

## COLLECTIVE GENDER AND FERTILITY NORMS AND MODERN CONTRACEPTIVE USE

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### Collective Gender and Fertility Norms and Modern Contraceptive Use

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### PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to analyze DHS data and provide findings that will be useful to policymakers and program managers in low- and middle-income countries. DHS Analytical Studies serve this objective by providing in-depth research on a wide range of topics, typically including several countries and applying multivariate statistical tools and models. These reports are also intended to illustrate research methods and applications of DHS data that may build the capacity of other researchers.

The topics in this series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Analytical Studies will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low and middle-income countries.

Sunita Kishor Director, The DHS Program

### ABSTRACT

Evidence shows that collective fertility and gender norms affect the use of contraceptives, especially women's use of modern contraception. However, the association of collective fertility and gender norms on men's modern contraceptive use and how those associations differ between women and men have largely not been explored. In addition, the evidence on the differential association of those collective fertility and gender norms among peer and non-peer age groups on modern contraceptive use is mainly qualitative and limited in scope. In this study, we examine associations between collective gender and fertility norms and individual use of modern contraceptives. The study further explores whether these associations differ for men and women, within age-based peer groups, and across regions within the same country. Data for this study came from the most recent DHS surveys in Nepal (2016), Nigeria (2018), and Zambia (2018). The measures of collective fertility and gender norms were community-level measures of the ideal number of children, contraceptive decisionmaking, women's empowerment, and men's beliefs about contraceptives and promiscuity. We used multilevel logistic regression to model the effect of collective fertility and gender norms on women and men's modern contraceptive use and controlled for individual and community-level covariates. We used the proportional reduction in variance measure to estimate the proportion of decrease in community-level variation for the model with the addition of covariates.

Our findings suggest that there are differences in the effects of collective norms on men's use of modern contraceptives compared to women's. We find that in all three countries, women's collective fertility norms, as measured by the average number of ideal children, has a significantly negative effect on women's modern contraceptive use. Most community-level effects were heterogeneous on individual modern contraceptive use across the three countries. Although this study was focused on the influence of the community-level norms, two individual-level characteristics, desire for children soon and the woman being involved in contraceptive decisionmaking, were associated with women's use of modern contraceptive use in all three countries. In addition, we did not find a stronger effect of collective norms among age peer groups on individual behavior. In each country, the proportional reduction in variance was either the same or smaller for men compared to the women for each of the full models. These findings show that while collective norms have an important influence on modern contraceptive use, more research is needed to identify, understand, and measure these norms, especially for men.

Key words: contraceptive use, family planning, fertility and fertility preferences, gender

### ACRONYMS AND ABBREVIATIONS

aOR	adjusted odds ratio
DHS	Demographic and Health Survey
ICC IUD	intra-class correlation intra-uterine device
LAM LMIC	lactation amenorrhea method low- and middle-income country
OR	odds ratio
PRH PRV	population and reproductive health proportional reduction in variance
SD SWPER	standard deviation survey-based women's empowerment index
USAID	United States Agency for International Development
VIF	variance inflation factor

### 1 BACKGROUND OF THE REPORT

The importance of social norms for individual behavior has long been recognized by both practitioners and researchers who seek to understand and influence behavioral and health outcomes. Social norms refer broadly to the behavioral "rules" and social expectations shared by a given society, community, or group, or reference group, with whom individuals compare themselves and whose opinions are important enough to motivate compliance with social expectations (Cislaghi and Heise 2017). Social norms collectively define what is considered "normal" and appropriate behavior for that group, and are often unspoken, reinforced, and internalized through the socialization process, supported by beliefs or attitudes (both of which are specific to individuals rather than social groups as a whole), and enforced through social sanctions and rewards (Bicchieri and Group 2014; Cislaghi and Heise 2017). The strength of the influence of these norms on any particular behavior may be direct (proximal) or indirect (distal) and is dependent on both how public or detectable the behavior, are easily observed by others, and are enforced though strong social sanctions can be expected to have greater influence (Cislaghi and Heise 2018). These rules interact with other individual, social, and structural factors to influence virtually all aspects of human behavior to some degree, and are changing and evolving over time (Cislaghi and Heise 2017).

The social norm itself is important, but equally important is the reference group. The reference group includes the people whose opinions or behavior matter to an individual for a particular behavior or context (Learning Collaborative to Advance Normative Change 2019). There may be variation in social norms within groups or in the strength of the sanction for nonconformity. Therefore, the relative effect of the social norm on an individual may differ depending on the level of the norm within their specific reference group. These reference groups are often operationalized by geographic proximity, age, religion, and other characteristics, and may also be used to define the reference group for a behavior (Calhoun et al. 2022; Costenbader, Zissette, et al. 2019; Learning Collaborative to Advance Normative Change 2019). Since reference groups are typically defined by a similar characteristic, they may also be referred to as "peer group."

While social norms are "social" in that they operate at the group level and rely on social interactions and processes, much of the social norms literature and research has been focused on individuals. At this level, social norms can be thought of as people's beliefs or perceptions about what other people in their reference group do in terms of behavior (referred to as a "descriptive norm" or "empirical expectations"), and what they believe the members of the reference group approve and disapprove (referred to as "injunctive" or "subjective" norms or "normative expectations") (Bicchieri 2006; Cialdini, Kallgren, and Reno 1991; Cislaghi and Heise 2017; Geber et al. 2021; Rimal and Lapinski 2015). More recent work has extended this to focus on also understanding and measuring social norms at the larger societal or group level, referred to as "collective norms" (Geber et al. 2021; Sedlander and Rimal 2019). As shown in Table 1, these group-level social norms can be divided into descriptive and injunctive norms. Rather than base these on perceptions of beliefs at the individual level, these reflect actual behavior of the reference group and aggregate attitudes within the reference group towards that behavior.

#### Table 1 Descriptive and injunctive norms as perceived and collective norms

	Descriptive norms	Injunctive norms
Perceived norms (individual level)	Individual's belief about the peer group's behavior	Individual's belief about the peer group's approval of the behavior
Collective norms (group level)	The peer group's behavior	The peer group's attitude toward the behavior
Source: Geber et al. 20	21	

There are number of advantages to adopting the group lens to understanding the influence of social norms on behavior. First, this allows for a comparison of the relative influence of perceived norms at the individual level and collective norms at the group level and provides additional information about how social norms influence behavior and where to focus programmatic and research efforts. Secondly, this approach is consistent with other frameworks such as the socioecological model that shows how individuals are embedded within households and broader social structures (Bronfenbrenner 1979). This allows for a more complex understanding of how different social norms interact to shape behavior. For example, use of contraception is likely to be influenced by multiple social norms at the group level, including those related to age, gender and social status, each of which interact with individual-level characteristics to influence behavior.

Demographers and reproductive health researchers have long understood that social norms are important in shaping fertility preferences and other health outcomes (Costenbader et al. 2017; Mason 1983; Thomson and Goldman 1987; Udry 1982). Despite this, empirical evidence for the effect of norms on contraceptive use has been mixed, partly due to inconsistencies in how norms have been defined and measured. The majority of research in this area has focused on the effect of broader gender norms or norms that are specific to family planning, and has used an individual rather than a collective approach, which focused narrowly on behavior-specific norms at the expense of a broader, more nuanced view of normative influence (Bingenheimer 2019; Costenbader et al. 2017).

Research to date on normative influences on contraceptive use has found mixed results, although this is likely to be partly due to the diversity of definitions and measures used (Costenbader et al. 2017). Collective gender norms, which are group-level beliefs about gender and gender roles, have generally shown significant associations with modern contraceptive use in different settings (Okigbo et al. 2018; Paek et al. 2008; Wado et al. 2019), although the evidence for the effect of collective family planning behavioral or attitudinal norms, such as ideal number of children and approval of family planning, on modern contraceptive use is more mixed (Kaggwa, Diop, and Storey 2008; Sedlander and Rimal 2019; Zimmerman et al. 2019). A recent study that looked at community collective gender norms and their associations with individual contraceptive use over nine sub-Saharan African countries found significant associations of collective attitudinal norms on contraceptive use and total demand satisfied with any contraceptive method. However, the relative importance of community-level factors varied widely across countries, from 3.5% in Swaziland to 60% in Nigeria (Mejía-Guevara et al. 2020).

In addition to the broader effect of gender norms on contraceptive behavior, research suggests that men's and women's contraceptive behavior may not be influenced to the same degree by particular norms (Dynes et al. 2012) or even by the same social norms (Costenbader, Zissette, et al. 2019). This pointed to the value of taking a more complex, nuanced approach to understanding the influence of norms on behavior. In

particular, this suggests that contraceptive use is influenced by multiple, interrelated social norms, some which are specific to the use of contraception and other broader norms, such as gender and reproductive norms. For example, recent research in the Ouagadougou Partnership Region—Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal, and Togo—identified five different sets of norms that influence contraceptive use to varying degrees in each of the included countries: norms on fertility (how many children to have and when); norms on sex (when to have sex and with whom); norms on decisionmaking/agency (negotiating choices and power in day-to-day life); systemic norms (how people engage and access larger institutions/communities); and norms about the body (how the body should look and function) (Breakthrough ACTION 2020). Each of these is likely to be shaped by broader gender norms that dictate expectations for behavior based on biological sex. This is especially true for reproductive behaviors, because these are often central to social definitions of masculinity and femininity.

This evidence points to the need to use a more complex approach to understanding the relationship between the normative context and contraceptive behavior. In particular, it is important that research conceptualize and measure norms at multiple levels and understand that contraceptive behavior is influenced by multiple types of norms. This study takes this approach, by applying the socioecological model to address two key gaps in research on the normative influences on contraceptive use in lower- and middle-income countries (LMICs). First, the majority of studies in this area have focused only on women's contraceptive behavior. As a result, relatively little is known about which norms matter for men and women, if these are the same, how they may influence each other, or if particular norms are stronger or weaker depending on gender. Second, while research on social norms often implicitly has adopted a multilevel approach to understanding the determinants of behavior at the individual level, this has not always been explicitly included in the modeling approach. Even when this has been done, this has not always taken into account the differences in sampling weights at different levels, which could potentially bias the parameter estimates (Heck 2015). In the case of studies using DHS data, almost all have used only individual weights in their analyses and excluded the community (or Level 2) weights (Babalola, John, et al. 2015; Babalola, Kusemiju, et al. 2015; Dynes et al. 2012; Kaggwa, Diop, and Storey 2008; LeMasters et al. 2021; Mejía-Guevara et al. 2020; Okigbo et al. 2018; Paek et al. 2008; Storey and Kaggwa 2009; Wado et al. 2019; Zimmerman et al. 2019).

Using nationally representative data in three countries for which relevant data are available, this study explores associations between collective gender and fertility norms and individual modern contraceptive use. The study further explores if these associations differ for men and women, differ within age-based peer groups, and differ across regions within the same country.

#### DATA AND METHODS 2

#### 2.1 Data

This analysis used data from the most recent DHS survey from each of the three countries—Nepal 2016, Nigeria 2018, and Zambia 2018. These countries were selected on the following characteristics: recent DHS survey (since 2016), global geographic representation, contraceptive S-curve classification,<sup>1</sup> and status as a priority USAID Population and Reproductive Health (PRH) country. The DHS households are also drawn from a nationally representative sample of households and are representative subnationally, as well as by urban and rural residence. Households identified for participation in the survey are selected with a stratified two-stage cluster sampling design. At the first stage, enumeration areas are selected within each stratum, and are typically based on the most recent census. In the second stage, a sample of households is randomly selected from a household listing. The households selected within each enumeration area are then described as clusters. Table 2 shows the year and sample of clusters, interviewed women and men in the respective surveys for each country, as well as the analytic sample of women and men for this study. For this analysis, respondents were limited to in union nonpregnant women and in union men with nonpregnant partners, since we postulated that factors influencing contraceptive use among women and men not in union would be fundamentally different from those in union.

Country	S-curve classification	DHS survey	Number of clusters	Number of interviewed women age 15–49	Number of interviewed men age 15–59	Number of in union nonpregnant women age 15–49	Number of in union men with nonpregnant partners age 15–59
Nigeria	Low	2018	1,389	41,821	13,311	24,822	6,810
Nepal	Growth	2016	383	12,862	4,063	9,370	2,520
Zambia	Growth	2018	545	13,683	12132*	6,727	5,715ª

#### Table 2 Country data used in this analysis

ample includes men age 15–49 only.

<sup>&</sup>lt;sup>1</sup> For more information on the S-curve, visit:

http://www.track20.org/pages/data\_analysis/in\_depth/mCPR\_growth/s\_curve.php

#### 2.2 Measures

As described above, we used a socioecological model to guide the selection of our variables (Figure 1).





Note: Societal factors are not included in this analysis.

For the purposes of this analysis, contraceptive decisionmaking is considered as an individual-level variable as while the process of making decisions is likely to involve others, the decision ultimately is experienced primarily by the individual.

The main covariates of interest for this analysis are the cluster-level gender and contraceptive norm variables, while the outcome is individual-level modern contraceptive use. In the sections below, measures are first described at the individual level, and then at the cluster level.

#### 2.2.1 Individual-level measures

#### Outcome

*Modern contraceptive use.* For both women and men, the outcome of interest was modern contraceptive use. The questions asked to determine this information were slightly different for women and men. While women were asked about whether they or their partner are currently doing something or using any method to delay or avoid getting pregnant, men were asked about what method they or their partner used the last time they had sex, and whether any method to avoid or prevent a pregnancy was used. Women's use can therefore be understood as general current use, while men's use is focused specifically on the last time they had sex.

In all three countries, a modern contraceptive method is defined as one of the following: male and female sterilization, injectables, intrauterine devices (IUDs), contraceptive pills, implants, female and male condoms, the standard days method, the lactational amenorrhea method (LAM), and emergency contraception. Nepal did not include female condom or standard days method as response options. Respondents who reported that they or their partner were using any one of these methods (or were using one the last time they had sex) were considered to be using modern contraception.

#### **Covariates of interest**

*Age.* Women age 15–29 were categorized as "younger," while women age 30–49 were categorized as older. Men age 15–34 were categorized as "younger" in each country, while men age 35–49 (in Nepal) and 35– 59 (Nigeria and Zambia) were categorized as "older," which reflected the upper age that men were interviewed in each country.

*Education.* A man's level of education was grouped into the following categories according to their highest education level completed: none, primary, and secondary or higher. Women's education is included in the calculation of the survey-based women's empowerment index (SWPER) social independence domain (see below), so was not included in the women's model as a covariate.

*Household wealth quintile.* The wealth quintile is a measure of relative household wealth. In the DHS, a household wealth index is calculated based on ownership of a range of assets and housing materials. Wealth quintiles are then calculated based on the distribution of the index across the de jure population in the country. Additional details on the construction of the household wealth index and quintiles are available in previous DHS publications (Rutstein 2008; Rutstein and Johnson 2004).

Number of children ever born. Number of children ever born was kept as a continuous variable.

*Family planning messaging.* Men and women were categorized as "exposed to family planning messaging" if they heard family planning messages in the last few months from any of the following media sources: TV, radio, paper, or mobile.

**Desire for children.** Women and men were asked about their future fertility intentions. Individuals were then grouped into one of two categories. First, those who indicated that they wanted no more children, wanted a child after 2 years, or were unsure about the timing, who had been sterilized or whose partner had been sterilized, or who were undecided about having another child were categorized as "not wanting

a(nother) child now." The second category identified those who indicated they wanted a(nother) child within the next 2 years. Those who self-reported as infecund were coded as missing.

*Ideal number of children.* Women and men were asked the number of children they would choose if they could choose the exact number of children to have in their whole life. This variable was coded 0–12, with anyone reporting that they wanted 12 or more children categorized as "12+".

*Contraceptive decisionmaking.* Women were asked about their participation in the decision to use (if currently using a method) or not to use (if not currently using a method) contraception. If they participated in contraceptive decisionmaking about use or non-use, either as sole decisionmaker or as a joint decisionmaker with husband, they were categorized as a "decisionmaker." If the main contraceptive use or non-use decisionmaker is the husband or someone else, women were categorized as "not a decisionmaker."

*Women's empowerment.* The domains of the SWPER Global were used as the measures of women's empowerment. The SWPER was developed using principal component analysis to identify three domains of women's empowerment and has been validated for LMICs (Ewerling et al. 2020). It has subsequently been applied in a variety of contexts and outcomes, including maternal health care, contraceptive use, and child vaccination. These three domains—attitude toward violence, social independence, and women's decisionmaking power—were constructed using the original author's publicly available Stata code.<sup>2</sup> The specific items included in each domain are described in Table 3. Each domain has a standardized score centered around 0, with 0 representing an average of level of empowerment relative to all women in the country's respective region (South Asia for Nepal, West and Central Africa for Nigeria, and Southern and Eastern Africa for Zambia), negative values representing below average levels, and positive values representing above-average levels. Community-level measures of each domain of the SWPER are the average domain score for women in the cluster. For a complete description of the each of the domains and their process of development, please refer to the Ewerling et al. 2020 paper.

<sup>&</sup>lt;sup>2</sup> Accessed Nov 24, 2021 at:

https://www.dropbox.com/sh/cw6e2th24l4ausa/AAC792VQx3CL7CuIdLwTxKiWa?dl=0. Calculations can be accessed at: https://jogh.org/documents/issue202002/jogh-10-020434-s001.pdf

#### Table 3 Items included in the SWPER domains

SWPER (1): Attitudes towards violence	This domain of empowerment includes all empowerment variables listed in this table but is most heavily weighted by five variables that represent women's attitude to violence. These include responses to the questions:
	<ul> <li>In your opinion, is a husband justified in hitting or beating his wife in the following situations: <ol> <li>If she goes out without telling him?</li> <li>If she neglects the children?</li> <li>If she argues with him?</li> <li>If she refuses to have sex with him?</li> <li>If she burns the food?</li> </ol> </li> <li>Responses are categorized as follows: <ul> <li>Justified= -1; don't know=0; not justified=1</li> </ul> </li> </ul>
SWPER (2): Social independence	<ul> <li>This domain of empowerment includes all empowerment variables listed in this table but is most heavily weighted by six variables that represent social independence. These variables are:</li> <li>1) Frequency of reading newspaper or magazine</li> <li>2) Woman's education in completed years of schooling</li> <li>3) Education difference (woman's minus husband's completed years of schooling)</li> <li>4) Age difference (woman's age minus husband's age)</li> <li>5) Age at first cohabitation</li> <li>6) Age of woman at first birth</li> </ul>
SWPER (3): Decisionmaking	<ul> <li>This domain of empowerment includes all empowerment variables listed in this table, but is most heavily weighted by three variables that represent women's role in household decisionmaking: <ol> <li>Who usually decides on respondent's health care?</li> <li>Who usually decides on large household purchases?</li> <li>Who usually decides on visits to family or relatives?</li> </ol> </li> <li>Responses are coded as follows: <ul> <li>joint decision or respondent alone (1) or husband or other (including family elder) alone (-1)</li> </ul> </li> </ul>

*Men's beliefs about contraceptives and promiscuity.* Men were also asked about their beliefs about contraception as it relates to gender. They were asked whether they agree or disagree that women who use contraception may become promiscuous. Community-level measures are the proportion of men in the cluster who believe that contraceptives make a woman more promiscuous.

#### 2.2.2 Community-level measures

The following are our main covariates of interest, representing collective gender and contraceptive norms. These community-level covariates are cluster-level aggregates of the individual-level variables described above. In the subanalyses comparing differential effects of age peer and nonpeer norms on modern contraceptive use, these measures are calculated by age, i.e., among women 15–29, 30–49, and then among men 15–34, and 35–49 in Nepal and 35–59 on Nigeria and Zambia.

*Ideal number of children.* The community-level measure is the average ideal number of children desired by women or men in the cluster.

*Contraceptive decisionmaking.* The community-level measure of contraceptive decisionmaking is the proportion of women in the cluster who report making decisions about contraception themselves or jointly with their husband.

*Women's empowerment.* Community-level measures of each domain of the SWPER are the average domain score for women in the cluster.

*Men's beliefs about contraceptives and promiscuity*. The community-level measure is the proportion of men in the cluster who believe that contraceptives make a woman more promiscuous.

Other community-level covariates only included at the cluster level were:

**Distance as a problem accessing care.** A dummy variable was created to designate a cluster as having problems accessing care if over 50% of women interviewed in the cluster reported that distance to a health facility was a barrier in accessing health care.

*Residence.* Each cluster/primary sampling unit is a priori classified as being a primarily urban area or a primarily rural area based on the country's statistical office classification at the time of the survey.

*Men's education.* Mean years of men's education was included as a community-level covariate. Women's education was not included as a community-level covariate due to its inclusion in the SWPER.

#### 2.3 Methods

#### 2.3.1 Descriptive analysis

We estimated the prevalence of modern contraceptive use among men and women for each country, followed by cross-tabulations of men's, women's, and community-level characteristics according to their modern contraceptive use status. Differences in the distributions were assessed using chi-squared tests. Differences in means of continuous variables were assessed using *t*-tests.

#### 2.3.2 Regression analysis

We conducted multilevel, multivariable logistic regression to examine the relationships between modern contraceptive used and community-level gender and family planning norms for men and women.

These models were built sequentially, with each using the *melogit* command in Stata with the cluster as the grouping structure and *svyset* multilevel weights. First, an empty model (model 0) was constructed which included no covariates and allowed us to estimate the intraclass correlation coefficient (ICC) of modern contraceptive use overall. The next model (model 1) included only the individual-level factors described earlier. The subsequent model (model 2) included only the community-level factors.

The full model (model 3) included covariates for all individual- and community-level factors, including the individual-level values for the community-level aggregate covariates of primary interest in this study. This approach of including both individual- and community-level variables is recommended when trying to estimate the contextual, or community-level, effect of a covariate while controlling for the individual-level effect of that same covariate (Enders and Tofighi 2007), although there is the risk of collinearity between individual- and community-level variables. Collinearity among the individual- and community-level variables was assessed and none of the variables had a variance inflation factor (VIF) over 5. Individual-level covariates were not centered to allow for calculation of directly interpretable regression coefficients (Begg and Parides 2003). Community-level covariates constructed from individual-level variables—all except place of residence and whether distance to a health facility was a barrier—were standardized to have a mean of 0 and standard deviation (SD) of 1 within each country for ease of interpretation. The set of

covariates included in the full model for men was slightly different than those included in the full model for women (See Table 4).

	Included mod		
	Women	Men	- Reason for omission
Community-level variables			
Urban	х	х	
Distance to health facility is a barrier	х	х	
Ideal number of children (community mean)	х	х	
Proportion of women in the community involved in making contraceptive decisions	х	х	
SWPER - attitude toward domestic violence (community mean)	х	х	
SWPER - social independence (community mean)	х	х	
SWPER - household decisionmaking (community mean)	х	х	
Men's education (community mean)	х	х	
Proportion of men in the community who believe FP makes women more promiscuous	x	х	
ndividual-level variables			
Younger age	х	х	
Education		х	Woman's education level included in SWPER
Wealth index	х	х	
Parity	х	х	
Exposed to any FP message	х	х	
Ideal number of children	х	х	
Desire for children	х	х	
Involved in contraceptive decisionmaking	х		Data not available, only women asked this question
SWPER - attitude toward domestic violence	х		SWPER calculated using information from women only
SWPER - social independence	x		SWPER calculated using information from women only
SWPER - household decisionmaking	х		SWPER calculated using information from womer only
Believes FP makes women more promiscuous		х	Data not available, only men asked this question

#### Table 4 Variables included in women's and men's full models

We report the community-level random effect for each model, which indicates variation at the community level due to unobserved covariates.

The ICC of each model was calculated using the formula:

$$ICC = \frac{var_{Grouplevel}}{(var_{Grouplevel} + var_{Individuallevel})}$$

where  $var_{Grouplevel}$  is the variance of the community-level random intercept and  $var_{Individuallevel}$  is the within-subject variance. The ICC represents the proportion of the variance explained by the grouping structure in the population. In addition, the proportional reduction in unexplained variance (PRV) statistic was also calculated for each of the models with predictors using the following formula (Peugh 2010; Raudenbush and Bryk 2002):

$$PRV = \frac{(var_{NoPredictors} - var_{Predictors})}{var_{NoPredictors}}$$

We calculated the PRV for the community level using the random effect variance from a model with no predictors and the subsequent models with predictors. Therefore, our PRV represents the reduction in community-level variation when predictors are added.

All multilevel models applied methods for estimating cluster weights using DHS data sets (Elkasabi, Ren, and Pullum 2020). Elksabi and colleagues recently developed an approach to allow for Level 2/community weights when conducting multilevel analyses with DHS data and demonstrated that omitting these weights may lead to an underestimate of the variation between Level 2 units. This suggests that the findings of these prior studies may be biased in ways that lead to incorrect interpretations of the effect of norms on behavior.

As mentioned in the background section, the norms within specific reference groups and the influence of norms from different reference groups on an individual may differ. For example, some recent research has examined the differential effects of norms within peer and non-peer groups on contraceptive use. These differential effects have been observed in Malawi as well as in cross-country research (Bhushan et al. 2021; Mejía-Guevara et al. 2020). In order to explore potential differential associations of reference group norms on modern contraceptive use, in addition to the national-level models for men and women, we also conducted multilevel, multivariable logistic regression for younger and older women, as well as for women by region or province in Nepal and Nigeria. In Zambia, we conducted these subgroup analyses for men as well as for women. In Nepal, the men's survey was only conducted in one-half, and in Nigeria one-third of the sample households. This meant that in these countries, the men's sample size was very small. For our analysis, the number of individuals per cluster, and therefore the number of individuals contributing to our measures of collective norms, would be very low, which could lead to biased estimates (Schunck 2016). As a result, the subgroup analyses are conducted only for Zambia. As described earlier, women age 15–29 were categorized as younger, and women age 30–49 were categorized as older, while in Zambia, men age 15–34 were categorized as younger, while men age 35-59 were categorized as older. Prior to conducting these analyses, multicollinearity of the younger and older group collective norms was assessed and all VIFs were less than 5.

Sensitivity analyses were conducted, limiting the analysis to respondents living in clusters with at least 10 individuals, for women only in Nepal and Nigeria, and for men and women in Zambia due to the men's sample sizes discussed previously. Limiting the sample in this way did not change the findings substantively.

All analysis was conducted using Stata 17.

### 3 **RESULTS**

The results are organized into four sections. The first section presents the main results, including the descriptive findings and the multivariable logistic regression results for all men and women. The second section presents the secondary results, including the findings of the multivariable logistic regressions for women (and men where applicable) by age group and region. The third section summarizes all the findings within a country. Within each section, results are presented by country. The final section presents the cross-cutting findings.

#### 3.1 Main Results

#### 3.1.1 Nepal

Just under half (45%) of in-union nonpregnant women in Nepal use a modern contraceptive method with moderate variation by province (Figure 2a). Modern contraceptive use ranged from 39% in Province 4 to 52% in Province 2. Higher modern contraceptive use was reported by Nepali men with approximately 58% of in-union men who reported using a modern method (Figure 2b). This ranged from 53% in Province 1 to 71% in Province 7.

#### Figure 2 Maps of modern contraceptive use by province in Nepal for men and women





In Appendix Table 1, we present cross-tabulations of modern contraceptive use among women and men by individual- and community-level characteristics and their bivariate association with modern contraceptive use. In Nepal, for both women and men, modern contraceptive use differed by age, education, number of children ever born, and desire for children. Modern contraceptive use also differed by contraceptive decisionmaking among women with higher percentage of use who are decisionmakers. We also observe a slight difference in modern contraceptive use among men by exposure to family planning messages with higher use among men who were exposed to these messages, but this was not significantly different for women. Modern contraceptive use also differed by the individual-level SWPER domains for social independence and decisionmaking among women. None of the community-level variables were significantly associated with modern contraceptive use for both women and men, except for a slight difference in the mean ideal number of children among women, where the community average number of ideal children among female non-users of modern contraception was higher than among users of modern contraception.

#### Modern contraceptive use among women-multilevel logistic regression results

In Nepal, in Model 1 which included only individual-level variables, age, number of children ever born, exposure to family planning messages, desire for children, contraceptive decisionmaking, and the SWPER domains for attitude towards violence and social independence were significantly associated with modern contraceptive use (see Table 5, Model 1). For the model that only includes community-level variables (Table 5, Model 2), only the average ideal number of children and the community-level SWPER domain on social independence were significantly associated with modern contraceptive use.

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		Wc	Women			Men	u	
	Model 0: Null model	Model 1: Individual-level covariates only	Model 2: Community-level covariates only	Model 3: Full model	Model 0: Null model	Model 1: Individual- level covariates only	Model 2: Community-level / covariates only	Model 3: Full model
Collective norms (community level) OR (95% Cl) Urban ( <i>Ref: Rural</i> ) Distance to health facility is barrier ( <i>Ref: Not a barrier</i> ) OR per 1 SD increase (95% Cl) Average ideal number of children % women involved in contraceptive decisions Average SWPER action independence Average SWPER decisionmaking Average SWPER decisionmaking Average years men's education % men believe FP makes women more promiscuous			1.2 [1.0-1.4] 1.1 [1.0-1.5] 0.8** [0.7-0.9] 1.1 [1.0-1.2] 1.0 [0.9-1.1] 0.9* [0.8-1.0] 1.1 [1.0-1.2] 1.0 [0.9-1.1] 1.0 [0.9-1.1]	1.2 [1.0-1.5] 1.3 [1.0-1.5] 0.8** [0.7-0.9] 0.3 [0.9-1.0] 0.9 [0.9-1.1] 1.1 [0.9-1.2] 0.9 [0.9-1.1] 0.9 [0.9-1.1] 0.9 [0.9-1.1]			1.3 [0.9-2.0] 1.2 [0.7-2.0] 1.1 [0.9-2.0] 1.1 [0.9-1.4] 0.8 [0.6-1.0] 0.8 [0.6-1.0] 0.8 [0.7-1.1] 0.8-1.2] 0.8-1.2]	1.4 [0.9–2.1] 1.2 [0.7–2.2] 0.9 [0.7–1.2] 1.3 [10–1.4] 1.3 [0.9–1.4] 0.8 [0.6–1.1] 0.9 [0.7–1.1] 0.9 [0.7–1.1] 0.9 [0.7–1.1]
Individual-level variables OR (95% CI) Younger age (Ref: Older age) Primary education (Ref: No education) Second Wealth Quintile (Ref: Lowest) Primary education (Ref: No education) Second Wealth Quintile (Ref: Lowest) Highest Wealth Quintile (Ref: Lowest) Second Wealth Quintile (Ref: Lowest) Highest Wealth Quintile (Ref: Lowest) Highest Wealth Quintile (Ref: Lowest) Kef: Not any FP makes women more promiscuous (Ref: Not any Phenese		0.5**     [0.4-0.6]       1.1     [0.9-1.3]       1.1     [0.9-1.3]       1.1     [0.9-1.3]       1.1     [0.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       0.1     [0.1-0.1]       0.8**     [0.7-0.8]       0.9     [0.9-1.0]		0.5**     [0.4-0.6]       1.1     [0.9-1.3]       1.1     [0.9-1.3]       1.1     [0.9-1.3]       1.1     [0.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [0.9-1.3]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.2]       1.1     [1.1-1.6]       1.1     [1.1-1.6]       1.1     [1.1-1.6]       0.1     [0.1-0.1]       0.8**     [0.7-0.8]       0.9     [0.9-1.0]		0.6* [0.5-0.9] 1.2 [0.7-2.1] 1.0 [0.6-1.6] 1.1 [0.7-2.1] 1.2 [0.7-1.7] 1.3 [0.8-2.3] 1.3 [0.8-2.3] 1.4 [0.7-2.9] 1.3 [0.9-1.7] 0.1** [0.0-0.1] 0.1** [0.5-1.0]		0.7* [0.5-0.9] 1.2 [0.7-2.1] 1.1 [0.7-1.7] 1.1 [0.7-1.7] 1.2** [0.7-1.9] 1.3 [0.8-2.4] 1.3 [0.8-2.4] 1.2** [1.1-1.4] 1.2** [0.9-0.1] 0.1** [0.0-0.1] 0.7* [0.5-1.0]
Random effect	1.6** [1.4–1.8]	1.8** [1.6–2.1]	1.5** [1.4–1.7]	1.7** [1.5–1.9]	6.8** [3.6–12.6]	11.9** [5.3–27.0] 5.5**	[3.2–9.5]	9.3** [4.5–19.0]
Observations	9,370	9,069	9,370	6,069	2,520	2,405	2,520	2,405
Number of groups	383	383	383	383	383	383	383	383
ICC PRV	0.128	0.153 -0.125	0.115 0.063	0.138 -0.062	0.367	0.430 -0.750	0.341	0.404 -0 368
* Significant at $p < .05$ ; ** significant at $p < .01$		0	0	4			5	00000

OR = odds ratio SD = standard deviation CI = confidence interval FP = family planning ICC = Intra-dass correlation PRV = Proportional reduction in variance

In the full model (Model 3), which includes the individual and the community-level variables, we find that of the community-level factors, only the average ideal number of children retained its significance (see Figure 3). A 1 SD increase in women's average ideal number of children was associated with a 20% decrease in the odds of using modern contraception (aOR = 0.8; 95% CI: 0.7-0.9). All individual-level variables that were significant in Model 1 retained their significance in the full model.



### Figure 3 Multilevel regression results of Model 3 for men and women's modern contraceptive use, Nepal, community variables only

Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; SWPER = survey-based women's empowerment index; HH = household; SD = standard deviation

Table 5 shows the ICC of Model 0, which indicates that before accounting for any individual or community characteristics, 13% of the variation in modern contraceptive use among women can be attributed to differences between communities. After adjusting for individual- and community-level covariates, the ICC for modern contraceptive use among women in Model 3 increased slightly to 14%. The PRV for the full model is -6.2%, which indicates that the variance increased after adding community- and individual-level predictors.

#### Modern contraceptive use among men-multilevel logistic regression results

Table 5 and Figure 3 also summarize the regression results among men in Nepal. At the individual level, age, parity, and desire for children were significantly associated with modern contraceptive use. At the community level, only the SWPER domain of attitude towards domestic violence was significant; a 1 SD increase was associated with a 20% increase in the odds of modern contraceptive use in men or their partner (aOR = 1.2; 95% CI: 1.0-1.5). This significance was retained in the full model as well and with a slightly

higher odds ratio (aOR = 1.3; 95% CI: 1.0-1.7). In addition, the individual-level covariates that were significant in the individual-level model retained their significance in the full model.

Before accounting for any individual or community characteristics, 37% of the variation in modern contraceptive use can be attributed to differences in communities. After adjusting for individual- and community-level covariates, this increased to 40%. The PRV for the full model is -36.8%, which indicates that the variance increased after adding community- and individual-level predictors.

#### 3.1.2 Nigeria

Only one in seven (14%) of in union nonpregnant women in Nigeria use a modern contraceptive method, although this varies by region (Figure 4a). Modern contraceptive use ranged from 8% in the North West to 27% in the South West. Nigerian men reported lower overall levels of use of modern contraception than women, with approximately 12% of in union men reporting use of a modern method (Figure 4b). Use of modern contraception was lowest in the North West (5%) and highest in the South South (20%) regions. With the exception of the North Central region, where levels of use of modern contraception were relatively high, use among both men and women in the southern regions of modern contraceptive methods was higher in southern regions than in northern regions.



Figure 4 Map of modern contraceptive use by state in Nigeria for men and women



Appendix Table 1 presents the bivariate associations between modern contraceptive use among men and women in Nigeria and a range of individual- and community-level characteristics. As in Nepal, modern contraceptive use was associated with a range of individual-level factors for both men and women. For both groups, modern method use was significantly associated statistically with age, education, number of children ever born, having been exposed to family planning messaging, and desire for children. For women only, modern method use was also associated with each of the SWPER domains (attitudes to violence, social independence, and household decisionmaking) as well as whether or not a woman was involved in contraceptive decisionmaking.

In contrast to Nepal, a number of community-level variables were also associated with modern contraceptive use in Nigeria. For both men and women, place of residence, ease of access to care, the mean ideal number of children, mean proportion of women who were involved in contraceptive decisionmaking, and each of the SWPER measures (mean attitudes to violence, social independence score, and women's decisionmaking scores) were statistically significantly associated with using a modern method. Mean community agreement (among men) that contraception makes women promiscuous was also associated with modern method use, although only for women.

#### Modern contraceptive use among women-multilevel logistic regression results

In Model 1, which included only individual-level variables, many of the covariates were statistically significantly associated with women's modern contraceptive use in Nigeria (see Table 6). This included age, household wealth, parity, exposure to family planning messages, ideal number of children, desire for additional children, contraceptive decisionmaking and each of the SWPER domains .Similarly, in Model 2, the majority of the community-level variables were also statistically significantly associated with use of modern methods, with the only exceptions being the mean value of the SWPER domain of social independence and the proportion of men in the community who agree that use of family planning makes women more promiscuous.

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	Model 0: Null model	Model 1: Individual-level covariates only	Model 2: el Community-level y covariates only	2: /-level only	Model 3: Full model	Model 0: Null model	Model 1: Individual-level covariates only	Model 2: Community-level covariates only		Model 3: Full model
Collective norms (community level) OR (95% CI) Urban ( <i>Ref: Rural</i> )			1.3** [1.1- 0.7** [0.6	[1.1–1.5] 1.1 D.6.001 0.0**	* [1.0–1.3]			0.9 [0.7–1.2] 0.0 [0.7–1.2]	0.9	[0.7-1.2]
Distance to neaturi facility is ballier (Rev. Not a barrier) OR per 1 SD increase (95% CI)								•	0. 1	[0.1–1.0]
Average ideal number of children % women involved in contraceptive decisions Average SWPER attitude to violence				[0.7–0.8] 0.8 [1.2–1.4] 1.2* [1.2–1.4] 1.2* [0.0 1 1] 1.2*	* * [0./-0.9]			0.6 <sup>55</sup> [0.5-0.8] 1.1 [1.0-1.3] 1.0 [0.8-1.1] 1.0 [0.6 1.1]	, 1.1 2 2 1 0 1 1 0 1 1 0 1 1 0 1 0 1 1 0 1 0	[0.9–0.9] [0.9–1.2] [0.8–1.1]
Average SWTER social invependence Average SWTER decisionmaking Average years man's education % men believe FP makes women more promiscuous			1.2** [1.3* 1.5** [1.1- 1.0 [1.0	[0.0-1.1] 0.3 [1.1-1.3] 1.1 [1.3 - 1.6] 1.4** [1.0-1.1] 1.0				1.0 [0.0-1.2] 1.2* [1.0-1.4] 2.2** [1.8-2.6] 1.2** [1.1-1.4]	1.7	[1:0-1:2] [1:0-1:3] [1:3-2:2] [1:0-1:4]
Individual-level variables										
Younger age (Ref: Older age) Primary education (Ref: Ov education)		1.2* [1.0–1.5]		1.3**	* [1.1–1.5]				1.3* 1.4	[1.0–1.7] [0.7–2.5]
Secondary+ education ( <i>Ref: No education)</i> Second Wealth Quintile ( <i>Ref: Lowest</i> ) Middle Wealth Quintile ( <i>Ref: Lowest</i> )		1.4** [1.1–1.8] 2.4** [1.9–3.1]		1.2	* [0.9–1.5] * [1.3–2.1]				2.3 1.0 1.0	[1.3-4.3] [0.8-2.2] [0.6-1.7]
C Fourth Wealth Quintile (Ref: Lowest) D Highest Wealth Quintile (Ref: Lowest)				2.1** 2.3**			1.5 [0.9–2.5] 1.6 [0.9–2.8]		0.0 0.0	[0.5–1.6] [0.5–1.7]
Exposed to any FP message ( <i>Ref: Not exposed</i> )		1.1 [1.0-1.1] 1.2* [1.0-1.4] 0.9** [0.9-0.9]		1.2*					1.0, *10.	[1.0-1.0] [1.0-1.8] [0.9-1.0]
Wants a/nother child soon (Ref: Does not want another child soon)		0.3** [0.3–0.4]		0.3**	* [0.3–0.4]		0.5** [0.4–0.7]		0.5**	[0.4–0.7]
Worldan involved in contraceptive decisioning (Ref. Not involved) SWPER attitude to violence SWPER social independence SWPER decisionmation		1.5** [1.2–1.8] 1.2** [1.1–1.3] 1.1* [1.0–1.1] 1.1** [1.1–1.2]		1.1.4**	* [1.1–1.7] [1.0–1.2] [1.0–1.1]					
Believes FP makes women Ref: Does not believe) (Ref: Does not believe)				:	-		1.1 [0.9–1.4]		1.0	[0.8–1.3]
Random effect	6.4** [5.2–8.0]	2.4** [2.1–2.7]	2.2**	[2.0–2.4] 2.2**	* [1.9–2.5]	12.3** [7.6–20.1]	4.6** [3.1–6.8]	4.3** [3.0–6.2]	4.5**	[3.0-6.6]
Observations	24,822	22,888	24,574	74	22,666	6,810	6,079	6,783	ġ	6,079
Number of groups	1,389	1,389	1,369	39	1,369	1,372	1,352	1,358	<b>–</b>	1,352
100	0.361	0.208	0.192	2	0.192	0.433	0.318	0.308	0	0.313
PRV		0.625	0.656	.9	0.656		0.626	0.650	0.(	0.634
* Significant at $\rho < .05$ ; ** significant at $\rho < .01$ OR = odds ratio SD = standard deviation										

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CI = confidence interval FP = family planning ICC = intra-class correlation PRV = proportional reduction in variance
In the full model, Model 3, where both individual- and community-level variables are included, we find a similar pattern, both in terms of statistical significance and the direction and magnitude of the association, as in the separate individual- and community-level models, with a few notable exceptions. Of the community-level variables, all except for urbanicity, the average value of the SWPER measures for social independence and decisionmaking and the proportion of men in the community agreeing that use of family planning made women more promiscuous, were statistically significant (see Figure 5). Of the individual-level variables, all except for one of the household wealth categories (second wealth quintile) and the SWPER social independence measure retained their significance.





Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; SWPER = survey-based women's empowerment index; HH = household; SD = standard deviation

As shown in Table 6, the models suggest that 36% of the variation in modern contraceptive use can be attributed to individual or community differences, before accounting for specific individual or community characteristics. After adjusting for both individual- and community-level covariates, this declines to 19%, which suggests that the included covariates explain much of the differences observed between communities.

#### Modern contraceptive use among men-multilevel logistic regression results

Table 6 also summarizes the regression results among men in Nigeria. In the full model, the association with modern contraceptive use was statistically significant for three individual-level variables: education (specifically having a secondary or higher education compared to no education), exposure to family planning messages, and desire for children. At the community level, three measures were also associated with men's use of modern methods of contraception. A 1 SD increase in the ideal number of children in the

community was associated with a 30% (aOR = 0.7; 95% CI: 0.5–0.9) reduction in the odds of using a modern method. In contrast, a 1 SD increase in the average years of men's education in the community was associated with a 70% increase in the odds (aOR= 1.7; 95% CI: 1.3–2.2) of using a modern method. Interestingly, a one SD increase in the proportion of men who agreed that use of family planning made women more promiscuous was associated with 20% *higher* odds (aOR = 1.2; 95% CI: 1.0–1.4) of using modern contraception for men.

Before accounting for any individual or community characteristics, 43% of the observed variation in men's use of modern contraception can be attributed to differences between communities. After adjusting for both individual and community characteristics, this decreased to 31%, which suggested that the covariates explain a significant proportion of the differences between communities. Overall, the proportion of modern contraceptive use attributed to differences between communities is higher for men than women in Nigeria, possibly implying that community-level factors may be more influential for men. The PRV is over 60% for the full model, which indicates that the addition of the individual- and community-level predictors reduces the community-level variance by over 60%.

#### 3.1.3 Zambia

Just over half (54%) of in union nonpregnant women in Zambia use a modern contraceptive method (Figure 6a). This ranged from 34% in Western Province to 61% in Eastern Province. Among men there was a lower (51%) reporting of use of a modern method of contraception, ranging from 30% in Northern Province to 64% in Eastern Province 7 (Figure 6b).

Figure 6 Map of modern contraceptive use by province in Zambia for men and women



(a) Women



In Zambia, users and non-users of modern contraception, both men and women, differ by age, wealth quintile, education, number of children ever born, family planning message exposure, ideal number of children, and desire for another child (Appendix Table 1). Among women, users and non-users of modern contraception differ by contraceptive decisionmaking. Women living in urban clusters and clusters where access to health care is not a barrier were more likely to use modern contraceptives.

#### Modern contraceptive use among women-multilevel logistic regression results

Among women in Zambia, at the individual level, age, wealth, ideal number of children, desire for children, contraceptive decisionmaking, as well as the SWPER decisionmaking domain, were all significantly associated with modern contraceptive use (see Table 7). When looking only at community-level variables, distance being a barrier to health care, women's average ideal number of children, SWPER social independence, and decisionmaking domains were all significantly associated with modern contraceptive use.

Collective norms (community level)		Wor	Women				2	Men			
Collective norms (community level)	Model 0: Null model	Model 1: Individual-level covariates only	Model 2: Community-level covariates only	l 2: ty-level s only	Model 3: Full model	Model 0: Null model	Model 1: Individual-level covariates only	Model 2: el Community- level ly covariates only	2: - level only	Model 3: Full model	l 3: odel
Urban ( <i>Ref: Rural</i> ) Urban ( <i>Ref: Rural</i> ) Distance to health facility is barrier ( <i>Ref: Not a barrier</i> )			1.0 0.8* [0.	[0.9–1.3] 1. [0.6–1.0] 0.	1.0 [0.9–1.1] 0.8* [0.6–1.0]			-7.0] 0.9 -6.0]	[0.7–1.1] 0.7* [0.6–1.1] 0.9		[0.5–0.9] [0.7–1.1]
OR per 1 SD increase (95% CI) Average ideal number of children % women involved in contraceptive decisions Average SWPER attitude to violence Average SWPER social independence Average SWPER decisionmaking Average veans men's education			**************************************	[0.7-0.9] [0.9-1.0] [1.0-1.2] [0.7-0.3] [1.0-1.2] [0.9-1.2] [1.0-1	0.8** 0.9** 1.2** 0.9-1.3] 0.9-1.3] 0.9-1.2] 0.9-1.2] 0.9-1.2] 0.9-1.2] 0.9-1.2]			0.8** [0.7–0.9 1.0 [0.9–1.7 1.3** [1.2–1.4 0.8** [0.7–0.9 0.8** [0.7–0.9 0.8** [1.2–4]	$ \begin{bmatrix} 0.7 - 0.9 \\ 0.9 - 1.1 \\ 1.2 - 1.5 \\ 1.2 - 1.5 \\ 1.3^{*} \\ 0.7 - 0.9 \\ 0.8^{*} \\ 0.1 - 0.9 \\ 0.8^{*} \\ 1.1 - 1.1 \\ 1.1 - 1.4 \\ 1.1 \\ 1.1 \end{bmatrix} $		[0.7-1.0] [0.9-1.1] [1.2-1.5] [0.7-1.0] [0.9-1.3] [0.9-1.3]
ventert betrevent in makes wontert more promiscuous Individual-level variables OR (95% CI) Youngen age (Ref: Older age) Primarv education (Ref: Older age)		1.7** [1.4–2.1]				-	1.9** [1.5–2.4] 0.7 [0.5–1.0]	3			[1.4–2.3] [0.5–1.1]
52 Middle Wealth Quintile (Ref: No education) Second Wealth Quintile (Ref: Lowest) Middle Wealth Quintile (Ref: Lowest) Fourth Wealth Quintile (Ref: Lowest) Highest Wealth Quintile (Ref: Lowest)		1.2 [1.0–1.5] 1.4** [1.1–1.8] 1.6** [1.2–2.1] 1.4 [1.0–1.1]		~~~~~	1.2 [1.0–1.5] 1.4* [1.1–1.8] 1.4* [1.1–1.8] 1.4* [0.8–1.8] 1.2 [0.8–1.8]		1.0 [0.7–1.4] 1.2 [0.9–1.4] 1.4* [1.1–1.9] 1.6* [1.1–2.2] 1.9** [1.3–2.7] 1.3* [1.3–2.7]		5.0* 5.0* 7.0* 7.0* 7.0*		[0.7–1.5] [0.9–1.5] [1.1–2.0] [1.1–2.4] [1.3–3.0]
rany Exposed to any FP message ( <i>Ref: Not exposed</i> ) Ideal number of children Wants s/nother child soon <i>(Ref: Does not want another child</i>									- <del>1</del>		[1.1–1.7] [0.9–1.0]
soon) Soon) Woman involved in contracentive decisionmaking		0.2** [0.2–0.3]		0	0.2** [0.2–0.3]	1	0.5** [0.4–0.6]		0.5**		[0.4–0.6]
(Ref. Not involved) SWPER attitude to violence SWPER social independence SWPER decisionnaking		1.7**         [1.4-2.1]           1.0         [0.9-1.0]           1.1         [1.0-1.2]           1.1*         [1.0-1.2]		~~~~	1.7** [1.4–2.1] 1 [0.9–1.0] 1.1 [1.0–1.2] 1.1* [1.0–1.2]						
California intervention intervention profiliosouches (Ref. Does not believe)											[0.8–1.2]
Random effect	2.2** [1.8–2.7] 6 241	2.2** [1.8–2.7] 5.682	1.9** [1.	[1.7-2.2] 2. 6.241	2.0** [1.7–2.4] 5.683	l] 3.3** [2.6–4.2] 5.304	3.6** [2.8–4.7] 5.051	] 2.7** [2.2–3.3] Балл	-3.3] 3.0**	L.	[2.3–3.8] ne1
Observations Number of groups	0,241 507	0,000 507	Ó	507	507 507	507 507	507	507		507	
ICC	0.195	0.196	0.	0.166	0.177	0.267	0.280	0.232		0.249	
PRV		0.000	.0	0.136	0.091		-0.091	0.182		0.091	
* Significant at <i>p</i> < .05; ** significant at <i>p</i> < .01 OR = odds ratio SD = standard deviation CI = confidence interval FP = family planning ICC = intra-class correlation											

Association of community norms and individual use of modern contraception using multilevel logistic regression for women and men, Zambia

Table 7

In the full model, accounting for both individual- and community-level characteristics, among the covariates of interest, most of the community covariates that were significant in the community-only model sustained their significance. A 1 SD increase in the cluster-level proportion of women reporting distance as a barrier was associated with 10% decreased odds of using modern contraception (aOR = 0.9; 95% CI: 0.8–1.0) and a 1 SD increase in women's average ideal number of children was associated with a 20% decrease (aOR = 0.8; 95% CI: 0.7–1.0). Among the collective-level SWPER domains, both the attitude towards domestic violence and the social independence domains were significantly associated with modern contraceptive use, but in the opposite directions. Attitude towards domestic violence was positively associated with modern contraceptive use (aOR = 1.2; 95% CI: 1.0–1.3), while social independence had a negative association (aOR = 0.9; 95% CI: 0.8–1.0). Adjusted odds ratios for the community-level variables of interest are shown in Figure 7.

#### Figure 7 Multilevel regression results of Model 3 for men and women's modern contraceptive use, Zambia, community variables only



Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; SWPER = survey-based women's empowerment index; HH = household; SD = standard deviation

Before accounting for any individual or community characteristics, 20% of the variation in modern contraceptive use can be attributed to differences in communities. After adjusting for individual- and community-level covariates, this decreased slightly to 18%. The full model (Model 3) reduced the community-level variance by 9.1% from the null model.

#### Modern contraceptive use among men-multilevel logistic regression results

Among men in Zambia, at the individual level, age, wealth, parity, exposure to family planning messages, ideal number of children, and desire for children were all significantly associated with modern contraceptive

use (Table 6, Model 1). When looking only at community-level variables, community-level average men's ideal number of children and community-level average SWPER social independence and decisionmaking domains were negatively associated with modern contraceptive use. Community-level average SWPER attitude towards domestic violence and average years of men's education were both significantly positively associated with modern contraceptive use.

After accounting for both individual- and community-level characteristics (see Table 6, Model 3), the full model shows that living in an urban area (aOR = 0.8; 95% CI: 0.7–1.0), community-level average men's ideal number of children (aOR = 0.9; 95% CI: 0.7–1.0), and two of the three community-level average SWPER domains (social independence (aOR = 0.8; 95% CI: 0.7–1.0); and decisionmaking (aOR = 0.8; 95% CI: 0.7–0.9) were negatively significantly associated with men's modern contraceptive use in Zambia. An increase of 1 SD in the community-level average SWPER attitude towards domestic violence domain was associated with a 30% increase in men's modern contraceptive use (aOR = 1.3; 95% CI: 1.2–1.5).

Before accounting for any individual or community characteristics (see Table 6, Model 0), 27% of the variation in men's modern contraceptive use can be attributed to differences in communities. After adjusting for individual- and community-level covariates, this decreased slightly to 25%. The PRV from the full model (Model 3) was 9.1%, the same as for women.

### 3.2 Secondary Results

#### 3.2.1 Nepal

Appendix Table 2 and Figure 8 summarize the multilevel regression tables for women in Nepal, grouped into younger and older ages.

While urbanicity was not significant in the full model as shown in Table 5, it was significant among younger women with 20% higher odds of modern contraceptive use among young women living in urban clusters compared to rural. Men's education had significant effects on younger women's modern contraceptive use: a 1 SD increase in younger men's education was associated with a 10% decrease in the odds of modern contraceptive use among younger women decreased by 20% with a 20% increase. The odds of modern contraceptive use for younger women decreased by 20% with a 1 SD increase in older women's community level average SWPER on decisionmaking (aOR = 0.8; 95% CI: 0.7-1.0). Finally, a 1 SD increase in the average of older men who believe that family planning makes a woman more promiscuous is associated with 20% higher odds of modern contraceptive use among younger women (aOR = 1.2; 95% CI: 1.0-1.3).

# Figure 8 Multilevel regression results of modern contraceptive use for younger (age 15–29) and older (age 30–49) women, Nepal, community variables only



Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase FP = family planning; HH = household; SD = standard deviation

Among older women, we find that living in a cluster where distance is a barrier to health care was significantly positively associated with modern contraceptive use. While we found lower odds of modern contraceptive use among young women with an increase in the average SWPER score in household decisionmaking among the older age group, this showed higher odds of contraceptive use among older women and the average SWPER score in household decisionmaking in the younger age group (aOR = 1.2; 95% CI: 1.0-1.4). We also observe this inverse relationship, where changes in the norm among the nonpeer group have an effect, when looking at the proportion of men who believe that family planning makes a woman more promiscuous. A 1 SD increase in the average of younger men who believe that family planning makes a woman more promiscuous is associated with 20% lower odds of modern contraceptive use among older women (aOR = 0.8; 95% CI: 0.7-0.9). Finally, 1 SD increase in the average SWPER score on social independence among older women is associated with 20% lower odds of modern contraceptive use among older women is associated with 20% lower odds of modern contraceptive use among their peers (aOR = 0.8; 95% CI: 0.7-1.0).

Appendix 3 shows the associations of the different collective norm variables over the seven provinces in Nepal. The most consistent association is seen in the community-level average ideal number of children, which was negatively associated with women's modern contraceptive use in four provinces. Community average SWPER score for social independence was significantly negatively associated with modern contraceptive use in two provinces. Finally, the community proportion of men who believe that family planning makes a woman more promiscuous was significantly and negatively associated with women's modern contraceptive use in two provinces.

As described in the methods section, since Nepal only sampled a subset of men in the survey, the regressions by age groups and province among men were not fit.

#### 3.2.2 Nigeria

Appendix 4 and Figure 9 summarize the multilevel regression tables for women in Nigeria, grouped into older (30–49) and younger (15–29) ages. Among the younger women, only two of the community-level variables included in the models were associated with modern contraceptive use to a statistically significant degree. For this group, distance being a barrier to accessing health care in the cluster is associated with a 20% decline in the odds of using modern contraception (aOR = 0.8; 95% CI: 0.7–1.0), while a 1 SD increase in the mean ideal number of children among other young women was associated with a 30% decline (aOR = 0.7; 95% CI: 0.5–0.9). Modern contraceptive use among young women was not associated with any of the covariates measured among older women, including ideal family size. As was the case for all women, a number of individual-level covariates were associated with modern contraceptive method use, including wealth, parity, and desire for additional children.

# Figure 9 Multilevel regression results of modern contraceptive use for younger (age 15–29) and older (age 30–49) women, Nigeria, community variables only



Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; HH = household; SD = standard deviation

Among older women (age 30–49), we find that modern contraceptive use is associated with the average years of men's education among the younger age group and with the average SWPER score for attitudes towards violence among their peers. These effects are quite large—an increase by 1 SD in either younger men's education (aOR = 1.3; 95% CI: 1.1-1.5) or the SWPER measure of attitudes towards violence (aOR = 1.3; 95% CI: 1.1-1.7) is associated with 30% higher odds of modern method use. At the individual level,

modern contraceptive use was associated with household wealth (although the effect of this appears to be concentrated in the differences between the poorest and richer/richest groups), whether the woman had been exposed to family planning messages, her ideal number of children, and her desire for additional children.

Appendix 5 shows the associations of the different collective norm variables with modern contraceptive use over the six regions of Nigeria. There is a great deal of variation across the regions, with the most consistent association being with the proportion of women in the community reporting that distance was a barrier to access to family planning, which was statistically significantly associated with lower odds of modern method use in three regions (North West, South South and South West). The average ideal number of children, average proportion of women making family planning decisions, and the average SWPER score on attitudes towards violence were all associated with modern method use in two regions.

#### 3.2.3 Zambia

Appendix 6 presents the multilevel regression tables for men and women in Zambia, grouped into younger and older ages.

For younger women in Zambia, none of the community norms in their peer group were significantly associated with modern contraceptive use. However, the odds of modern contraceptive use for younger women increased by 30% with a 1 SD increase in older women's community-level average SWPER attitude towards domestic violence (aOR = 1.3; 95% CI: 1.1-1.6). These odds decreased 30% with a 1 SD increase in older women's community-level average SWPER social independence (aOR = 0.7; 95% CI: 0.6-0.9).

For older women in Zambia, we also observed a 10% decrease in modern contraceptive use with a 1 SD increase in their peer's community-level average SWPER social independence (aOR = 0.9; 95% CI: 0.7-1.0). Community-level averages among younger age groups also had associations with older women's modern contraception. A 1 SD increase in the community-level average of younger men who believe family planning makes a woman more promiscuous is associated with a 10% decrease in the odds of older women's modern contraceptive use (aOR = 0.9; 95% CI: 0.8-1.0). The community-level average of younger women's ideal number of children is also associated with lower odds of older women's modern contraceptive use (aOR = 0.9; 95% CI: 0.8-1.0), as is living in a cluster where distance is a barrier to health care of older women's modern contraceptive use (aOR = 0.9; 95% CI: 0.8-1.0).

Figure 10 Multilevel regression results of modern contraceptive use for younger (age 15–29) and older (age 30–49) women and younger (age 15–34) and older (age 35–49) men, Zambia, community variables only



Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; HH = household; SD = standard deviation

Appendix 7 shows that the associations of the different collective norm variables vary over the 10 provinces in Zambia. The most consistent association is seen in the community-level average ideal number of children, which was negatively associated with women's modern contraceptive use in two provinces. Community prevalence of men's belief that family planning makes a woman more promiscuous was significantly associated with women's modern contraceptive use in half of the provinces. However, in three provinces there was a negative association, while in the other two provinces, there was a positive association.

Looking at Figure 10, which shows the regression results among younger men in Zambia, two of the collective norms within their peer group were significantly associated with the outcome of interest. The community-level average of younger men's ideal number of children was negatively associated (aOR = 0.6; 95% CI: 0.5-0.9) with men's modern contraceptive use, while the community-level average of younger men's years of education was positively associated (aOR = 1.5; 95% CI: 1.1-2.0) with the outcome. Collective norms among older men and women had effects on younger men's modern contraceptive use as well. A 1 SD increase in the community-level proportion of older women contraceptive decisionmakers was associated with a 40% increase in the odds of men's modern contraceptive use (aOR = 1.4; 95% CI: 1.1-1.7). Similar to the effects seen in the overall male population, the community-level older women's average social independence and decisionmaking SWPER domains were negatively associated with modern contraceptive use (social independence: aOR = 0.7; 95% CI: 0.6-1.0; decisionmaking: aOR = 0.7;

95% CI: 0.5–0.9), while community-level average attitude towards domestic violence among older women was positively associated (aOR = 1.5; 95% CI: 1.2-2.0).

Among older men in Zambia, there were fewer peer group effects seen. The only statistically significant finding was that the community-level average older women's attitude toward domestic violence was positively associated with older men's modern contraceptive use (aOR = 1.3; 95% CI: 1.0-1.6). One collective norm among younger people was associated with older men's modern contraceptive use. An increase in 1 SD in the community-level average younger women's SWPER decisionmaking domain was associated with a 20% decrease in the odds of older men's modern contraceptive use (aOR = 0.8; 95% CI: 0.7-1.0).

Appendix Table 7 shows the associations over the 10 provinces in Zambia. We can see that none of the collective norm covariates were consistently associated with men's modern contraceptive use. Living in an urban area and men's community average ideal number of children were both significantly negatively associated with men's modern contraceptive use in two provinces each, and the community level of women making contraceptive decisions, SWPER attitude towards domestic violence, and community level of men who believe that family planning makes a woman more promiscuous were each significantly positively associated with men's modern contraceptive use in three provinces.

## 3.3 Country Summaries

#### 3.3.1 Nepal

When examining Nepal as a whole among women, we found that only the average ideal number of children at the community level had an effect on modern contraceptive use (see Table 4). No other community-level variable was significantly associated with modern contraceptive use. However, when this was broken down by age, the importance of the community-level ideal number of children is lost, and other community variables were found to be significantly associated with modern use. Among peers, the effect of men's education acted in opposite directions for young women versus older women. Among younger women, an increase in young men's education decreased the likelihood of their contraceptive use, while among older women, an increase in older men's education increased the likelihood of their use. We also find opposite effects of community norms of younger women on older women and vice versa. For example, an increase in older women's average SWPER score on decisionmaking decreased younger women's contraceptive use, but an increase in the same SWPER score among younger women increased older women's contraceptive use. We also find these opposite effects based on age for the proportion of men who believe that family planning makes a woman more promiscuous. In summary, the influences of community norms, whether within peers or outside their peer group, does not follow the same pattern among younger and older women and should be considered separately.

Among men, only the average SWPER score on attitude towards domestic violence was significantly associated with their contraceptive use. This was not significant among women in the full model or in the models by age. We could not examine the community norm effects by age among men and therefore, we cannot know if this relationship still holds among age-based peer groups.

#### 3.3.2 Nigeria

When examining Nigeria as a whole, among women, we found that modern contraceptive use was influenced by a number of community factors: the proportion of women reporting distance as a barrier to access to medical care, the mean ideal number of children, proportion of women making family planning decisions, the mean SWPER score for attitudes towards violence, and the average years of men's education. When examining the differences between younger and older women, we find that the patterns of association are different for the two groups. For the younger women (age 15–29), only living in a community where distance is a barrier to health care access and the average ideal number of children among their peers are statistically significant, with none of the measures that are specific to older women (30-49) being statistically significantly associated with modern method use. For older women, modern contraceptive use was statistically significantly associated with the average years of men's education among the younger 15– 29 age group and the average SWPER score for attitudes towards violence among their peers. While the association between modern family planning use and the proportion of women in the community making family planning decisions was statistically significant in the full model, it was not significant for either younger or older women. In summary, the relationship between community norms, either within peers or outside of the peer group, appears to be somewhat different for older and younger women, at least in terms of which community factors are associated with modern method use. This suggests that analyzing these groups separately and using their corresponding age group as a reference provides additional insights.

The relationship between community factors and men's use of modern contraception also appears to be different than that for women. For men, use of modern methods was associated with the average ideal number of children among other men in the community, the average years of education of men in the community, and the proportion of men that agreed that using family planning made women more promiscuous. In contrast to women, living in a community where distance is a barrier to medical care access, the proportion of women in the community reporting making family planning decisions, and the SWPER domain of attitudes towards violence were not statistically significantly associated with use of modern methods. In addition, beliefs about the effect of family planning use on promiscuity were only associated with men's use of modern methods, having no statistically significant effect on women's behavior. This again suggests that the ways in which community norms influence men's behavior may be different than for women and should be considered separately. We were not able to examine whether the observed relationship between community factors and use of modern methods differed by age group or region due to sample size considerations.

#### 3.3.3 Zambia

Looking at Zambia as a whole, we can see that among women, modern contraceptive use was influenced by a number of community factors: the proportion of women reporting distance as a barrier to access to medical care, the mean ideal number of children for women, proportion of women making family planning decisions, the mean SWPER score for attitudes towards domestic violence and social independence, and the average years of men's education. When examining the differences between younger and older women, we find that the pattern of associations differs for the two groups. For the younger women (age 15–29), only the mean SWPER scores for attitudes towards domestic violence and social independence among older women (age 30–49) are statistically significant, with none of the measures that are specific to their peer group (women age 15–29) being statistically significantly associated with modern method use. For older women, modern contraceptive use was statistically significantly associated with the proportion of women reporting distance as a barrier to access to medical care, average ideal number of children among younger women, younger men's belief that family planning use leads to promiscuity, and the average SWPER score for social independence among their peers. Taken together, we can say that the effect of community norms from peer age groups or nonpeer age groups appears to differ for older and younger women.

The relationship between community factors and men's use of modern contraception also appears to be different than that for women. For men, use of modern methods was associated with living in an urban cluster, the average ideal number of children among other men in the community, and the average SWPER scores for all three domains. In contrast to women, neither distance as a barrier to medical care access nor the proportion of women in the community reporting making family planning decisions were not statistically significantly associated with use of modern methods among men. In addition, living in an urban cluster and the average SWPER score for household decisionmaking were only associated with men's use of modern methods, with no statistically significant effect on women's behavior. This suggests in Zambia, there may be overlap in the way that community-level collective norms affect both men's and women's modern contraceptive use.

When examining the differences between younger and older men, we find that the pattern of associations are different for the two groups. For both young and older men, living in an urban cluster and the average SWPER score for attitudes towards domestic violence among older women were associated with modern contraceptive use. In addition, for the younger men (age 15–34), the average level of education among their peers, and the average ideal number of children among their peers are statistically significantly associated with modern method use, as well as the proportion of older women in their community who are involved in family planning decisionmaking, and all three SWPER domains among older women. For older men, modern contraceptive use was statistically significantly associated with the average SWPER score for household decisionmaking among younger women, and the average SWPER score for attitude towards domestic violence among older women.

## 3.4 Cross-cutting Findings

Figure 11 shows the effects of the community-level variables on women's and men's modern contraceptive use for all three countries.

## Figure 11 Multilevel regression results of Model 3 for women and men's modern contraceptive use, Nepal, Nigeria, and Zambia, community variables only



Note: All variables except Urban and Distance to facility are standardized; Odds ratio is per 1 SD increase. FP = family planning; SWPER = survey-based women's empowerment index; HH = household; SD = standard deviation

Figure 11 shows that the community-level factors that influence modern contraceptive use are not the same for men and women. Although within countries there are some variables that are significantly associated with men's and women's contraceptive use, in each country there are multiple community-level factors that are significantly associated only with women's or only with men's contraceptive use. In addition, while there are some patterns in effects across countries, such as a consistently negative effect of the average ideal number of children on women's modern contraceptive use, there are notable differences in effects as well. For example, the proportion of women in the cluster who are involved in family planning decisionmaking has a positive effect on women's modern contraceptive use in Nigeria, a negative effect in Zambia, and a null effect in Nepal.

The full model (Model 3) reduced the community-level variance for both men's and women's modern contraceptive use by over 60% in Nigeria, but by a much smaller proportion (9.1%) in Zambia, and actually increased the community-level variance in Nepal by 6% for women and 37% for men.

## 4 **DISCUSSION**

This study is among the first to use DHS data to assess the effects of community-level fertility and gender norms on individual-level modern contraceptive use applying multilevel weights and to compare the effects on men versus women. Our findings suggest that there are differences in the effects of collective norms on men's modern contraceptive use compared to women's. Looking at the results overall, there appear to be five key findings.

First, the one universal finding was the influence of women's collective fertility norms as measured by the average number of ideal children on women's modern contraceptive use. This is in line with other studies which have found significant effects of community average ideal number of children on women's modern contraceptive use, but not on men's (Dynes et al. 2012; Nurjaeni et al. 2021). In Nepal, an increasing community-level average number of ideal children was significantly associated with lower women's modern contraceptive use, while the woman's own number of ideal children did not have an effect. In Nigeria and Zambia, a woman's own ideal number of children also had a significantly negative effect on her modern contraceptive use. These findings may be due to the low ideal number of children among our sample of women in Nepal (2.2) compared to Nigeria (6.6) and Zambia (5.2), and a larger proportion of Nepalese women having the same ideal number of children as children ever born (34%) compared to Nigeria (13%) and Zambia (16%). These findings suggest that in Nepal, women's contraceptive use is more influenced by the collective fertility norm in her community than her own fertility desires, while in Nigeria and Zambia, both are important.

Second, most community-level effects were heterogeneous on individual modern contraceptive use across the three countries. In Nepal, apart from the average ideal number of children at the community level among women and the average SWPER on attitudes towards domestic violence among men, none of the community-level variables were found to be significantly associated with modern contraceptive use. Other community or family influences may be at play in Nepal. Previous studies have found religion and ethnicity to be significantly associated with contraceptive use (Sekine et al. 2021; Sharma, Pratap, and Ghimire 2011; Wasti et al. 2017), which are community variables that were not included in this analysis. In a qualitative study, Sekine et al. (2021) also found that there was a social pressure at the community level to give birth soon after marriage in Nepal. This can be linked to the average ideal number of children, which was found to be significantly associated with modern contraceptive use in women. The role of the mother-in-law, as well as the woman's position in the household, can also have an influence on the contraceptive use that could be stronger than the community-level factors (Diamond-Smith et al. 2017; Link 2010; Sekine et al. 2021; Sharma, Pratap, and Ghimire 2011; Wasti et al. 2017). As found in previous research (Link 2011; Underwood, Dayton, and Hendrickson 2020), this analysis found a strong positive relationship between contraceptive decisionmaking among women (self or jointly with their husband) and modern contraceptive use.

Nepal was also the only country where the addition of individual-level predictors resulted in an *increase* rather than a decrease in the ICC (the amount of variation in the outcome that is due to the similarities between people in "clusters," such as communities). This is unusual as the addition of predictors in most cases reduces the ICC and increases the proportion of the total variation "explained" by other factors. However, there are cases in which the ICC might plausibly increase when adding other predictors, primarily

when the communities with higher levels of modern contraceptive use have higher levels of individual predictors and communities with higher levels of modern contraceptive use have lower levels of individual predictors. In this way, some of the community-level variation in the null model (model 0) may have been cancelled out by the opposite variation in the proportion of the individual predictors (Gelman and Hill 2006). In Nepal, this appears to be the case for many of the predictors—age, parity, family planning messaging, ideal number of children, desire for more children, and all three SWPER domains (results not shown). This also likely contributed to the negative PRV of Models 1 and 3 in the men's and women's models in Nepal. While some have argued that a negative PRV is reason for concern (Roberts and Monaco 2006), given the reduction in ICC with the addition of predictors in the Nepal models, the negative PRV could be expected.

Of the three countries, community factors explain the greatest proportion of the variance in modern contraceptive use for both men and women in Nigeria. This is consistent with findings from prior research in Nigeria that demonstrates the importance of religion and other cultural factors in shaping norms that influence fertility, including those related to gender, preferences for larger families, and broader religious/cultural factors (Akamike et al. 2020; Hutchinson et al. 2021; Izugbara and Ezeh 2010; Okigbo et al. 2018). While many of these community-level factors were the same as those observed in Nepal or Zambia, the number of community-level factors that were associated with modern contraceptive use to a statistically significant degree was larger. Furthermore, there are some features of these relationships that are specific to Nigeria. In particular, the average education of men in the community had a stronger association with modern contraceptive use in Nigeria, with each additional year of education associated with an increase in the odds of using a modern method by 40% for women and 70% for men. This is broadly consistent with the literature linking higher levels of education to modern contraceptive use, although its importance for both men and women while controlling for individual levels of education suggests that living in communities where men have more education has a broader effect on community behavior.

While a variety of community factors were associated with use of modern contraceptive use at the national level, there are important differences between men and women and across regions, which suggests even greater heterogeneity than is the case for the cross-national comparisons. The regional differences in levels of use of modern contraception and associated social and normative factors in Nigeria are well documented (Bolarinwa et al. 2021). The lack of consistent relationships between community-level factors and use of modern contraception is consistent with this broader pattern. The differing strength of the relationship between specific community-level factors and modern contraceptive use between men and women, such as for the SWPER measures (significant for women but not men), the proportion of women reporting distance to health centers as a barrier (significant for women more promiscuous (significant for men but not women), also highlights the differences between these groups. This is also the case when examining the relationship for different age groups of women, with some factors only associated with younger or older women's contraceptive behavior.

Zambia is the only country where having the woman as the FP decisionmaker was associated with lower odds of using modern contraception. This may be due to the fact that the vast majority of women who report being involved in contraceptive decisions are making decisions jointly with their husbands, and prior research in Zambia has shown that any involvement of the husband can decrease contraceptive use, even when the couple agrees on short-term fertility goals (Belohlav and Karra 2013). The level of agency that

women who are jointly making contraceptive decisions with their husbands are exercising may in fact be low. Our measures of contraceptive decisionmaking do not take the *quality* of the involvement in decisionmaking into account.

Our findings show that after accounting for individual- and community-level fertility and gender norms, access to health facilities is an issue for women's modern contraceptive use in Nigeria and Zambia. In Zambia, over 30% of the population live more than 30 minutes from a health facility, and nearly 20% live more than 60 minutes (Weiss et al. 2020). In addition, the Ministry of Health only approved scale-up of a community-based provision of injectables in 2018, the year the Zambia data were collected, and injectables make up the largest share of modern contraceptive method use in Zambia. Therefore, at the time, most women who were using contraception in 2018 could only access it at health facilities.

The third key finding was that although this study was focused on the influence of the community-level norms, two individual-level characteristics, desire for children soon and the woman being involved in contraceptive decisionmaking, were associated with women's modern contraceptive use in all countries, and desire for a child soon was associated with men's report of modern contraceptive use in all countries. Women and men with a desire to have a child soon would understandably not be using a form of contraception in order to increase their chances of conceiving a child soon. These characteristics have also been shown to be consistently associated with modern contraceptive use in other research (Tekelab, Melka, and Wirtu 2015; Yaya et al. 2018).

The fourth key finding from our study was that we did not find a stronger effect of collective norms among age peer groups on individual behavior. The literature shows that peers play an important role as socializing agents and a clear reference group, especially during adolescence and on the topic of contraception (Mwaikambo et al. 2011; Umberson, Crosnoe, and Reczek 2010). Our findings are therefore in contrast with recent findings that show stronger effects of collective gender norms among age peer groups on adolescent girls' use of contraception compared to non-peer age groups (Mejía-Guevara et al. 2020). Qualitative work has shown that both older individuals, such as parents, as well as peers are key influencers in the contraceptive decisionmaking process, but that their influence works in different ways (Sanchez et al. 2020). Our findings may be due to the fact that our peer age groups were not derived based on specific life stages and were constructed partly based on sample size considerations.

Finally, the PRV, which estimates the proportion of decrease in community-level variation for the model, was either the same or smaller for the men compared to the women for each of the full models in a given country. This indicates that the covariates in the full models are not capturing the salient community-level factors for men's contraceptive decisionmaking to the same degree as for women. Previous research has described similar issues with relatively low explanatory power for men's contraceptive use or ideation and suggests that omitted factors such as additional sociocultural norms about fertility, contraception, and gender, level of community and religious leader support for family planning, and couple dynamics may be at play (Babalola, Kusemiju, et al. 2015; Namasivayam et al. 2020; Nanda, Schuler, and Lenzi 2013).

The present study had some limitations. First, DHS enumeration areas and age groups are inferred reference groups and may not represent individuals' actual reference group. Age cutoffs were made to maximize group sizes, not based solely on an assessment of who would have an influence on an individual's contraceptive decisions. The small cluster sample sizes, particularly for the men's clusters, may have

attenuated some community-level results, as community-level norms were measured through aggregation of individual-level behaviors. However, we conducted sensitivity analyses to explore this potential effect, removing clusters with fewer than 10 individuals for the women's models in all countries and for the men's model in Zambia, and found similar community-level results. It was also impossible to include all collective norm factors that may affect contraceptive use, as the DHS does not collect data on many norms. Since we also wanted to have comparable measures in the three countries, certain country-specific community measures such as ethnicity and religion were not included. Since the DHS data are cross-sectional, we are unable to make any statements about causality.

Despite these limitations, this is one of the first studies to directly compare the effects of collective norms on men's versus women's use of modern contraception, as well as one of the first to apply the new multilevel weights in the calculation of those effects.

## Conclusion

As expected, given our socioecological framing, we found heterogeneous effects of community-level norms on women's and men's modern contraceptive use across countries. In particular, gender norms showed different effects depending on the country and whether we were modeling women's or men's contraceptive use. Fertility norms appear to have consistent effects on women's modern contraceptive use.

Future work on the effect of collective norms should build on recent advances in social norm measurement (Costenbader, Cislaghi, et al. 2019), include perceived and/or injunctive norms, and compare the effects of the different types of norms on individual contraceptive use. In addition, our findings support further research into the identification of appropriate reference groups for women's and men's modern contraceptive use in order to better understand what norms matter for women and men.

## REFERENCES

Akamike, I. C., I. N. Okedo-Alex, I. I. Eze, O. B. Ezeanosike, and C. J. Uneke. 2020. "Why Does Uptake of Family Planning Services Remain Sub-Optimal among Nigerian Women? A Systematic Review of Challenges and Implications for Policy." *Contraception and Reproductive Medicine* 5 (1): 30. https://doi.org/10.1186/s40834-020-00133-6

Babalola, S., N. John, B. Ajao, and I. S. Speizer. 2015. "Ideation and Intention to Use Contraceptives in Kenya and Nigeria." *Demographic Research* 33 (8): 211–238. https://www.demographic-research.org/volumes/vol33/8/33-8.pdf

Babalola, S., B. Kusemiju, L. Calhoun, M. Corroon, and B. Ajao. 2015. "Factors Associated with Contraceptive Ideation among Urban Men in Nigeria." *International Journal of Gynecology & Obstetrics* 130 (S3): E42-E46. https://doi.org/10.1016/j.ijgo.2015.05.006

Begg, M. D., and M. K. Parides. 2003. "Separation of Individual-Level and Cluster-Level Covariate Effects in Regression Analysis of Correlated Data." *Statistics in Medicine* 22 (16): 2591–602. https://doi.org/10.1002/sim.1524

Belohlav, K., and M. Karra. 2013. "*Household Decisionmaking and Contraceptive Use in Zambia*." Washington DC: Population Reference Bureau. https://www.prb.org/wp-content/uploads/2021/02/11202013-zambia-household-decisionmaking-contraception.pdf

Bhushan, N. L., E. B. Fisher, S. Maman, I. S. Speizer, N. C. Gottfredson, T. Phanga, D. Vansia, A. E. Pettifor, and N. E. Rosenberg. 2021. "Communication, Social Norms, and Contraceptive Use among Adolescent Girls and Young Women in Lilongwe, Malawi." *Women's Health* 61 (5): 440–451. https://doi.org/10.1080/03630242.2021.1917479

Bicchieri, C. 2006. *The Grammar of Society: The Nature and Dynamics of Social Norms*. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511616037

Bicchieri, C., and Penn Social Norms Group. 2014. "Why Do People Do What They Do? A Social Norms Manual for Zimbabwe and Swaziland." In *Innocenti Toolkit Guide*. Florence, Italy: UNICEF Office of Research. https://www.unicef-irc.org/research/pdf/429-Social-Norms-Manual-ESARO.pdf

Bingenheimer, J. B. 2019. "Veering from a Narrow Path: The Second Decade of Social Norms Research." *Journal of Adolescent Health* 64 (4): S1–S3. https://doi.org/10.1016/j.jadohealth.2019.01.012

Bolarinwa, O. A., Z. T. Tessema, J. B. Frimpong, A-A. Seidu, and B. O. Ahinkorah. 2021. "Spatial Distribution and Factors Associated with Modern Contraceptive Use among Women of Reproductive Age in Nigeria: A Multilevel Analysis." *PLoS ONE* 16 (12): e0258844. https://doi.org/10.1371/journal.pone.0258844 Breakthrough ACTION. 2020. A Taxonomy for Social Norms That Influence Family Planning in Ouagadougou Partnership Countries. Breakthrough ACTION.

https://breakthroughactionandresearch.org/wp-content/uploads/2020/10/Taxonomy-for-Social-Norms-OP-Countries.pdf

Bronfenbrenner, U. 1979. *The Ecology of Human Development*. Cambridge, MA, USA: Harvard University Press. https://khoerulanwarbk.files.wordpress.com/2015/08/urie\_bronfenbrenner\_the\_ecology\_of\_human\_devel opbokos-z1.pdf

Calhoun, L. M., A. Mirzoyants, S. Thuku, L. Benova, T. Delvaux, T. van den Akker, C. McGuire, B. Onyango, and I. S. Speizer. 2022. "Perceptions of Peer Contraceptive Use and Its Influence on Contraceptive Method Use and Choice among Young Women and Men in Kenya: A Quantitative Cross-Sectional Study." *Reproductive Health* 19 (1): 16–16. https://doi.org/10.1186/s12978-022-01331-y

Cialdini, R. B., C. A. Kallgren, and R. R. Reno. 1991. "A Focus Theory of Normative Conduct: A Theoretical Refinement and Reevaluation of the Role of Norms in Human Behavior." *Advances in Experimental Social Psychology* 23 (1991): 201–234. https://doi.org/10.1016/S0065-2601(08)60330-5

Cislaghi, B., and L. Heise. 2017. *Measuring Social Norms*. STRIVE Technical Brief. London, UK: London School of Hygiene and Tropical Medicine. https://researchonline.lshtm.ac.uk/id/eprint/4646477/1/Measuring-social-norms.pdf

Cislaghi, B., and L. Heise. 2018. "Four Avenues of Normative Influence: A Research Agenda for Health Promotion in Low and Mid-Income Countries." *Health Psychology* 37 (6): 562-573. https://psycnet.apa.org/doi/10.1037/hea0000618

Costenbader, E., B. Cislaghi, C. J. Clark, L. Hinson, R. Lenzi, D. R. McCarraher, C. McLarnon-Silk, et al. 2019. "Social Norms Measurement: Catching up with Programs and Moving the Field Forward." *Journal of Adolescent Health* 64 (4): S4–S6. https://doi.org/10.1016/j.jadohealth.2019.01.001

Costenbader, E., R. Lenzi, R. B. Hershow, K. Ashburn, and D. R. McCarraher. 2017. "Measurement of Social Norms Affecting Modern Contraceptive Use: A Literature Review." *Studies in Family Planning* 48 (4): 377–389. https://doi.org/10.1111/sifp.12040

Costenbader, E., S. Zissette, A. Martinez, K. LeMasters, N. A. Dagadu, P. Deepan, and B. Shaw. 2019. "Getting to Intent: Are Social Norms Influencing Intentions to Use Modern Contraception in the DRC?" *PLoS ONE* 14 (7): e0219617. https://doi.org/10.1371/journal.pone.0219617

Diamond-Smith, N., A. Raj, N. Prata, and S. D. Weiser. 2017. "Associations of Women's Position in the Household and Food Insecurity with Family Planning Use in Nepal." *PLoS ONE* 12 (4): e0176127. https://doi.org/10.1371/journal.pone.0176127

Dynes, M., R. Stephenson, M. Rubardt, and D. Bartel. 2012. "The Influence of Perceptions of Community Norms on Current Contraceptive Use among Men and Women in Ethiopia and Kenya." *Health & Place* 18 (4): 766–773. https://doi.org/10.1016/j.healthplace.2012.04.006

Elkasabi, M., R. Ren, and T. W. Pullum. 2020. *Multilevel Modeling Using DHS Surveys: A Framework to Approximate Level-Weights*. DHS Methodological Reports No. 27. Rockville, Maryland, USA: ICF. https://www.dhsprogram.com/pubs/pdf/MR27/MR27.pdf

Enders, C. K., and D. Tofighi. 2007. "Centering Predictor Variables in Cross-Sectional Multilevel Models: A New Look at an Old Issue." *Psychological Methods* 12 (2): 121–138. https://psycnet.apa.org/doi/10.1037/1082-989X.12.2.121

Ewerling, F., A. Raj, C. G. Victora, F. Hellwig, C. V. Coll, and A. J. D. Barros. 2020. "SWPER Global: A Survey-Based Women's Empowerment Index Expanded from Africa to All Low- and Middle-Income Countries." *Journal of Global Health* 10 (2): 020343-020343. https://jogh.org/documents/issue202002/jogh-10-020434.pdf

Geber, S., E. Baumann, F. Czerwinski, and C. Klimmt. 2021. "The Effects of Social Norms among Peer Groups on Risk Behavior: A Multilevel Approach to Differentiate Perceived and Collective Norms." *Communication Research* 48 (3): 319–345. https://doi.org/10.1177%2F0093650218824213

Gelman, A., and J. Hill. 2006. *Data Analysis Using Regression and Multilevel/Hierarchical Models*, *Analytical Methods for Social Research*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511790942

Heck, R., and Thomas, S. L. 2015. *An Introduction to Multilevel Modeling Techniques*. New York and London: Routledge. https://doi.org/10.4324/9781315746494

Hutchinson, P. L., U. Anaba, D. Abegunde, M. Okoh, P. C. Hewett, and E. W. Johansson. 2021. "Understanding Family Planning Outcomes in Northwestern Nigeria: Analysis and Modeling of Social and Behavior Change Factors." *BMC Public Health* 21 (1): 1168. https://doi.org/10.1186/s12889-021-11211-y

Izugbara, C. O., and A. C. Ezeh. 2010. "Women and High Fertility in Islamic Northern Nigeria." *Studies in Family Planning* 41 (3): 193–204. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1728-4465.2010.00243.x

Kaggwa, E. B., N. Diop, and J. D. Storey. 2008. "The Role of Individual and Community Normative Factors: A Multilevel Analysis of Contraceptive Use among Women in Union in Mali." *International Family Planning Perspectives* 34 (2): 79–88. https://www.guttmacher.org/sites/default/files/pdfs/pubs/journals/3407908.pdf

Learning Collaborative to Advance Normative Change. 2019. *Resources for Measuring Social Norms: A Practical Guide for Program Implementers*. Washington, DC: Institute for Reproductive Health, Georgetown University. https://gehweb.ucsd.edu/wp-content/uploads/2020/01/resources\_for\_measuring\_social\_norms\_guide\_final.pdf

LeMasters, K., E. Costenbader, A. Martinez, I. S. Speizer, and S. Igras. 2021. "Men's Social Networks, Social Norms, & Amp; Family Planning in Benin." *Global Public Health* May 25: 1–15. https://doi.org/10.1080/17441692.2021.1933125 Link, C. F. 2010. *Husbands, Wives, and in-Laws: Family Dynamics and Childbearing Behavior in Nepal,* University of Michigan. https://hdl.handle.net/2027.42/78808

Link, C. F. 2011. "Spousal Communication and Contraceptive Use in Rural Nepal: An Event History Analysis." *Studies in Family Planning* 42 (2): 83–92. https://doi.org/10.1111/j.1728-4465.2011.00268.x.

Mason, K. 1983. "Norms Relating to the Desire for Children." In *Determinants of Fertility in Developing Countries*, edited by R Bulatao and R Lee. New York: Academic Press. https://pdf.usaid.gov/pdf\_docs/PNAAW486.pdf

Mejía-Guevara, I., B. Cislaghi, A. Weber, E. Hallgren, V. Meausoone, M. R. Cullen, and G. L. Darmstadt. 2020a. "Association of Collective Attitudes and Contraceptive Practice in Nine Sub-Saharan African Countries." *Journal of Global Health* 10 (1): 010705. https://jogh.org/documents/issue202001/jogh-10-010705.pdf

Mwaikambo, L., I. S. Speizer, A. Schurmann, G. Morgan, and F. Fikree. 2011. "What Works in Family Planning Interventions: A Systematic Review." *Studies in Family Planning* 42 (2): 67–82. https://doi.org/10.1111/j.1728-4465.2011.00267.x

Namasivayam, A., S. Lovell, S. Namutamba, and P. J. Schluter. 2020. "Predictors of Modern Contraceptive Use among Women and Men in Uganda: A Population-Level Analysis." *BMJ Open* 10 (2): e034675. http://dx.doi.org/10.1136/bmjopen-2019-034675

Nanda, G., S. R. Schuler, and R. Lenzi. 2013. "The Influence of Gender Attitudes on Contraceptive Use in Tanzania: New Evidence Using Husbands' and Wives' Survey Data." *Journal of Bioscience Science* 45 (3): 331–44. https://doi.org/10.1017/S0021932012000855

Nurjaeni, N., Y. Sawangdee, U. Pattaravanich, C. Holumyong, and A. Chamratrithirong. 2021. "The Role of Structural and Process Quality of Family Planning Care in Modern Contraceptive Use in Indonesia: A Multilevel Analysis." *BMC Public Health* 21 (1): 1790. https://doi.org/10.1186/s12889-021-11858-7

Okigbo, C. C., I. S. Speizer, M. E. Domino, S. L. Curtis, C. T. Halpern, and J. C. Fotso. 2018. "Gender Norms and Modern Contraceptive Use in Urban Nigeria: A Multilevel Longitudinal Study." *BMC Women's Health* 18 (1): 178. https://doi.org/10.1186/s12905-018-0664-3

Paek, H-J., B. Lee, C. T. Salmon, and K. Witte. 2008. "The Contextual Effects of Gender Norms, Communication, and Social Capital on Family Planning Behaviors in Uganda: A Multilevel Approach." *Health Education & Behavior* 35 (4): 461–477. https://doi.org/10.1177%2F1090198106296769

Peugh, J. L. 2010. "A Practical Guide to Multilevel Modeling." *Journal of School Psychology* 48 (1): 85–112. https://doi.org/10.1016/j.jsp.2009.09.002

Raudenbush, S. W., and A. S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods*. 2nd ed. Thousand Oaks, CA: Sage Publications.

Rimal, R. N., and M. K. Lapinski. 2015. "A Re-Explication of Social Norms, Ten Years Later." *Communication Theory* 25 (4): 393–409. https://doi.org/10.1111/comt.12080

Roberts, J. K., and Monaco, J. P. 2006. "Effect Size Measures for the Two-Level Linear Multilevel Model" Paper presented at the American Educational Research Association [AERA], San Francisco.

Rutstein, S. O. 2008. *The DHS Wealth Index: Approaches for Rural and Urban Areas*. DHS Working Papers No. 60. Calverton, Maryland, USA: Macro International. http://dhsprogram.com/pubs/pdf/WP60/WP60.pdf

Rutstein, S. O., and K. Johnson. 2004. *The DHS Wealth Index*. DHS Comparative Reports No. 6. Calverton, Maryland, USA: ORC Macro. http://dhsprogram.com/pubs/pdf/CR6/CR6.pdf

Sanchez, E. K., I. S. Speizer, E. Tolley, L. M. Calhoun, C. Barrington, and A. O. Olumide. 2020. "Influences on Seeking a Contraceptive Method among Adolescent Women in Three Cities in Nigeria." *Reproductive Health* 17 (1): 167. https://doi.org/10.1186/s12978-020-01019-1

Schunck, R. 2016. "Cluster Size and Aggregated Level 2 Variables in Multilevel Models. A Cautionary Note." *Methods, Data, Analytics* 10 (1): 120. https://doi.org/10.12758/mda.2016.005

Sedlander, E., and R. N. Rimal. 2019. "Beyond Individual-Level Theorizing in Social Norms Research: How Collective Norms and Media Access Affect Adolescents' Use of Contraception." *Journal of Adolescence Health* 64 (4s): S31–S36. https://doi.org/10.1016/j.jadohealth.2018.12.020

Sekine, K., N. Khadka, R. R. Carandang, K. I. C. Ong, A. Tamang, and M. Jimba. 2021. "Multilevel Factors Influencing Contraceptive Use and Childbearing among Adolescent Girls in Bara District of Nepal: A Qualitative Study Using the Socioecological Model." *BMJ Open* 11 (10): e046156. http://dx.doi.org/10.1136/bmjopen-2020-046156

Sharma, S. K., N. Pratap, and D. R. Ghimire. 2011. "Ethnic Differentials of the Impact of Family Planning Program on Contraceptive Use in Nepal." *Demographic Research* 25 (27): 837–868. https://www.demographic-research.org/volumes/vol25/27/25-27.pdf

Storey, J. D., and E. B. Kaggwa. 2009. "The Influence of Changes in Fertility Related Norms on Contraceptive Use in Egypt, 1995–2005." *Population Review* 48 (1): 1–19. https://muse.jhu.edu/article/264739

Tekelab, T., A. S. Melka, and D. Wirtu. 2015. "Predictors of Modern Contraceptive Methods Use among Married Women of Reproductive Age Groups in Western Ethiopia: A Community Based Cross-Sectional Study." *BMC Women's Health* 15 (1): 52. https://doi.org/10.1186/s12905-015-0208-z

Thomson, E., and P. Goldman. 1987. "Measuring Fertility Norms." *Population and Environment* 9 (3): 173–185. https://doi.org/10.1007/BF01259307

Udry, J. R. 1982. "The Effect of Normative Pressures on Fertility." *Population and Environment* 5 (2): 109–122. https://doi.org/10.1007/BF01367490

Umberson, D., R. Crosnoe, and C. Reczek. 2010. "Social Relationships and Health Behavior across Life Course." *Annual Review of Sociology* 36: 139–157. https://doi.org/10.1146/annurev-soc-070308-120011

Underwood, C. R., L. I. Dayton, and Z. M. Hendrickson. 2020. "Concordance, Communication, and Shared Decision-Making About Family Planning among Couples in Nepal: A Qualitative and Quantitative Investigation." *Journal of Social and Personal Relationships* 37 (2): 357–376. https://doi.org/10.1177%2F0265407519865619

Wado, Y. D., E. Gurmu, T. Tilahun, and M. Bangha. 2019. "Contextual Influences on the Choice of Long-Acting Reversible and Permanent Contraception in Ethiopia: A Multilevel Analysis." *PLoS ONE* 14 (1): e0209602. https://doi.org/10.1371/journal.pone.0209602

Wasti, S., R. Simmons, N. Limbu, S. Chipanta, L. Haile, J. Velcoff, and D. Shattuck. 2017. "Side-Effects and Social Norms Influencing Family Planning Use in Nepal." *Kathmandu University Medical Journal* 15 (59): 222-9. http://www.kumj.com.np/issue/59/222-229.pdf

Weiss, D. J., A. Nelson, C. A. Vargas-Ruiz, K. Gligorić, S. Bavadekar, E. Gabrilovich, A. Bertozzi-Villa, et al. 2020. "Global Maps of Travel Time to Healthcare Facilities." *Nature Medicine* 26 (12): 1835–1838. https://doi.org/10.1038/s41591-020-1059-1

Yaya, S., O. A. Uthman, M. Ekholuenetale, and G. Bishwajit. 2018. "Women Empowerment as an Enabling Factor of Contraceptive Use in Sub-Saharan Africa: A Multilevel Analysis of Cross-Sectional Surveys of 32 Countries." *Reproductive Health* 15 (1): 214. https://doi.org/10.1186/s12978-018-0658-5

Zimmerman, L. A., S. O. Bell, Q. Li, A. Morzenti, P. Anglewicz, P. M. A. P. I. Group, and A. O. Tsui. 2019. "Individual, Community and Service Environment Factors Associated with Modern Contraceptive Use in Five Sub-Saharan African Countries: A Multilevel, Multinomial Analysis Using Geographically Linked Data from PMA2020." *PLoS ONE* 14 (6): e0218157. https://doi.org/10.1371/journal.pone.0218157

## **APPENDIX TABLES**

#### Appendix Table 1 Modern contraceptive use by individual- and cluster-level covariates

	Ne	pal	Nig	eria	Zan	nbia
	Women	Men	Women	Men	Women	Men
	% [CI]	% [CI]	% [CI]	% [CI]	% [CI]	% [CI]
ndividual-level characteristics						
Age	***	***	***	**	***	***
15–24	24.5 [22.0,27.2]	33.9 [28.2,40.1]	8.3 [7.3,9.3]	10.7 [6.7,16.6]	56.6 [53.3,59.9]	50.8 [45.8,55.8]
25–34 35–49	44.1 [41.7,46.6] 57.5 [55.2,59.8]	53.6 [48.6,58.6]	15.9 [14.7,17.1] 15.0 [14.0,16.1]	13.2 [11.3,15.3]	59.4 [57.2,61.6]	57.8 [54.6,61.0] 52.5 [49.5,55.5]
50+	NA	65.4 [61.9,68.8] NA	NA	12.8 [11.5,14.3] 8.5 [6.9,10.3]	46.6 [44.3,48.9] NA	32.0 [28.7,35.6
Wealth quintile			***	***	***	***
Lowest	44.5 [40.9,48.0]	59.5 [53.9,64.8]	4.4 [3.7,5.2]	3.7 [2.8,5.0]	43.7 [40.4,47.0]	43.8 [40.4,47.3]
Second	47.4 [44.4,50.4]	62.1 [56.7,67.2]	7.5 [6.2,9.1]	8.1 [6.5,10.1]	50.0 [46.9,53.1]	48.1 [44.8,51.4
Middle	45.4 [42.3,48.5]	56.4 [50.8,61.8]	13.2 [12.0,14.5]	11.7 [9.6,14.2]	56.9 [53.5,60.2]	55.4 [52.0,58.8
Fourth	44.5 [41.3,47.7]	55.9 [50.7,61.0]	20.4 [18.9,22.0]	14.5 [12.2,17.0]	61.7 [59.0,64.4]	52.0 [47.6,56.3]
Highest	44.4 [41.7,47.2]	56.6 [50.6,62.5]	24.9 [23.3,26.6]	18.1 [15.5,20.9] ***	56.0 [52.4,59.5] ***	56.1 [51.5,60.7]
Education None	*** 53.5 [50.8,56.2]	* 60.2 [53.9,66.2]	5.1 [4.5,5.7]	2.7 [1.8,4.0]	40.6 [36.3,45.0]	*** 53.4 [46.8,59.8
Primary	44.9 [41.8,48.0]	62.8 [57.3,68.0]	15.9 [14.6,17.4]	8.5 [6.8,10.5]	52.1 [49.8,54.5]	45.7 [43.0,48.4]
Secondary+	36.9 [35.0,38.8]	55.4 [52.0,58.7]	23.0 [21.9,24.2]	17.1 [15.6,18.8]	59.0 [56.5,61.5]	55.3 [52.8,57.7]
Number of children				1 , 1		
ever born	***	***	***	***	***	***
0	10.4 [8.1,13.2]	18.3 [13.0,25.1]	1.8 [1.1,2.9]	7.2 [4.1,12.3]	5.8 [3.1,10.6]	22.4 [14.0,33.8
1—2	39.9 [37.7,42.1]	56.4 [52.3,60.4]	13.2 [12.1,14.4]	13.8 [11.9,15.9]	56.4 [53.6,59.1]	52.4 [48.9,55.8
3–4	58.8 [56.2,61.4]	68.3 [64.0,72.4]	18.1 [16.8,19.6]	16.0 [14.0,18.2]	58.8 [56.2,61.3]	56.2 [52.7,59.6]
5+	54.8 [51.0,58.5]	63.3 [56.8,69.3]	13.4 [12.6,14.4]	8.7 [7.5,9.9]	50.4 [48.0,52.8]	48.8 [46.0,51.5]
Any family planning		+	***	***	**	***
message exposure No	44.7 [42.4,46.9]	53.6 [49.1,58.1]	10.9 [10.2,11.7]	9.4 [8.1,11.0]	52.6 [50.8,54.5]	47.5 [45.2,49.8]
Yes	45.8 [43.8,47.8]	60.0 [56.7,63.2]	19.4 [18.2,20.7]	14.5 [13.0,16.1]	57.3 [54.3,60.3]	55.6 [52.5,58.6]
Ideal number of	. / .	. , ,	. / .	. / .	. / .	• • •
children			***	***	***	***
0	35.8 [26.8,46.0]	ND	5.7 [3.8,8.4]	5.6 [1.9,15.4]	52.6 [38.4,66.4]	40.8 [22.9,61.5
1–3	45.4 [43.8,47.1]	58.2 [55.3,61.2]	27.1 [24.1,30.2]	19.0 [15.6,22.9]	55.6 [51.4,59.6]	55.5 [49.2,61.7]
4-6	45.2 [39.4,51.0]	52.3 [42.2,62.3]	19.0 [18.0,20.1]	16.6 [14.9,18.4]	56.5 [54.6,58.3]	54.0 [51.7,56.3]
7–9 10+	ND NA	ND NA	8.8 [7.7,9.9] 4.5 [3.9,5.2]	11.4 [8.8,14.5] 3.7 [2.9,4.8]	46.5 [42.3,50.8] 34.7 [29.2,40.6]	43.6 [39.9,47.4] 39.6 [35.2,44.2]
Desire for a(nother)	IN/A	NA .	4.0 [0.0,0.2]	0.7 [2.0,4.0]	34.7 [23.2,40.0]	55.0 [55.2,44.2]
child	***	***	***	***	***	***
Does not want soon	51.3 [49.6,53.1]	64.2 [61.2,67.1]	18.6 [17.6,19.6]	14.8 [13.4,16.3]	59.8 [57.9,61.6]	54.9 [52.8,57.1]
Wants soon	7.1 [5.3,9.4]	11.6 [7.9,16.7]	6.4 [5.7,7.1]	8.3 [7.0,9.9]	32.0 [28.7,35.5]	38.0 [34.3,41.8
Contraceptive	***	NIA	***	NIA	***	NIA
decision-maker Self/joint with		NA		NA		NA
husband	46.1 [44.4,47.8]		15.5 [14.7,16.4]		55.0 [53.2,56.7]	
Husband/other	39.9 [36.4,43.4]		7.5 [6.5,8.8]		45.2 [41.4,49.2]	
SWPER attitude to						
violence - mean (SD)		NA	***	NA	*	NA
Among non-users	0.46 (0.02)		0.30 (0.02)		-0.30 (0.03)	
Among users	0.46 (0.01)		0.66 (0.02)		-0.22 (0.03)	
SWPER social						
independence - mean (SD)	***	NA	***	NA		NA
Among non-users	-0.05 (0.03)		0.18 (0.02)		-0.08 (0.03)	IN/A
Among users	-0.30 (0.02)		0.75 (0.03)		-0.06 (0.02)	

(continued...)

#### Appendix Table 1—*Continued*

	Ne	pal	Nig	eria	Zan	nbia
	Women	Men	Women	Men	Women	Men
	% [CI]	% [CI]	% [CI]	% [CI]	% [CI]	% [CI]
SWPER decisionmaking - mean (SD) Among non-users Among users	*** -0.24 (0.03) -0.13 (0.02)	NA	*** 0.05 (0.02) 0.52 (0.03)	NA	** -0.01 (0.03) 0.11 (0.03)	NA
Believe contraception makes women promiscuous Disagree Agree	NA	58.0 [54.8,61.2] 56.4 [50.7,62.0]	NA	12.0 [10.7,13.5] 12.4 [10.9,14.0]	NA	50.8 [48.5,53.0] 51.4 [48.3,54.4]
Community-level characteristics Place of residence Rural Urban	43.2 [40.2,46.1] 46.5 [44.5,48.6]	55.7 [50.6,60.7] 59.1 [55.6,62.5]	*** 9.2 [8.4,10.1] 20.8 [19.6,22.0]	*** 9.5 [8.4,10.8] 14.9 [13.1,16.9]	*** 50.4 [48.2,52.6] 58.5 [56.0,61.0]	50.8 [48.6,53.0] 51.5 [48.0,55.0]
Access to care Not a barrier Is a barrier	43.3 [41.5,45.2] 46.5 [44.0,49.0]	57.6 [52.9,62.1] 58.1 [54.3,61.8]	*** 15.6 [14.7,16.6] 8.4 [7.2,9.7]	*** 13.0 [11.7,14.3] 8.4 [7.0,10.2]	** 55.8 [53.9,57.7] 48.8 [45.7,52.0]	51.9 [49.5,54.3] 49.3 [46.1,52.5]
Ideal number of children - mean (SD) Among non-users Among users	* 2.22 (0.02) 2.18 (0.02)	2.36 (0.04) 2.29 (0.03)	*** 6.72 (0.05) 5.43 (0.05)	**** 8.22 (0.12) 5.86 (0.14)	*** 5.23 (0.04) 4.99 (0.04)	*** 5.83 (0.08) 5.56 (0.06)
Woman involved in contraceptive decisionmaking - mean (SD) Among non-users Among users	0.14 (0.01) 0.14 (0.01)	0.15 (0.01) 0.14 (0.01)	**** 0.20 (0.01) 0.12 (0.01)	*** 0.18 (0.01) 0.13 (0.01)	0.13 (0.01) 0.13 (0.01)	0.13 (0.01) 0.13 (0.01)
SWPER attitude to violence - mean (SD) Among non-users Among users	0.46 (0.02) 0.46 (0.01)	0.45 (0.02) 0.47 (0.02)	*** 0.29 (0.02) 0.63 (0.01)	*** 0.40 (0.02) 0.62 (0.02)	*** -0.33 (0.03) -0.22 (0.03)	*** -0.35 (0.03) -0.2 (0.02)
SWPER social independence - mean (SD) Among non-users Among users	-0.15 (0.02) -0.17 (0.02)	-0.10 (0.03) -0.14 (0.03)	**** 0.17 (0.02) 0.77 (0.03)	*** 0.42 (0.02) 0.93 (0.04)	* -0.09 (0.03) -0.06 (0.02)	-0.08 (0.03) -0.07 (0.02)
SWPER decisionmaking - mean (SD) Among non-users Among users	-0.19 (0.02) -0.19 (0.02)	-0.20 (0.03) -0.17 (0.03)	*** 0.05 (0.02) 0.48 (0.02)	**** 0.23 (0.02) 0.57 (0.03)	** 0.02 (0.03) 0.08 (0.02)	** 0.08 (0.02) 0.02 (0.02)
Believe contraception makes women promiscuous - mean (SD) Among non-users Among users	0.25 (0.01) 0.25 (0.01)	0.24 (0.02) 0.25 (0.01)	*** 0.38 (0.01) 0.34 (0.01)	0.36 (0.01) 0.38 (0.02)	* 0.37 (0.01) 0.35 (0.01)	0.35 (0.01) 0.36 (0.01)

# Appendix Table 2 Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic multilevel model for younger (age 15–29) and older (age 30–49) women, Nepal

		er women i–29)		women –49)
Collective norms (community level) OR (95% CI) Urban ( <i>Ref: Rural</i> ) Distance to health facility is barrier ( <i>Ref: Not a barrier</i> )	1.4* 1.3	[1.0–1.9] [0.9–1.8]	1.1 1.4*	[0.8–1.5] [1.0–1.9]
OR per 1 SD increase (95% CI) Younger age group Average ideal number of children % women involved in contraceptive decisions Average SWPER attitude to violence Average SWPER social independence Average SWPER decisionmaking Average years men's education % men believe FP makes women more promiscuous	0.9 1.0 1.2 1.0 0.9* 0.9	[0.7–1.1] [0.9–1.2] [1.0–1.5] [0.8–1.3] [0.8–1.0] [0.8–1.0]	1.0 1.0 1.0 0.9 1.2* 0.9 0.8**	[0.8–1.2] [0.9–1.1] [0.8–1.1] [0.7–1.0] [1.0–1.4] [0.8–1.0] [0.7–0.9]
Older age group Average ideal number of children % women involved in contraceptive decisions Average SWPER attitude to violence Average SWPER social independence Average SWPER decisionmaking Average years men's education % men believe FP makes women more promiscuous	0.9 1.1 0.9 1.0 0.8* 1.2* 1.2*	[0.7–1.1] [0.9–1.3] [0.8–1.1] [0.8–1.3] [0.7–1.0] [1.0–1.4] [1.0–1.3]	0.9 1.1 1.0 0.8* 1.1 1.2* 1.1	[0.7–1.1] [1.0–1.3] [0.8–1.2] [0.7–1.0] [0.9–1.2] [1.0–1.4] [0.9–1.2]
Individual-level variables OR (95% CI) Second Wealth Quintile ( <i>Ref: Lowest</i> ) Middle Wealth Quintile ( <i>Ref: Lowest</i> ) Fourth Wealth Quintile ( <i>Ref: Lowest</i> ) Highest Wealth Quintile ( <i>Ref: Lowest</i> ) Parity Exposed to any FP message ( <i>Ref: Not exposed</i> ) Ideal number of children Wants a/nother child soon ( <i>Ref: Does not want another child soon</i> ) Woman involved in contraceptive decisionmaking ( <i>Ref: Not involved</i> ) SWPER attitude to violence SWPER social independence SWPER decisionmaking	1.1 0.9 1.1 1.6** 1.2 0.9 0.2** 1.1 1.1 0.8* 1.1		1.0 1.1 0.9 1.1 1.0 1.1 1.0 0.1** 1.5** 1.1 0.7** 0.8**	$\begin{matrix} [0.7-1.3]\\ [0.8-1.5]\\ [0.7-1.3]\\ [0.9-1.7]\\ [0.9-1.3]\\ [0.9-1.2]\\ [0.0-0.1]\\ [1.2-1.9]\\ [1.0-1.3]\\ [0.6-0.8]\\ [0.7-0.9] \end{matrix}$
Observations	9,	058	8,6	645
Number of groups	:	346	:	345
ICC	0.	220	0.1	89

Appendix Table 3 Assoc

Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic multilevel model for women, Nepal, by province

							2	rovince						
		-		2		3		4		5		9		7
Collective norms (community level)														
Urban (Ref: Rural)	0.8	[0.5–1.1]	1.2	[0.6–2.7]	1.5	[0.7–3.1]	1.0	[0.8–1.9]	1.6	[1.0–2.7]	0.7	[0.5–1.0]	1.0	[0.7–1.5]
Distance to health facility is barrier ( <i>Ref:</i> <i>Not a barrier</i> )	1.1	[0.8–1.9]	1.0	[0.4–2.7]	1.6	[0.8–2.9]	1.5*	[1.0–2.2]	1.4	[0.9–2.2]	0.8	[0.4–1.5]	2.2	[0.8–6.3]
OR per 1 SD increase (95% CI)														
Average ideal number of children	0.6*	[0.4-0.9]	0.9	[0.6-1.3]	<u>.</u>	[0.7–1.8]	1.0	[0.8–1.4]	0.6**	[0.4-0.8]	0.7*	[0.5–1.0]	0.6**	[0.4-0.9]
% women involved in contraceptive	1.2	[1.0–1.5]	1.1	[0.7–1.8]	1.0	[0.8–1.2]	1.1	[1.0–1.3]	12	0.8-1.8	1.0	0.8-1.2]	1.5	[1.0–2.3]
Viorado CM/DED attitudo to violondo	-	LO 8 1 31	00	LU 7 1 11	0	ID 6 1 61	00	IO 7 1 31	1 0	[10] 1 EI	, ,	IO 7 1 61	۲ ۲	1 D D 1 E1
Averade SWPER social independence	0 6.	[0.1–0.0]	0.9 1 1	[0.7-1.1] [0.6-2.2]	0.1	[0.0-1.0] [0.7_1.6]	0.9	[0.1–1.0] [0.6–1.1]	7 O O	[0.1-0.1]	1.1 0 4**	[0.1–1.0] [0.3–0.7]	- 6	0.5-1.3]
Average SWPER decisionmaking	1.1	0.8-1.6	1.0	0.6-1.6	; <del>(</del>	[1.0–1.7]	1.2	[1.0–1.5]	0.9 0.9	0.6-1.3	1.0	0.8-1.3	0.7	0.4-1.2
Average years men's education	1.0	[0.8–1.4]	1.1	[0.8–1.4]	1.2	[1.0–1.5]	1.0	[0.7–1.3]	0.7*	0.5-1.0]	1.1	0.8–1.5	0.8	[0.6–1.0]
% men believe FP makes women more promiscuous	1.1	[0.9–1.4]	1.0	[0.7–1.4]	0.8	[0.6–1.1]	0.8*	[0.6–0.9]	1.1	[0.8–1.5]	1.0	[0.9–1.2]	0.8**	[0.6–0.9]
Individual-level variables הסקיג בוו														
Younger age (Ref: Older age)	6.0	[0.6–1.2]	0.2**	[0.2-0.3]	0.7	[0.5-1.1]	0.5**	[0.3-0.7]	0.5**	[0.3-0.7]	0.3**	[0.2-0.5]	0.4**	[0.3-0.5]
Second Wealth Quintile (Ref: Lowest)	1.0	[0.6–1.6]	0.9	[0.4–1.8]	6.0	[0.5–1.4]	1.6	[1.0–2.5]	1.0	[0.6-1.5]	1.5	[0.9–2.5]	÷	[0.7-1.7]
Middle Wealth Quintile (Ref: Lowest)	0.9	[0.5–1.6]	1.0	[0.5-2.2]	0.8	[0.5–1.6]	1.2	[0.7–2.0]	0.8	0.5-1.5	2.4**	[1.3-4.4]	1.6	[0.9–2.9]
Fourth Wealth Quintile (Ref: Lowest)	0.7	[0.4–1.3]	1.1	[0.5–2.5]	9.0	[0.3–1.0]	1.2	[0.7–2.3]	1.1	[0.6–1.8]	1.8	[0.9–3.5]	1.7*	[1.0–2.8]
Highest Wealth Quintile (Ref. Lowest)	0.9	[0.4–1.9]	1.5	[0.6-3.7]	0.5	[0.3-1.1]	1.6	[0.8-3.1]	0.8	[0.4–1.6]	2.7**	[1.3–5.7]	- 1.8	[0.6–4.9]
Parity	ک د	[4: L–2: L]	0.7	[0.9–1.2]		[1.0–1.3] [0 0 1 7]		[0.9–1.2] [2,0–0,1]		[1.0-1.5]		[Z. L-0. L]	c	[7.1-0.1]
Exposed to any FP message ( <i>Ret: Not</i> exposed)	0.9	[7.1–1.2]	-	[c.1-0.0]	-	[0.8–1.7]	-	[c.1–6.0]	-	[C.1-P.0]	-	[0.1–0.0]	7. -	[0.3-1.7]
Ideal number of children	1.1	[0.9–1.4]	1.1	[0.9–1.4]	1.0	[0.8–1.3]	1.0	[0.7-1.4]	6.0	[0.7–1.0]	0.9	[0.7–1.2]	1.0	[0.8–1.3]
Wants a/nother child soon (Ref: Does not	0.2**	[0.1–0.3]	0.0**	[0.0-0.1]	0.1**	[0.0-0.2]	0.1**	[0.0-0.3]	0.1**	[0.1–0.3]	0.2**	[0.1–0.3]	0.2**	[0.1–0.4]
want another child soon)	*0 <b>*</b>			ro 0 0 31		F F 0	• •	10 1 2 01			r c	ro F 4 01	1	
woman involved in contraceptive decisionmaking <i>(Ref: Not involved</i> )	0.	[1.1–2.4]	<u>-</u>	[c.z-o.u]	-	[1.1–1.1]	-	[0.1–1.0]	<u>.</u>	[1.0-2.2]	0.7	[z.1-c.0]	<u>.</u>	[U. <del>3</del> -2.3]
CWDER attitude to violence	4 2	[1 0_1 7]	- -	ID 0-1 31	1 2	ID 9-1 71	0	[0 7_1 3]	1 2	[0 0-1 5]	0	ID 8-1 31	+ +	ID 0-1 51
SWPER social independence	6.0	[0.7-1.1]	0.6**	[0.4–0.7]	0.7**	[0.6-0.9]	0.7**	[0.5-0.8]	101	[0.8–1.2]	o1	[0.6–0.9]	0.8**	[0.6-0.9]
SWPER decisionmaking	0.9	[0.8–1.1]	1.2**	[1.1–1.4]	0.8	[0.6–1.1]	0.8	[0.7–1.1]	0.8**	[0.7–0.9]	0.9	[0.8–1.0]	1.0	[0.8–1.2]
Observations		1,304	-	,551	-	1,078	1,	1,150	-	1,470	1,	1,303	-	1,213
Number of groups		57		56		58		52		56		52		52
ICC	0	0.093	Ö	0.135	0	0.158	0.1	0.044	0	0.102	0.0	0.057	0	0.124

Significant at p < .05; \*\* significant at p < .01

# Appendix Table 4 Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic multilevel model for younger (age 15–29) and older (age 30–49) women, Nigeria

		er women i–29)		women ⊢49)
Collective norms (community level)				
OR per 1 SD increase (95% CI)				
Urban (Ref: Rural)	0.8	[0.6–1.1]	1.2	[1.0–1.5]
Distance to health facility is barrier (Ref: Not a barrier)	0.6*	[0.4–0.9]	0.8	[0.6–1.1]
Younger age group				
Average ideal number of children	0.7*	[0.5–0.9]	0.9	[0.7–1.1]
% women involved in contraceptive decisions	1.2	[1.0–1.4]	1.1	[0.9–1.2]
Average SWPER attitude to violence	0.9	[0.7–1.3]	0.9	[0.7–1.1]
Average SWPER social independence	1.1	[0.8–1.5]	1.1	[0.9–1.3]
Average SWPER decisionmaking	0.8	[0.7–1.1]	1.0	[0.8–1.2]
Average years men's education	1.1	[0.9–1.4]	1.3**	[1.1–1.5]
% men believe FP makes women more promiscuous	0.9	[0.8–1.1]	1.0	[0.9–1.1]
Older age group				
Average ideal number of children	1.0	[0.8–1.4]	0.9	[0.7–1.1]
% women involved in contraceptive decisions	1.2	[1.0–1.4]	1.1	[1.0–1.3]
Average SWPER attitude to violence	1.2	[0.9–1.6]	1.3*	[1.1–1.7]
Average SWPER social independence	0.9	[0.7–1.2]	0.8	[0.7–1.0]
Average SWPER decisionmaking	1.1	[0.8–1.3]	1.0	[0.8–1.2]
Average years men's education	1.1	[0.9–1.3]	1.1	[1.0–1.3]
% men believe FP makes women more promiscuous	1.1	[0.9–1.2]	1.0	[0.9–1.1]
ndividual-level variables				
OR (95% CI)				
Second Wealth Quintile (Ref: Lowest)	1.0	[0.6–1.6]	1.0	[0.8–1.5]
Middle Wealth Quintile (Ref: Lowest)	1.8**	[1.2–2.7]	1.2	[0.9–1.8]
Fourth Wealth Quintile (Ref: Lowest)	2.6**	[1.6–4.3]	1.5*	[1.1–2.2]
Highest Wealth Quintile (Ref: Lowest)	3.3**	[1.9–5.7]	1.5*	[1.0–2.2]
Parity	1.3**	[1.2–1.4]	1.0	[1.0–1.1]
Exposed to any FP message (Ref: Not exposed)	1.2	0.9–1.5	1.3*	[1.0–1.5]
Ideal number of children	1.0	0.9–1.0	1.0*	0.9-1.0
Wants a/nother child soon (Ref: Does not want another child soon)	0.4**	[0.3–0.5]	0.3**	[0.2–0.4]
Woman involved in contraceptive decisionmaking ( <i>Ref: Not involved</i> )	0.9	[0.7–1.4]	1.3	[1.0–1.8]
SWPER attitude to violence	1.2	[1.0–1.4]	1.1	[1.0–1.3]
SWPER social independence	1.1	[1.0–1.3]	1.0	[1.0–1.1]
SWPER decisionmaking	1.1	[1.0–1.3]	1.1	[1.0–1.1]
Observations			18,8	
Number of groups		911		911
CC		302		223

Significant at p < .05; \*\* significant at p < .01

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Appendix Table 5 Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic multilevel model for women, Nigeria by state	/e gender, d el for wome	ler, decisionmaking, an omen, Nigeria by state	ving, an y state	d contract	eptive b	eliefs and	the indi	ividual use	of mode	ern contra	Iception	u using
				IJON	I Edst	NOLL	Iwest	Inoc	n cast	unoe	UINOS	Inoc	I West
and main failing interimpediations transformed areas (95% c) areas (95% c) a	Collective norms (community level) OR (95% Cl)												
anthe lattice (Ref. Not a barnet)         0.9         (0.6-1.4)         (1.4         (0.8-2.5)         0.3*         (0.1-0.7)         0.8         (0.6-1.2)         0.4*         (0.3-0.7)         0.6*           rease (35%)         0         0         0.9-1.4)         1.7         (1.3-2.1)         1.7         (0.5-1.4)         1.4         (0.1-2.4)         0.4*         (0.3-0.7)         0.6*           weld normeschine decisions         0.7         (0.5-1.4)         1.7         (1.3-2.1)         1.1         (0.1-1.3)         1.4         (0.1-2.4)         1.4         (0.1-3)         1.4         (0.2-1.3)         1.4	Urban (Ref: Rural)	0.0	[0.7–1.2]	0.8	[0.4–1.6]	1.1	[0.8–1.7]	1.2	[0.9–1.6]	1.1	[0.8-1.5]	1.6**	[1.2–2.1]
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Distance to health facility is barrier ( <i>Ref. Not a barrier</i> ) OR per 1 SD increase (95% CI)	0.9	0.6–1.4	1.4	0.8–2.5	0.3**	[0.1–0.7]	0.8	0.6–1.2	0.4**	0.3-0.7	0.6*	0.4-0.9
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Averade ideal number of children	0.7*	[0.5-1.0]	1.3	[0.9–2.0]	0.7*	[0.5-0.9]	1.4	[0.7-2.7]	0.7	[0.5-1.2]	0.7	[0.4–1.2]
Ref attude to volence         11 $[0.8-14]$ $1.4^{+}$ $[10-18]$ $1.2$ $[10-14]$ $1.6^{+}$ $[11-24]$ $0.8$ $0.5-13$ $1.1$ Ex costal independence         11 $[0.8-13]$ $0.8$ $0.5-113$ $1.1$ $0.8-1.3$ $1.0$ $0.6-1.3$ $0.0$ $0.6-1.3$ <t< td=""><td>% women involved in contraceptive decisions</td><td>0.9</td><td>[0.8–1.1]</td><td>1.7**</td><td>[1.3–2.1]</td><td>1.1</td><td>[0.9–1.5]</td><td>1.0</td><td>[0.8–1.3]</td><td>1.4**</td><td>[1.2-1.7]</td><td>1.0</td><td>[0.8–1.3]</td></t<>	% women involved in contraceptive decisions	0.9	[0.8–1.1]	1.7**	[1.3–2.1]	1.1	[0.9–1.5]	1.0	[0.8–1.3]	1.4**	[1.2-1.7]	1.0	[0.8–1.3]
ER social independence         11 $[08-13]$ 13 $[08-13]$ 11 $[08-13]$ 11 $[08-13]$ 11           Fired existionmaking         11 $[03-13]$ 18 $[05-10]$ 10 $[08-13]$ 11 $[08-$	Average SWPER attitude to violence	1.1	[0.8–1.4]	1.4*	[1.0–1.8]	1.2	[1.0–1.4]	1.6*	[1.1–2.4]	0.8	[0.5-1.4]	1.1	[0.7–1.8]
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Average SWPER social independence	1.1	[0.8–1.4]	1.0	[0.6–1.7]	1.3	[0.8–2.0]	1.0	[0.7–1.3]	1.0	[0.8–1.3]	1.1	[0.8–1.4]
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Average SWPER decisionmaking		[0.8–1.3]	0.8	[0.5-1.1]	4.4	[1.0–1.9]		[0.8–1.4]	1.0	[0.8–1.3]		[0.9–1.4]
ariables           Bet Officer age ( $Mer age$ )         ( $Mer age$ )          ( $Mer age$ )	Average years men's equcation % men believe FP makes women more promiscuous	7.1 1.1	[1.0–1.4] [0.9–1.3]	0.8	[1.3–2.4] [0.6–1.0]	7.1 1.0	[0.8–1.1] [0.8–1.1]		[0.8-1.4] [1.0-1.3]	0.9 1.1	[0.7–1.1] [1.0–1.2]	0.1	0.7–1.3] [0.8–1.1]
Ref: Older age) Countile (Ref: Lowest)         13         (09-1.8)         10         (06-1.5)         1.6         (10-2.4)         2.0°         (1.4-2.8)         13         (09-1.8)         13         (09-1.8)         13         (09-1.8)         13         (09-1.4)         0.6         (02-1.4)         0.8           Outinitie (Ref: Lowest)         12         (03-1.9)         12         (03-1.4)         13         (04-2.8)         0.6         (02-1.4)         0.6           Outinitie (Ref: Lowest)         15         (03-2.13)         33         (10-2.4)         2.0°         (13-6.1)         0.1         (04-2.8)         0.6           Outinitie (Ref: Lowest)         12         (10-2.1)         1.1         (10-1.1)         1.1         (10-4.8)         0.6         02-1.4)         0.6           Outinitie (Ref: Lowest)         23°         (12-4.2)         26°         (11-1.3)         1.1         (10-1.2)         1.1           Outinitie (Ref: Lowest)         13         (09-1.6)         14         10         10         11         11         11         12         11         12         11         12         11         12         11         12         11         12         12         12         12	Individual-level variables												
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Younger age (Ref: Older age)	1.3	[0.9–1.8]	1.0	[0.6–1.5]	1.6*	[1.0–2.4]	2.0**	[1.4–2.8]	1.3	[0.9–1.8]	1.2	[0.8–1.7]
Quintle (Ref: Lowest)         12 $[0.7-1.9]$ 1.8* $[1.0-2.9]$ $2.7^*$ $[1.5-5.0]$ $6.8^*$ $[1.3-36.1]$ $1.1$ $[0.4-2.8]$ $0.9$ Quintle (Ref: Lowest)         1.5 $[0.9-2.5]$ $3.9^*$ $[1.9-8.2]$ $3.0^*$ $[1.5-6.1]$ $10.8^*$ $[2.1-59.6]$ $1.1$ $[0.2-3.5]$ $1.1$ Quintle (Ref: Lowest)         1.3 $[0.9-1.9]$ $1.0$ $[1.0-1.1]$ $1.1$ $[1.0-1.1]$ $1.1^*$ $[2.3-3.5]$ $1.1$ VF message (Ref: Not exposed)         1.3 $[0.9-1.9]$ $1.0$ $[1.0-2.1]$ $1.1$ $[1.0-1.1]$ $1.1^*$ $[0.5-3.5]$ $1.1$ $[0.5-3.5]$ $1.1$ $[0.5-3.5]$ $1.1^*$ $[1.0-1.2]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.1^*$ $[1.2-2.1]$ $1.2^*$ $[1.2-2.1]$ $1.2^*$ $[1.2-2.1]$ $1.2^*$ $[1.2^*$ $1.2^*$ $[1.2^*$	Second Wealth Quintile (Ref. Lowest)	1.1	[0.7–1.9]	1.2	[0.8–1.8]	1.3	[0.8–2.3]	5.3	[1.0–28.4]	0.6	[0.2–1.4]	0.8	[0.5–1.2]
Quintile (Ref: Lowest)       1.5 $[0.9-2.5]$ $3.3^{**}$ $[1.9-8.2]$ $3.0^{**}$ $[1.5-6.1]$ $10.8^{**}$ $[2.1-56.5]$ $1.3$ $[0.5-3.5]$ $1.1$ $0.0intile (Ref: Lowest)$ $2.3^{**}$ $[1.2-4.2]$ $2.6^{**}$ $[1.1-6.0]$ $4.1^{**}$ $[1.9-8.4]$ $11.1^{**}$ $[2.1-50.6]$ $1.1$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $[1.1, 1.0^{**}]$ $[1.1, 1.0^{**}]$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ $[1.0-1.2]$ $1.1^{**}$ <td>Middle Wealth Quintile (Ref: Lowest)</td> <td>1.2</td> <td>[0.7–1.9]</td> <td>1.8*</td> <td>[1.0–2.9]</td> <td>2.7**</td> <td>[1.5–5.0]</td> <td>6.8*</td> <td>[1.3–36.1]</td> <td>1.1</td> <td>[0.4–2.8]</td> <td>0.9</td> <td>[0.5–1.5]</td>	Middle Wealth Quintile (Ref: Lowest)	1.2	[0.7–1.9]	1.8*	[1.0–2.9]	2.7**	[1.5–5.0]	6.8*	[1.3–36.1]	1.1	[0.4–2.8]	0.9	[0.5–1.5]
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fourth Wealth Quintile (Ref: Lowest)	1.5	[0.9–2.5]	3.9**	[1.9–8.2]	3.0**	[1.5–6.1]	10.8**	[2.1–56.5]	1.3	[0.5 - 3.5]		[0.7–1.8]
F message (Ref. Not exposed) $1.2^{-1}$ $1.10^{-1.11}$ $1.10^{-1.11}$ $1.10^{-1.11}$ $1.10^{-1.11}$ $1.10^{-1.11}$ $1.11^{-1.11}$ $1.11^{-1.11}$ $1.11^{-1.11}$ $1.11^{-1.11}$ $1.11^{-1.11}$ $1.12^{-2.11}$ $1.2^{-2.11}$	Highest Wealth Quintile ( <i>Ref: Lowest</i> )	2.3**	[1.2-4.2]	2.6*	[1.1–6.0]	4.1**	[1.9–8.4]	11.1**	[2.1–59.6]	4.4	[0.5-4.0]	0.9	[0.6–1.5]
V FP message (Ver. Not exposed)       1.3 $[0.9-1.0]$ $1.4$ $[1.0-2.1]$ $1.0$ $[0.0-1.0]$ $1.1$ $[0.8-1.2]$ $1.6^{-1.1}$ $1.2^{-2.11}$ $1.2^{-2.11}$ $1.2^{-2.11}$ $0.3^{+1.1}$ $0.9^{+1.10}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.1^{-2.11}$ $1.2^{-2.11}$ $0.1^{-2.01}$ $0.3^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.9^{-1.01}$ $0.1^{-1.01}$ $1.1^{-1}$ $0.9^{-1.01}$ $0.1^{-1.01}$ $1.1^{-1}$ $0.9^{-1.01}$ $0.1^{-1.01}$ $1.1^{-1}$ $0.9^{-1.01}$ $0.1^{-1.01}$ $1.1^{-1}$ $0.9^{-1.01}$ $1.1^{-1}$ $0.8^{-1.14}$ $1.1^{-1}$ $0.8^{-1.14}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$ $0.9^{-1.21}$ $1.1^{-1}$	Parity		[1.1–1.3] [1.1–1.3]	0.1	[1.1–0.1]		[1.0-1.1]		[1.1–1.3]	1.1	[1.0-1.2]		[1.1–1.1]
A matrix on Ref: Does not want another child       0.5*       [0.2-0.5]       0.5*	Exposed to any FP message ( <i>Ret: Not exposed</i> ) Ideal number of children	1.3 0 0*	[0.9–1.8] [0.8–1.0]	1.4 0	[1.0–2.1] [0.9–1.0]	0.6	[0.6–1.6] [0 9–1 0]	1.1 0 9**	[0.8–1.5] [0.8–0.9]	1.6**	[1.2-2.1] [0 0-1 1]	1.2 0 9**	[0.9–1.4] [0.8–1.0]
ad in contraceptive decisionmaking ( <i>Ref: Not</i> 1.8*       [1.3-2.5]       0.8 $[0.5-1.3]$ 1.2 $[0.7-2.0]$ 2.2* $[1.3-3.8]$ 1.4 $[0.8-2.4]$ 1.1         le to violence         1.1 $[0.9-1.3]$ 1.2 $[1.0-1.3]$ 1.2 $[0.9-1.6]$ 1.1 $[0.9-1.2]$ 1.0         independence       1.1 $[0.9-1.2]$ 1.2 $[1.2-1.18]$ $1.2*$ $[1.0-1.2]$ 1.1 $[0.9-1.2]$ 1.0         independence       1.1 $[0.9-1.2]$ $1.5*$ $[1.2-1.18]$ $1.2*$ $[1.0-1.2]$ $1.0$ $[0.9-1.2]$ $1.0$ independence       1.1 $[0.9-1.2]$ $1.5*$ $[1.2-1.18]$ $1.2*$ $[1.0-1.4]$ $1.1$ $[1.0-1.4]$ $1.0$ independence       1.1 $[0.9-1.2]$ $1.5*$ $[1.2-1.18]$ $1.2*$ $[1.0-1.4]$ $1.0$ $[0.9-1.2]$ $1.0$ independence $1.2*$ $[1.2-1.18]$ $1.2*$ $[1.0-1.4]$ $1.2*$ $[0.9-1.2]$ $1.0$ $[0.9-1.2]$ $1.0$ inmaking $2.669$ $2.169$ $2.669$	Wants a/nother child soon (Ref: Does not want another child		0.4-0.7	0.3**	0.2-0.5	0.3**	[0.2-0.5]	0.5**	[0.3-0.7]	0.3**	0.2-0.5	0.3**	0.2-0.5
ad in contraceptive decisionmaking ( <i>Ref: Not</i> 1.8**       [1.3-2.5]       0.8       [0.5-1.3]       1.2       [0.7-2.0]       2.2**       [1.3-3.8]       1.4       [0.8-2.4]       1.1         the to violence       1.1       [0.9-1.3]       1.2       [1.0-1.4]       1.1       [1.0-1.3]       1.2       [0.9-1.6]       1.1       [0.8-1.4]       1.0         independence       1.1       [0.9-1.2]       1.2*       [1.0-1.4]       1.1       [1.0-1.5]       1.1       [0.9-1.2]       1.0         independence       1.1       [0.9-1.2]       1.5*       [1.2-1.8]       1.3**       [1.1-1.6]       0.9       [0.8-1.1]       1.2       1.0         independence       1.1       [0.9-1.2]       1.5*       [1.2-1.8]       1.3**       [1.1-1.6]       0.9       [0.8-1.1]       1.2       1.0         independence       1.4       [0.9-1.2]       1.5*       [1.2-1.8]       1.3**       [1.1-1.6]       0.9       [0.8-1.1]       1.2       1.0         independence       2.15       2.1       4.165       2.454       2.456       2.456       2.456       2.456       2.456       2.456       2.456       2.456       2.456<	soon)				•								•
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Woman involved in contraceptive decisionmaking (Ref: Not	1.8**	[1.3–2.5]	0.8	[0.5 - 1.3]	1.2	[0.7–2.0]	2.2**	[1.3–3.8]	1.4	[0.8–2.4]	1.1	[0.6–2.0]
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	involved) SWPFR attitude to violence	÷	[0 9–1 3]	12	[1 0–1 4]	, ,	[1 0–1 3]	1 2	[0 9–1 6]	۲ ۲	IO 8-1 41		IO 9-1 21
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SWPFR social independence	÷	[0 9–1 2]	10	[0 9–1 3]	1 2*	[1 0-1 5]		[0 9–1 2]	10	[0 9–1 2]		[0 9–1 1]
4,054 4,256 6,158 2,669 2,454 245 215 271 184 216 0.167 0.268 0.199 0.095 0.074	SWPER decisionmaking	÷.	[0.9–1.2]	1.5**	[1.2–1.8]	1.3**	[1.1–1.6]	0.9	[0.8–1.1]	1.2	[1.0-1.4]		[0.7–1.0]
245 215 271 184 216 0.167 0.268 0.199 0.095 0.074 0.1	Observations		4,054	4,	256	, 9	158	2,6	969	3	454	ю́	075
0.167 0.268 0.199 0.095 0.074	Number of groups		245		215		271		84		216		238
			).167	0.2	68	0	66	0.0	<u> 395</u>	0.0	174	0.0	382

\* Significant at p < .05; \*\* significant at p < .01

#### Appendix Table 6

# Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic multilevel model for younger (age 15–29) and older (age 30–49) men and women in Zambia

		er women 5–29)		women )–49)		ger men i–34)		er men 5–59)
Collective norms (community level) OR per 1 SD increase (95% CI)								
Urban ( <i>Ref: Rural</i> ) Distance to health facility is barrier ( <i>Ref: Not a barrier</i> )	1.0 0.8	[0.6–1.6] [0.5–1.2]	0.9 0.7*	[0.6–1.3] [0.5–1.0]	0.5* 0.9	[0.3–1.0] [0.5–1.4]	0.6 1.0	[0.4–1.0] [0.7–1.3]
OR per 1 SD increase (95% CI)								
Younger age group								
Average ideal number of children	0.9	[0.7–1.1]	0.9*	[0.8–1.0]	0.6**	[0.5–0.9]	0.8	[0.7–1.0]
% women involved in contraceptive decisions	1.0 1.1	[0.8–1.3] [0.9–1.4]	0.9 1.1	[0.9–1.0] [0.9–1.3]	1.0 1.0	[0.8–1.2] [0.8–1.3]	1.0 1.0	[0.9–1.1]
Average SWPER attitude to violence Average SWPER social independence	0.9	[0.9-1.4] [0.7-1.1]	1.1	[0.9–1.3]	1.0	[0.8–1.3] [0.9–1.6]	1.0	[0.9–1.2] [0.8–1.1]
Average SWPER decisionmaking	0.9	[0.7–1.1] [0.9–1.4]	0.9	[0.9–1.2]	0.8	[0.9–1.0]	0.8*	[0.6–1.1]
Average years men's education	1.2	[0.0–1.4]	1.0	[0.9–1.2]	1.5**	[0.0-1.1]	1.1	[0.9–1.3]
% men believe FP makes women more	0.9	[0.7–1.1]	0.9**	[0.8–1.0]	1.1	[0.8–1.6]	1.0	[0.8–1.2]
promiscuous	0.0	[0.1 11]	0.0	[0.0 1.0]		[0.0 1.0]	1.0	[0.0 1.2]
Older age group Average ideal number of children	0.9	[0.7–1.1]	0.9	[0.8–1.1]	0.9	[0.7–1.1]	1.0	[0.8–1.3]
% women involved in contraceptive decisions	0.9	[0.7–1.1]	0.9	[0.8–1.1]	0.9 1.4**	[0.7–1.1] [1.1–1.7]	1.0	[0.8–1.3]
Average SWPER attitude	1.3*	[1.1–1.6]	1.0	[0.9–1.1]	1.5**	[1.2–2.0]	1.3*	[1.0–1.6]
Average SWPER social independence	0.7**	[0.6–0.9]	0.9*	[0.7–1.0]	0.7*	[0.6–1.0]	0.9	[0.8–1.1]
Average SWPER decisionmaking	0.9	[0.8–1.1]	1.1	[0.9–1.3]	0.7*	[0.5–0.9]	1.0	[0.8–1.1]
Average years men's education	1.1	[0.9–1.3]	1.0	[0.9–1.2]	1.1	[0.8–1.4]	1.0	[0.8–1.3]
% men believe FP makes women more	1.0	[0.8–1.2]	1.0	[0.9–1.2]	1.0	[0.8–1.3]	1.1	[0.9–1.3]
promiscuous								
Individual-level variables OR (95% CI)								
Primary education (Ref: No education)					1.2	[0.5–2.9]	0.6*	[0.4–0.9]
Secondary+ education ( <i>Ref: No education</i> )					1.3	[0.6–3.0]	0.8	[0.5–1.4]
Second Wealth Quintile ( <i>Ref: Lowest</i> )	1.3	[0.9–1.9]	1.0	[0.7–1.4]	1.3	[0.8–2.1]	1.0	[0.7–1.4]
Middle Wealth Quintile (Ref: Lowest)	1.7*	[1.1–2.6]	1.2	[0.8–1.8]	1.5	[0.8–3.1]	1.4	[0.9–2.0]
Fourth Wealth Quintile (Ref: Lowest)	1.5	[0.8–2.7]	1.3	[0.8–2.3]	1.9	[0.9–4.2]	1.9*	[1.1–3.1]
Highest Wealth Quintile (Ref: Lowest)	1.5	[0.7–3.0]	1.0	[0.6–1.8]	2.0	[0.7–5.9]	1.9*	[1.1–3.6]
Parity	1.0	[0.9–1.2]	1.0	[1.0–1.1]	1.3**	[1.1–1.4]	1.0	[1.0–1.1]
Exposed to any FP message (Ref: Not exposed)	1.2	[0.8–1.7]	1.1	[0.8–1.6]	1.2	[0.8–1.9]	1.5**	[1.1–2.0]
Ideal number of children	1.0	[0.9–1.1]	0.9*	[0.9–1.0]	1.0	[0.9–1.1]	0.9*	[0.9–1.0]
Wants a/nother child soon (Ref: Does not want another child soon)	0.2**	[0.1–0.2]	0.3**	[0.2–0.4]	0.4**	[0.3–0.6]	0.5**	[0.3–0.7]
Woman involved in contraceptive decisionmaking (Ref: Not involved)	2.2**	[1.4–3.4]	1.5*	[1.1–2.1]				
SWPER attitude to violence	0.9	[0.8–1.1]	1.0	[0.9–1.1]				
SWPER social independence	1.1	[0.9–1.4]	1.1	[1.0–1.3]				
SWPER decisionmaking	1.1	[0.9–1.3]	1.1	[0.9–1.2]				
Believes FP makes women more promiscuous (Ref: Does not believe)					1.1	[0.7–1.6]	0.8	[0.6–1.1]
Observations		049		681		245		962
Number of groups		483		483		483		484
ICC	0.	395	0.	246	0.	536	0.	362

\* Significant at p < .05; \*\* significant at p < .01

		Cei	Central			Сорреі	pperbelt			Eastern	Ę			Luapula	nla			Lusaka	Ka	
		Men	×	Women	2	Men	٨٥	Women		Men	Wo	Women	2	Men	Ň	Women	_	Men	Ŵ	Women
Collective norms (community level)																				
OK (95% Cl) Urban ( <i>Ref: Rural</i> ) Distance to health facility is barrier ( <i>Ref: Not a barrier</i> )	0.3	[0.1–0.9] [0.5–2.6]	0.8 0.7	[0.4–1.6] [0.3–1.5]	0.8 0.7	[0.5–1.4] [0.5–1.1]	1.5 0.6	[0.9–2.5] [0.3–1.1]	0.9 1.3	[0.4–1.7] [0.8–2.2]	1.4 0.8	[0.8–2.5] [0.5–1.1]	1.1 0.7	[0.5–2.4] [0.4–1.5]	1.1 1.1	[0.7–3.0] [0.4–2.9]	0.3** 0.9	[0.1–0.6] [0.5–1.7]	0.6 0.8	[0.3–1.1] [0.3–1.9]
OR per 1 SD increase (95% CI Average ideal number of children % women involved in	0.7 0.8	[0.5–1.1] [0.6–1.2]	1.1	[0.8–1.3] [0.7–1.4]	1.1	[0.8–1.7] [0.9–1.4]	1.0	[0.7–1.5] [0.8–1.3]	1.1	[0.8–1.7] [0.9–1.4]	0.0 0.9	[0.6–1.3] [0.8–1.1]	0.8 0.9	[0.5–1.3] [0.5–1.7]	0.7 0.9	[0.5–1.0] [0.5–1.6]	0.6* 1.5**	[0.4–1.0] [1.1–2.1]	0.7** 1.0	[0.5–0.9] [0.8–1.2]
contraceptive decisions Average SWPER attitude to	0.5	[0.2–1.4]	0.9	[0.5–1.5]	1.5*	[1.0–2.1]	1.1	[0.7–1.7]	1.1	[0.7–1.7]	0.9	[0.6–1.3]	1.1	[0.8–1.5]	1.0	[0.5–2.1]	1.4	[0.7–2.8]	0.9	[0.5–1.8]
Violence Average SWPER social	0.8	[0.4–1.5]	1.1	[0.6–1.9]	0.8	[0.6–1.1]	0.8	[0.6–1.1]	0.6**	[0.4–0.9]	0.7*	[0.5–1.0]	1.1	[0.6–2.1]	0.8	[0.4–1.3]	0.7	[0.5–1.0]	0.9	[0.7–1.1]
Average SWPER	1.5	[0.9–2.5]	1.4	[0.9–2.1]	1.2	[0.9–1.8]	1.1	[0.8–1.6]	1.3	[0.9–1.9]	0.9	[0.7–1.3]	1.3	[0.9–2.0]	1.7**	[1.1–2.4]	1.0	[0.5–2.0]	1.0	[0.6–1.6]
vectsorinitating Average years men's education % men believe FP makes women more promiscuous	1.7 0.6	[0.8–3.7] [0.3–1.0]	1.0 0.9	[0.5–1.9] [0.7–1.3]	1.2 1.6**	[0.6–2.4] [1.2–2.1]	1.2 1.5**	[0.9–1.8] [1.1–1.9]	0.9 1.4*	[0.6–1.3] [1.0–1.9]	1.1	[0.8–1.5] [0.8–1.2]	1.1 0.9	[0.7–1.9] [0.6–1.3]	1.0 0.7*	[0.6–1.5] [0.5–0.9]	1.0	[0.7–1.5] [0.8–2.1]	0.7 0.7*	[0.5–1.0] [0.5–1.0]
Individual-level variables																				
Younger age ( <i>Ref: Older age</i> ) Primary education ( <i>Ref: No</i>	1.3 0.9	[0.7–2.2] [0.3–2.4]	2.5**	[1.3–4.9]	1.6* 0.2	[1.0–2.6] [0.0–2.5]	1.1	[0.7–1.8]	3.1** 0.5*	[1.7–5.5] [0.3–1.0]	1.8*	[1.0–3.0]	1.9* 2.0	[1.1–3.5] [0.8–5.5]	2.2	[0.9–5.0]	1.6 1.5	[0.9–2.7] [0.4–5.9]	2.2*	[1.1–4.4]
education) Secondary+ education ( <i>Ref: No</i>	0.9	[0.3–2.8]			0.3	[0.0–3.6]			0.6	[0.3–1.3]			2.0	[0.6–6.3]			2.0	[0.5–7.7]		
eaucation) Second Wealth Quintile ( <i>Ref:</i>	0.9	[0.5–1.9]	0.7	[0.4–1.3]	1.5	[0.5–4.6]	0.4*	[0.2–1.0]	1.4	[0.9–2.1]	1.6*	[1.1–2.5]	0.9	[0.5–1.6]	0.8	[0.5–1.4]	1.4	[0.4–5.3]	1.5	[0.4–5.9]
Middle Wealth Quintile ( <i>Ref:</i>	1.0	[0.4–2.5]	1.0	[0.5–1.8]	1.0	[0.4–2.8]	0.4	[0.2–1.1]	2.4**	[1.5–3.8]	1.6	[0.9–2.8]	1.0	[0.4–2.3]	1.4	[0.7–2.9]	1.1	[0.3-4.3]	1.1	[0.4–3.5]
Fourth Wealth Quintile (Ref:	1.5	[0.5-4.1]	1.5	[0.6–3.9]	0.9	[0.3–2.8]	0.3*	[0.1–0.9]	2.1	[0.9–4.8]	0.9	[0.5–1.9]	1.6	[0.4–6.0]	1.9	[0.7–5.5]	4.0	[0.9–18.7]	1.4	[0.4–4.8]
Lowest) Highest Wealth Quintile ( <i>Ref.</i>	1.0	[0.3–3.6]	1.4	[0.4-4.6]	1.5	[0.4–4.9]	0.2**	[0.1–0.5]	11.7**	[3.8–36.6]	1.3	[0.4–3.8]	1.3	[0.5–3.9]	1.6	[0.4–6.1]	3.8	[0.8–18.1]	1.3	[0.4–4.5]
Exposed to any FP message	1.1 3.7**	[0.9–1.2] [1.8–7.5]	1.1 0.8	[1.0–1.3] [0.5–1.4]	1.0 1.4	[0.9–1.2] [0.9–2.3]	0.9 1.3	[0.8–1.0] [0.6–2.5]	÷. ÷.	[1.0–1.2] [0.7–1.9]	1.1	[1.0–1.2] [0.7–1.6]	1.0	[0.9–1.1] [0.6–1.7]	1.1 0.7	[0.9–1.3] [0.4–1.2]	1.0 1.4	[0.9–1.2] [0.8–2.5]	1.1	[0.9–1.3] [0.7–2.1]
(Ker: Not exposed) Ideal number of children Wants a/nother child soon ( <i>Ref:</i> Does not want another child	0.9 0.4**	[0.8–1.1] [0.2–0.8]	0.9* 0.4**	[0.8–1.0] [0.2–0.7]	1.0 0.7	[0.9–1.1] [0.3–1.4]	1.0 0.1**	[0.9–1.1] [0.1–0.2]	1.0 0.6	[0.9–1.0] [0.3–1.2]	1.0 0.3**	[0.9–1.1] [0.2–0.4]	1.0 0.4*	[0.9–1.1] [0.2–1.0]	1.0 0.2**	[0.9–1.1] [0.1–0.7]	1.0 0.5*	[0.8–1.1] [0.2–0.9]	0.9 0.2**	[0.9–1.0] [0.1–0.4]
soon) Woman involved in contraceptive decision-making ( <i>Ref: Not</i>			1.3	[0.8–2.1]			1.8*	[1.2–2.9]			1.3	[0.8–2.3]			3.8**	[1.9–7.4]			1.2	[0.7–2.0]
<i>invoited</i> ) SWPER attitude to violence SWPER social independence SWPER decisionmaking Believes FP makes women more promiscuous ( <i>Ref: Does not</i>	0.8	[0.5–1.5]	<u>1.01</u>	[0.8–1.3] [0.7–1.4] [0.8–1.4]	0.7	[0.4–1.3]	0.9 1.1 3.3	[0.8–1.1] [0.8–1.4] [0.9–1.7]	0.9	[0.6–1.4]	1.1 1.4** 0.9	[0.9–1.3] [1.1–1.8] [0.8–1.1]	1.0	[0.6–1.6]	0.9 1.2 1.0	[0.8–1.1] [0.9–1.6] [0.8–1.2]	1.3	[0.8–2.0]	0.9 1.1 1.1	[0.6–1.3] [1.0–1.6] [0.8–1.6]
Deservations	ц)	571		631	- 40	559	ý	650	·~	713	2	791	()	579	,	571	9	652	1-	785
Number of groups		55		55		61		61		62		62		54		54		66		66
ICC	0	0.214	Ö	0.128	0.1	0.103	0.091	91	0.116	16	0.0	0.087	ö	0.186	Ö	0.161	0.159	59	0.0	0.093

Appendix Table 7 Association of collective gender, decisionmaking, and contraceptive beliefs and the individual use of modern contraception using logistic

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	-	Men	-	Women	Men			Women	2	Men	Women	 	Men			Women	Z	Men	-	Women
Collective norms (community level)																				
OR (95% CI) Urban ( <i>Ref: Rural</i> ) Distance to health facility is	0.4 0.6	[0.1–1.5] [0.3–1.3]	0.8 0.7	[0.3–1.9] [0.4–1.4]	0.5	[0.2–1.4] [0.3–2.1]	0.7 0.6	[0.4–1.4] [0.3–1.3]	0.7 1.7	[0.3–1.8] [0.7–3.9]	1.4 [0.6- 1.2 [0.7-	[0.6–3.2] [0.7–2.2] C	0.5 [0	[0.1–4.0]	0.9	[0.4–2.2]	0.8 0.4	[0.2–3.0] [0.1–1.6]	0.4 0.3	[0.1–1.4] [0.1–1.1]
barrier (Ref: Not a barrier) OR per 1 SD increase (95% Cl) Averane ideal number of children	<del>,</del>	IN 7_1 91	0	[0 8_1 2]		-	90	IO 4-1 01	1 0	ID 7_9 11				5_18 11	<del>,</del>	ID 6_2 11	, c	ID 8-1 71	2.0	IO 4-1 21
werage recar intriber of crinical % women involved in	1.4*	[1.1–1.7]	0.0	[0.7–1.0]	1.0	[0.5–1.9]	0.0	[0.6-1.4]	1.0	0.7-1.5	0.6** [0.4-	[0.4–0.9]	1.1 1.1	[0.7–1.6]	0.8	[0.6–1.3]	- <del>[</del> .	[0.6-2.0]	1.0	[0.5–1.7]
connaceptive decisions Average SWPER attitude Average SWPER social	1.8* 0.9	[1.1–3.0] [0.5–1.4]	1.2 0.8	[0.7–2.0] [0.6–1.1]	0.7 1.1	[0.4–1.5] [0.4–2.8]	1.2 0.9	[0.8–1.9] [0.4–1.7]	0.5 0.9	[0.3–1.1] [0.5–1.9]	1.1 [0.8- 0.9 [0.7-	[0.8–1.6] 1 [0.7–1.2] 1	1.1 1.0 [0	[0.3–3.5] [0.5–2.1]	1.1	[0.6–1.6] [0.6–1.8]	1.2 1.0	[0.6–2.6] [0.5–2.3]	0.9 2.0*	[0.3–2.1] [1.0–3.5]
independence Average SWPER	0.7	[0.5–1.1]	1.0	[0.7–1.4]	0.5** [	[0.3–0.8]	0.8	[0.5–1.3]	1.7	[0.8–3.3]	2.6** [1.4-	[1.4–4.7] 0	0] 6.0	[0.2–3.3]	1.4	[0.6–3.2]	1.0	[0.4–2.8]	0.8	[0.4–1.5]
Aecisionmaking Average years men's education % men believe FP makes women more normiscitoris	1.3 1.1	[0.6–2.9] [0.4–2.5]	1.2	[0.6–2.4] [0.6–1.9]	2.0* 1.0	[1.1–3.6] [0.6–1.9]	2.1* 1.5*	[1.2–3.5] [1.0–2.2]	1.3	[0.5–3.1] [0.7–2.3]	0.7 [0.4- 0.6* [0.4-	[0.4–1.3] 2 [0.4–0.9] 1	2.1 1.1 [0	[0.9–4.7] [0.3–3.4]	0.9 1.2	[0.5–1.5] [0.8–1.8]	1.2 0.9	[0.5–2.7] [0.4–1.9]	0.7 0.8	[0.3–1.4] [0.5–1.3]
Individual-level variables																				
Younger age (Ref: Older age) Primary education (Ref: No	1.7 1.9	[0.9–3.3] [0.4–8.1]	1.4	[0.8–2.6]	0.9	[0.5–1.8] [0.2–3.3]	0.7	[0.4–1.3]	1.9 0.4	[0.9–3.8] [0.1–3.0]	2.2* [1.1-	[1.1–4.0] 10 1	10.8 [0.9 1.6 [0	[0.9–124.1] [0.2–9.9]	0.0	[0.4–1.8]	3.5* 0.9	[1.3–9.7] [0.3–2.5]	2.6**	[1.3–5.4]
education) Secondary+ education (Ref: No	2.9	[0.7–12.9]			] 6.0	[0.2-4.0]			1.3	[0.2–10.4]		.,	3.4 [0.	[0.2–52.8]			1.1	[0.3-4.0]		
equication) Second Wealth Quintile ( <i>Ref:</i>	1.0	[0.6–1.9]	2.0*	[1.2–3.3]	0.6	[0.3–1.5]	1.2	[0.7–2.2]	1.7	[0.7–4.1]	1.3 [0.6-	[0.6–3.0]					1.0	[0.4–2.5]	0.4*	[0.2–0.9]
Middle Wealth Quintile (Ref:	1.5	[0.6–3.5]	2.4*	[1.2–5.0]	0.8	[0.2–3.0]	1.2	[0.6–2.6]	2.3	[0.8–6.3]	1.5 [0.6-	[0.6–3.4]					2.0	[0.5–7.7]	1.2	[0.4–3.5]
Fourth Wealth Quintile (Ref:	0.7	[0.3–1.9]	1.0	[0.4–2.1]	1.1	[0.4–3.2]	0.4	[0.1–1.5]	2.2	[0.6–8.1]	1.8 [0.6-	[0.6–5.3] C	0.5 [0	[0.1–3.4]	2.6**	[1.5–4.2]	0.7	[0.1–4.3]	0.9	[0.2–4.8]
Lowesy Highest Wealth Quintile ( <i>Ref:</i> Lowest	1.9	[0.6–6.3]	2.5	[0.5–12.7]	1.2	[0.3–4.3]	1.0	[0.3–2.8]	3.8*	[1.0–14.0]	2.4 [0.8-	[0.8–7.3] 0	0.4 [0	[0.0–5.0]	4.3	[0.5–33.8]	0.6	[0.1–5.3]	1.1	[0.2–5.7]
Parity Exposed to any FP message	1.1 1.5	[1.0–1.2] [0.9–2.7]	1.0 1.3	[0.8–1.1] [0.8–2.1]	1:1 1:2	[0.9–1.3] [0.7–2.1]	0.9* 1.1	[0.8–1.0] [0.5–2.2]	1.1 1.6	[0.9–1.3] [0.8–2.9]	1.2* [1.0- 0.7 [0.3-	[1.0–1.4] 1 [0.3–1.5] 0	1.2 [1 0.7 [0	[1.0–1.5] [0.1–4.5]	0.9 1.5	[0.7–1.2] [0.7–3.3]	1.1 2.1	[0.9–1.3] [0.8–5.9]	1.0 1.8	[0.8–1.3] [0.6–6.0]
(ret: Not exposed) Ideal number of children Wants a/nother child soon (Ref: Does not want another child	1.0 0.5*	[0.9–1.0] [0.3–1.0]	1.0 0.2**	[0.9–1.2] [0.1–0.4]	0.9 [0.3**	[0.8–1.0] [0.2–0.7]	1.0 0.2**	[0.9–1.1] [0.1–0.3]	1.0 0.6	[0.9–1.1] [0.3–1.2]	0.8* [0.7- 0.1** [0.1-	[0.7–1.0] C	0.9 0.4 [0	[0.7–1.2] [0.1–2.5]	0.8 0.7	[0.6–1.1] [0.2–2.2]	0.9 0.2**	[0.7–1.0] [0.1–0.5]	1.0 0.3**	[0.9–1.2] [0.2–0.7]
soon) Woman involved in contraceptive decisionmaking ( <i>Ref: Not</i>			4.0**	[2.0-8.4]			1.6	[0.8–3.2]			1.4 [0.7-	[0.7–3.0]			7.6*	[1.2–46.6]			2.3	[0.7–7.4]
<i>INVORED</i> SWPER social independence SWPER social independence SWPER decisionmaking Believes FP makes women more promiscuous ( <i>Ref: Does not</i>	0.7	[0.4–1.3]	1.1	[0.9–1.2] [0.7–1.1] [0.8–1.0]	1.1	[0.6–2.1]	1.0 0.9 1.1	[0.8–1.2] [0.6–1.4] [0.8–1.5]	0.9	[0.4–1.8]	0.8* 0.8 [0.6- 1.3 [0.9-	[0.6–1.0] [0.5–1.2] [0.9–1.9] C	0.7 [0	[0.3–2.1]	0.0 0.0	[0.7–1.2] [0.2–2.2] [0.3–2.7]	1.3	[0.6–2.7]	0.8 0.8 2.0**	[0.6–1.1] [0.6–1.2] [1.4–2.9]
Observations		524		611	ά	548	9	611	4	409	441		146		÷	185		350	4	407
Number of groups		45		45		53	53	53		43	43		19			19		49		49
ICC	0.1	0.167	0.	0.140	0.321	21	0.1	39	0.233	33	0.087		0.138		0.000	00	0.3	0.385	0.393	13
* Significant at $p$ < .05; ** significant at $p$ < .01	t p < .01																			