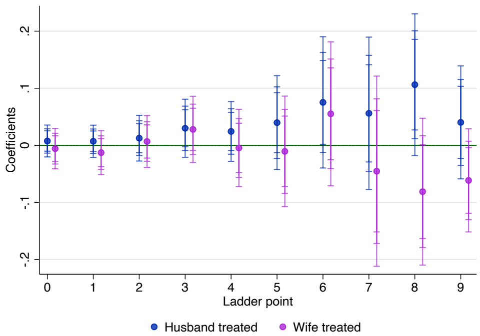
(b) Baseline sample



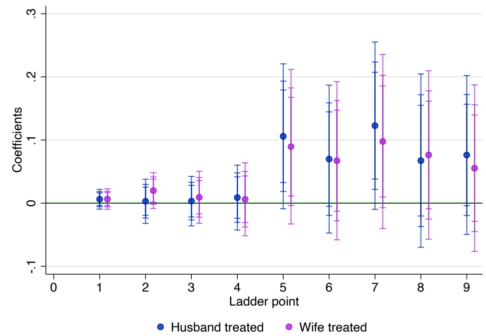
Notes: The outliers with husband's ideal fertility greater than 50 are dropped in all the DHS data.

Figure A6: Effect on assessed likelihood of complication - woman over 40

(a) Husband respondent



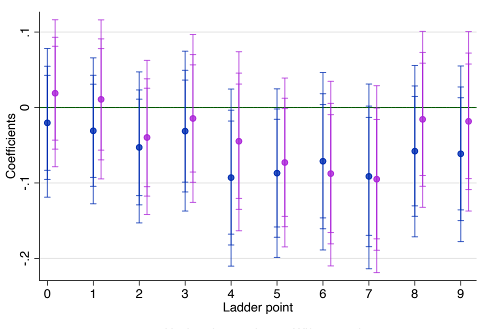
(b) Wife respondent



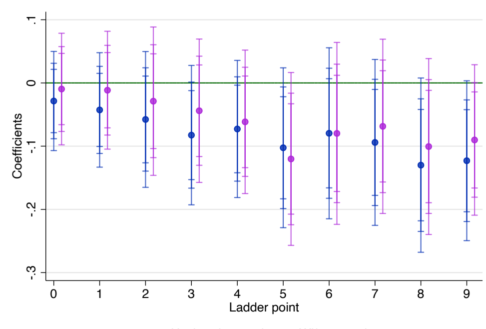
Notes: The figure depicts the effect of the intervention on the assessed likelihood of having pregnancy complications, as expressed by a ladder from 0 to 10, for an hypothetical women who is older than 40 years old. The respondents are the husband (left) and wife (right). The different colors indicate which spouse was treated.

Figure A7: Effect on assessed likelihood of having another child

(a) Husband Respondent



(b) Wife Respondent



Notes: The figure depicts the effect of the intervention on the assessed likelihood of having another child, as expressed by a ladder from 0 to 10. Each dot corresponds to the coefficient associated with treatment status ($Husbandtreated$ or $WifeTreated$ in a linear probability model regression where the dependent variable equals 1 if the ladder point is greater or equal to the value on the horizontal axis, and 0 otherwise).

B Theoretical Appendix

B.1 Both spouses uninformed with bias: computations

We study the case in which both spouses have a biased perception of the distribution of the health cost with mean θ^G. The structure of the game is the same as before.

Privately Optimal Fertility Given the new assumption on the distribution of the maternal health cost, the optimal fertility of the wife is now equal to:

$$n_b^W = argmax \int_0^1 [-(\alpha^W - \theta - n)^2] f^G(\theta) d\theta = \alpha^W - \theta^G$$

and that of the husband:

$$n_b^H = argmax \int_0^1 [-(\alpha^H - \delta\theta - n)^2] f^G(\theta) d\theta = \alpha^H - \delta\theta^G$$

The structure of the game is the same as before. The game is solved by backward induction.

Equilibrium transfers and number of children Given the wife's preferences, the mapping between transfers and fertility is as follows:

$$n(t) = \begin{matrix} n_b^W & if & \int_0^1 [-(\alpha^W - \theta - n_{Bt}^H)^2] f^G(\theta) d\theta + t < \int_0^1 [-(\theta^G - \theta)^2] f^G(\theta) d\theta \\ n_{Bt}^H & if & \int_0^1 [-(\alpha^W - \theta - n_{Bt}^H)^2] f^G(\theta) d\theta + t \geq \int_0^1 [-(\theta^G - \theta)^2] f^G(\theta) d\theta \end{matrix}$$

Maximising the husband utility function with transfers, we have: $n_{Bt}^H = \frac{n_b^H + \gamma(n_b^W)}{1+\gamma}$ that corresponds to the minimum level of transfers that compensate the wife for her utility loss is equal to: $t_{MIN} = \left(\frac{\alpha^H - \alpha^W}{1+\gamma} + \frac{(\delta+\gamma)\theta^G}{1+\gamma}\right)^2 - 2\left(\frac{\alpha^H - \alpha^W}{1+\gamma} + \frac{(\delta+\gamma)}{1+\gamma}\right)\theta^G + (\theta^G)^2$.

Let us define the husband indirect utility with transfers as:

$$IU(n_{Bt}^H) = \int_0^1 [-(\alpha^H - \delta\theta - n_{Bt}^H)^2] f^G(\theta)\theta - \gamma t_{MIN}$$

and the husband indirect utility without transfers as

$$IU(n_b^H) = \int_0^1 [-(\alpha^H - \delta\theta_j - \alpha^W + \theta^G)^2] f^G(\theta) d\theta = -(\alpha^H - \alpha^W + \theta^G)^2 - \delta^2\sigma^G + 2\delta(\alpha^H - \alpha^W + \theta^G)\theta^G$$

As before, the husband finds optimal to implement this transfers to the wife if his expected utility is higher with transfers than without, that is if $IU(n_{Bt}^H) > IU(n_b^H)$. This difference is equal to:

$$\Delta = \frac{\left(\frac{\alpha^H - \alpha^W}{\theta^G} + (1+\delta)\right)^2 (\theta^G)^2}{1+\gamma} > 0.$$

Since, even with biased beliefs, this condition is always satisfied so the optimal fertility in equilibrium is equal to $n_B^* = \frac{n_b^H + \gamma(n_b^W)}{1+\gamma}$.

B.2 Effect of the intervention: propositions and lemmas

B.2.1 Wife treated with information

When the wife is treated, she is the one getting a perfectly informative signal on her cost realization.

Structure of household decision making The structure of the game is modified as now there is the possibility of a communication stage in which the wife can try to provide information about her health cost realization. The structure of the game is modified as follows:

1. The wife communicates about θ_j
2. The husband updates θ_j and offers $t(n_u^*)$ with commitment
3. The wife accept or refuses n_u^*
4. The husband pays $t(n_u^*)$

Again, the model is solved by backward induction.

Optimal Fertility and Transfers Given that the wife is informed, her privately optimal fertility is equal to the complete information case: $n_j^W = \alpha^W - \theta_j$, while that of the husband depends on his beliefs about θ_j, and is equal to $n_u^H = \alpha^H - \delta E_H[\theta_j]$, where $E_H[\theta_j]$ is the husband's posterior on the expected maternal health cost of the wife after communication takes place. Maximizing the husband's utility function with transfers, we have that equilibrium fertility with transfers is equal to $n_u^{Ht} = \frac{n_u^H + \gamma(\alpha^W - E_H[\theta_j])}{1+\gamma}$.

To understand when it is optimal for the husband to give a transfer to his wife, we need to study the communication game in the first stage.

Communication Studying information sharing by the wife and information updating by the husband, we have the following lemma.

Lemma 1. *When the wife perfectly observes the realization of θ_j, no perfectly informative communication occurs between her and her husband, unless preferences are aligned ($\alpha^H - \alpha^W = 0$ and $\delta > \frac{1-\gamma}{2}$). Under Assumption 1, transfers and fertility behave as follows:*

(i) For a given α^W, when α^H is high enough ($\alpha^H > A^{IC}$), transfers occur and fertility is based on the husband's optimal choice;

(i) otherwise, fertility follows the woman's optimum $n_j^* = \alpha^W - \theta_j$.

Proof. See Appendix B.3 ■

Studying the aggregate change in communication and fertility after the intervention when the wife is treated, we have the following result:

Proposition 1. *After the intervention, when the wife is treated, no perfectly informative communication occurs between her and her husband, unless preferences are aligned ($\alpha^H - \alpha^W = 0$ and $\delta > \frac{1-\gamma}{2}$). Under Assumption 1, when α^H is low, transfers and fertility decrease.*

Proof. See Appendix B.3 ■

B.2.2 Husband treated with information

In the husband treatment arm, the husband receives a perfectly informative signal.

Optimal actions when the husband is informed We now analyze the case in which the husband is perfectly informed about the cost realization and the wife is not. This corresponds to our intervention treatment, in which we provide precise information on maternal health to the husband, whenever the wife is not already perfectly informed herself.

The main difference with the case in which the wife has to communicate comes from the fact that the husband transmits information through the transfer he offers to the wife, and that he can get to his private optimum by offering the appropriate transfer. In other words, transfers can provide a signal of the health cost realization to the wife.

Structure of household decision making Again, the structure of the game is modified to account for the possibility of communication between husband and wife. The husband can provide information about the health cost realization θ_j to the wife. The structure of the game is as follows:

1. The husband offers $t(n(\theta_j),E_W[\theta_j])$ signaling θ_j

2. The wife updates about θ_j and accept or refuses $t(n(\theta_j),E_W[\theta_j])$

3. The husband pays $t(n^*)$

where $E_W[\theta_j]$ is the information the wife has after Bayesian updating occurs, based on the message of the husband.

The Bayesian Nash equilibrium of the game is such that the equilibrium fertility is determined by the offer of the husband, that also signals θ_j, and transfers are based on the posterior of the wife about θ_j.

Equilibrium transfers and number of children The equilibrium fertility that the husband asks when proposing the transfers to the wife is $n_v^{Ht} = \frac{n_h(m(\theta_j)) + \gamma(\alpha^W - m(\theta_j))}{1+\gamma}$. This constitutes an informative signal of the cost realisation since the husband commits to pay transfers based on this fertility level.

Transfers are aligned to the wife's information set. When the wife has a posterior equal to $E_W[\theta_j]$, transfers are determined based on the fertility outcome and the wife receives $t = (\alpha^W - E_W[\theta_j] - n_v^{Ht})^2$, so that her level of indirect utility is equal to 0, her outside option.[40]

When communication is not possible (that happens with probability $1-p_c^H$) fertility is based on the information set of the husband and transfers on that of the wife.

Communication To study information sharing by the husband and information updating by the wife, we have to understand the husband's incentives to truthfully report the maternal health cost θ_j.

As soon as some information transmission occurs, average fertility is affected as well. Communication, transfers and fertility are affected in the following way:

Proposition 2. *After the intervention, when the husband is treated, for δ sufficiently high and α^H sufficiently small, or for γ sufficiently low, informative communication about θ_j occurs. Transfers increase and fertility decreases among couples in which either α^H or γ are sufficiently low.*

[40] The husband always prefers to make a transfer since, without a transfer, fertility would coincide with the wife's ideal fertility in expectation $n^W = \alpha^W - E_W[\theta_j]$.

Proof. See Appendix B.3 ■

B.2.3 Asymmetrically informed couples prior to the intervention

We now discuss what can arise from gendered spheres by assuming that there exist *asymmetrically informed* couples, in which the wife knows the cost realization θ_j at the moment in which optimal fertility is chosen, while the husband does not observe the realization of the cost and believes the cost to be drawn from the a different distribution with mean θ^G.

The effect of the treating the wife in this type of household are the following: when the wife is already informed about her cost realisation, average ideal fertility of the wife is not affected by the intervention. Furthermore, neither communication nor realized fertility are affected by the treatment. When the husband is treated and the wife was ex-ante informed the effects of the intervention are the following: no information is transmitted between the husband and wife, fertility decreases only in couples in which the ideal fertility of the husband is high, and transfers increase for all type of couples. These effects are due to the fact that the intervention solve the asymmetry of information between the two spouses, allowing them to agree on transfers and realized fertility.

B.3 Proofs

Proof. Lemma 1

We look for Perfect Bayesian Equilibria in information transmission, transfers and fertility.

To study communication, we define $m(\theta_j)$ as the message sent by the wife. If the husband perfectly updates his information based on the message ($E_H[\theta_j]=m(\theta_j)$), we can compare the utility of the wife under truthful information transmission and any other message. Under truthful information transmission, the indirect utility of the wife is equal to 0. Under any other message, it is equal to:

$$IU_j^W = -\left(\frac{\alpha^W - \alpha^H + \delta m(\theta_j) + \gamma m(\theta_j)}{1+\gamma} - \theta_j\right)^2 + \left(\frac{\alpha^H - \alpha^W - \delta m(\theta_j) - \gamma m(\theta_j)}{1+\gamma} + m(\theta_j)\right)^2.$$

It is easy to show that for every θ_j, when $\alpha^H - \alpha^W > \frac{\gamma+\delta-(1-\delta)}{2}$ the optimal message is always equal to $m(\theta_j)=1$; for $0 < \alpha^H - \alpha^W < \frac{\gamma+\delta-(1-\delta)}{2}$, the optimal message is equal to 1, for $\theta_j > \frac{\gamma+\delta-2(\alpha^H-\alpha^W)-(1-\delta)}{1+\gamma}$; instead, when $\alpha^H - \alpha^W < 0$, the optimal message is always equal to $m(\theta_j)=0$, so full information transmission does not occur. If $1-\delta > \gamma+\delta$, no information is shared in equilibrium.

We now discuss optimal transfers when no information is transmitted: for transfers to occur for every possible θ_j, the husband needs to be ready to accept making higher transfers compared to when the wife is uniformed.

We first show that no incentive compatible contract contingent on θ can exist in equilibrium. The wife accepts to adapt to the fertility of the husband if $t \geq (\alpha^W - \theta_j - n_u^{Ht})^2$. Given the husband's posterior $E_H[\theta_j]$, the transfer offered to the wife would be $t = \left(\alpha^W - E_H[\theta_j] - \frac{n_u^H + \gamma(\alpha^W - E_H[\theta_j])}{1+\gamma}\right)^2$. This transfer would give a level of utility to the wife equal or greater than 0 (her outside option) only when $\theta_j \leq E_H[\theta_j]$, hence when the husband attributes a cost to the wife which is higher than the one she actually faces.

We then show that when contracts that include the highest edge of the distribution exist, given the husband's posterior $E_H[\theta_j]$, they exist for any other upper limit of the contract, θ^h. From what we just showed, we know that when the husband believes that θ_j belongs to a given interval $\left[\theta^l, \theta^h\right]$ with mean $\overline{\theta}(\theta^h)$, the only possible contracts that it is accepted by all θ_j in the interval is the one in which compensations occur based on the highest θ^h. If the husband propose a contract in which he compensate up to $\overline{\theta}(\theta^h)$ then the average θ_j accepting the contract will be $\overline{\theta}(\overline{\theta}) < \overline{\theta}(\theta^h)$. We show here that when α^H is high enough, so that including the highest θ_j is optimal, any other contract in which transfers are accepted up to an intermediate θ_j exists as well and are dominated by the one that include the highest θ_j. Let's consider the case in which transfers are accepted up to $\overline{\theta}(\theta^h)$. This means that the expected utility of the husband is the following:

$$\begin{gathered}
\int_{\theta^l}^{\overline{\theta}(\theta^h)} \left[-\left(\alpha^H - \delta\theta_j - \frac{\alpha^H - \delta\overline{\theta}(\overline{\theta}) + \gamma\alpha^W - \gamma\overline{\theta}(\theta^h)}{1+\gamma}\right)^2 - \right. \\
\left. -\gamma\left(\alpha^W - \theta_j - \frac{\alpha^H - \delta\overline{\theta}(\overline{\theta}) + \gamma\alpha^W - \gamma\overline{\theta}(\theta^h)}{1+\gamma}\right)^2 \right. f^G(\theta)d\theta - \\
-\int_{\overline{\theta}(\theta^h)}^{\theta^h} [-(\alpha^H - \delta\theta_j - \alpha^W + \overline{\theta}(1))^2] f^G(\theta)d\theta
\end{gathered}$$

that is dominated by a contract for which the expected utility is

$$\begin{gathered}
\int_{\theta^l}^{\theta^h} \left[-\left(\alpha^H - \delta\theta_j - \frac{\alpha^H - \delta\overline{\theta}(\theta^h) + \gamma\alpha^W - \gamma\overline{\theta}(\theta^h)}{1+\gamma}\right)^2 - \right. \\
\left. -\gamma\left(\alpha^W - \theta_j - \frac{\alpha^H - \delta\overline{\theta}(\theta^h) + \gamma\alpha^W - \gamma\overline{\theta}(\theta^h)}{1+\gamma}\right)^2 \right. f^G(\theta)d\theta
\end{gathered}$$

as long as transfers are convenient up to θ^h. This is due to the fact that, since the cost of transfers are increasing in θ_j, if they are optimal for the highest θ_j, they are optimal for the rest of the relevant interval.

Finally, we then show that for a sufficiently high $\alpha^H - \alpha^W > 0$, when no information transmission occurs, the husband finds optimal to make transfers compatible with the highest possible θ (we show that for $\theta=1$). The optimal fertility and transfers for the husband, when providing incentives for $\theta=1$ are determined maximizing:

$$n_{IC}^{H}=argmax\int_{0}^{1}[-(\alpha^{H}-\delta\theta_{j}-n)^{2}-\gamma(\alpha^{W}-1-n)^{2}]f^{G}(\theta)d\theta=\frac{\alpha^{H}-\delta\theta^{G}+\gamma\alpha^{W}-\gamma}{1+\gamma}$$

This gives an indirect utility to the husband equal to:

$$IU_{IC}^{h}=-\frac{\gamma(\alpha^{H}-\alpha^{W})^{2}}{(1+\gamma)^{2}}-\frac{2\gamma(\alpha^{H}-\alpha^{W})}{(1+\gamma)^{2}}((1+\gamma)(2-\delta\theta^{G})-2\delta\theta^{G})+\frac{\delta^{2}(\theta^{G})^{2}-2\gamma\delta\theta^{G}+\gamma}{1+\gamma}-\delta^{2}\sigma^{G}$$

Whether the husband decides to offer such a high level of transfer depends whether IU_{IC}^{h} is higher than the indirect utility of the husband with no transfers, $IU(n_{b}^{H})$. Rearranging terms we get the following disequation:

$$\frac{(\alpha^{H}-\alpha^{W})^{2}}{1+\gamma}-2\left(\frac{\theta^{G}(1+\gamma+\delta)-2\gamma}{(1+\gamma)}\right)(\alpha^{H}-\alpha^{W})+\frac{\delta^{2}(\theta^{G})^{2}-2\gamma\delta\theta^{G}+\gamma}{1+\gamma}-2\delta(\theta^{G})^{2}>0.$$

So transfers will happen for α^{H} bigger than

$$A^{IC}=\alpha^{W}+\theta^{G}(1+\gamma+\delta)-2\gamma+\sqrt{(\theta^{G}(1+\gamma+\delta)-2\gamma)^{2}-\delta^{2}(\theta^{G})^{2}-2\gamma\delta\theta^{G}+\gamma+2\delta(\theta^{G})^{2}(1+\gamma)^{2}}$$

and will stop otherwise. ■

Proof. Proposition 1

When the spouses had biased knowledge of the cost distribution, after the intervention, when the wife gets treated, the average ideal fertility of the wife moves from $\alpha^{W}-\theta^{G}$ to $\alpha^{W}-\theta^{Z}$. Furthermore, contracts break down (transfers stop) for $\alpha^{H}<A^{IC}$ and fertility in equilibrium is equal to the optimal fertility of the wife. (See proofs of Lemma 1).

When $\alpha^{H}>A^{IC}$, transfers move from t_{MIN} to $t_{IC}=(\alpha^{W}-1-n_{IC}^{H})$, with $t_{MIN}<t_{IC}$: the difference in transfers is equal to $\frac{(1-\delta)(1-\theta^{Z})}{1+\gamma}$. Fertility moves to n_{IC}^{H}, with the reduction equal to $\frac{(\gamma+\delta)(1-\theta^{Z})}{1+\gamma}$. ■

Proof. Proposition 2 We look for Perfect Bayesian Equilibria in transfers and fertility.

We define $m(\theta_{j})$ as the message sent by the husband: the husband propose to the wife to compensate her utility loss for accepting a level of fertility equal to $n_{I}^{H}=\frac{\alpha^{H}+\gamma\alpha^{W}-(\delta+\gamma)m(\theta_{j})}{1+\gamma}$.

The wife updates her information based on the message so that her new posterior is equal to $(E_W[\theta_j]=f(m(\theta_j)))$. Thus, we can compare the utility of the husband under truthful information transmission and any other message. Under truthful information transmission the utility of the husband is equal to $IU(\theta_j)=-\frac{\gamma}{1+\gamma}\left[\alpha^H-\alpha^W+(1-\delta)\theta_j\right]^2$. Under any other message, it is equal to:

$$IU(m(\theta_j))=-\left[\frac{\gamma\left(\alpha^H-\alpha^W+m(\theta_j)\right)+\delta m(\theta_j)}{1+\gamma}-\delta\theta_j\right]^2-\gamma\left[\frac{\alpha^H-\alpha^W-(\delta+\gamma)m(\theta_j)}{1+\gamma}+f(m(\theta_j))\right]^2$$

.

We first show that communication is informative for sufficiently low level of γ and low conflict of preferences. Whether communication is informative or not, depends on whether for the husband is more costly to have an utility loss due to suboptimal fertility or due to higher transfers.

Separating equilibrium The husband compares $IU(\theta_j)$ with $IU(m(\theta_j))$. We study the optimal message, given the indirect utility of the husband. If $f(m(\theta_j))=m(\theta_j)$, the first order condition when maximizing $IU(m(\theta_j))$ gives:

$$m^T(\theta_j)=\frac{(\delta^2+\delta\gamma)\theta_j-\gamma(\alpha^H-\alpha^W)}{\delta^2+\gamma}$$

.

For $\alpha^H-\alpha^W>\frac{\delta^2+\delta\gamma}{\gamma}$ or $\alpha^H-\alpha^W<-1$, the optimal message does not depend on the realization of θ_j and no informative communication occurs. Otherwise, $m^T(\theta_j)\leq\theta_j$. In particular, when γ is sufficiently close to zero, $m^T(\theta_j)=\theta_j$.

To show the existence of a general separating equilibrium, we derive a generic $f(m)$ and characterize the existence of a one-to-one belief function and a feasible message function $m^*(\theta_j)$ maximizing $IU(m(\theta_j))$.

To show the existence of a generic $f(m)$, we compute the FOC of $IU(m(\theta_j))$ with respect to $m(\theta_j)$ and derive the following beliefs solution:

$$f'(m)=\frac{\delta+\gamma}{1+\gamma}+\frac{\delta+\gamma}{\gamma(1+\gamma)}\frac{(1+\gamma)\delta f(m(\theta_j))-\gamma(\alpha^H-\alpha^W)-\gamma(\delta+\gamma)m(\theta_j)}{\alpha^H-\alpha^W+(1+\gamma)f(m(\theta_j))-(\delta+\gamma)m(\theta_j)}. \tag{3}$$

The inverse of this belief function, given consistency $(f(m)=\theta_j)$, implies the following ordinary differential equation:

$$m'(\theta_j) = \frac{\gamma[\alpha^H - \alpha^W + (1+\gamma)\theta_j - (\delta+\gamma)m(\theta_j)]}{(\delta+\gamma)^2[\theta_j - m(\theta_j)]}. \tag{4}$$

where $m'(\theta_j) > 0$ for $\theta_j > m(\theta_j)$ and $m'(\theta_j) < 1$ (implying that the solution is one-to-one and feasible) for $\gamma(\alpha^H - \alpha^W) < (\delta+\gamma)^2[\theta_j - m(\theta_j)] - \gamma[(1+\gamma)\theta_j - (\delta+\gamma)m(\theta_j)]$.

For a given level of α^W, when α^H or γ are low enough and δ high enough, this condition is satisfied. In particular, the necessary condition for this to hold is that $\delta^2 + 2\delta\gamma - \gamma < 0$ and that γ is sufficiently low for $m'' > 0$. Under these conditions, $f(m) = \theta_j$ and $m^*(\theta_j) \leq \theta_j$.

For $\theta_j \in (0,1]$ the continuity and double differentiability of this message function ensures uniqueness implying that $m^*(\theta_j)$ is the only message solving the differential equation defined in 4. For $\theta_j = 0$, $m^*(\theta_j) = 0$. Equilibrium fertility is going to be $n^*(m^*(\theta_j)) = n_I^H(m^*(\theta_j))$.

Partition Equilibrium Here, we derive the conditions under which a partition equilibrium with partial information transmission occurs. That is we derive the conditions under which there exists at least one partition equilibrium of size $N = 2$.

For this to be the case, there should be at least one cost realization $\theta_j \in (0,1)$, given the knowledge of the wife, is indifferent between belonging to the highest or the lowest intervals of the cost distribution, that are $[0,\theta_j]$ and $[\theta_j,1]$. For this to be true, it must be that:

$$-\left[\frac{\gamma\left(\alpha^H - \alpha^W\right) + (\gamma+\delta)\beta^W\theta_j}{1+\gamma} - \delta\theta_j\right]^2 - \gamma\left[\frac{\alpha^H - \alpha^W + (1-\delta)\beta^W\theta_j}{1+\gamma}\right]^2 =$$
$$-\left[\frac{\gamma\left(\alpha^H - \alpha^W\right) + (\gamma+\delta)((1-\beta^W)\theta_j + \beta^W)}{1+\gamma} - \delta\theta_j\right]^2 - \gamma\left[\frac{\alpha^H - \alpha^W + (1-\delta)((1-\beta^W)\theta_j + \beta^W)}{1+\gamma}\right]^2.$$

For $\gamma\left(\alpha^H - \alpha^W\right)$ sufficiently small, we have that the LHS is bigger than the RHS when $\theta_j = 0$, and the reverse is true when $\theta_j = 1$. Since both are monotonically increasing in $\theta_j = 1$, it must be that there exists a level of θ_j for which this indifference condition holds. Furthermore, when this θ_j exists, since $\beta^W < \beta^Z$, $E^W(\theta) > \beta^W$ and fertility decreases.

When only the partition equilibria exist, the most informative equilibrium is selected through the NITS criterion (Chen, Kartik and Sobel, 2007). When the separating equilibrium exists, the Intuitive Criterion applies for selecting the most informative equilibrium (Cho and Kreps, 1987).

Equilibrium fertility and transfers For a given α^W, when α^H or γ are low enough information transmission occurs: as shown before, equilibrium fertility is going to be $n^*(m^*(\theta_j)) = n_I^H(m^*(\theta_j))$.

Transfers are based on the information set of the woman. Due to the fact that knowledge converges to the true distribution, transfers increases given the update in knowledge and the fact that the husband sets optimal fertility on a θ_j equal or lower than the realized one: $\theta_j - \frac{(\gamma+\delta)m^*(\theta_j)}{1+\gamma)} > m^*(\theta_j) - \frac{(\gamma+\delta)m^*(\theta_j)}{1+\gamma)}$ for all $m^*(\theta_j) \leq \theta_j$. Also, due to the fact that knowledge converges to the true distribution (implying that $|m(\theta - j) - \theta_j|$ decreases) and that transfers increase and that the husband prefer to transmit information, optimal husband fertility decreases.

When δ increases, fertility decreases and transfers decreases as well.

■

Proof. Implication 1 Results follow directly form the proofs of proposition 1 and proposition 2.

■

Proof. Implication 2 We define α^H as being high when $\alpha^H > \alpha^W + A^{IC}$. Given the results of proposition 1 and proposition 2, starting from the same ex ante knowledge of the woman cost, we consider changes in fertility either when the wife or the husband is treated:

- both spouses uninformed and α^H high: fertility decreases only when the husband is treated and δ is low. It moves from $n_b^{Ht} = \frac{n_b^H + \gamma n_b^W}{1+\gamma}$ to $n^*(m^*(\theta_j))$
- both spouses uninformed and α^H low: fertility decreases both when the wife and the husband are treated. For the wife, it moves to her preferred level of utility. For the husband, it is going to be either equal to $n^*(m^*(\theta_j))$.
- wife informed and α^H high: fertility moves when the husband is treated. Fertility moves to n_j^{Ht}.
- wife informed and α^H low: fertility moves only when the husband is treated. Fertility increase to n_j^{Ht}.

■

Proof. Implication 3 We define α^H as being high when $\alpha^H > \alpha^W + A^{IC}$. Given the results of proposition 1 and proposition 2, starting from the same ex ante knowledge of the woman cost, we consider changes in transfers either when the wife or the husband is treated:

- both spouses uninformed and α^H high: slight increase in transfers when the husband is treated (and γ is sufficiently low), slight increase when the wife is treated. When the husband is treated and γ is sufficiently low transfers move to $t = (\frac{\alpha^H - m(\theta_j) - \alpha^W + E_W[\theta_j])}{1+\gamma})^2$, implying a higher level of transfers since transfers are increasing in $E[\theta_j]$. When the wife is treated transfers move to $t_{IC}=(\alpha^W-1-n^H_{IC})$.

- both spouses uninformed and α^H low: when the husband is treated, transfers adapt to an increase information in the couple and transfers increase.
- wife informed and α^H high: no change when the wife is treated, slight decrease when the husband is treated. When the husband is treated, transfers move from t_{IC} to t_{min}.
- wife informed and α^H low: no change when the wife is treated, transfers increases only when the husband is treated. When the husband is treated, transfers move from zero to t_{min}.

■

Proof. Implication 4 See proof of implication 2. When communication does not occur, fertility moves less than when communication occurs. ■

Proof. Implication 5 For a given level of α^H, we consider the cost as being high when $\theta_j>\theta^Z$ When θ_j is high, providing information to a spouse will move optimal fertility downwards. When θ_j is low, providing information to a spouse will move optimal fertility upwards for $\theta_j<\theta^G$ and downwards $\theta^G<\theta_j\leq\theta^Z$ ■

B.4 Alternative functional forms

An alternative functional form for the preferences of the husband and of the wife is the following:

$$U_j^H=-\left(\alpha^H-n\right)^2-2\delta\theta_j^H n-\gamma t$$

$$U_j^W=-\left(\alpha^W-n\right)^2-2\theta_j n+t$$

With this preferences, spouses' individual optimal fertility is unchanged. The equilibrium fertility with transfers and complete information is now:

$$n_j^{Ht}=\alpha^H+\gamma\alpha^W-\delta\theta_j-\gamma\theta_j$$

while when both spouses are uninformed:

$$n_b^{Ht}=\alpha^H+\gamma\alpha^W-\delta\theta_j^G-\gamma\theta_j^G$$

As before, when information is symmetric for both spouses, transfers are always optimal.

B.4.1 Only the wife is informed

To study communication when only the wife is informed, let's define her indirect utility, given transfers and fertility, as follow:

$$V^{Wt} = -\big((1-\gamma)\alpha^W - \alpha^H + (\delta+\gamma)m(\theta_j)\big)^2 - 2\theta_j\big(\alpha^H + \gamma\alpha^W - \delta m(\theta_j) - (\theta_j)\big) +$$
$$+\big((1-\gamma)\alpha^W - \alpha^H + (\delta+\gamma)m(\theta_j)\big)^2 + 2m(\theta_j)\big(\alpha^H + \gamma\alpha^W - \delta m(\theta_j) - (\theta_j)\big) +$$
$$+m(\theta_j)^2 - 2m(\theta_j)\alpha^W$$
$$=$$
$$-2\theta_j\big(\alpha^H + \gamma\alpha^W\big) - 2(\delta+\gamma)m(\theta_j)(m(\theta_j) - \theta_j) + 2m(\theta_j)\alpha^H + m(\theta_j)^2$$

Maximizing this, we find the optimal message:

$$m(\theta_j)^{Wt} = \tfrac{\alpha^H + (\delta+\gamma)\theta_j}{1-2(\delta+\gamma)}$$

from which it follows immediately that no communication occurs if $\alpha^H > 1 - 2(\delta+\gamma)$.

B.4.2 Only the husband is informed

Let's now the incentive of the husband to communicate. The indirect utility that he maximizes when he propose a contract and communicate about θ_j is:

$$V^{Ht} = -\big(-\gamma\alpha^W + (\delta+\gamma)m(\theta_j)\big)^2 - 2\delta\theta_j\big(\alpha^H + \gamma\alpha^W - (\delta+\gamma)m(\theta_j)\big) -$$
$$-\gamma\Big[\big((1-\gamma)\alpha^W - \alpha^H + (\delta+\gamma)m(\theta_j)\big)^2 + 2\delta m(\theta_j)\big(\alpha^H + \gamma\alpha^W - \delta m(\theta_j) - \gamma m(\theta_j)\big) +$$
$$+m(\theta_j)^2 - 2m(\theta_j)\alpha^W$$

In this case, the optimal message is:

$$m(\theta_j)^{Wt} = \tfrac{(\delta+\gamma)\delta\theta_j - (1-\delta-\gamma)\gamma(\alpha^H + \gamma\alpha^W) + \gamma\alpha^W}{(1+\gamma)(\delta+\gamma)^2 + 2\gamma(1-\delta-\gamma)}$$

B.5 Both spouses uninformed without bias

We now study optimal fertility for the type of household where the both the husband and the wife do not observe the realization of θ_j when deciding about the optimal contract. They only know the distribution of the maternal health cost. The structure of the game is the same as before.

Privately Optimal Fertility Given the incomplete information on the maternal health cost, we define the optimal fertility of the wife in isolation as:

$$n_I^W = argmax \int_0^1 [-(\alpha^W - \theta_j - n)^2] f^Z(\theta) d\theta_j = \alpha^W - \theta^Z$$

and that of the husband as:

$$n_I^H = argmax \int_0^1 [-(\alpha^H - \delta\theta_j - n)^2] f^Z(\theta) d\theta_j = \alpha^H - \delta\theta^Z$$

The structure of the game is the same as before. The game is solved by backward induction.

Equilibrium transfers and number of children Again, the wife declares her fertility strategy. In order to maximize her utility, she chooses:

$$n(t) = \begin{matrix} n_I^W & if & \int_0^1 [-(\alpha^W - \theta_j - n_{It}^H)^2] f^Z(\theta) d\theta_j + t < \int_0^1 [-(\theta^Z - \theta_j)^2] f^Z(\theta) d\theta_j \\ n_{It}^H & if & \int_0^1 [-(\alpha^W - \theta_j - n_{It}^H)^2] f^Z(\theta) d\theta_j + t \geq \int_0^1 [-(\theta^Z - \theta_j)^2] f^Z(\theta) d\theta_j \end{matrix}$$

Maximising the husband utility function with transfers, we have: $n_{It}^H = \frac{n_I^H + \gamma(n_I^W)}{1+\gamma}$.

Given the mapping strategy announced by the wife, this implies a minimum level of transfers equal to $t_{MIN} = (\alpha^W - n_{It}^H)^2 - (\alpha^W - n_{It}^H) - \sigma^Z$.

The husband finds optimal to implement this transfers to the wife if his expected utility is higher with transfers than without, that is if:

$$\int_0^1 [-(\alpha^H - \delta\theta_j - n_{It}^H)^2] f^Z(\theta) d\theta_j - \gamma t_{MIN} > \int_0^1 [-(\alpha^H - \delta\theta_j - \alpha^W + \theta^Z)^2] f^Z(\theta) d\theta_j$$

This condition is always satisfied so the optimal fertility in equilibrium is equal to $n_I^* = \frac{n_I^H + \gamma(n_I^W)}{1+\gamma}$.

Supplemental Materials

Scripts from the group meetings

"Good afternoon, my name is.... And my name is ... Today, we would like to talk to you about how to protect the health of your wife."

Maternal mortality treatment specific section (MM)

"Pregnancy is a very important part of a woman's life. In Zambia, health complications are very common among women who carry and deliver a child. Over the course of a lifetime, 1 out of 59 women in Zambia may die during pregnancy or delivery. Think about 59 women that you know from your community, like the ones in this figure. That means that 1 of them may die at childbirth and just 5826 will keep living. In Zambia, one woman dies every 4 hours due to complications during pregnancy or childbirth. A woman can experience health complications related to childbirth that would severely affect her health.

Mortality and complications are not a woman's fault. You may have heard that they happen to unfaithful women or to women whose husbands have unfaithful. The fact is that infidelity CAN lead to death–through sexually transmitted infections such as HIV. So being unfaithful can have bad health consequences. BUT the things that happen to women during pregnancy and childbirth are the result of medical and health issues, such as lack of appropriate health care before, during, and after delivery. This is why it is very important to attend a health facility for antenatal care, to deliver at a health facility and to seek the appropriate postnatal care.

Today you will hear about the way that pregnancy and childbirth affects a woman's body, and why this can lead to negative health effects and even death. Women who have many children already or who became pregnant right after having had a baby are exposed to an especially high risk because their bodies are more vulnerable.

Women in some other parts of Africa are less exposed to these complications. As you can see in this picture, for example, while 1 out of every 59 woman dies at childbirth in Zambia, in Botswana it is one in 230 and in South Africa it is 1 in 300. This means that women in Zambia are almost four times more at risk than women in Botswana and they are 6 times more at risk than women in South Africa. This is due to better health care and lower number of children per woman in South Africa. Women in these 3 countries are probably similar in their behavior in marriage, and yet they are exposed to very different risks! Now I will describe to you some causes of maternal mortality and health complications during pregnancy and childbirth.

You may have heard or seen that women get sick more often while they're pregnant than other times. There is a medical reason for this. Your body has a defense system against illness called the immune system. The immune system acts like an army, fighting off infection. To give you an example, HIV suppresses the immune system, which is why people with HIV become ill easily, or get other diseases such as TB. A baby is part you and part your wife, but it is its own person. This means that in order for a woman to carry the baby safely, her immune system has to stand down; The army that protects your wife from infection has to take a break, so that it doesn't hurt the baby by mistake. When your wife is pregnant, instead of a whole army, she only has one or two soldiers to protect her from infection. That's why women are especially vulnerable to diseases like malaria during pregnancy, and also many kinds of bacterial infections, such as respiratory infections. If not treated, these infections can kill the mother and harm the baby. 10,000 women die in Zambia every year due to malaria in pregnancy. Women who have chronic diseases and other long term conditions, such as anemia, HIV or hepatitis, may also be more likely to experience complications. This is sometimes because their immune system is already affected by the disease and cannot effectively support the woman while she's pregnant.

Every pregnancy is a risk. When your wife is pregnant, you can protect her health by practicing safe childbirth. That means that your wife should go for ante-natal care, including regular check-ups, and she should give birth in a health center.

Complications at childbirth can affect any woman. The more times your wife is pregnant, the more exposed she is to these risks. Additionally, pregnancy is particularly risky to certain groups of women, as I will explain to you now.

Young women under 18 years old who become pregnant face high health risks because their bodies may not be mature enough to handle the physical stress of pregnancy and childbirth. This woman in the picture is just a girl herself, and she is carrying a child. When it comes time to deliver, her body might not be big enough for the baby to fit well. This can cause obstructed labor, where the baby cannot fit through the mother's birth canal.

Sometimes, when this happens, the woman can get a tear in her birth canal called a fistula. Fistulas are tears between a woman's birth canal and the area where her urine or feces is supposed to go. You may have seen women in your community become outcasts because they cannot hold urine or feces due to fistula.

A trained health provider can help with these complications. Giving birth in a health centre is one way to avoid the worst consequences of obstructed labor and fistula. The best way for a young woman to prevent these complications is to delay her first pregnancy and wait for the right time before becoming pregnant.

As women grow older, their risk of complications increases.

Women over the age of 35 have a high risk of developing health problems and of dying because of childbirth.

The risk of death is 5 times larger for a woman who is over 35 than for a woman who is 20 years old.

Women over age 35 can have children, but they should take some more precautions. Let me give you an example: every time you cross the road here in Lusaka, there is a risk that a car or a bike can hurt you. But when there is more traffic, the risk increases. So, when there is a lot of traffic, you pay more attention when you cross, you wait more to cross the street, or you decide to stay on the same side of the road. Similarly, women over age 35 should consider their higher risk when deciding to have another child, and take the appropriate precautions.

Women who had many children are more exposed to complications if they have another child, because their body is tired after the effort of pregnancy, delivery and breastfeeding for each child. Look at the woman in this picture. She already has six children and now she is pregnant again. She is at high risk of complications. If something happens to her, who is going to take care of all her children? The risk of maternal death increases a lot for each birth after the fourth. With each birth, the mother's body becomes more tired and the uterus becomes weaker.

Women who just had a child are more exposed to complications if they have another one right away. This is because their body needs some time to recover from the previous pregnancy and delivery. Remember we talked about the army that protects your body from infection? That army has no time to rebuild if a woman has another baby right away. Look at the woman in this picture. She has a little child who is probably two, and another one who may be 9 or 8 months old and she is already pregnant! Her body must be very tired, which exposes her to a large risk of complications and death.

One common cause of complications and mortality is hemorrhage. This means that a woman loses a large amount of blood during pregnancy or after delivery. Such bleeding can cause the death of the mother, and is the number 1 killer of mothers in Zambia.

Let me give you one example of why a hemorrhage happens. This area where the baby lives is called the uterus, and the connection between the mother and the baby is the umbilical cord. During pregnancy, the baby is nourished through the mother's blood supply. A placenta grows in the uterus to nourish the baby and provide it with all the blood it needs. However, because there is so much blood flowing from the mother to the baby, you can see why the mother is at risk. As the baby comes out, the umbilical cord and the placenta comes with it. Some bleeding is natural when this happens. But in some cases, the uterus does not contract and blood begins to fill the space. In this example, the uterus has not returned to its original size and fails to compress blood flow, which can lead to serious bleeding. In these pictures, you can see the difference between a normal uterus after childbirth and a uterus that has not contracted., the uterus tears. This happens especially when women have had many babies before, or have recently had a baby. The uterus becomes scarred and weak, and is less likely to contract, or become smaller and stop additional bleeding. As a result, major bleeding can happen, and the mother can die.

A woman needs plenty of time to rest and recover between pregnancies to prevent hemorrhage in the first place. Once a women is pregnant, a healthcare provider can help deal with complications, including bleeding.

Infections are caused by germs that affect the human body. All of us are exposed to germs in everyday life, but after giving birth, women are weaker and thus have less defenses against these germs. After childbirth, women are especially subject to infections where the baby comes out, since there is bleeding in this area, and the woman may have been exposed to unclean conditions during delivery. Infections can give high fever and pain, and can cause the death of the mother. Giving birth in a health facility can help prevent infections.

Women who may be weak, because they have a disease or they have recently had a child, are more exposed to the risk of infections.

Spacing children appropriately, especially if the woman is at higher risk, is important to protect the health of mother and child. Contraceptives(family planning services), like those pictured here, allow you and your wife to decide how many children to have, when you want to have them and how much spacing you desire.

Using contraceptives to plan for the health and well-being of your family is called family planning. There are at least three reasons to use family planning.

If someone does not want to have a child at all at one point in time, for example young people who aren't ready for children, then family planning can help this person to not have children at that point.

Second, if a couple wants to limit the size of their family, then family planning can help control how many children they have. For example, a couple with five children may feel that they do not want a sixth child and can use family planning.

Third, a couple that wants to space children or decide when it is the best time to have a child would also use family planning, such as the couple in this picture with a new baby."

Common section (FP)

"Let us now talk about what family planning options are available at Chipata/ Chaisa Clinic.

There are several family planning methods. We will discuss the methods that are available for you at the clinic. Because there are so many methods, a couple can choose the method they are more comfortable with and that better fits their needs. A nurse can help you make the decision about what is the best method for you and your wife.

Let me explain to you a little bit about how family planning works. Pregnancy occurs when a sperm from a man and an egg from a woman join.

Male and female condoms create a barrier that prevents a man's sperm from contacting his partner, which means the sperm cannot get to the egg. This barrier prevents the woman from becoming pregnant and also prevents the transmission of STIs when used each time you have sex. In order to work properly, a new condom must be used for each intercourse. On the chart here, you can see male and female condoms.

Medicinal methods such as the pill prevent a woman from producing an egg (which is called ovulating). As a result, she will not get pregnant as long as she continues to use these methods, when they are used properly. They do not interfere with the couple's sexual intercourse. On the chart here you can see several medicinal methods, such as pills, Jadelle, the loop, and MyChoic.

The longest term method is sterilization which permanently stops people from having children and is an option if you have completed your family. Women can be sterilized, which prevents eggs from coming to the uterus permanently, or men can be sterilized, which prevents sperm from fertilizing an egg.

There are also certain natural methods of birth control such as the Lactational Amenorrhea method , commonly known as LAM, when a woman breastfeeds her baby exclusively after giving birth .This means that her baby does not drink anything besides breast milk. The act of breastfeeding naturally changes a woman's hormones so that she does not become pregnant. Like any other contraceptive method LAM is only effective when used correctly and very few women who use LAM correctly get pregnant (1 out of 100). However, a large proportion of women who use this method in the first 6 months get pregnant if they don't practice it correctly (2 out of 100). This method works for six months after delivery only if a woman: - Does not substitute other foods for breast milk meal. - Feeds her baby at-least every four hours during the day and every six hours at night. - Has not had her period since delivery. Keep in mind that breastfeeding does not protect you from sexually transmitted diseases. And also keep in mind that this method can only be relied on for six months after delivery after which you should start using birth control. Because this method requires much commitment the clinics also offer alternative methods such as installing s loop right after delivery. Other methods can be used but only six weeks after delivery and oral contraceptives (except Microloot) can only be used six months after delivery.

Remember, condoms are the only method that prevents the spread of HIV and other STIs. To effectively prevent these diseases and unwanted pregnancy, you may want to use condoms together with another family planning method.

The reason some people like to use another method plus condoms is because condoms have to be used every time correctly in order to work. These other methods can be taken before you have sex so that you know you are protected.

Now I want to talk to you about a few things that you may have heard regarding family planning. First, you may have heard that family planning can cause health problems in women.

Some methods of family planning do have mild side effects, but overall they are safe and effective. Side effects can include dizziness, headache, breast tenderness, nausea, and heavier-than-usual or lighter-than-usual periods. In the experience of the nurses at the clinic, most of these side effects go away over time. Only for few women will the side effects continue and be bad enough for her to need to switch methods. By talking to a nurse about what method is right for you, you'll find one that won't make your wife feel badly. If your wife does experience some side effects, a nurse can advise her on how to manage them or on whether she should switch methods.

Some people say that if a couple uses family planning, the wife will never be able to have children again.

Except for sterilization, all methods of family planning are reversible. Many people use them and then go back to having children, like the woman in this picture, who has decided it's time for a baby. If you decide to stop family planning, your wife's fertility will return shortly after, at which point she will be able to get pregnant again.

Medicinal family planning works by stopping the egg from coming to the uterus. However, once your wife stops using family planning, the egg will travel to the uterus, and she can get pregnant as usual. Let me give you an example: You know that when your wife is pregnant, she cannot get pregnant again at the same time. This is because her body knows not to send another egg while one baby is already growing. And yet, after she gives birth, she can get pregnant once again. This is the same way family planning works.

You may have heard that women who use family planning are free to sleep with other men and will become promiscuous.

This is not true - there is no evidence to support the idea that women who seek family planning change morally or misbehave. Men who do not discuss family planning with their wives may have these suspicions.

A woman's faithfulness does not change because she is using family planning.

In fact, a couple can use family planning in order to have the family size that a woman can take care of well, so that she will not become overburdened. If a family is of a manageable size and does not occupy all her time and energy, she may even have more time for her husband. Look at the woman in this picture, who is happily spending time with her husband.

Family planning is about helping you and your wife better manage your family together.

It is your responsibility as a man to take care of your family.

If you like, you can talk to your wife about what we discussed today, about family planning and about how you can help her and protect her by using contraceptives.

You and your wife can go together to talk to a nurse about family planning. A nurse will be able to answer questions about all your doubts and can help you find the best way to protect the health of your wife. "

Questionnaire Wording of the Main Variables

Table D1: Main Outcomes and Corresponding Questions in the Survey

Dependent Variables	Correponding Questions in the Survey
Living children	How many living biological children do you have in total? (from all marriages)

Ideal number of children	Currently, if it were entirely up to you, what is the ideal total number of children you would like to have? (from all marriages)
Likelihood of having another child (Likelihood Have More Kids)	Pick the point on the ladder that reflects how likely you think it is that... you will have another child?
Want another child (dummy)	If it were completely up to you, would you like to have another child within the next year, after one year or not at all? Answer "within one year/after one year"
Diff in ideal and current number of children	Difference in Ideal number of children and Living children
Fraction contrac. methods believed to be bad for health	To the best of your knowledge, to what extent do you think these contraceptive methods are bad for a woman's health? a) Pill b) IUD c) Implants d) Injectables e) Female condom f) Male condom g) Female sterilization h) Male sterilization The fraction of answering "Very bad/Somewhat bad" for any of the method.
Fraction contrac. methods believed to lower fecundity	To what extent do you think these contraceptives decrease the ability of a woman to become pregnant once she wants to stop using them? a) Pill b) IUD c) Implants d) Injectables e) Female condom f) Male condom g) Female sterilization h) Male sterilization The fraction of answering "Somewhat/Very Much" for any of the method.
Agrees that contrac. help women be unfaithful	(Do you agree or disagree with the statement...) It's easier for a woman who uses contraceptives to be unfaithful to her husband.
Ideal space between children (m)	How much space is ideal to have between children? (month)
Months woman should give body to recover post-birthing (Months to recover)	How long do you feel it takes to recover before it is safe to become pregnant again? (if any time at all is needed)

Older women at higher risk of complications (Correct on age)	Imagine two women in your community, with the same physical and mental health that you have. They have the same number of children. Their last delivery was more than two years ago. Both are pregnant. The first is 40 years old. The second is 20. Everything else about them is the same. Which one do you think faces a bigger risk of dying from childbirth? Answer "The 40 year old".
Women with more kids at higher risk of complications (Correct on parity)	Imagine two woman in your community, with the same physical and mental health, the same age that you have . Their last delivery was more than two years ago. One had 6 children already. The other pregnant woman has had 2 children. They are currently pregnant. Everything else about them is the same. Which one do you think faces a bigger risk of complications in her pregnancy? Answer "The woman with 6 children".
Likelihood of complications if woman is younger than 40 (Younger than 40 scale)	Imagine a woman in your community, with the same physical and mental health that you have. She has 2 children. Her last delivery was more than two years ago. She is YOUNGER than 40. She is pregnant. Pick the point on the ladder that reflects how likely you think it is that... she would experience any complication?
Likelihood of complications if woman is older than 40 (Older than 40 scale)	Imagine a woman in your community, with the same physical and mental health that you have. She has 4 children. Her last delivery was more than two years ago. She is OLDER than 40. She is pregnant. Pick the point on the ladder that reflects how likely you think it is that... she would experience any complication?

Likelihood of complications if woman has less than 4 kids (Fewer than 4 kids scale)	Imagine a woman in your community, with the same physical and mental health, the same age that you have. Her last delivery was more than two years ago. She has LESS THAN 4 CHILDREN. She is pregnant. Pick the point on the ladder that reflects how likely you think it is that… she would experience any complication?
Likelihood of complications if woman has more than 4 kids (More than 4 kids scale)	Imagine a woman in your community, with the same physical and mental health, the same age that you have. Her last delivery was more than two years ago. She has MORE THAN 4 CHILDREN. She is pregnant. Pick the point on the ladder that reflects how likely you think it is that… she would experience any complication?
Likelihood of complications if woman gets pregnant 24 months after delivery (2-yrs. spacing scale)	Imagine a woman in your community, with the same physical and mental health, the same age and the same number of children that your wife has. She just delivered and got pregnant AFTER 24 MONTHS. Pick the point on the ladder that reflects how likely you think it is that… she would experience any complication?
Likelihood of complications if woman gets immediately pregnant (No spacing scale)	Imagine a woman in your community, with the same physical and mental health, the same age and the same number of children that you have. She just delivered and IMMEDIATELY got pregnant. Pick the point on the ladder that reflects how likely you think it is that… she would experience any complication?
Reports that infidelity increases risk of complications	What factors make women more at risk for complications during pregnancy and childbirth? Answer "Infidelity".

Relative infidelity weight (Infidelity weight)	Here on these cards are 3 possible factors from the previous question. Here are 30 buttons. Please divide these buttons between the cards according to how important each factor is in making women more at risk for complications during pregnancy and childbirth. a) Infidelity b) Overall health c) Not going for checkups or not delivering with a skilled birth assistant. The percentage of "Indidelity".
Past maternal and birth complications or difficulties	Have you/your wife ever experienced any complications or difficulty during pregnancy or childbirth?
Past maternal complications or difficulties	Have experienced maternal complications or difficulties.
Immediate family member died from complications	Have any of the following people experienced a complication (C), or died (D) during pregnancy or childbirth? a) Immediate family (mother, sister) b) Close relative (cousin, aunt, sister-in-law) c) Wife of close friend or close neighbor d) Distant friend or acquaintence Answer "Immediate family (mother, sister)".
Close relative died from complications	Have any of the following people experienced a complication (C), or died (D) during pregnancy or childbirth? a) Immediate family (mother, sister) b) Close relative (cousin, aunt, sister-in-law) c) Wife of close friend or close neighbor d) Distant friend or acquaintence Answer "Close relative (cousin, aunt, sister-in-law)".
Close friend died from complications	Have any of the following people experienced a complication (C), or died (D) during pregnancy or childbirth? a) Immediate family (mother, sister) b) Close relative (cousin, aunt, sister-in-law) c) Wife of close friend or close neighbor d) Distant friend or acquaintence Answer "Wife of close friend or close neighbor".

Distant friend died from complications	Have any of the following people experienced a complication (C), or died (D) during pregnancy or childbirth? a) Immediate family (mother, sister) b) Close relative (cousin, aunt, sister-in-law) c) Wife of close friend or close neighbor d) Distant friend or acquaintence Answer "Distant friend or acquaintence".
Communicated info about future possibility of complications	Have you/your wife ever conveyed any information about the possibility of complication in giving birth to your husband/you ?
Wife: Currently Pregnant	Are you currently pregnant?
Wife: Became Pregnant Post-Int.	Currently pregnant or gave birth at least 8 months after intervention (dummy)
Wife: Birth Spacing (mo)	Spacing between intervention and getting pregnant
Husband: WTP for voucher	Husband's Willingness To Pay for voucher
Wife: Using any contrac.	Have you ever used any of the following contraceptives? a) Pill b) IUD c) Implant d) Injectables e) Male condoms f) Female condoms g) Male sterilization h) Female sterilization i) LAM j) Rhythm/natural k) Withdrawal l) Others Answer "using it now" for any of the contraceptives.
Wife: Using modern contrac.	Have you ever used any of the following contraceptives? a) Pill b) IUD c) Implant d) Injectables e) Male condoms f) Female condoms g) Male sterilization h) Female sterilization i) LAM j) Rhythm/natural k) Withdrawal l) Others Answer "using it now" for any of the modern contraceptives (Pill, IUD, Implant, Injectables, Male condoms, Female condoms, Male sterilization and Female sterilization).
Wife: Consistently using any contrac. for contrac. users	When did you last use this method (ask only for the method currently being used)? Answer "using pills within last 6 days/currently wearing IUD/currently wearing Implants/taking Injections within 13 week/using Female condom within 30 days/using Male condom within 30 days".

Wife: Using trad. contrac.	Have you ever used any of the following contraceptives? a) Pill b) IUD c) Implant d) Injectables e) Male condoms f) Female condoms g) Male sterilization h) Female sterilization i) LAM j) Rhythm/natural k) Withdrawal l) Others Answer "using it now" for any of the traditional contraceptives (LAM, Rhythm/natural and Withdrawal).
Wife: Uses contrac. while partner unaware	Partner Ever Unaware you were using this method? Answer "yes" for pill/IUD/ Injectables/Female sterilization.
Wants More Kids	If it were completely up to you would you want to have another child?
Wants Ano. Kid in $<$ 2yrs	Do you want to have a child in less than 2 years or more than 2 years?
Believes Spouse Wants Ano. Kid	To the best of your knowledge, if it were completely up to her/him, would your partner want to have another child?
Believes Spouse Wants More Than Self	To the best of your knowledge, currently what is the ideal total number of children your husband would like to have? Currently, if it were entirely up to you, what is the ideal total number of children you would like to have? (from all marriages)
Believes Spouse Wants Less Than Self	To the best of your knowledge, currently what is the ideal total number of children your husband would like to have? Currently, if it were entirely up to you, what is the ideal total number of children you would like to have? (from all marriages)
Sex frequency past week	In the past seven days, how many times have you had sex with your husband?
Any sex	*Sex frequency past week* is greater than 0.
Times using contrac. past week	On how many of those times did you use birth control with your husband?
Proportion using contrac. past week	*Times using contrac. past week*/ *Sex frequency past week*

Unsafe Sex	A dummy equals 1 if there existed unprotected sex during past week
Comm. MM risk to partner	Have you ever conveyed any information about the possibility of complication in giving birth to your husband/wife ?
Agreement on contrac. Use	Do you and your husband/wife agree on whether to use contraceptives?
Tried Convince Partner Use contrac.	Did you ever attempt to convince your husband/wife to use contraceptives in your marriage?
Partner Changed Resp's Mind contrac. using	Did your husband/wife manage to change your mind and convince you to use contraceptives in your marriage?
Partner Tried to Convince Resp Use contrac.	Did your husband/wife ever attempt to convince you to use contraceptives in your marriage?
Any of the 3 Risk Factors	What factors make women more at risk for complications during pregnancy and childbirth? Answer any of Adv. Age/High Parity/Low Spacing as risk factor.
Wife comp. likelihood	Pick the point on the ladder that reflects how likely you think it is that… your wife would experience any complication, if she got pregnant right now?
Gifts to wife past month (dummy)	Have you given your wife any gifts in the past month?
Value of gifts last month	What would you say is the monetary value of the gifts you have given her in the past month?
Hit wife last month (freq.)	How many times have you been physically violent toward your wife in the last month?
Contrac. causes infidelity	(Do you agree or disagree with the statement...) It's easier for a woman who uses contraceptives to be unfaithful to her husband. Answer "Agree" or "Strongly agree".
Contrac.helps women decide no. of children by herself	(Do you agree or disagree with the statement...) A woman who uses contraceptives can decide how many children she can have without listening to her husband. Answer "Agree" or "Strongly agree".

Pills are bad for health	(Do you agree or disagree with the statement...) Being on the pill is bad for women's health. Answer "Agree" or "Strongly agree".
Happy with marriage	How happy are you with your marriage?
Satisfied with sex life	How happy are you with your sexual life in your marriage?
Satisfied with life	All things considered, how satisfied are you with your life as a whole these days?
Family Planing Causes Infidelity	What concerns do you have about family planning, if any? Answer "Causes infidelity".
Contrac. use leads to Infidelity	(Do you agree or disagree with the statement...) It's easier for a woman who uses contraceptives to be unfaithful to her husband.
Should confess Lover's name to avoid comp	(Do you agree or disagree with the statement...) In my community, women who have been unfaithful to their husband confess their lovers' names before delivering to avoid complications
Should not look at child/blood to avoid comp	(Do you agree or disagree with the statement...) In my community, women who have been unfaithful to their husband do not look at her child or at their blood when delivering
Infidelity increases risk of complications	What factors make women more at risk for complications during pregnancy and childbirth? Answer "Infidelity".
Agrees with superstition	(Do you agree or disagree with the statement...) Women who are unfaithful to their husbands are more likely to die at childbirth.
Infidelity index	Constructed from the answer of folowing questions: a) What concerns do you have about family planning, if any? Answer "Causes infidelity". b) (Do you agree or disagree with the statement...) It's easier for a woman who uses contraceptives to be unfaithful to her husband.

	c) (Do you agree or disagree with the statement...) In my community, women who have been unfaithful to their husband confess their lovers' names before delivering to avoid complications d) (Do you agree or disagree with the statement...) In my community, women who have been unfaithful to their husband do not look at her child or at their blood when delivering e) (Do you agree or disagree with the statement...) Women who are unfaithful to their husbands are more likely to die at childbirth. f) What factors make women more at risk for complica- tions during pregnancy and childbirth? Answer "Infi- delity".