B For Online Publication – Appendices

B.1 Theoretical Appendices

B.1.1 Proof of proposition one

The couple will choose $s = 1$ if and only if there exists some readily-available technology on the frontier (P, H) such that $u_i(P, H) \geq u_i^0 \quad \forall i = m, f$. Define

$$I^0 = \left\{(P, H) \in R^2 | u_i(P, H) \geq u_i^0, i = m, f\right\} \tag{B.1}$$

as the set of all points (P, H) that satisfies both partner's participation constraints. [32]

To see why the optimal choice of health is increasing in α, assume that the intersection $\{US, FC, MC\} \cap I^0$ is non-empty, and thus that sex with some readily-available technology provides greater utility to both members of the couple than no sex. Consider then the unconstrained household maximisation problem

$$\max_H \{\alpha u_f(P(H), H) + (1 - \alpha) u_m(P(H), H)\}. \tag{B.2}$$

Since each $u_i(P(H), H)$ is quasi-concave, the objective function is also quasi-concave and has a unique solution. Denote this solution $\widetilde{H}(\alpha)$. It follows straightforwardly from the single crossing property in Assumption 1 that $\widetilde{H}'(\alpha) > 0$.

For convenience of notation, define

$$U_j(H) = u_j(P(H), H) \tag{B.3}$$

for partner $j = m, f$, where $P(H)$ describes the technological frontier. Equation B.2 becomes

$$\max_H \{\alpha U_f(H) + (1 - \alpha) U_m(H)\}. \tag{B.4}$$

[32]Specifically, $I^0 = I_m^0 \cap I_f^0$, where $I_i^0 = \left\{(P, H) \in R^2 | u_i(P, H) \geq u_i^0\right\}$ is the upper contour set of the indifference curve corresponding to the reservation utility u_i^0.

The first-order condition is

$$\alpha U_f'(H) + (1-\alpha) U_m'(H) = 0. \tag{B.5}$$

Note this implies that at the optimal choice $\widetilde{H}$, U_f' and U_m' must be of opposite signs. It follows from the single-crossing property in Equation 1 that at the optimum, $U_f'(H) > 0$ and $U_m'(H) < 0$.

The second-order condition is

$$\alpha U_f''(H) + (1-\alpha) U_m''(H) < 0. \tag{B.6}$$

Taking the first-order condition in Equation B.5 as an implicit definition of $\widetilde{H}(\alpha)$, and differentiating with respect to α, we obtain

$$\left[\alpha U_f''(H(\alpha)) + (1-\alpha) U_m''(H(\alpha))\right] \widetilde{H}'(\alpha) + U_f'(H) - U_m'(H) = 0, \tag{B.7}$$

which yields

$$\widetilde{H}'(\alpha) = -\frac{U_f'(H) - U_m'(H)}{\alpha U_f''(H(\alpha)) + (1-\alpha) U_m''(H(\alpha))}. \tag{B.8}$$

To determine the sign of the numerator, note that from the first-order condition we have that

$$-U_m'(H) = \frac{\alpha}{1-\alpha} U_f'(H), \tag{B.9}$$

and thus that

$$sgn\left[\widetilde{H}'(\alpha)\right] = sgn\left[U_f'(H) - U_m'(H)\right] = sgn\left[U_f'(H)\left(1 + \frac{\alpha}{(1-\alpha)}\right)\right] = sgn\left[U_f'(H)\right]. \tag{B.10}$$

As reasoned above, at the optimum $U_f'(H) > 0$ because of the single-crossing property. Thus $\widetilde{H}'(\alpha) > 0$.

However, it is possible that $\widetilde{H}(\alpha)$ does not lie on the intersection of I^0 and the technology frontier. By the single crossing assumption, the left-most endpoint H_L of this intersection is defined by $u_f(P(H_L), H_L) = u_f^0$, while the right-most endpoint H_U

is defined by $u_f(P(H_U), H_U) = u_m^0$. This is illustrated in Figure 1. It could therefore be that $u_f\left(P\left(\widetilde{H}(\alpha)\right), \widetilde{H}(\alpha)\right) < u_f^0$ or that $u_m\left(P\left(\widetilde{H}(\alpha)\right), \widetilde{H}(\alpha)\right) < u_m^0$ (but not both). Consider the case in which her participation constraint binds, such that $u_f\left(P\left(\widetilde{H}(\alpha)\right), \widetilde{H}(\alpha)\right) < u_f^0$. The couple then instead chooses the closest incentive-compatible choice, which solves the incentive-constrained household utility maximisation problem

$$\max_H \left\{u_m(P(H), H) \,|\mu_f \left[u_f(P(H), H) - u_f^0\right]\right\}. \tag{B.11}$$

They hence choose H_L, which is independent of α. Vice versa, if his participation constraint binds they choose H_U. If neither partner's participation constraint binds, they choose $\widetilde{H}(\alpha)$ as before.

Given that $\widetilde{H}(\alpha)$ is increasing in α, this implies that there are threshold values for α defined by $\widetilde{H}(\alpha_j) = H_j$ for $j = L, U$ such that

$$H^*(\alpha) = \begin{cases} H_L & \text{if } \alpha < \alpha_L \\ \widetilde{H}(\alpha) & \text{if } \alpha \in [\alpha_L, \alpha_U] \\ H_U & \text{if } \alpha > \alpha_U. \end{cases} \tag{B.12}$$

It follows that $H^*(\alpha)$ is weakly increasing in α: $H^*(\alpha)$ is constant below α_L and above α_H, and is strictly increasing inbetween. This is illustrated in Figure B.1.

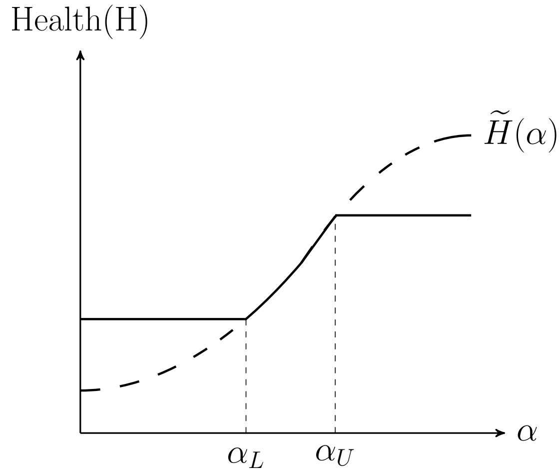
When only the binary set $\{US, MC\}$ is available, it follows directly from the weakly increasing nature of $H^*(\alpha)$ that there will be cut-off values of α such that

$$H^*(\alpha) = \begin{cases} H_L & \text{if } \alpha < \alpha_L \\ H_{US} & \text{if } \alpha \in [\alpha_L, \alpha'] \\ H_{MC} & \text{if } \alpha \in [\alpha', \alpha_U] \\ H_U & \text{if } \alpha > \alpha_U. \end{cases} \tag{B.13}$$

The introduction of female condoms expands the available technologies to the ternary set $\{US, FC, MC\}$.[33] Given that $H_{MC} > H_{FC} > H_{US}$, it follows directly that there

[33]Inserting female condoms prior to intercourse may also allow women with low bargaining

Figure B.1: Interior optimum health choices by female bargaining power



will threshold values of α such that

$$H^*(\alpha) = \begin{cases} H_L & \text{if } \alpha < \alpha_L \\ H_{US} & \text{if } \alpha \in [\alpha_L, \alpha''] \\ H_{FC} & \text{if } \alpha \in [\alpha'', \alpha'''] \\ H_{MC} & \text{if } \alpha \in [\alpha''', \alpha_U] \\ H_U & \text{if } \alpha > \alpha_U. \end{cases} \tag{B.14}$$

QED.

B.1.2 Proof of proposition two

Prior to the introduction of female condoms, the couple will only choose $s = 1$ if the set $\{US, MC\} \cap I^0$ is non-empty. Meanwhile, following the introduction of female condoms, the couple will choose $s = 1$ if the set $\{US, FC, MC\} \cap I^0$ is non-empty. Since FC is an intermediate option between US and MC, and since I^0 is a quasi-convex set, the latter condition is more likely to be satisfied. Put differently, there is a weakly positive probability that there exist couples for whom US and MC lie outside of I^0, but for

power to change the default from unprotected sex to female condom use as partners enter into bargaining over condom use.

whom $FC \in I^0$.

QED.

B.1.3 Model with transfers

We can generalize the model to include transfers in the following way. Let q_i be an action that spouse i can take, for example housework, with marginal cost to spouse i of unity and marginal benefit to the other spouse of $\phi(q_i)$. This nests the no-transfer case if $\phi(q) = 0$. Let $\phi(0) = 0$, and assume that $\phi'(q) \in [0, 1]$ and $\phi''(q) < 0$, implying that transfers involve some friction. We normalise such that at no sex, $s = 0$, both transfers are equal to zero.

The individual utility functions with sex and transfers become

$$v_i(P, H, q_i, q_{-i}) = u_i(P, H) - q_i + \phi(q_{-i}). \tag{B.15}$$

All other aspects of the model are kept intact.

Extensive Margin: The couple will choose $s = 1$ if and only if there exists some $(P, H, q_m, q_f) \in \{US, FC, MC\} \times \times R^2_+$ such that $v_i(P, H, q_i, q_{-i}) \geq u_i^0 \;\; \forall i = m, f$. It follows that the possibility of transfers increases the likelihood that $s = 1$ compared to the no-transfer case, insofar as there are cases where $s = 1$ occurs with transfers but would not if transfers were not possible. Note that it is still the case that the choice of $s = 0$ or $s = 1$ does not depend on α.

Intensive Margin: Suppose that the above condition is satisfied and thus that $s = 1$. The unconstrained household utility maximisation problem generalises to

$$\max_{H, q_m, q_f} \{(1-\alpha)[u_m(P(H), H) - q_m + \phi(q_f)] + \alpha[u_f(P(H), H) - q_f + \phi(q_m)]\}. \tag{B.16}$$

Due to the separable form, the first-order condition with respect to H is the same for the model without transfers, namely

$$\alpha u'_{fH}\left(P(H),H\right)+\left(1-\alpha\right)u'_{mH}\left(P(H),H\right)=0. \tag{B.17}$$

Thus the unconstrained function $\widetilde{H}\left(\alpha\right)$ is preserved. In addition we now have the complementary slackness conditions

$$\left(1-\alpha\right)\geq\alpha\phi'\left(q_m\right), \tag{B.18}$$

and

$$\left(1-\alpha\right)\phi'\left(q_f\right)\leq\alpha, \tag{B.19}$$

implying a solution $\widetilde{q}_j\left(\alpha\right)$ for $j=m,f$. Note that $\phi'\left(q\right)\leq1)$ implies that only one of the complementary slackness conditions can hold with equality — i.e. q_f and q_m cannot be positive at the same time — and thus transfers will only occur in one direction. Intuitively, if α is low then $q_f>0$, and vice versa if α is high. Taken together, this gives rise to implied utilities

$$\widetilde{V}_i\left(\alpha\right)=u_i\left(P(\widetilde{H}\left(\alpha\right)),\widetilde{H}\left(\alpha\right)\right)-\widetilde{q}_i\left(\alpha\right)+\phi\left(\widetilde{q}_{-i}\left(\alpha\right)\right)i=m,f \tag{B.20}$$

with $\widetilde{V}'_f\left(\alpha\right)>0$ and $\widetilde{V}'_m\left(\alpha\right)<0$.

However, as before, if α is low enough such that $\widetilde{V}_f\left(\alpha\right)<u^0_f$ then the female's participation constraint binds. The couple instead choose an allocation that just satisfies her participation constraint, solving

$$\max_{H,q_m,q_f}\left\{U_m\left(P(H),H\right)-q_m+\phi\left(q_f\right)|U_f\left(P(H),H\right)-q_f+\phi\left(q_m\right)\geq u^0_f\right\}, \tag{B.21}$$

with the following Lagrangean

$$L=U_m\left(P(H),H\right)-q_m+\phi\left(q_f\right)+\mu_f\left\{U_f\left(P(H),H\right)-q_f+\phi\left(q_m\right)-u^0_f\right\}. \tag{B.22}$$

Since the female's participation constraint failed at the unconstrained solution, it follows that the constrained solution involves a larger implicit relative weight to the woman: $\mu_f^* \geq \alpha/(1-\alpha)$. The reverse logic applies if his participation constraint fails.

Taken together, this implies that $H^*(\alpha)$ is weakly increasing in α as in the no-transfer case, but that the range of values for which it is strictly increasing (i.e. in which an interior solution $\widetilde{H}$ is chosen) is smaller than in the no-transfer case. In terms of Figure B.1, as transfers become less costly, the horizontal segments of the line move closer to one another vertically, and thus the range $\alpha_H - \alpha_L$ becomes smaller.

B.1.4 The limiting case of frictionless transfers

Consider the limiting case where transfers are frictionless, such that $\phi'(\cdot)$ is constant and equal to unity. In this case we can simply refer to q as the net transfer from her to him, which is negative if on net he transfers to her. Hence the household's unconstrained optimisation problem collapses to

$$\max_{H,q}\left\{(1-\alpha)\left[u_m\left(P(H),H\right)+q\right]+\alpha\left[u_f\left(P(H),H\right)-q\right]\right\}. \tag{B.23}$$

It is straightforward to see that this problem has no solution, except in the knife-edge case where $\alpha = 1/2$. Taking the first-order condition with respect to q, we obtain

$$1-\alpha-\alpha=0. \tag{B.24}$$

Since generically $\alpha \neq 1/2$, the solution will involve infinite transfers in one of the two possible directions. However, this then trivially leads to the failure of the donor's participation constraint. Suppose that $\alpha < 1/2$ whereby she is the donor. In that case the couple instead solves

$$\max_{H,q}\left\{u_m\left(P(H),H\right)+q | u_f\left(P(H),H\right)-q \geq u_f^0\right\}, \tag{B.25}$$

with Lagrangean

$$L = u_m\left(P(H), H\right) + q + \mu_f^*\left[u_f\left(P(H), H\right) - q - u_f^0\right]. \tag{B.26}$$

Note that the first-order condition with respect to q is $1 - \mu_f^* = 0$, implying $\mu_f^* = 1$. The first-order condition with respect to H therefore implies $u'_{fH}\left(P(H), H\right) = u'_{mH}\left(P(H), H\right)$. By a corresponding analysis of the case where $\alpha < 1/2$, we obtain that, with frictionless transfers, $u'_m\left(H\right) = u'_f\left(H\right)$ characterizes the couple's choice of H for any α. That is, the choice of contraceptive technology is independent of the bargaining weight. In terms of Figure B.1, we reach the limiting case where the horizontal segments of the line become completely aligned vertically, and $\widetilde{H}$ is just a constant for an value of α.

B.2 Additional Tables

Table B.1: Predictors of attrition – treatment and control

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Treatment		**Control**		**Test $\beta_1 = \beta_2$**			**N**	
	Mfx	**p-val**	**Mfx**	**p-val**	χ^2	**p-val**	**T**	**C**	**All**
Demographics									
Age in years	-0.01	0.12	-0.01	0.22	0.03	0.86	152	146	298
Years of education	-0.01	0.45	-0.01	0.46	0.00	0.99	152	146	298
Literate	-0.09	0.27	-0.06	0.52	0.13	0.71	152	146	298
Household head	-0.05	0.49	0.01	0.95	0.32	0.57	152	146	298
Income									
Has job	-0.03	0.67	0.01	0.89	0.17	0.68	152	146	298
Personal income last 30 days (MZN)	-0.00	0.11	-0.00	0.17	0.89	0.35	152	146	298
Relationships									
In a stable relationship (incl. married)	-0.08	0.32	-0.02	0.82	0.31	0.58	152	146	298
Married (officially or unofficially)	-0.02	0.78	0.04	0.57	0.35	0.56	152	146	298
Years relation	-0.01	0.20	-0.01	0.15	0.01	0.93	152	146	298
# Partners last 12 months	-0.09	0.19	0.00	0.98	0.84	0.36	152	146	298
Sexual knowledge & behaviour									
Pregnant	0.00	<0.01	0.03	0.86	0.03	0.86	152	146	298
HIV positive (self-report)	0.12	0.07	0.02	0.84	1.37	0.24	131	129	260
STI last 3 months (self-report)	0.06	0.47	-0.16	0.25	1.80	0.18	135	124	259
Wants another child now	-0.04	0.74	0.11	0.29	0.72	0.40	152	146	298
Wants another child	-0.02	0.80	0.12	0.10	1.62	0.20	152	146	298
Beliefs high risk of HIV – general	-0.10	0.11	-0.17	0.02	0.15	0.70	152	146	298
Beliefs high risk of HIV – for self	-0.11	0.08	-0.18	0.01	0.18	0.68	152	146	298
Walking distance to health centre (in min.)	0.00	0.47	0.00	0.36	0.01	0.92	152	146	298
Mentions female condom as contraceptive	-0.04	0.53	-0.06	0.39	0.01	0.94	152	146	298
Contraceptive use									
Ever use female condoms	0.05	0.60	0.06	0.64	0.00	0.94	152	146	298
Ever use male condoms	0.08	0.28	-0.00	0.95	0.75	0.39	152	146	298
Ever use other	-0.07	0.27	0.05	0.56	1.44	0.23	152	146	298
Use female condoms last 30 days	-0.01	0.94	0.00	<0.01	0.01	0.94	152	146	298
Use male condoms last 30 days	-0.04	0.53	-0.09	0.31	0.06	0.80	152	146	298
Current use female condoms	0.00	<0.01	0.00	<0.01	n.a.	n.a.	152	146	298
Current use male condoms	0.07	0.23	0.01	0.90	0.64	0.42	152	146	298
Current use other	-0.03	0.68	0.08	0.28	1.03	0.31	152	146	298

Notes: N=298 in the baseline sample prior to attrition. Lower sample sizes reflect observations that are missing or not applicable. "Treatment" contains all individuals assigned to the treatment group (i.e. to the first round of the family planning training sessions), whether or not they attended the sessions. "Control" contains all individuals assigned to the control group (i.e. to the second round of training sessions). Columns 1-4 show marginal effects (Mfx) and *p*-values (p-val) for logit regressions of the probability of attritting on each covariate, in the treatment and control group, respectively. Columns 5 and 6 show the χ^2 statistic and *p*-value for the test that the marginal effects are equal across the treatment and control groups. Columns 7-9 show sample sizes. Unless otherwise indicated, all are binary variables. MZN stands for Mozambican meticais. HIV stands for Human Immune-deficiency Virus. STI stands for Sexually Transmitted Infections. "Beliefs high risk of HIV – general ' and "... – for self" are binary variables which are coded 1 (and 0 otherwise) if the respondent scored a value above the median for the questions "What is the risk of being infected with HIV when having unprotected sex for a woman in general? And for you specifically?" measured on a 1-5 scale ranging from No risk to Very risky. "Ever used other" and "Current use other" refer to use of any other modern contraceptive method apart from condoms, e.g. the pill, injectables, or an IUD.

Table B.2: Diary sample representativeness of full sample – covariates

	Mean	Survey Mean	Diaries Mean	t-test	Survey N	Diaries N
Demographics						
Age in years	30.48	30.32	31.32	-0.81	298	56
Years of education	6.17	6.22	5.95	0.62	298	56
Literate	0.84	0.84	0.84	0.14	298	55
Household head	0.24	0.22	0.30	-1.18	298	56
Income						
Has job	0.38	0.38	0.38	0.02	298	56
Personal income last 30 days (MZN)	896.90	880.74	1005.36	-1.18	298	56
Relationships						
In a stable relationship (incl. married)	0.84	0.85	0.84	0.12	298	56
Married (officially or unofficially)	0.61	0.63	0.54	1.24	298	56
Years relation	9.13	8.50	11.78	-2.24**	298	41
# Partners last 12 months	0.92	0.92	0.91	0.24	298	56
Sexual knowledge & behaviour						
Pregnant	0.05	0.05	0.00	4.11***	298	56
HIV positive (self-report)	0.33	0.33	0.33	-0.09	260	48
STI last 3 months (self-report)	0.13	0.13	0.12	0.12	259	48
Mentions female condom as contraceptive	0.39	0.41	0.27	2.08**	298	55

Notes: N=298 in the baseline sample, of which N=56 are in the subsample who respond to the diaries. Lower sample sizes in columns 5 and 6 reflect observations that are missing or not applicable. "Survey" contains all individuals in the baseline sample, whether or not they participated in the diaries. "Diaries" contains only the subsample of individuals who also responded to the diaries. Column 4 presents the t-test statistic for the null hypothesis that the mean in the diary subsample is equal to the mean in the survey sample. Unless otherwise indicated, all are binary variables. MZN stands for Mozambican meticais. HIV stands for Human Immunedeficiency Virus. STI stands for Sexually Transmitted Infections. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$.

Table B.3: Interaction of treatment with bargaining power index

	(1) Current use of female condoms
Treatment	0.215**
	(0.097)
Bargaining power index	-0.037
	(0.058)
Treatment × Bargaining power index	-0.198*
	(0.103)
Controls	✓
Observations	194
Control mean endline	0.020

Notes: Regressions on the balanced sample of respondents who are in a stable relationship (N=194). Dependent variable is a binary indicator for current use of female condoms at endline. The regressions are lineair probability model ANCOVA specifications where we include the baseline value of the dependent variable, as well as all control variables as in Figure 3. "Treatment" contains all individuals assigned to the treatment group (i.e. to the first round of the family planning training sessions), whether or not they attended the sessions. "Control" contains all individuals assigned to the control group (i.e. to the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treatment" is the intent-to-treat effect. "Bargaining power index" is the result of a factor analysis on all the survey questions in the decision-making and power dynamics survey modules. The index is normalized so that a one point increase represents an increase of one standard deviation. All regressions include facilitator dummies (N=16) since randomisation was stratified on facilitator. Standard errors are robust to individual-level heteroskedasticity, since this was the level of randomisation. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$.

Table B.4: Impacts on current use of female condoms by female bargaining power

	(1) All	(2) All	(3) All	(4) All	(5) All	(6) No MC at baseline
Low bargaining power	-0.241**	-0.054	-0.087	-0.083	-0.094	0.087
	(0.094)	(0.122)	(0.107)	(0.081)	(0.122)	(0.206)
Treatment	0.074**	0.328**	0.373**	0.339**	0.296*	0.326**
	(0.033)	(0.151)	(0.150)	(0.156)	(0.142)	(0.161)
Low bargaining power× Treatment		-0.347**	(-0.366)**	-0.339**	-0.312*	-0.381**
		(0.165)	(0.157)	(0.156)	(0.176)	(0.183)
High bargaining power	-0.229***	-0.077	-0.047	-0.072	-0.090	0.014
	(0.079)	(0.088)	(0.086)	(0.083)	(0.077)	(0.079)
High bargaining power× Treatment		-0.285*	-0.330**	-0.295*	-0.260*	-0.288*
		(0.154)	(0.152)	(0.159)	(0.153)	(0.167)
Controls	✓	✓	✓			✓
Lasso-selected controls					✓	
Observations	194	194	194	194	194	113
Control mean endline	0.020	0.020	0.020	0.020	0.020	0.020

Notes: Regressions on the balanced sample of respondents who are in a stable relationship (N=194) in Columns (1)-(5), and for a subset of respondents in a stable relationship who were not using male condoms at baseline in Columns (6). Dependent variable is a binary indicator for current use of female condoms at endline. "Treatment" contains all individuals assigned to the treatment group (i.e. to the first round of the family planning training sessions), whether or not they attended the sessions. "Control" contains all individuals assigned to the control group (i.e. to the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treatment" is the intent-to-treat effect. The threshold for low versus intermediate bargaining power was set at the 5^{th} centile of the bargaining power index, and the threshold for intermediate versus high bargaining power was set at the 20^{th} centile of the bargaining power index. "Bargaining power index" is the result of a factor analysis on all the survey questions in the decision-making and power dynamics survey modules. The regression is a linear probability model ANCOVA specification. We include the baseline value of the dependent variable, as well as all control variables. Controls are "Age in years," "Years of education," "Literacy," "Household head," "Has job," "Personal income last 30 days (MZN)," "In a stable relationship (incl. married)," "Married," "Years relation," "Number of partners in the last 12 months," "Pregnant," "Wants another child now," "Wants another child," "Beliefs high risk HIV – general," "Beliefs high risk HIV – for self," "Walking distance to the health centre," "Mentions female condoms as contraceptive." All regressions include facilitator dummies (N=16) since randomisation was stratified on facilitator. Standard errors are robust to individual-level heteroskedasticity, since this was the level of randomisation. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$.

Table B.5: Heckman sample selection correction for attrition – primary outcomes

	(1) Ever use female condoms	(2) Ever use male condoms	(3) Use last 30 days female condoms	(4) Use last 30 days male condoms	(5) Current use female condoms	(6) Current use male condoms
Treatment Heckman	0.192***	0.003	0.052*	-0.001	0.091**	0.119
	(0.045)	(0.048)	(0.027)	(0.099)	(0.037)	(0.111)
Controls	✓	✓	✓	✓	✓	✓
Observations	525	525	525	525	525	525
Selected observations	227	227	227	227	227	227

Notes: Results from a Heckman selection correction for attrition, to check if our results are robust to the possibility that unobservables differentially predict attrition across treatment and control. Treatment is an indicator for being assigned to the treatment group (i.e. to the first round of the family planning training sessions) as opposed to the control group (i.e. the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the effect of treatment represents the intent-to-treat effect. The regression is a linear probability model ANCOVA specification, controlling for the baseline value of the use of the specified contraceptive method and facilitator dummies (N=16) since randomisation was stratified on facilitator. To select the predictors of attrition for the selection equation in the Heckman we first run a LASSO specification of attrition on all our control variables, measures of baseline contraceptive use, treatment, and facilitator dummies. The LASSO-selected variables are then included in our sample selection equation that we use for the Heckman selection correction. The LASSO-selected variables are "Use of male condoms in the last 30 days at baseline," "Current use of female condoms at baseline,"; "Literate," "Years of education," "Has job," "In a stable relationship," "Years relation," "# Partners last 12 months," "Pregnant," "Beliefs high HIV risk – general," "Beliefs high HIV risk – general," "Treatment," "Facilitator 2," "Faciolitator 33' "Facilitator 4," "Facilitator 9. The number of observations in the selection equation is 298, and the number of observations in the selected regression equation is 227.

Table B.6: Impacts on current use of condoms by female bargaining power – Alternative explanations

	(1) Current use female condoms	(2) Current use female condoms	(3) Current use female condoms	(4) Current use female condoms	(5) Current use female condoms	(6) Current use male condoms
Low bargaining power	-0.054	-0.052	-0.062	-0.128	-0.052	-0.098
	(0.122)	(0.121)	(0.128)	(0.156)	(0.121)	(0.248)
Treatment	0.328**	0.332**	0.286*	0.380**	0.368**	0.116
	(0.151)	(0.155)	(0.147)	(0.183)	(0.154)	(0.216)
Low bargaining power×Treatment	-0.347**	-0.341**	-0.355**	-0.320	-0.366**	0.007
	(0.165)	(0.166)	(0.175)	(0.214)	(0.171)	(0.333)
High bargaining power	-0.077	-0.074	-0.106	-0.056	-0.072	-0.025
	(0.088)	(0.091)	(0.088)	(0.111)	(0.084)	(0.188)
High bargaining power×Treatment	-0.285*	-0.289*	-0.265*	-0.397**	-0.301*	-0.092
	(0.154)	(0.156)	(0.155)	(0.187)	(0.154)	(0.232)
Use other contraceptives×Treatment		-0.010				
		(0.079)				
Distance to health facility×Treatment			0.119			
			(0.105)			
HIV positive×Treatment				0.151		
				(0.105)		
Partner involved with others×Treatment					-0.071	
					(0.058)	
Controls	✓	✓	✓	✓	✓	✓
Observations	194	194	194	169	193	194
Control mean endline	0.020	0.020	0.020	0.020	0.020	0.353

Notes: Regressions on the balanced sample of respondents who are in a stable relationship (N=194). Dependent variable is a binary indicator for current use of female condoms at endline. "Treatment" contains all individuals assigned to the treatment group (i.e. to the first round of the family planning training sessions), whether or not they attended the sessions. "Control" contains all individuals assigned to the control group (i.e. to the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treatment" is the intent-to-treat effect. The threshold for low versus intermediate bargaining power was set at the 5^{th} centile of the bargaining power index, and the threshold for intermediate versus high bargaining power was set at the 20^{th} centile of the bargaining power index. "Bargaining power index" is the result of a factor analysis on all the survey questions in the decision-making and power dynamics survey modules. The regression is a linear probability model ANCOVA specification. We include the baseline value of the dependent variable, as well as all control variables. Controls are "Age in years," "Years of education," "Literacy," "Household head," "Has job," "Personal income last 30 days (MZN)," "In a stable relationship (incl. married)," "Married," "Years relation," "Number of partners in the last 12 months," "Pregnant," "Wants another child now," "Wants another child," "Beliefs high risk HIV – general," "Beliefs high risk HIV – to self," "Walking distance to the health centre," "Mentions female condoms as contraceptive." All regressions include facilitator dummies (N=16) since randomisation was stratified on facilitator. Standard errors are robust to individual-level heteroskedasticity, since this was the level of randomisation. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$.

Table B.7: Treatment effects – heterogeneity by relationship status

	(1) **Ever use female condoms**	(2) **Ever use male condoms**	(3) **Use last 30 days female condoms**	(4) **Use last 30 days male condoms**	(5) **Current use female condoms**	(6) **Current use male condoms**
Treatment	0.358***	-0.089	0.040	0.061	0.165*	0.179
	(0.103)	(0.112)	(0.054)	(0.153)	(0.088)	(0.150)
Stable relationship	0.030	-0.038	0.007	-0.052	0.024	-0.064
	(0.051)	(0.078)	(0.020)	(0.120)	(0.024)	(0.109)
Treat×Stable relationship	-0.202*	0.090	0.009	-0.132	-0.102	-0.141
	(0.109)	(0.121)	(0.064)	(0.166)	(0.093)	(0.162)
Observations	227	227	220	221	227	227
Control mean endline	0.088	0.824	0.010	0.366	0.020	0.353

Notes: Regressions on the balanced sample, N=227. Reduced observations in columns (3) and (4) reflect there being no variation in the outcome variable conditional on the facilitator fixed effect and controls. Dependent variables are binary indicators for the use of female condoms (FC) and male condoms (MC). Columns 1 and 2 refer to whether the respondent has ever used the method, columns 3 and 4 to whether she has used it in the last 30 days, and columns 5 and 6 to whether she is currently using it. "Treatment" is an indicator for being assigned to the treatment group (i.e. to the first round of the family planning training sessions) as opposed to the control group (i.e. the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treatment" is the intent-to-treat effect. "Stable relationship" is a dummy equal to one if the respondent reports being in a stable relationship at baseline. All regressions are linear probability model ANCOVA specifications, including the baseline value of the dependent variable as a regressor. All regressions include facilitator dummies (N=16) since randomisation was stratified on facilitator. Standard errors (in parentheses) are robust to individual-level heteroskedasticity, since this was the level of randomisation. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$.

Table B.8: Treatment effects – bargaining power

	Mfx	s.e.	p-val	N
Who decides about...				
...buying clothes for you?	-0.03	0.04	0.46	227
...buying phone credit?	0.03	0.04	0.52	227
...education for the children?	-0.03	0.04	0.46	226
...health expenses for you?	-0.10	0.04	0.01	227
...health expenses for the children?	-0.06	0.04	0.13	225
...if you are allowed to work?	-0.06	0.04	0.16	227
...how earnings are used?	-0.01	0.04	0.74	227
...visits to friends?	-0.00	0.04	1.00	226
...visits to family?	-0.01	0.05	0.80	226
Who usually has more say when you talk about serious things	0.11	0.05	0.03	177
In general, who do you think has more power in your relationship	0.11	0.05	0.02	177
Power dynamics				
Most of the time, we do what my partner wants to do	-0.03	0.05	0.45	193
My partner won't let me wear certain things	-0.01	0.05	0.82	193
When my partner and I are together, I'm pretty quiet	-0.04	0.05	0.37	193
My partner has more say about important decisions that affect us	-0.03	0.05	0.51	193
My partner tells me who I can spend time with	-0.03	0.05	0.52	193
I feel trapped or stuck in our relationship	-0.00	0.05	0.99	193
My partner does what he wants, even if I do not want him to	-0.05	0.05	0.27	193
I am more committed to our relationship than my partner is	0.04	0.05	0.34	193
My partner is involved with other people apart from me	-0.15	0.05	0.00	193
My partner always wants to know where I am	0.13	0.04	0.00	193
When my partner and I disagree, he gets his way most of the time	0.07	0.05	0.12	193

Notes: Regressions on the balanced sample (N=227). Lower sample sizes reflect observations that are missing or not applicable. Dependent variables are the individual bargaining power indicators measured at endline, as indicated in each row. The decision-making questions "Who has more say" and "Who has more power" as well as the "Power dynamics" questions were asked only of women in a stable relationship (N=194). Columns (1)-(3) shows the marginal effects (Mfx), standard errors (s.e.), and p-values (p-val) respectively, for regressions on the "Treatment" indicator of being assigned to the treatment group (i.e. to the first round of the family planning training sessions) as opposed to the control group (i.e. the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treatment" is the intent-to-treat effect. All regressions are linear probability model ANCOVA specifications, including the baseline value of the dependent variable as a regressor. All regressions include facilitator dummies (N=16), since randomisation was stratified on facilitator. Standard errors are robust to individual-level heteroskedasticity, since this was the level of randomisation.

Table B.9: Impacts on proportion of sex acts in a week where the respondent and her partner had discussions about protection – diary subsample

	(1) **Discussion full endline**	(2) **Female-initiated full endline**	(3) **Discussion last 30 days**	(4) **Female-initiated last 30 days**	(5) **Discussion last 14 days**	(6) **Female-initiated last 14 days**
Treat×endline	-0.031	-0.078	-0.126	-0.144*	-0.282**	-0.219***
	(0.111)	(0.078)	(0.103)	(0.075)	(0.110)	(0.064)
Facilitator×endline f.e.'s	✓	✓	✓	✓	✓	✓
Observations	398	398	259	259	179	179
Control mean	0.227	0.192	0.275	0.228	0.311	0.265

Notes: Regressions on the balanced diary sample, N=56. Dependent variables are the proportion of sex acts of a respondent in a particular week where the respondent and her partner had discussions about condom use. Column 1 and 2 report the results for the full endline period, Column 3 and 4 for the last 30 days, and Column 5 and 6 the last 14 days. Columns 1, 3, and 5 report the results for any discussion while Columns 2, 4, and 6 report results only for female-initiated discussions. All regressions are linear probability individual fixed effects models comparing the proportion of sex acts of a respondent in a week with discussions during the baseline period with the proportion of sex acts of a respondent in a week with discussions during the endline period, with the respondent-week as the unit of observation and weeks with zero sex acts being counted as missing (N=398 for the full endline period, N=259 for the last 30 days, and N=169 for the last 14 days). "Treat × endline" is an indicator for observations in the treatment group (i.e. to the first round of the family planning training sessions) during the relevant endline period ("full endline", "last 30 days", or "last 14 days") as opposed to the control group (i.e. the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the coefficient on "Treat × endline" is the intent-to-treat effect. All regressions include facilitator × endline fixed effects (N=16) since randomisation was stratified on facilitator. Standard errors (in parentheses) are robust to individual-level heteroskedasticity, since this was the level of randomisation. Significance levels $p < 0.10^{*}$, $p < 0.05^{**}$, $p < 0.01^{***}$

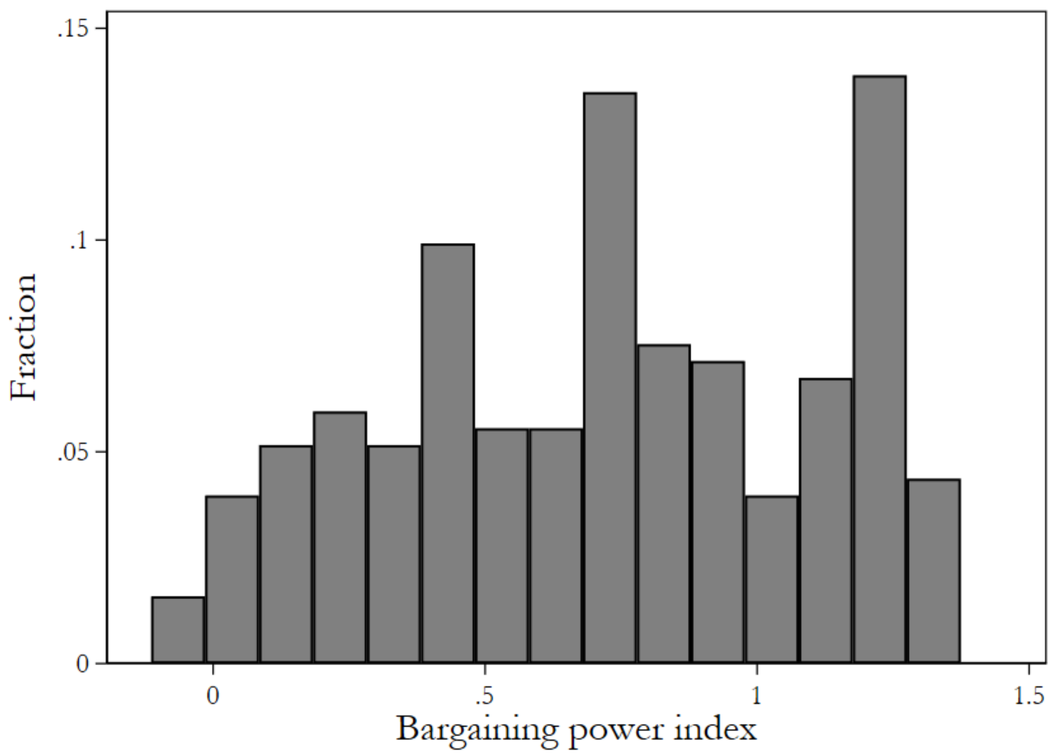
Table B.10: Equality of means baseline and endline contraceptive use in control group

	Mean	Baseline Mean	Endline Mean	t-test	Control N
Ever use female condoms	0.09	0.07	0.11	-0.94	107
Ever use male condoms	0.79	0.77	0.81	-0.84	107
Ever use other	0.71	0.71	0.72	-0.15	107
Used female condoms last 30 days	0.02	0.02	0.02	0.00	107
Used male condoms last 30 days	0.33	0.30	0.36	-1.01	107
Current use female condoms	0.04	0.03	0.05	-0.72	107
Current use male condoms	0.36	0.36	0.36	0.00	107
Current use other	0.40	0.38	0.41	-0.42	107

Notes: Based on the subset of respondents in the balanced sample who were assigned to the control group (N=107). "Control" contains all individuals assigned to the control group (i.e. to the second round of training sessions). Column 4 presents the t-statistic of the hypothesis that there is no difference between the mean of our outcome measures for contraceptive use in the baseline and endline. Outcome measures are binary indicators for the use of female condoms, male condoms, and other modern contaceptive methods (other), such as the pill, injectables, or IUD.

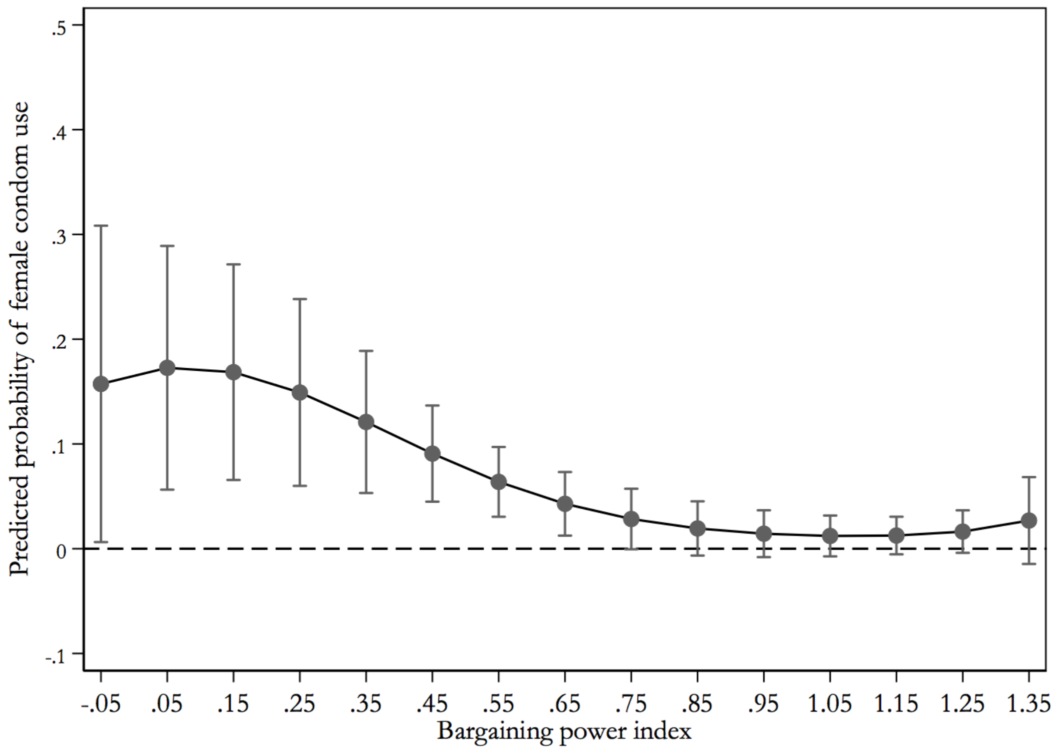
B.3 Additional Figures

Figure B.2: Histogram of the bargaining power index



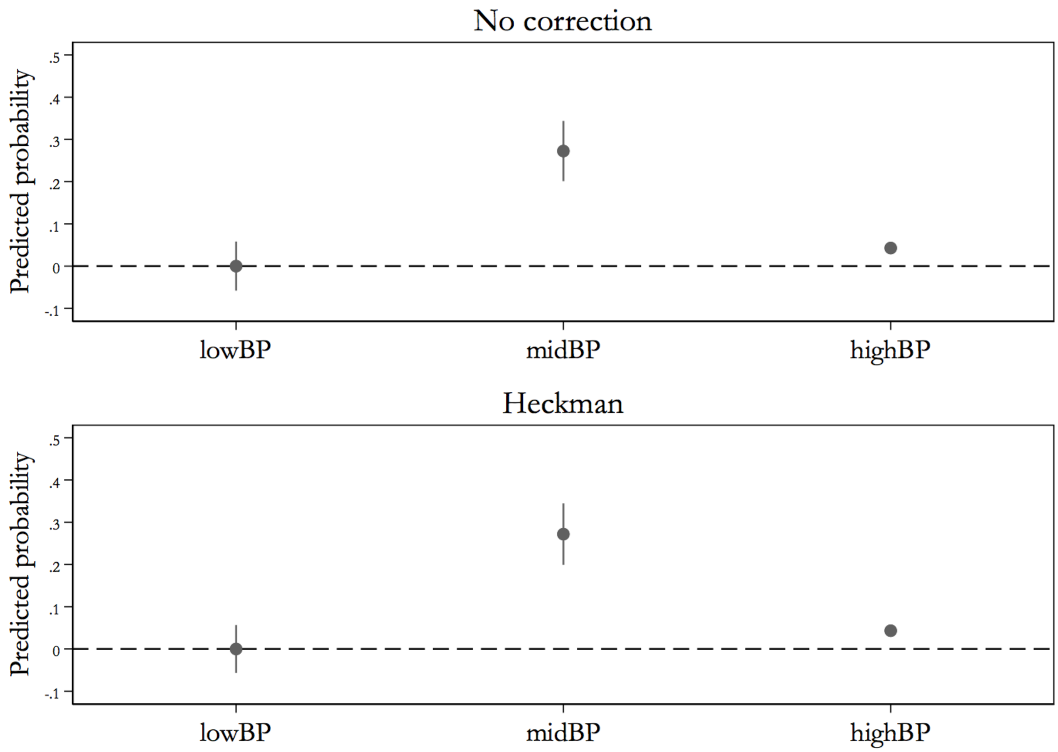
Notes: Histogram of the distribution of the bargaining power index in our balanced sample (N=194). The bargaining power index was created by conducting a tetrachoric factor analysis of all the baseline bargaining power survey questions that were asked in the "Decision-making" and the "Power dynamics" survey module (see Table 2. The index is normalized so that a one point increase represents an increase of one standard deviation.

Figure B.3: Predicted marginal effect of bargaining power index on female condom use



Notes: Predicted marginal effects of the bargaining power index on the current use of female condoms at endline. The marker (circle) presents the predicted marginal effect. The bars represent the 95% confidence interval. The predicted marginal effects are based on a regression on the balanced sample of respondents who are in a stable relationship (N=194). Dependent variable is a binary indicator for current use of female condoms at endline. The predicted marginal effect is the effect of the bargaining power index on current use of female condoms, produced by a regression including bargaining power, its square, and its cube, baseline use of female condoms, treatment and control variables as in Figure 3. The bargaining power index was created by conducting a tetrachoric factor analysis of all the baseline bargaining power survey questions that were asked in the "Decision-making" and the "Power dynamics" survey module as in Table 2. The index is normalized so that a one point increase represents an increase of one standard deviation.

Figure B.4: Heckman sample selection correction for attrition – heterogeneity results



Notes: Panel (a) shows the results from Figure 3. Panel (b) shows the results from a Heckman selection correction for attrition, to check if our results are robust to the possibility that unobservables differentially predict attrition across treatment and control. Both panels show the predicted marginal effect on current use of female condoms for respondents with low bargaining power (lowBP), intermediate bargaining power (midBP), and high bargaining power (highBP) for the treatment and control group combined. The threshold for low versus intermediate bargaining power was set at the 5^{th} centile, and the threshold for intermediate versus high bargaining power was set at the 20^{th} centile. Each marker (circle) represents the predicted marginal effect. Each bar represents the 90% confidence interval. Treatment is an indicator for being assigned to the treatment group (i.e. to the first round of the family planning training sessions) as opposed to the control group (i.e. the second round of training sessions). Not all respondents assigned to treatment attended the sessions, thus the effect of treatment represents the intent-to-treat effect. The marginal effects are predicted based on a regression on the balanced survey sample (N=227) for those women in a stable relationship (N=194). The regression is a linear probability model ANCOVA specification where dummies for low bargaining power (versus intermediate bargaining power) and high bargaining power (versus intermediate bargaining power) are interacted with treatment. The regressions include the baseline value of the use of female condoms, controls (as in Figure 3), and facilitator dummies (N=16) since randomisation was stratified on facilitator. To select the predictors of attrition for the selection equation in the Heckman we first run a LASSO specification of attrition on all our control variables, measures of baseline contraceptive use, treatment, and facilitator dummies. The LASSO-selected variables are then included in our sample selection equation that we use for the Heckman selection correction. The LASSO-selected variables are "Use of male condoms in the last 30 days at baseline," "Current use of female condoms at baseline,"; "Literate," "Has job," "Years relation," "# Partners last 12 months," "Beliefs high HIV risk – general," "Treatment," "Facilitator 2," "Facilitator 4," "Facilitator 9. The number of observations in the selection equation is 298, and the number of observations in the selected regression equation is 194.

B.4 Cost-Effectiveness and Cost-Benefit Analysis

We estimate the effects on the entire population of Southern Mozambique of scaling up the intervention to cover all women in the age-group typically considered as most sexually active (15-49 years) for the years 2015-30, excluding high-risk groups.[34] We take the current HIV/AIDS national strategic program in Mozambique as given, assuming that commitments including the provision of anti-retroviral therapies (ART) would not change if female condoms were also offered. We first simulate a control projection, where estimates from 2015-16 are taken and projections for 2017-30 are made based on the status quo, with none of the epidemiological and behavioural parameters changed. We then simulate two female condom intervention scenarios, based on the impacts of the intervention estimated from our experiment. In the first scenario, we focus purely on the increase in condom coverage and marginal decrease in average condom effectiveness when individuals adopt female condoms as a result of the intervention. In the second scenario, we also take into account the behavioural response via the estimated increase in the number of sex acts. This second scenario is our preferred estimate, but comparison with the first scenario allows us to quantify the importance of the behavioural response and its negative spillovers.

To model the health impacts of our intervention, we use the we use the AIM module of the SPECTRUM suite of epidemiological models (as used by UNAIDS) to estimate the number of HIV infections and disability-adjusted life years (DALYs) that the scale-up scenarios would help to avert in comparison to the control scenario. Figure B.5 shows the simulated number of new HIV infections per year in the control as well as the two intervention scenarios. Table B.11 summarizes the total number of HIV infections and DALYs that would be averted by 2030.[35]

[34]In the epidemiological model that we use, adults above the median age of first sex are allocated into one of five risk categories, identified for males and females separately. These are: stable couples (men and women reporting a single partner in the last year); multiple partners (men and women with more than one partner in the last year); female sex workers and clients; men who have sex with men; and injecting drug users. Our intervention targets women in the first two categories, whose partners are estimated by the epidemiological model to be primarily in the second category. It does not target individuals in the last three, high-risk categories.

[35]The SPECTRUM suite is developed by Avenir Health, see http://www.avenirhealth.

To estimate the implied financial benefits to the healthcare system, we focus on the reduction in the number of adults and children that require ART, cotrimoxazol (an antibiotic used both to treat and prevent pneumocystis pneumonia and toxoplasmosis in people with HIV/AIDS) and the number of mothers requiring Prevention of Mother-To-Child Transmission for the period from 2015-2030, including unit costs for counseling, drugs and treatment (tables available on request). To estimate the cost-savings of our intervention in terms of productivity gains, we estimate the reduction in productivity losses as a result of continued workforce participation of adults who did not get infected with HIV as a result of our intervention.

We next calculate an upper and a lower bound of the intervention costs per participant. For the upper bound, we use the full costs of our intervention as implemented, plus the full cost of acquiring and distributing the subsequent increase in the number of female condoms used between 2015 and 2030, assuming full subsidisation of female condom provision by the government (tables available on request). For the lower bound, we assume that the provision of information about female condoms is included into existing sex education programmes in schools and at health centres. This is a realistic add-on to such programmes, given that they already provide information about and practical demonstrations of male condoms, as well as information about HIV/AIDS and other STIs. The lower bound cost estimates therefore comprise just the costs of acquiring and distributing the additional number of female condoms when adoption subsequently increases, assuming that the government fully subsidises free provision of female condoms (tables available on request).

Comparing the programme costs to the DALYs averted allows us to calculate the incremental cost-effectiveness ratio (ICER). This measure is often used to compare the cost-effectiveness of policies across the public health spectrum, in terms of cost per DALY averted (see e.g. (Creese et al., 2002; Oster, 2005)). Comparing the programme costs to the cost savings allows us to calculate the internal rate of return (IRR). This is an indicator of cost-benefit, which can be used to evaluate the policy as a financial

org/software-spectrum.php.

investment.

In scenario 1 the ICER for the full intervention is -50 USD, i.e. a saving of 50 USD per DALY averted, meaning that scaling up the full intervention is therefore *very cost-effective*.[36] It also offers a positive financial return, with an IRR of 1.02. Meanwhile, the ICER for the lower-cost, add-on intervention is -1,574 USD, i.e. a saving of 1,574 USD. This means that adding female condom provision to existing sex education programs is also *very cost-effective*, and in fact represents a substantial saving per DALY averted compared to the existing set of treatments. It also offers a highly favourable return on investment of 1.82.

In contrast, in scenario 2 the ICER for the full intervention is 7,413 USD, meaning that a full scale-up of the intervention is *not cost-effective*. Nonetheless, the ICER for the lower bound is 3,497 USD, implying that adding female condom provision to existing sex education programs is *cost-effective*. Yet despite being cost-effective in the lower bound scenario, the intervention does not offer a positive financial return on investment: the IRR for the upper-bound cost is 0.21 and for the lower-bound cost is 0.36.

In summary, in scenario two when taking account the observed increase in risky sex acts, only adding female condom provision to existing sex education programmes is *cost-effective*. However, there are still several reasons to believe that our estimates of the IRR and ICER are conservative, and thus that scale-up of both the full programme and adding female condoms to existing initiatives could be substantially more cost-effective than we estimate. First, we use an upper bound for the estimated costs of condoms, which is likely to be highly conservative given that the scale-up of the intervention to the entire female population of South Mozambique would lead to economies of scale in production and procurement. Second, as mentioned above, potentially sizeable benefits such as reduction in unwanted pregnancies and other STIs, indirect costs to the health system, and costs for orphan care, are not included in our estimates.

[36] Following the recommendations of the Commission on Macroeconomics and Health, WHO-CHOICE deems interventions *highly cost-effective* if the ICER is less than GDP per capita, cost-effective if the ICER is between one and three times GDP per capita, or *not cost-effective* if the ICER is higher than three times GDP per capita (Walensky et al., 2013). The GDP per capita of Mozambique was 511 USD in 2014.

Figure B.5: Simulation of annual number of HIV infections

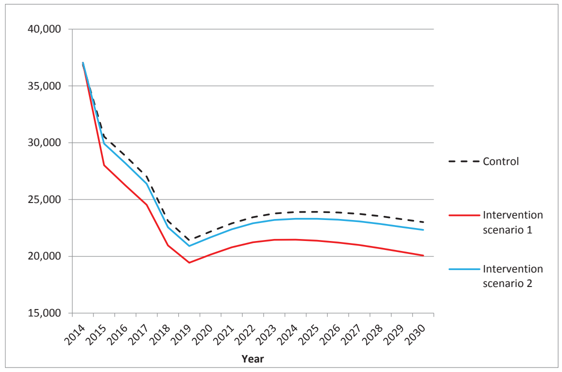


Table B.11: Simulation of impact on HIV infections and DALYs averted by 2030

	# HIV infections averted	**# DALYs averted**
Scenario 1: condom use response only	39,425	72,628
Scenario 2: condom use response & sex act response	9,647	3,607

Notes: Results from simulations based on 2017 UNAIDS data of South Mozambique using the DemProj, AIM, and GOALS module of Avenir Health's SPECTRUM software. Total population (15-49 years) in 2014 was 3,048,905. Columns 1 and 2 present the number of HIV infections and the number of Disability-Adjusted Life Years (DALYs) averted in each scenario, respectively. The statistics are calculated by comparing control projections up to 2030 without any changes to the demographic and behavioural data (control) with intervention projections where behavioural data (condom use) and epidemiological data (condom efficacy) are changed from 2015 onward.