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Understanding the Multilevel Factors Related to Spousal Communication and Contraception Among Married Adolescent Girls and their Husbands in Dosso, Niger

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy

in

Public Health (Global Health)

by

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The dissertation of Sneha Challa is approved, and it is acceptable in quality and form for publication on microfilm and electronically.

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DEDICATION

To my parents, whose dedication to lifelong learning is my biggest inspiration.

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LIST OF ABBREVIATIONS

FP – Family Planning
RMA – Reaching Married Adolescents
SRH – Sexual and Reproductive Health
HTSP – Healthy Timing and Spacing of Pregnancy

LIST OF SYMBOLS

^p-value for one-sample t-tests comparing 2-category outcome across continuous demographic characteristics
^^p-value for ANOVAs comparing 3-category outcome across continuous demographic characteristics
*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics
[a]Covariates: treatment, district
[b]Covariates: treatment, district, wife's age, parity, wife's education, husband's education
[c]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration, district
[d]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration
[e]No covariates or nested random effects of participant within village included
[f]No covariates or random effects included
**significant $p<0.05$
[g]Covariates: district
[h]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration, district

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ABSTRACT OF THE DISSERTATION

Understanding the Multilevel Factors Related to Spousal Communication and Contraception Among Married Adolescent Girls and their Husbands in Dosso, Niger

by

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Doctor of Philosophy in Public Health (Global Health)

University of California San Diego, 2020
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In the West African nation of Niger, adolescent girls have the highest total fertility rate in the world, attributable to high rates of early marriage and childbirth. Gender norms that place men in decision-making positions and charge women with childbearing and childrearing, preclude engagement in discussions about fertility and family planning (FP) and as a result, contraceptive use remains low. As men are increasingly included in FP promotion efforts alongside women, it is important to understand the forces that shape couples' interactions in the FP process. Utilizing data from married adolescent girls and their husbands in the Dosso region of Niger, this dissertation studies individual-, family-, and community-level factors to better understand how couples communicate about contraception and make decisions about actual contraceptive use. First, this work assesses the effects of couples' individual attitudes about FP on spousal communication about contraception. This includes the separate, joint, and interacting effects of adolescent wives' and husbands' individual attitudes and their relationship with recent

discussions about contraception, including those that were wife-initiated and wife-led. Second, is an examination of the effects of a community-based, gender-synchronized FP promotion program, including individual- and group-based approaches, on spousal communication about contraception. A study of the potential mediating effects of spousal communication about contraception sheds light on whether this is an important intermediate outcome of such programs. Finally, this dissertation seeks to characterize men's social networks and their impact on men's FP-related attitudes and behaviors. The work will also explore how FP messages spread through these networks to spur social change. Findings will help advance the study of relationship dynamics as they pertain to contraceptive use and improve the design and implementation of programs that aim to encourage more equitable FP decision-making.

INTRODUCTION

Women in Niger between 2010-2015 experienced the highest adolescent fertility rate in the world (208 births per 1000 women ages 15-19 years) and the highest overall fertility rate (7.6 births per woman).[1, 2] This high fertility can be linked to the prevalence of early marriage in Niger where 28% of girls are married by age 15 years and 76% are married by age 18 years.[3] The health consequences of early marriage include high risk for unintended and inadequately spaced pregnancy, and have significant implications for the trajectory of girls' lives.[4-6] Additionally, family planning (FP) is limited with contraceptive prevalence measured at only 18.5% for all women and 15.5% for adolescents.[7] What is more, coupled with environmental pressures including variability in rainfall that severely impacts an economy based on agricultural production, the population growth rate in Niger increases the risk of widespread food insecurity and persistent poverty.[8] An important mitigation strategy is the expansion of access to and demand of FP services and contraceptive methods. However, in order to do so, it is imperative to build the evidence base around the process of fertility decision-making to ensure the development of effective, efficient, and equitable solutions.

An understanding of the early marriage, high fertility, and low contraceptive use context can be informed by Connell's Theory of Gender and Power (1987) which outlines how the division of labor, the division of power, and the structure of cathexis (gender-based behavioral norms) affect contraceptive use and fertility behaviors.[9] The division of labor in Niger dictates that men provide for the economic wellbeing of the family while women bear and raise children to secure their position in the household.[10, 11] Further, Nigerien communities are often stratified by status symbols including gender, wealth, education, etc., such that the division of power gives men control over decision-making and diminishes young married girls' autonomy and ability to exercise choice in matters of fertility.[10] In fact, data from the United Nations Population Fund estimates that only 7% of married women in Niger participated in decisions regarding key three domains: sex, contraception, and healthcare.[12] The structure of cathexis then guides normative behavior for young married girls, who are expected to give birth soon after marriage.[11] This distribution of labor, power, and expected behavior that characterize relationships between young married women and their husbands demonstrates how fertility-related decisions remain under men's control. Qualitative and ethnographic research in rural Nigerien communities highlights the importance of male partners' support

for young married women's engagement in FP-related behaviors.[10, 11] Extant research demonstrates that this support, perhaps voiced through couple communication about contraception, is positively associated with contraceptive use.[13-15] However, given the gender-segregation of many Nigerien communities, these discussions are rare and there is very little known about the correlates of communication between young women and their husbands.[10]

To better understand how couples' interactions may be critical to FP-related behaviors including communication and contraceptive use, Olsen and Cromwell's (1975), Power in Families describes communication as a process of power through which a person may exert control in a relationship.[16] Thus couple communication about contraception may be critical to how one member of the couple influences the others' FP-related decision-making, choices, or behaviors. Additionally, in their study using The Integrated Gateway Model, Schwandt et al. (2015) have identified couple communication about contraception as a key gateway behavior, linking it to a cascade of downstream behaviors including actual contraceptive use in Egypt and Nigeria.[17] They also identified perceived community norms around FP and individual attitudes towards contraceptive methods as key elements that create context for gateway behaviors such as couple communication. Importantly, recent work has explicitly demonstrated a link between spousal communication about contraception and modern contraceptive method use in rural Niger.[18]

Importantly however, we currently have little understanding of the contextual factors that shape couples' interactions around fertility, FP, and contraceptive use. These factors, captured in the Social-Ecological Model, operate within and across levels of the social environment including the individual-, family-, community-, organizational-, and environmental-levels.[19, 20] Understanding these cross-cutting factors is particularly important given the emphasis on increasing male participation and engagement in the FP process.[21-24] These gender-synchronized efforts involve both members of the couple, seeking to shift norms and attitudes around gender roles and FP. By engaging both men and women, these programs seek to treat couple communication as a modifiable exposure with potential to promote more equitable decision-making around contraception.[23, 25]

Despite the established importance of spousal communication about contraception, increased programmatic focus on its promotion, and the lack of research focused on its correlates and effects, few

studies have sought to characterize individual-, couple-, or social network-level characteristics that make such discussions, particularly those that are woman-led, more likely. Further, research on couple communication overall has been limited in its inclusion of representative samples of married adolescent girls, who are particularly vulnerable to early and inadequately spaced pregnancies. When considering FP promotion programs, there little examination of how these programs affect couples' communication and a lack of engagement of social networks to better comprehend influences on men's FP-related attitudes and behaviors, as key gatekeepers to contraceptive use. This body of work proposes to fill these gaps in the literature by conducting secondary data analyses, cross sectional and longitudinal, of dyadic data from a representative sample of married adolescent girls (ages 13-19 years) and their husbands in rural Niger drawn from the *Reaching Married Adolescents in Niger* (RMA) study. The proposed study will assess individual, couple, and social network characteristics hypothesized to affect spousal communication about contraception and examine how this relates to actual contraceptive use. Results from this work have the potential to inform programs seeking to improve the health, wellbeing, and life trajectories of young married girls by increasing equitable decision-making around FP through couple communication.

CHAPTER 1: A study of Nigerien couples' attitudes regarding family planning and their relationship with spousal communication about contraception

1.0 Abstract

Attitudes about family planning (FP) have been linked to actual contraceptive use, as has couple communication about contraception. However, limited work has characterized the relationship between these important correlates of contraceptive use. This is particularly salient in Niger, where men's roles as decision-makers and the expectation that women bear as many children as God intends may preclude positive and equitable attitudes about FP and FP-related discussions. This work will assess longitudinal relationships between adolescent wives' and husbands' accepting/equitable FP attitudes and recent spousal communication about contraception, including wife-initiated recent discussions, and recent discussions for which the purpose was the wife's desire to use contraception. Baseline and follow-up data from the *Reaching Married Adolescents in Niger* (RMA) study were used with logistic mixed models to assess separate, joint, and interacting effects of wives' and husbands' accepting/equitable FP attitudes on spousal communication outcomes. Results showed that adolescent wives' and husbands' more accepting/equitable FP attitudes had differential associations with spousal communication outcomes. Importantly, findings demonstrated that even after accounting for wives' and husbands' attitudes, only those of the wife were found to be associated with recent discussions. Additionally, there were no interacting effects between wives' and husbands' attitudes found. Results align with qualitative work suggesting that while generally lacking power, adolescent wives may be asserting themselves in the FP domain. Future research and programs aimed at modifying attitudes about FP should take care to promote young wives' attitudes which may be most important to couples' engagement in wife-led, fertility-related discussions.

1.1 Introduction

Though the onus of FP has historically been placed on women, men often remain decision-makers in traditional, patriarchal societies, leaving women with less power to independently make choices about their health or fertility.[5] This is true in countries such as Niger where ethnographic studies show that parents seek to marry their daughters early to keep them safe, avoid risk of pregnancy outside of marriage, and also to ensure that in her young age, she will remain deferential to her husband, an

important role for women in marriage.[10, 26] Estimates show that roughly one-fourth of girls are married by age 15 years and three-fourths by age 18 years.[27] As a result, girls begin their reproductive lives very early, with data from the most recent Demographic and Health Survey showing that 33% of adolescents aged 15-19 years had already given birth for the first time.[28] This has resulted in both the highest overall and highest adolescent fertility rates in the world, likely perpetuated by limited FP and low contraceptive use as research shows these decisions are still under men's control and childbearing is seen as women's primary role.[2, 10] While Niger is a signatory to FP 2020, a global commitment to rights-based FP, and has thus aimed to reach a 50% modern contraceptive prevalence rate, coverage was found to be only 18.5% among married women.[7, 29, 30]

Evidence suggests that in studying contraceptive use and uptake, we must consider the importance of the multi-level influences on adolescents' sexual and reproductive health (SRH). Influences on adolescents' SRH behavior in low and middle income countries, including those in West Africa, have been found to operate at every level of adolescent girls' social environment.[31, 32] Per Bronfenbrenner's (1977) Ecological Framework and the application of this framework to health promotion put forth by McLeroy et al. (1988), attitudes at the individual level are an important contributor to health behavior.[19, 33] With respect to SRH behaviors, studies have shown that women's attitudes towards FP, beliefs about specific methods, and perceptions of gender roles related to FP are key factors in SRH decision-making.[34-36] However, research in various South Asian and sub-Saharan African contexts also supports that contraceptive nonuse and adolescent pregnancy are perpetuated by young women's lack of power in reproductive decision-making in their relationships.[37, 38] Ethnographic work in Niger has demonstrated that gender, age, status, and wealth afford social capital, generally placing men in positions of power and senior males at the head of households.[10] Traditional gender norms, adolescent girls' age, and the age difference between adolescent girls and their male partners are all factors that perpetuate power differentials. Thus, it is possible that, while important, the attitudes of young married girls in Niger do not function independently, instead working in conjunction with other factors to affect their behavior.[39]

Connell's Theory of Gender and Power supports the gender-based division of power, which in Niger is in favor of men.[9] Accordingly, male partners and their attitudes play a predominant role in decision-making around FP and contraceptive use, with medical anthropological research demonstrating

the weight of male partner influence, particularly early in a partnership or when there are fewer children.[40] As a result, integrating women's and men's attitudinal perspectives may be critical to understanding FP-related behaviors. Additionally, in societies such as Niger where traditional gender norms prevail, considering whether links between women's attitudes and their behavioral outcomes differ based on their husbands' attitudes could lend insight to men's role as gatekeepers to contraceptive use.

While study of beliefs and attitudes as direct influences on contraceptive use is important, there are also precursors to these behaviors that lack understanding. These include relationship dynamics, namely support from male partners and couple communication about contraception, that have been linked to actual contraceptive use in a variety of samples.[13-15, 41, 42] However, little work has focused on understanding these dynamics, particularly their individual attitudinal determinants, for couples with adolescent wives, while taking into account the unique power dynamics and resulting vulnerabilities of these young girls. It has been shown that husbands and wives in Niger lead very separate lives, with many women practicing a form of seclusion and men residing in their own area of family compounds.[10] This likely limits regular interaction and affects their communication, particularly with respect to sensitive topics such as those related to fertility.

Importantly, there remains a gap in quantitative exploration of spousal communication about contraception and how couples' attitudes towards FP may shape these discussions over time, ultimately impacting contraceptive use. As men are increasingly participating in FP programs that seek to promote couple communication as a way to increase contraceptive use, an improved understanding of couples' individual attitudes and their communication has the potential to help tailor messaging to modify these correlates of actual use. The purpose of this work is thus to, among a sample of adolescent wives and their husbands, examine longitudinal associations between adolescent wives' accepting/equitable FP attitudes and their reports of spousal communication about contraception (including who initiated the most recent discussion and its purpose) two years later. This assessment will account for husbands' attitudes and explore whether wives' and husbands accepting/equitable attitudes interact to inform spousal communication outcomes.

1.2 Methods

1.2.1 Data Source

This longitudinal analysis includes data from adolescent wives and their husbands who participated in baseline and 24-month follow-up of the *Reaching Married Adolescents in Niger* (RMA) Study, a cluster randomized controlled trial (Clinical Trials ID: NCT03226730) of a gender-synchronized FP promotion program in Niger. Baseline data were collected in 2016 following a multi-stage stratified random approach from 48 villages across the Dosso, Doutchi, and Loga districts of the Dosso region of Niger. Participants were recruited from a list of all adolescent wives in each village provided by the village chief based on the following eligibility criteria for adolescent girls: 1) ages 13-19 years, 2) married, 3) fluent in Hausa or Zarma, 4) residing in the village where recruitment was taking place with no plans to move away in next 18 months or plans to travel for more than 6 months during that period, and 5) not currently sterilized. Follow-up data were collected 24 months later in 2018. All data were collected by gender-matched research assistants who obtained assent from husbands or heads of household for adolescent wives' participation. Following obtaining explicit verbal consent from adolescent wives and husbands themselves for their own participation, the survey was administered orally in separate private locations in either the local languages of Hausa or Zarma using pre-programmed tablets. Details about study design, intervention protocols, and data collection procedures can be found in Challa et al., 2019.[43] The University of California San Diego Institutional Review Board and the Ethics Committee of the Nigerien Ministry of Health approved consent procedures and data collection protocols for this study.

1.2.2 Measures

The exposure in this study, wives' accepting/equitable FP attitudes, was measured at baseline and represented by participants' score summed responses to nine items (Cronbach's Alpha=0.86). Reponses were summed for a score from 0-9 with a higher score representing more accepting and equitable attitudes about FP. Scores were then dichotomized at the median to represent more accepting/equitable FP attitudes vs. less accepting/equitable FP attitudes. Husbands' accepting/equitable FP attitudes were captured using a subset of five items also asked of wives, for which responses were summed for a score from 0-5 and also dichotomized at the median. Survey items asked only of

adolescent wives included: 1) Is it okay for a couple to wait two years or more between births, 2) Is it okay for a couple to try to limit the number of children they have, 3) I feel it is important to wait a healthy amount of time in between pregnancies, 4) I believe there is a family planning method that would help me to not get pregnant too soon after giving birth. Survey items asked of both adolescent wives and husbands were as follows: 1) It is a man's responsibility to ensure his wife does not get pregnant too soon after giving birth, 2) The woman has the right to decide to use a family planning method to delay pregnancy, 3) My religion supports the healthy spacing of births, 4) My husband would help me if I wanted to wait two years after giving birth to get pregnant again (or I would help my wife if she wanted to wait), 5) It is the responsibility of both a woman and her husband to healthily space pregnancy. Response options to all items included yes/no/don't know/decline to answer or agree/disagree/don't know/decline to answer, with "don't know" responses coded as "no" or "disagree" and "decline to answer" responses made missing. Only participants with valid data on all items were included.

The outcomes of interest, measured at follow-up, included adolescent wives' reports of spousal communication about contraception in the past 12 months, who initiated the most recent discussion about contraception (in the past 12 months), and what was the purpose of this most recent discussion (in the past 12 months). If adolescent wives said they had ever had a discussion with their husbands about doing something or using any method to space or delay pregnancy and that they had discussed contraception with their husbands in the past 12 months, they were considered to have engaged in recent spousal communication about contraception. If participants had a recent discussion about contraception, they were asked who initiated the most recent discussion. Responses to this outcome were coded as either wife- or husband-initiated communication. Finally, participants were asked what the purpose of their most recent discussions about contraception was. Responses were coded to include wife desired contraceptive use compared to other reasons for a discussion around FP and contraception.

Covariates considered for inclusion were measured at baseline using demographic information captured in a Household Recruitment Survey conducted with husbands or heads of households and data from the main participant survey. Covariates treated continuously included wife's age, age difference between husband and wife, and wife's age at marriage. Covariates treated categorically included parity (no children, one child, two or more children), wife's/husband's education (no schooling, attendance at

Quranic school only, attendance at government school), husband's number of wives (polygamous or monogamous), husband's migration (greater than three months away in the past year), household assets (less than median, median, above median), and district (Dosso, Doutchi, Loga).

1.2.3 Analysis

First, we examined the demographic variables across levels of the three spousal communication outcomes for group differences using chi-squared tests, t-tests, and ANOVAs. Next, we used Generalized Linear Mixed Models (GLMMs) to carry out initial logistic regressions. Separate models were used to assess associations between adolescent wives' baseline accepting/equitable FP attitudes and the following outcomes reported by adolescent wives at follow-up: 1) recent discussion about contraception, 2) wife-initiated most recent discussion about contraception 3) husband-initiated most recent discussion about contraception, 4) most recent discussion was for the purpose of wife's desire to use contraception, and 5) most recent discussion was for another FP- or contraception-related purpose. The same models were also run examining associations between husbands' baseline accepting/equitable FP attitudes and the spousal communication outcomes. The reference for these outcomes was not reporting a recent (past 12 months) discussion about contraception. These initial models controlled for both treatment condition and district and included village-level random effects to account for study design considerations and clustering.

Then, we ran a set of models to assess the joint effects of wives' and husbands' accepting/equitable FP attitudes. These models controlled for demographic characteristics found to be associated with recent discussions about contraception at $p<0.1$, because the subsequent outcomes of who initiated the most recent discussion and its purpose were subcategories of having had a recent discussion. To examine whether the relationship between wives' accepting/equitable FP attitudes and the spousal communication outcomes differs based on husbands' attitudes, we introduced an interaction between wives' and husbands' attitudes into these models. Analyses were conducted using *SAS Studio*® (SAS Institute Inc., 2019).

1.3 Results

1.3.1 Demographic Characteristics and Prevalence of Exposures and Outcomes

Our sample comprised 941 couples who provided valid data at both baseline and follow-up. Of the adolescent wives, 53.5% were aged 18-19 years with 30.2% married to husbands 10 or more years older (Table 1.1). Discrepancies in educational attainment were seen, with only 34.8% of adolescent wives having attended government school to learn reading, writing, math, etc. but 46.9% of husbands having had such opportunities. In this sample, 66.6% reported that husbands had spent more than 3 months away in the past year.

Results show that 36.1% of adolescent wives had more accepting/equitable FP attitudes (Table 1.2) while 46.7% of the husbands held more accepting/equitable FP attitudes. In slightly under one-half of couples (48.5%), both adolescent wives and husbands had more accepting/equitable FP attitudes. However, among adolescent wives who held more accepting/equitable FP attitudes, about 45.6% had husbands who held less FP attitudes (Graph 1.1). Over half of the adolescent wives (n=510, 54.2%) reported not having had a recent discussion with their husbands about contraception while 45.0% (n=423) did report recent discussions. Of those adolescent wives who had recent discussions, 63.8% said they had initiated them with 56.5% reporting that the purpose was their own desire to use contraception. Across all outcomes, there were differences seen by wife's age, parity, wife's education, and husband's education. Higher proportions of adolescent wives in the oldest age group compared to the youngest (46.9% vs. 34.9%), adolescent wives with 2 or more children vs. no children (51.0% vs. 41.0%), adolescent wives who attended government vs. no school (54.7% vs. 40.2%), and adolescent wives whose husbands attended government vs. no school (48.1% vs. 36.4%), reported recent discussions about contraception. A similar pattern was seen for wife-initiated most recent spousal communication and a recent discussion for which was the purpose was the wife's desire to use contraception.

1.3.2 Associations of Wives' and Husbands' Accepting/Equitable FP Attitudes with Spousal Communication about Contraception

In the initial models adjusted for only treatment condition and district (Table 1.3), adolescent wives' more accepting/equitable FP attitudes were found to be positively associated with having had a

discussion with husbands in the past 12 months about contraception (AOR: 1.47, 95% CI: 1.10, 1.97), having had a wife-initiated most recent discussion (AOR: 1.57, 95% CI: 1.13, 2.18), and having had a most recent discussion for the purpose of the wife's desire to use contraception (AOR: 1.65, 95% CI: 1.16, 2.34). In separate models, husbands' more accepting/equitable FP attitudes were positively associated with a discussion in the past 12 months (AOR: 1.40, 95% CI: 1.05, 1.88), a husband-initiated most recent discussion (AOR: 1.79, 95% CI: 1.00, 3.20), and a recent discussion for the purpose of the wife's desire to use contraception (AOR: 1.43, 95% CI: 1.01, 2.04).

After adjusting for relevant covariates and including both wives' and husbands' attitudes in models (Table 1.4), wives' more accepting/equitable FP attitudes remained positively associated with discussing contraception with their husbands in the past 12 months (AOR: 1.41, 95% CI: 1.03, 1.92), with having initiated the most recent discussion (AOR: 1.44, 95% CI: 1.01, 2.04), and with reporting a recent discussion for the purpose of her desire to use contraception (AOR: 1.50, 95% CI: 1.04, 2.18). In these models, only the association between husbands' more accepting/equitable FP attitudes and a husband-initiated most recent discussion remained (AOR: 1.83, 95% CI: 1.01, 3.34). Finally, in testing the interaction between adolescent wives' and husbands' accepting/equitable FP attitudes, we did not find significance (p=0.45, p=0.50, p=0.62, p=0.80, p=0.93 for each of the spousal communication outcomes respectively).

1.4 Discussion

Our work found that adolescent wives' more accepting/equitable FP attitudes at baseline resulted in higher odds of wives reporting: 1) a recent (past 12 months) discussion with their husbands about contraception, 2) a wife-initiated most recent discussion with their husbands about contraception, and 3) a most recent discussion for which the purpose was their desire to use contraception at follow-up. Husbands' more accepting/equitable FP attitudes at baseline were associated with higher odds of wives' reporting: 1) having had a recent (past 12 months) discussion with their husbands about contraception, 2) having a husband-initiated most recent discussion about contraception, and 3) a recent discussion for which the purpose was the wife's desire to use contraception at follow-up. When both wives' and husbands' attitudes were considered together, there remained evidence that wives' more

accepting/equitable FP attitudes were still associated with recent discussions, wife-initiated discussions and discussions for the purpose or the wife's desire to use contraception. Finally, no significant interacting effects of wives' and husbands' accepting/equitable FP attitudes were found.

This study showed that though contraceptive use in Niger may be low, there are couples who hold accepting/equitable FP attitudes. Ethnographic research in the Maradi region of Niger suggests that while indigenous contraceptive methods and FP techniques have historically been more widely accepted, attitudes towards modern contraception are shifting to be more positive as a result of educational messages from community health workers.[10] Our results affirm this, demonstrating that there couples in which the adolescent wife and her husband both hold accepting and equitable attitudes about FP. Additionally, in independent models, both adolescent wives' and husbands' accepting/equitable FP attitudes associate with spousal communication outcomes indicating that these attitudinal determinants are salient to engagement in discussions about contraception.

A critical finding is that when accounting for both wives' and husbands accepting/equitable FP attitudes, wives' attitudes are still found to relate to spousal communication outcomes while husbands' attitudes only relate to their initiation of a recent discussion. This is of great interest as our results demonstrate that adolescent wives' attitudes impact communication about contraception despite husbands' roles as primary decision-makers. The odds ratios after accounting for husband's attitudes are diminished, but the persistence of these relationships is important in light of global research demonstrating adolescent girls' diminished power to advocate for or make decisions about FP and contraception.[37, 38, 44] Given what is known specifically about women's limited autonomy in the Nigerien context, it may be thought that husbands' attitudes are what really drive FP-related behaviors and thus it is important to note that most discussions about fertility topics are wife-initiated and that their attitudes that are most relevant to such discussions.[11] This is supported by qualitative research demonstrating that the FP arena is one in which women do attempt assert themselves, seeking control over their fertility.[10]

The interactions tested did not reach significance and thus, it was not possible to conclude any moderating effects between wives' and husbands' accepting/equitable FP attitudes. Among participants in our sample, gender segregation is a reality of daily life and has implications for couples' interactions.

Ethnographic research in Hausa communities, who reside in Niger and Nigeria, has demonstrated that adolescent wives and their husbands lead wholly separate lives characterized by wives' seclusion in private spaces of the home and husbands' occupation of their own areas of family compounds.[10] In some situations, couples' similarity or difference in reports of SRH beliefs, intentions, or behaviors have been shown to relate to achievement of fertility intentions and contraceptive use.[45-48] However in this context, adolescent wives' decisions to initiate and dictate the purpose of discussions about contraception are not dependent on their husbands' supportive attitudes and may instead be reached individually. As such, the focal point of FP programs should not necessarily be promotion of similar attitudes, but of individual accepting/equitable FP attitudes, particularly those of wives, as they are seen to be most salient to engagement in discussions about contraception.

These results should be considered in light of several limitations. First, these data are self-report on topics surrounding FP and contraception which are sensitive in nature for the participating communities. Precautions were taken to ensure participants felt safe and comfortable responding as accurately as possible including conducting the survey in a private location of the participant's choosing, discussing that responses are kept fully private and confidential, and informing participants they were free to decline to respond if they so decided. A major strength of this study includes the use of longitudinal, representative data, allowing for temporality to be established, and for the generalizability of findings to the districts from which data were collected. These findings represent a significant contribution to both the study of dyadic data and relationship dynamics related to SRH in West Africa.

1.5 Conclusion

Findings from this research help to establish the importance of couples' acceptance of general and gender equitable FP when studying communication about contraception and specifically communication that is initiated by women. This is critical to the process of promoting women-led or joint decision-making about contraception, particularly in a context in which patriarchal expectations of women and men and the roles that they occupy in their marriages and society at-large remain largely intact. Future research should focus on better understanding motivations for and context around discussions about FP and contraception, and what decisions or actions result. Effective interventions looking to

encourage discussions on these topics as a way to promote engagement in FP-related behaviors should further explore to what extent male partner inclusion is required given the apparent importance of women's attitudes to women-led and women-driven discussions.

Table 1.1 Demographic Characteristics by Spousal Communication Outcomes

	Total	Recent Discussion about Contraception			Initiation of Most Recent Discussion			Purpose of Most Recent Discussion		
		No	Yes		Wife	Husband		Wife Wanted Contraception	Other	
		(n=510)	(n=423)		(n=270)	(n=270)		(n=239)	(n=50)	
	n(%)	n(%)	n(%)	*p*	n(%)	n(%)	*p*	n(%)	n(%)	*p*
Wife Age										
13-14 years	43(4.6)	26(5.1)	15(3.6)		7(2.6)	4(6.1)		8(3.4)	1(2.0)	
15-17 years	395(42.0)	221(43.3)	172(40.7)	*0.053*^	100(37.0)	29(43.9)	*0.032*^^	86(36.0)	21(42.0)	*0.045*^^
18-19 years	503(53.5)	263(51.6)	236(55.8)		163(60.4)	33(50.0)		145(60.7)	28(56.0)	
Husband Age										
15-24 years	425(45.2)	240(47.1)	182(43.0)		110(40.7)	32(48.5)		95(39.8)	27(54.0)	
25-29 years	294(31.2)	156(30.6)	136(32.2)	*0.37*^	89(33.0)	24(36.4)	0.21^^	85(35.6)	13(26.0)	*0.33*^^
30 or more years	196(20.8)	106(20.8)	87(20.6)		61(22.6)	9(13.6)		50(20.9)	10(20.0)	
Age Difference										
0-4 years	175(18.6)	99(19.4)	74(17.5)		45(16.7)	8(12.1)		36(15.1)	12(24.0)	
5-6 years	232(24.7)	126(24.7)	105(24.8)	*0.70*^	65(24.1)	25(37.9)	*0.47*^^	58(24.3)	16(32.0)	*0.52*^^
7-9 years	224(23.8)	125(24.5)	98(23.2)		65(24.1)	13(19.7)		62(25.9)	7(14.0)	
10 or more years	284(30.2)	152(29.8)	128(30.3)		85(31.5)	19(28.8)		74(31.0)	15(30.0)	

^p-value for one-sample t-tests comparing 2-category outcome across continuous demographic characteristics
^^p-value for ANOVAs comparing 3-category outcome across continuous demographic characteristics

Table 1.1 Demographic Characteristics by Spousal Communication Outcomes, Continued

	Total	Recent Discussion about Contraception			Initiation of Most Recent Discussion			Purpose of Most Recent Discussion		
		No	Yes		Wife	Husband		Wife Wanted Contraception	Other	
		(n=510)	(n=423)		(n=270)	(n=270)		(n=239)	(n=50)	
	n(%)	n(%)	n(%)	*p*	n(%)	n(%)	*p*	n(%)	n(%)	*p*
Wife Age at Marriage										
13 and under	356(37.8)	193(37.8)	159(37.6)		101(37.4)	28(42.4)		88(36.8)	24(48.0)	
14-15	367(39.0)	193(37.8)	171(40.4)	*0.42*^	110(40.7)	28(42.4)	*0.15*^^	93(38.9)	20(40.0)	*0.014*^^
16-17	184(19.6)	102(20.0)	81(19.2)		54(20.0)	8(12.1)		52(21.8)	6(12.0)	
18-19	31(3.3)	19(3.7)	12(2.8)		5(1.9)	2(3.0)		6(2.5)	0(0.0)	
Parity										
None	364(38.7)	209(41.0)	149(35.2)		88(32.6)	22(33.3)		72(30.1)	17(34.0)	
1Child	314(33.4)	174(34.1)	140(33.1)	*0.053**	88(32.5)	24(36.4)	*0.039**	83(34.7)	11(22.0)	*0.002**
>=2 Children	263(28.0)	127(24.9)	134(31.7)		94(34.8)	20(30.3)		84(35.2)	22(44.0)	
Wife Education										
Government	327(34.8)	144(28.2)	179(42.3)		112(41.5)	30(45.5)		102(42.7)	20(40.0)	
Quranic	160(17.0)	95(18.6)	64(15.1)	*<0.001**	39(14.4)	13(19.7)	*<0.001**	33(13.8)	14(28.0)	*<0.001**
No School	445(47.3)	263(51.6)	179(42.3)		118(43.7)	23(34.9)		103(43.1)	16(32.0)	

^p-value for one-sample t-tests comparing 2-category outcome across continuous demographic characteristics
^^p-value for ANOVAs comparing 3-category outcome across continuous demographic characteristics
*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics

Table 1.1 Demographic Characteristics by Spousal Communication Outcomes, Continued

	Total	Recent Discussion about Contraception			Initiation of Most Recent Discussion			Purpose of Most Recent Discussion		
		No	Yes		Wife	Husband		Wife Wanted Contraception	Other	
		(n=510)	(n=423)		(n=270)	(n=270)		(n=239)	(n=50)	
	n(%)	n(%)	n(%)	*p*	n(%)	n(%)	*p*	n(%)	n(%)	*p*
Husband Education										
Government	441(46.9)	225(44.1)	212(50.1)		140(51.9)	35(53.0)		123(51.5)	32(64.0)	
Quranic	194(20.6)	103(20.2)	90(21.3)	*0.008**	59(21.9)	12(18.2)	*0.022**	52(21.8)	9(18.0)	*0.004**
No School	275(29.2)	172(33.7)	100(23.6)		60(22.2)	17(25.8)		54(22.6)	8(16.0)	
Number of Wives										
1 Wife	794(84.4)	440(86.3)	346(81.8)	*0.33**	217(80.4)	59(89.4)	*0.16**	195(81.6)	43(86.0)	*0.56**
>1 Wife	121(12.9)	62(12.2)	59(14.0)		43(15.9)	6(9.1)		35(14.6)	7(14.0)	
Household Assets										
Less than median	300(31.9)	162(31.8)	136(32.2)		81(30.0)	25(37.9)		73(30.5)	22(44.0)	
Median	290(30.8)	150(29.4)	136(32.2)	*0.25**	89(33.0)	19(28.8)	*0.60**	77(32.2)	10(20.0)	*0.29**
Above median	321(34.1)	188(36.9)	131(31.0)		89(33.0)	21(31.8)		79(33.1)	18(36.0)	

*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics

Table 1.1 Demographic Characteristics by Spousal Communication Outcomes, Continued

	Total	Recent Discussion about Contraception			Initiation of Most Recent Discussion			Purpose of Most Recent Discussion		
		No	Yes		Wife	Husband		Wife Wanted Contraception	Other	
		(n=510)	(n=423)		(n=270)	(n=270)		(n=239)	(n=50)	
	n(%)	n(%)	n(%)	*p*	n(%)	n(%)	*p*	n(%)	n(%)	*p*
Husband Migrate										
No	283(30.1)	148(29.0)	131(31.0)	*0.36**	79(29.3)	28(42.4)	*0.087**	68(28.5)	17(34.0)	*0.81**
Yes	627(66.6)	351(68.8)	272(64.3)		180(66.7)	37(56.1)		161(67.4)	33(66.0)	
District										
Dosso	312(33.2)	179(35.1)	130(30.7)		95(35.2)	11(16.7)		62(25.9)	15(30.0)	
Doutchi	301(32.0)	128(25.1)	171(40.4)	*<0.001**	90(33.3)	38(57.6)	*<0.001**	87(36.4)	25(50.0)	*<0.001**
Loga	328(34.9)	203(39.8)	122(28.84		85(31.5)	17(25.8)		90(37.7)	10(20.0)	

*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics

Table 1.2 Table 1.2 Adolescent Wives' and Husbands' Reported Attitudes Supporting FP and Spousal Communication Outcomes

	Total	Recent Discussion about Contraception		Initiation of Most Recent Discussion		Purpose of Most Recent Discussion	
		No	Yes	Wife	Husband	Wife Wanted Contraception	Other
		(n=510)	(n=423)	(n=270)	(n=66)	(n=239)	(n=50)
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Wives' FP Attitudes							
Less Accepting/Equitable	597(63.4)	67.3	58.4	58.5	53.0	57.7	56.0
More accepting/equitable	340(36.1)	32.4	41.1	41.1	47.0	42.3	42.0
Husbands' FP Attitudes							
Less Accepting/Equitable	467(49.6)	52.2	46.6	47.4	43.9	47.3	52.0
More accepting/equitable	439(46.7)	44.9	48.7	48.9	53.0	48.5	48.0

Graph 1.1 Proportion of Wives at Each FP Attitudes Level by Husbands at Each FP Attitudes Level

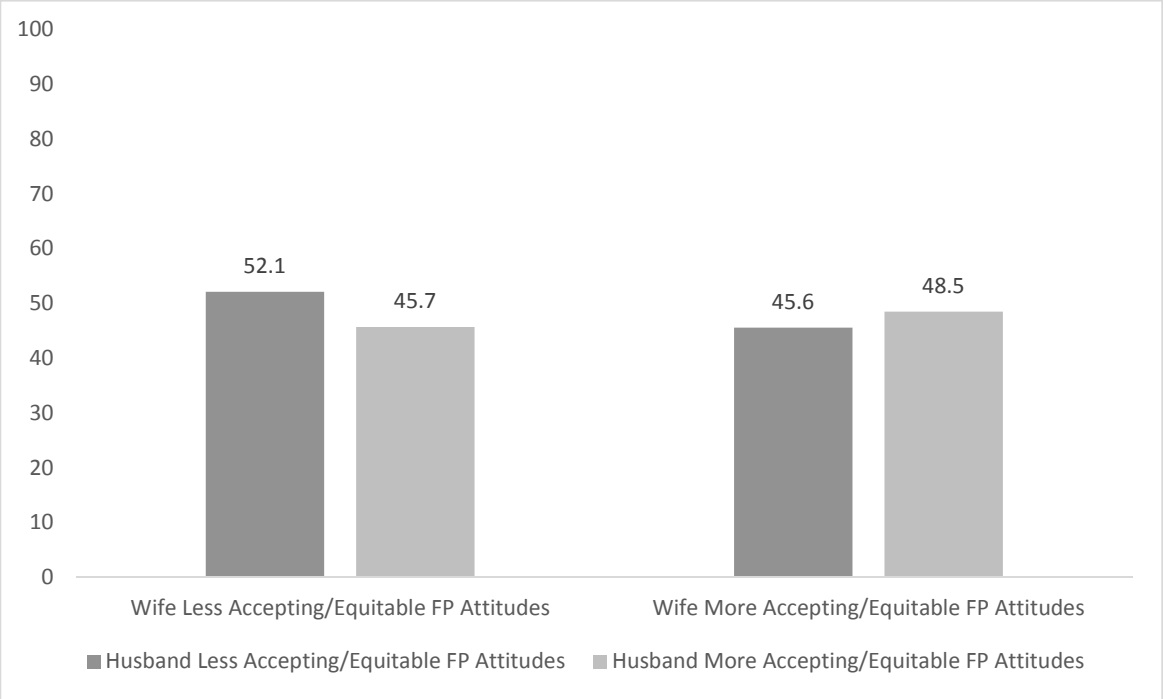


Table 1.3 Separate Associations of Wives' FP Attitudes and Husbands' FP Attitudes with Spousal Communication Outcomes

	Recent Discussion about Contraception[a]	**Initiation of Most Recent Discussion[a]**		**Purpose of Most Recent Discussion[a]**	
		Wife Initiated vs. No Discussion	**Husband Initiated vs. No Discussion**	**Wife Wanted Contraception vs. No Discussion**	**Other vs. No Discussion**
	AOR (95% CI) *p*	**AOR (95% CI) *p***	**AOR (95% CI) *p***	**AOR (95% CI) *p***	**AOR (95% CI) *p***
Wives' FP Attitudes					
Less Accepting/Equitable	ref	ref	ref	ref	ref
Highly Accepting/Equitable	**1.47 (1.10, 1.97) *0.009***	**1.57 (1.13, 2.18) *0.009***	1.58 (0.90, 2.77) *0.11*	**1.65 (1.16, 2.34) *0.005***	1.39 (0.74, 2.61) *0.31*
Husbands' FP Attitudes					
Less Accepting/Equitable	ref	ref	ref	ref	ref
Highly Accepting/Equitable	**1.40 (1.05, 1.88) *0.024***	1.32 (0.95, 1.84) *0.099*	**1.79 (1.00, 3.20) *0.049***	**1.43 (1.01, 2.04) *0.047***	1.18 (0.63, 2.19) *0.60*

[a]Covariates: treatment, district

Table 1.4 Joint Associations of Wives' FP Attitudes and Husbands' FP Attitudes with Spousal Communication Outcomes

	Recent Discussion about Contraception[b]	**Initiation of Most Recent Discussion[b]**		**Purpose of Most Recent Discussion[b]**	
		Wife Initiated vs. No Discussion	**Husband Initiated vs. No Discussion**	**Wife Wanted Contraception vs. No Discussion**	**Other vs. No Discussion**
	AOR (95% CI) *p*	**AOR (95% CI) *p***	**AOR (95% CI) *p***	**AOR (95% CI) *p***	**AOR (95% CI) *p***
Wives' FP Attitudes					
Less Accepting/Equitable	ref	ref	ref	ref	ref
Highly Accepting/Equitable	**1.41 (1.03, 1.92) *0.032***	**1.44 (1.01, 2.04) *0.043***	1.46 (0.79, 2.70) *0.22*	**1.50 (1.04, 2.18) *0.032***	1.19 (0.58, 2.41) *0.63*
Husbands' FP Attitudes					
Less Accepting/Equitable	ref	ref	ref	ref	ref
Highly Accepting/Equitable	1.35 (1.00, 1.92) *0.051*	1.26 (0.90, 1.77) *0.18*	**1.83 (1.01, 3.34) *0.047***	1.37 (0.95, 1.97) *0.092*	1.11 (0.57, 2.17) *0.75*

[b]Covariates: treatment, district, wife's age, parity, wife's education, husband's education

CHAPTER 2: Secondary impacts of a gender-synchronized family planning promotion program among adolescent wives and their husbands in Niger: Evaluating the effects of the Reaching Married Adolescents Program on spousal communication about contraception

2.0 Abstract

The gender synchronized *Reaching Married Adolescents* (RMA) program was designed to promote contraceptive use and gender equity among adolescent wives and their husbands in the high fertility, low contraceptive use context of Niger. As women's contraceptive use is influenced by forces at all levels of the social environment, this program includes household visits to provide individual education, and small group discussions to enhance connectedness and discourse within groups of women and men. The accompanying four-arm randomized controlled trial compared effects of the household visits, small group discussions, and a combination, to a control group. With both members of the couple involved, an important factor to consider is spousal communication about contraception, a behavior seldom examined by FP promotion programs. Baseline and follow-up data were used with a difference-in-differences approach to evaluate the effects of the program on spousal communication about contraception alongside causal mediation techniques to assess whether communication mediated the effects of the intervention on actual contraceptive use. Findings demonstrated that the intervention had positive effects on spousal communication about contraception compared to controls with the small group discussions showing positive effects compared to all other approaches. There was also evidence that spousal communication about contraception did mediate intervention effects on contraceptive use. Results indicate not only the weight of social comparison when seeking to enhance gender equity-related outcomes such as spousal communication, but also the importance of this communication when engaging both members of a couple to promote contraceptive use.

2.1 Introduction

In Niger, early childbearing is an experience common to many adolescents, demonstrated by the adolescent birth rate of 210 per 1,000 between 2009 and 2014, the highest in the world.[49] This is likely driven in large part by the prevalence of early marriage. In Niger, 29% of adolescent girls were reportedly married or in union between 2010 and 2016.[49] Consequences of both early marriage and early childbearing are dire and include higher rates of morbidity and mortality for both the adolescent mother

and her child.[50, 51] Ethnographic research from Niger suggests that the persistence of the practice of early marriage is due to both parents' concern for their daughters safety and futures as well as girls' expectations that being a good wife and mother are markers of their success in life.[26] The subsequent pressure to bear children may be attributable to girls' limited education, the resulting perspective that there are few viable alternatives to motherhood, and the societal belief that childbearing is women's primary role.[10, 26]

These norms around childbearing are evident in the only 16% of women in Niger using modern contraception.[10] Barriers to contraceptive use are rooted in the aforementioned social norms, specifically the idea that women should take advantage of their fertile years and that delaying birth (particularly first birth) after marriage would be going against the will of God.[10] Qualitative research in various parts of Niger has demonstrated that contraceptive use is seen as something for older women or those who have already given birth and proven their fertility with birth spacing viewed as a method to preserve the health of a woman and her children but not as a way to limit the number of children.[10, 11]

Important gatekeepers to sexual and reproductive health (SRH) behaviors and contraceptive use include husbands who, for married adolescents in Niger, are seen as primary decision-makers.[11] In fact, support from and communication with husbands has been demonstrated as a key facilitator to contraceptive use, with an increasing number of programs across South Asia and sub-Saharan Africa seeking to leverage these interactions between couples to promote contraception.[10, 25, 26, 52] However, rural Nigerien society being largely gender-segregated, with husbands and wives occupying separate spaces and the notion of marriage being more oriented towards necessity than togetherness, may prevent couples from engaging in mutual discussions, particularly about sensitive topics such as contraception.[53] Given the large number of married adolescent girls in Niger and the particular health and social risks they face, there is a significant lack of research focused on understanding the relationship dynamics driving SRH decision-making and behaviors.

To support the needs of adolescent girls in rural Niger, the *Reaching Married Adolescents* (RMA) intervention was developed to promote contraception, healthy timing and spacing of pregnancy (HTSP), and gender equity.[54] As RMA and other family planning (FP) promotion programs increasingly involve both women and men, it is especially important to improve our understanding of how couples' relationship

dynamics are modified as a result. This analysis will evaluate the impact of RMA on spousal communication about contraception and assess whether spousal communication is a key mediator of the program effects on contraceptive use. Results will inform design of programs that safely and effectively encourage mutually respectful discussions and thereby woman-centered decision-making around contraception.

2.2 RMA Program

The RMA program is theory-driven, taking inspiration from an adaptation of the Theory of Reasoned Action.[55] This adapted theory suggests that the combination of behavioral intention, individual attitudes, and perceived norms are critical to determining an individuals' likelihood of engaging in a specific behavior. Given male control over decision-making in this context, the importance of husband support for SRH behavior, and the strong social norms around childbearing, this theory guided the development of intervention components that target the multilevel influences on contraceptive use including engaging males and promoting couples' interactions to encourage uptake of modern contraceptive methods.

The RMA program is a gender-synchronized (involving both adolescent wives and their husbands), community-based program including individual-, group-, and community-level approaches. Specific details of the intervention and study design can be found in Challa et al., 2019.[56] Briefly, the first approach involved adolescent wives and their husbands receiving separate, monthly household visits with gender-matched community health workers (*relais)* to improve individual SRH knowledge and attitudes regarding contraception and HTSP. The second approach comprised small group discussions held separately with groups of adolescent wives (twice per month) and groups of husbands (once per month) to promote social cohesion and enhance peer support for SRH behaviors. In all communities assigned to receive intervention activities, community dialogues were held to engage all community stakeholders in meaningful discussions around SRH norms and practices to create an enabling environment for contraceptive use.

2.3 Methods

2.3.1 Study Design and Data Collection

To evaluate the effects of the RMA program, a four-arm randomized control trial (ClinicalTrials.gov NCT03226730), was designed and implemented. The RMA study aimed to detect effects of the household visits, small groups discussions, or a combination of the two, relative to a control group, on the primary outcome of interest, current modern contraceptive use as well as secondary gender equity-related outcomes including intimate partner violence, social norms, and relationship dynamics. Baseline data were collected in 2016 and follow-up data were collected two years later in 2018. Data are self-report from adolescent wives ages 13-19 and their husbands across 48 villages and 3 districts, Dosso, Doutchi, and Loga, of the Dosso region of Niger. Participants were selected through a multistage random sampling approach. Village eligibility criteria include: 1) having at least 1000 permanent inhabitants, 2) primarily Hausa or Zarma-speaking, 3) located in Dosso, Doutchi, or Loga districts (of the Dosso region), and 4) no other NGO known to be intervening specifically around FP or female empowerment with adolescent wives or their husbands. The intervention approach (household visits, small group discussion, combination) was assigned at the district level. In each district, 16 villages were selected with 12 randomly assigned to receive the intervention and 4 to a control condition.

In each selected village, the village leader was asked to provide a complete listing of all adolescent wives that resided there. Participants were then selected from this list using a random number generator. Eligibility criteria for adolescent wives included: 1) aged 13-19 years old, 2) married, 3) fluent in Hausa or Zarma, 4) residing in the village where recruitment was taking place with no plans to move away in next 18 months or plans to travel for more than 6 months during that period, and 5) not currently sterilized. At baseline, gender-matched research assistants would approach each household and complete a Household Recruitment Survey with the husband or head of household, including confirming the presence of an eligible couple as well as obtaining assent from the husband or head of household for the adolescent wife's participation, in keeping with local tradition. Individual verbal consent was also obtained from each adolescent wife and husband. Surveys were then administered orally in Hausa or Zarma (local languages) in private locations of the participants' choosing. At follow-up, the Household Recruitment Survey was replaced by a Verification Survey also completed by husbands or heads of

household to confirm that the couple being interviewed was in fact the same as baseline. This was again followed by survey administration with each consenting adolescent wife and husband separately. All data collection and consent procedures were approved by both the University of California San Diego Institutional Review Board and the Ethics Committee of the Nigerien Ministry of Health.

2.323 Participation and Data for Analysis

Longitudinal data from baseline and follow-up were used to conduct this analysis. Participation rates at baseline were 88.0% for adolescent wives and husbands (1,072 out of 1,218 eligible adolescent wives and 1,080 out of 1,227 eligible husbands). Retention rates at follow-up were 90.3% and 71.6% for adolescent wives and husbands respectively.

2.3.3 Measures

The main exposure in this analysis is participation in the intervention condition. This was measured in two ways. First, using a binary variable comparing treatment (combining all intervention arms) and control. The second measure was a four-category variable including: 1) household visits, 2) small group sessions, 3) combined, and 4) control. We also analyzed dose received of the intervention. This was captured using both adolescent wives' and husbands' reports of how many times an RMA *relais* visited them in the past 12 months or how many times they participated in an RMA discussion group for women or men in the past 12 months. In arms receiving household visits (household visit only and combined), wives' participation was categorized as: 1) no participation, 2) low participation (1-6 household visits), or 3) high participation (7 or more household visits) while in arms receiving small group discussions (small groups only and combined), wives' participation was categorized as: 1) no participation, 2) low participation (1-5 small group discussions), or 3) high participation (6 or more small group discussions). Since husbands had overall lower participation rates than wives, their dose was categorized as: 1) no participation, 2) low participation (1-3 household visits or group session), or 3) high participation (4 or more household visits or group sessions).

Recent spousal communication about contraception was measured using adolescent wives' reports of having had a discussion with their husbands about doing something or using a method to

space or delay pregnancy in the past 12 months. At baseline, participants were asked who their 'top decision-maker' was with respect to contraceptive use decisions and questions about communication about contraception were asked with respect to this 'top decision-maker'. Since the interest was in measuring spousal communication about contraception, we limited this measure to those who said their husband was their top decision-maker (95% of the sample). Thus, at baseline, participants were considered to have recently communicated with their husbands about contraception if they said that their husband was their 'top decision-maker', that they had ever had a discussion about contraception with their husbands, and that a discussion had occurred in the past 12 months. At follow up, participants were considered to have recently communicated with their husbands about contraception if they had ever had a discussion about contraception with their husbands and that either the first discussion had occurred in the past 12 months or that any discussion had occurred in the past 12 months.

The primary outcome of the RMA intervention and the outcome in the mediation analysis presented is current modern contraceptive method use. At both baseline and follow up, adolescent wives were asked if they had ever done something or used any method to space or delay pregnancy and subsequently if they were currently doing something or using any method to space or delay pregnancy. If they responded yes to both and stated that the method they were using included any of the following methods: 1) pills, 2) intrauterine device, 3) injectables, 5) implants, 4) male condom, 5) female condom, 6) emergency contraception, 7) lactation amenorrhea method, they were considered to currently be using a modern contraceptive method. Women who were pregnant at follow-up were excluded as they could not have been currently using contraception (there were no demographic differences found between pregnant and not pregnant women).

2.3.4 Analysis

Analyses were conducted using *SAS Studio*® (SAS Institute Inc., 2019) and Mplus® (Muthen & Muthen, 2019). Our first step involved testing whether the RMA intervention had effects on recent spousal communication about contraception as reported by adolescent wives. We used difference-in-differences (DID) models to detect differences between baseline and follow-up across intervention and control groups. The first DID model included time, treatment condition (treatment vs. control), a time-by-treatment

interaction and controlled for district and covariates associated with retention in the study including husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration. This model also included random effects for village and individual within village to account for both village-level clustering and repeated measures. Then, we ran a separate DID model, replacing the two-level treatment variable with a four-level variable (household visits, small group discussions, combined, control) to compare the performance of each intervention approach against the control as well as the other approaches. If a time-by-treatment interaction was found, we examined the simple effects of the treatment (or separate intervention arms) on the spousal communication about contraception at each time point.

Next, among those who participated in the intervention, we sought to assess whether those who had received a higher dose of intervention activities had higher odds of recent communication compared to those who received a lower dose. For this analysis we separately assessed the effects of dose received for adolescent wives and for husbands, restricting analyses to one study arm at a time to assess dose effects of each particular intervention approach. Again, we used DID models including time, dose (adolescent wife or husband – no, low, high), and time-by-dose interaction. Due to diminished cell sizes, dose analyses across all study arms did not include covariates. Analyses for household visits alone and small group sessions alone did not include nested random effects and analysis for the combined arm included no random effects due issues of convergence. If a time-by-dose interaction was found, we again examined the simple effects at each dose level.

Finally, we conducted a mediation analysis to assess whether the effects of the RMA intervention on the primary outcome, current modern contraceptive method use, operated through spousal communication about contraception. We followed causal mediation principles guided by the potential outcomes framework. To examine the causal effect of the treatment, it is necessary to compare the potential outcomes in the presence or absence of exposure to the treatment in the same individual at the same time.[57, 58] In this analysis, we examined the outcome model, which assessed the effects of the treatment (intervention vs. control) on the outcome (wives' reported current modern contraceptive use at follow-up) controlling for the mediator (wives' reports of spousal communication about contraception) at baseline and at follow up, wives' baseline reported current modern contraceptive use, district and the

same covariates as included in the DID models. We also examined the mediator model which assessed effects of the treatment (intervention vs. control) on the mediator (wives' reported recent spousal communication about contraception) controlling for wives' baseline reports of recent spousal communication about contraception and the same relevant covariates. Finally, we examined the total intervention effects decomposed into the indirect (mediated) and direct (unmediated) effects. In this study we focus on the *total natural indirect effect* and the *pure natural direct effect* which, applied to our study, are: 1) the *indirect* effect of the intervention on current modern contraceptive use if everyone were in the intervention group and the values of spousal communication about contraception were allowed to vary taking on values they would have if everyone were in the intervention group compared to if everyone was in the control group and 2) the *direct* effect of the intervention on current modern contraceptive use if spousal communication were fixed at the control group level.[59, 60] This analysis accounted for village-level clustering and used a maximum likelihood estimation method with 5000 bootstrapped samples to estimate confidence intervals.

2.4 Results

2.4.1 Description of the Sample

Results include participants who provided valid data at both baseline and follow-up (N=941). At baseline, 53.5% of adolescent wives were between ages 18-19 years with 30.2% of husbands at least 10 years older (Table 2.1). Two-fifths (39.0%) were married between ages 14-15 years and one-third (33.4%) had at least one child. Educational attainment was low among wives with 47.3% having no schooling while 46.9% of husbands had attended government school. Most couples at baseline were monogamous (84.4%) and two-thirds (66.6%) of husbands had spent at least 3 months of the past 12 traveling. At baseline, 20.8% of adolescent wives reported recent spousal communication about contraception which increased to 45.0% at follow-up (Table 2.2). At baseline, 10.4% of adolescent wives reported current modern contraceptive use at baseline increasing to 33.3% at follow-up. Among those that did not report recent communication at baseline, 82.7% also reported not using modern contraception (Graph 2.1). At follow-up, over half (51.1%) of the sample reported both recent spousal communication about contraception and current contraceptive use.

2.4.2 Intervention Effects on Spousal Communication about Contraception

In examining the effects of treatment compared to control on recent spousal communication about contraception (Table 2.3), we found that there was a time-by-treatment interaction ($p<0.001$). Simple effects demonstrated a positive effect of the intervention overall at follow-up (AOR: 2.41, 95% CI: 1.51, 3.84). In comparing the separate effects of intervention arms, we also found a time-by-study arm interaction ($p<0.001$). Simple effects showed a positive effect of household visits vs. control at follow-up (AOR: 2.21, 95% CI: 1.01, 4.83), of small group discussions vs. control at follow-up (AOR: 2.36, 95% CI: 1.09, 5.08), and of the combination of household visits and small group discussions vs. control at follow-up (AOR: 2.66, 95% CI: 1.25, 5.66). When we compared the effects of the intervention arms to each other, there was a positive effect of the small group discussion vs. household visits (AOR: 2.15, 95% CI: 1.20, 3.87) and vs. the combination (AOR: 2.83, 95% CI: 1.56, 5.12).

2.4.3 Effects of Dose Received

Across all intervention arms, we found that adolescent wives had a higher level of participation in the program than husbands. Among adolescent wives, 4.7% and 16.7% of wives did not participate in household visits across the household visits only and combined arms respectively while 59.1% and 55.8% respectively received a high dose (Graph 2.2). Among husbands, 22.4% and 26.2% did not participate in household visits in the household visits only and combined arm while 29.1% and 18.0% respectively received a high dose. For small group discussions, 14.1% of wives in the small group discussion only arm and 8.2% in the combined arm did not participate while 55.9% and 66.1% respectively received a high dose (Graph 2.3). On the other hand, 27.3% of husbands in the small group only arm and 21.5% in the combined arm did not participate while 25.9% and 24.5% respectively received high doses. We found positive effects of dose received on spousal communication about contraception specifically among wives that received household visits in the household visit only arm (Table 2.4). Those that received a high number of household visits (i.e. 7 or more visits) had greater odds of recent spousal communication compared to those who participated in no visits (AOR: 10.86, 95% CI: 1.26, 93.26) and compared to those who received a low number of visits (AOR: 1.85, 95% CI: 1.03, 3.32).

2.4.4 Mediating Effects of Spousal Communication about Contraception

Results from the mediation analysis followed the counterfactual framework with the a-path (treatment-mediator), b-path (mediator-outcome) and c-path (treatment-outcome) examined (Figures 2.1 and 2.2). We assessed these effects only accounting for design considerations (i.e. adjusting for district – Figure 2.1) and after including demographic characteristics (Figure 2.2). The mediator model which assessed the a-path (effects of the treatment on the mediator) corroborated results from the DID model (Table 2.5), showing a positive effect of the treatment on recent spousal communication about contraception after adjusting for baseline reports of spousal communication about contraception both without demographics (AOR: 2.30, 95% CI: 1.50, 3.53) and after adjusting for demographic characteristics (AOR: 2.26, 95% CI: 1.43, 3.56). The outcome model demonstrated that after accounting for recent spousal communication about contraception, there was neither an effect of the treatment on reports of current modern contraceptive use (c-path) before adjusting for demographics (AOR: 1.28, 95% CI: 0.62, 2.65) nor after (AOR: 1.26, 95% CI: 0.56, 2.81). However, recent spousal communication about communication was positively associated with current modern contraceptive use (b-path) in models without demographics (AOR: 4.44, 95% CI: 3.12, 6.33) and after controlling for them (AOR: 4.58, 95% CI: 3.08, 6.82). While indirect effects prior to including demographics were significant (AOR: 1.34, 95% CI: 1.19, 1.54) they dropped below the traditional cutoff for significance after including demographic characteristics (AOR: 1.23, 95% CI: 1.05, 1.46). Neither the direct effects nor the total effects were significant before or after including demographics.

2.5 Discussion

The primary aim of this analysis was to evaluate the impact of the RMA program, a gender-synchronized, community-based FP promotion program on spousal communication about contraception and to examine whether effects of the RMA program on current modern contraceptive use operate through recent spousal communication about contraception. Results demonstrated that the intervention had positive effects on spousal communication about contraception and that each of the three intervention approaches (household visits, small group discussions, and the combination) positively

affected adolescent wives' reports of recent spousal communication about contraception. When we compared each intervention approach to the others, we found that small groups performed better than both household visits alone and the combination. The only dose effect was seen for wives who received a high number (i.e. 7 or more) of household visits. Finally, there was important evidence that wives' reports of recent spousal communication about contraception mediate the intervention effects on contraceptive use.

An important finding of this study was that intervention approaches had varying effects on recent spousal communication about contraception. While all approaches did demonstrate effects relative to the control group, small group discussions were what showed positive effects on recent spousal communication about contraception relative to the other intervention approaches. In related analyses of RMA intervention effects on the main outcome of interest, current modern contraceptive use, household visits proved to be most effective in promoting current modern contraceptive method use.[61] While improved knowledge may have increased contraceptive uptake, it is possible that being in a group setting, actively discussing SRH topics with peers under the guidance of a facilitator may have lowered the barrier or stigma for couples to have their own discussions about contraception with one another. Research has suggested that discussing modern contraception is particularly sensitive and couples rarely engage in conversations around fertility in Nigerien communities, so though adolescent wives and husbands participate in these gender-matched small group discussions separately, these activities may have offered them a chance to practice communication techniques in a more comfortable environment first and helped normalize engaging in these discussions before taking them into their homes.[10]

When examining dose received within each intervention arm, only wives who received seven or more household visits saw a significant increase in likelihood of reporting spousal communication about contraception. It may be that because it takes receipt of this high number of household visits to see a difference specifically in the household visit only arm, we don't see an overall effect of this approach because no effects were found for household visits in the combined arm. It is possible that household visits work through individual knowledge and attitudes and alone may, under some circumstances, reinforce traditional gender norms as they do not allow for any social comparison. Thus, this approach may only affect change on individual behaviors but not on gender equity outcomes. This is supported by

other RMA evaluation outcomes that small group discussions had positive effects on gender equity outcomes, namely a reduction in reports of intimate partner violence.[61] These groups may be creating more normative change through social comparison and thus, be more salient to outcomes at the couple level, including spousal communication about contraception.

Finally, the mediation analysis provides evidence that recent spousal communication about contraception may mediate the RMA intervention effects on current modern contraceptive use, shedding light on the importance of addressing communication behaviors when intervening on SRH. Currently, while some FP promotion programs include spousal communication as a component, related studies do not necessarily examine this behavior as a mediator when studying the effects of such programs on contraceptive use.[10] While the indirect effects after including demographic characteristics drop below the traditional cutoff for significance, it is important to consider that both the a- (exposure-mediator) and b- (mediator-outcome) paths remain significant with consistent odds ratios across both models. Therefore, it may be that by adding additional variables capturing demographic information, there remains less power to detect mediation. Thus, these findings do provide evidence supporting the benefits of promoting couple communication and more open relationship dynamics between adolescent wives and their husbands in interventions aimed at contraceptive uptake. Future research should seek to understand more about this communication that leads to contraceptive use including the context for and content of these discussions as well as how the presence of communication may be correlated with intention to use contraception.

Considered comprehensively, related findings demonstrate that household visits were critical to uptake of contraception while results from the present study indicate that participation in small groups is associated with spousal communication about contraception and further, that spousal communication mediates treatment effects on contraceptive use.[61] Programs designed to encourage FP practices in similar contexts where traditional gender norms discourage contraception and preclude communication about its use may benefit from the integration of both individual- and group-based approaches. This would allow for improved knowledge about contraception and HTSP as well as fostering a sense of social cohesion that normalizes discourse about these topics within couples.

By examining communication as a key antecedent behavior of contraceptive use, this study builds on the growing body of literature that establishes cross-sectional associations between spousal

communication specifically about contraception and actual contraceptive use.[46, 62-66] These results also lend further support to the growing body of work that establishes the effect of FP promotion programs involving both members of a couple on communication in sub-Saharan Africa.[25, 67-69] Important to consider, is the dearth of programming and evaluation studies specifically considering couples in which the wife is an adolescent. In Niger, the United Nations Population Fund implemented "Schools for Husbands" which recruit husbands who are supportive of gender equity to discuss and work to resolve SRH issues in their communities.[70] While there is evidence that this initiative is gaining ground and has had a positive impact on men's attitudes and the dynamics within their marriage, they are still limited in scope and specifically engage men who already have some knowledge of SRH topics and are supportive of women's engagement in community life.[70, 71] The important contribution of the present study is its inclusion of adolescent wives, a particularly high-risk population, and the consideration of couples regardless of knowledge of or support for FP, contraception, and gender equity. Ethnographic research indicates the stratification of Nigerien society by wealth, gender, and age, so opportunities to engage in decision-making in the household or the community more broadly may be dominated by men and to a much lesser extent, women of higher status.[10] Programming to promote SRH-related behaviors must thus take care to account for the particular constraints on empowerment experienced by girls married early. Taken in tandem with results from other programs implemented in Niger such as the Schools for Husbands, the findings from this rigorous evaluation provide significant insight into designing SRH programs accounting for the unique vulnerabilities of adolescent wives and their husbands, improving their communication, and subsequently encouraging more equitable decision-making.

These findings should be considered with certain limitations taken into account. Measures of spousal communication about contraception, contraceptive use, and dose received in this analysis were reliant on self-report of participants and thus subject to social desirability and recall bias. These measures were limited to current or past 12 months to mitigate the latter source of bias. Findings are also limited to the presence or absence of recent discussions about contraception and how they may impact the effects of the intervention. Future research should consider inclusion of measures to capture information on topics discussed, agreement on intentions, etc. so as to understand what specific types and styles of communication may be more likely to be indicative of or lead to contraceptive use.

2.5 Conclusions

Couple communication about contraception is an important correlate to actual contraceptive use but a gap in comprehensive study of how this construct plays a role in promotion of FP-related behaviors remains. The RMA program, comprising household visits and small group discussions with adolescent wives and their husbands in rural Niger, appears to have successfully encouraged recent spousal communication about contraception along the path to increasing contraceptive use in a context of early marriage, high fertility, and low contraceptive use. Results from this study will contribute to the growing body of literature linking couple communication to contraceptive use and further establish the efficacy of gender-synchronized programs in promotion of both communication about and use of contraception. Future research should take care to explore motivations for, content of, and communication patterns associated with discussions about contraception between couples to ensure that norms around gender and communication are addressed in program design and to make certain that productive and mutually respectful interactions are endorsed.

Table 2.1 Demographic Characteristics by Spousal Communication about Contraception at Baseline and Follow-up

	Total	Spousal Communication – Baseline			Spousal Communication – Follow-up		
	n(%)	No (n=689) n(%)	Yes (n=196) n(%)	*p*	No (n=510) n(%)	Yes (n=423) n(%)	*p*
Wife's Age							
13-14 years	43(4.6)	35(5.1)	6(3.1)		26(5.1)	15(3.6)	
15-17 years	395(42.0)	302(43.8)	64(32.7)	***<0.001^***	221(43.3)	172(40.7)	0.053^
18-19 years	503(53.5)	352(51.1)	126(64.3)		263(51.6)	236(55.8)	
Husband's Age							
15-24 years	425(45.2)	333(48.3)	67(34.2)		240(47.1)	182(43.0)	
25-29 years	294(31.2)	214(31.1)	64(32.7)	***<0.001^***	156(30.6)	136(32.2)	0.37^
30 or more years	196(20.8)	126(18.3)	56(28.6)		106(20.8)	87(20.6)	
Age Difference							
0-4 years	175(18.6)	139(20.2)	28(14.3)		99(19.4)	74(17.5)	
5-6 years	232(24.7)	178(25.8)	39(19.9)		126(24.7)	105(24.8)	
7-9 years	224(23.8)	166(24.1)	45(23.0)	***<0.001^***	125(24.5)	98(23.2)	0.70^
10 or more years	284(30.2)	190(27.6)	75(38.3)		152(29.8)	128(30.3)	
Wife's Age at Marriage							
13 and under	356(37.8)	241(35.0)	97(49.5)		193(37.8)	159(37.6)	
14-15	367(39.0)	272(39.5)	72(36.7)	***<0.001^***	193(37.8)	171(40.4)	0.4^
16-17	184(19.6)	148(21.5)	24(12.2)		102(20.0)	81(19.2)	
18-19	31(3.3)	26(3.8)	2(1.0)		19(3.7)	12(2.8)	
Parity							
No Children	364(38.7)	311(45.1)	25(12.8)		209(41.0)	149(35.2)	
1Child	314(33.4)	223(32.4)	73(37.2)	***<0.001****	174(34.1)	140(33.1)	***0.053****
2 Children or More	263(28.0)	155(22.5)	98(50.0)		127(24.9)	134(31.7)	

^p-value for one-sample t-tests comparing 2-category outcome across continuous demographic characteristics

*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics

Table 2.1 Demographic Characteristics by Spousal Communication about Contraception at Baseline and Follow-up, Continued

	Total	Spousal Communication – Baseline			Spousal Communication – Follow-up		
	n(%)	No (n=689) n(%)	Yes (n=196) n(%)	*p*	No (n=510) n(%)	Yes (n=423) n(%)	*p*
Wife's Education							
Government	327(34.8)	232(33.7)	73(37.2)		144(28.2)	179(42.3)	
Quranic	160(17.0)	108(15.7)	43(21.9)	***0.022****	95(18.6)	64(15.1)	***<0.001****
No School	445(47.3)	343(49.8)	77(39.3)		263(51.6)	179(42.3)	
Husband's Education							
Government	441(46.9)	307(44.6)	100(51.0)		225(44.1)	212(50.1)	
Quranic	194(20.6)	137(19.9)	46(23.5)	***0.01****	103(20.2)	90(21.3)	***0.008****
No School	275(29.2)	224(32.5)	41(20.9)		172(33.7)	100(23.6)	
Number of Wives							
1 Wife	794(84.4)	585(84.9)	164(83.7)	0.78*	440(86.3)	346(81.8)	0.33*
>1 Wife	121(12.9)	88(12.8)	23(11.7)		62(12.2)	59(14.0)	
Household Assets							
Less than median	300(31.9)	217(31.5)	60(30.6)		162(31.8)	136(32.2)	
Median	290(30.8)	206(29.9)	67(34.2)	0.36*	150(29.4)	136(32.2)	0.25*
Above median	321(34.1)	246(35.7)	60(30.6)		188(36.9)	131(31.0)	
Has husband spend >3 months away							
No	283(30.1)	210(30.5)	59(30.1)	0.98*	148(29.0)	131(31.0)	0.36*
Yes	627(66.6)	458(66.5)	128(65.3)		351(68.8)	272(64.3)	
District							
Dosso	312(33.2)	248(36.0)	57(29.1)		179(35.1)	130(30.7)	
Doutchi	301(32.0)	188(27.3)	90(45.9)	***<0.001****	128(25.1)	171(40.4)	***<0.001****
Loga	328(34.9)	253(36.72)	49(25.0)		203(39.8)	122(28.8)	

^p-value for one-sample t-tests comparing 2-category outcome across continuous demographic characteristics

*p-values for chi-square tests for categorical outcomes across categorical demographic characteristics

Table 2.2 Prevalence of Spousal Communication about Contraception and Actual Contraceptive Use at Baseline and Follow-up

	Total
	n(%)
Communication – Baseline	
Yes	196(20.8)
No	689(73.2)
Communication – Follow-up	
Yes	423(45.0)
No	510(54.2)
Contraceptive Use – Baseline	
Yes	98(10.4)
No	723(76.8)
Contraceptive Use – Follow-up	
Yes	313(33.3)
No	504(53.6)

Graph 2.1 Baseline and Follow-up – Proportion of Participants Who Reported Communication and Contraceptive use

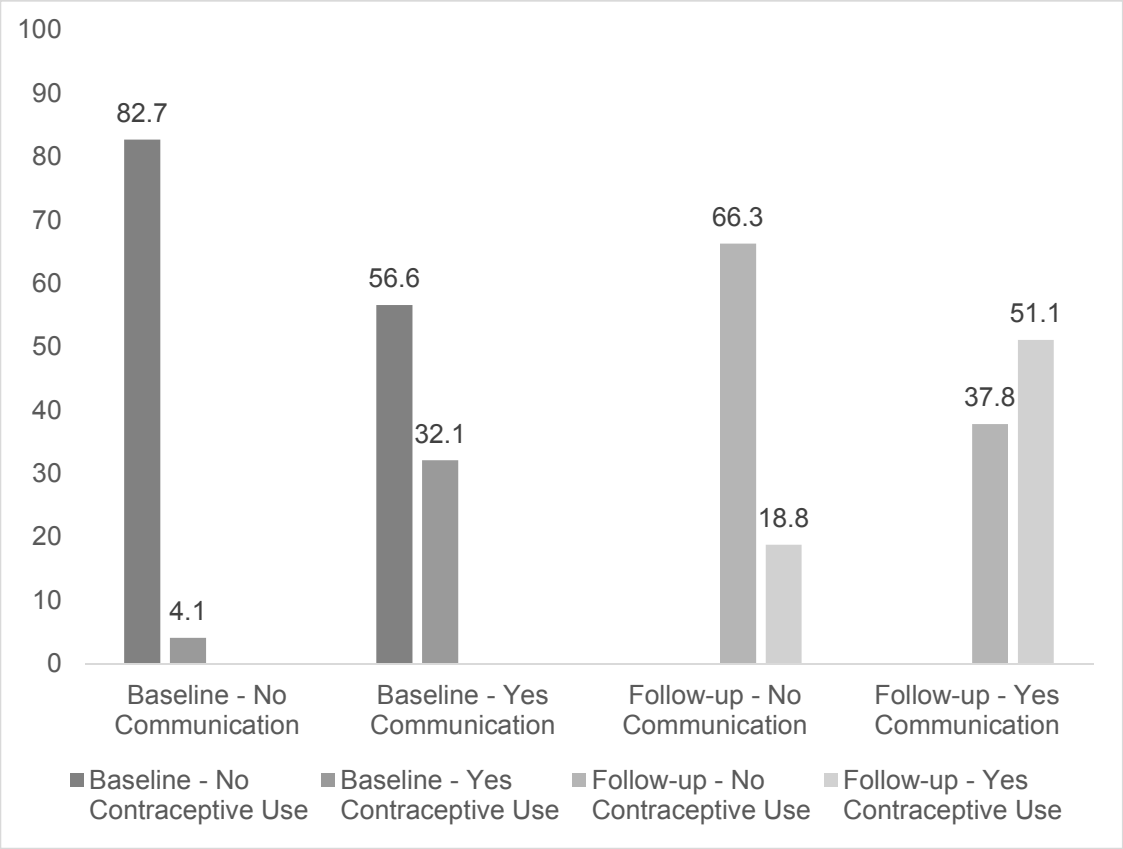


Table 2.3 Effects of Treatment and Study Arms on Spousal Communication about Contraception

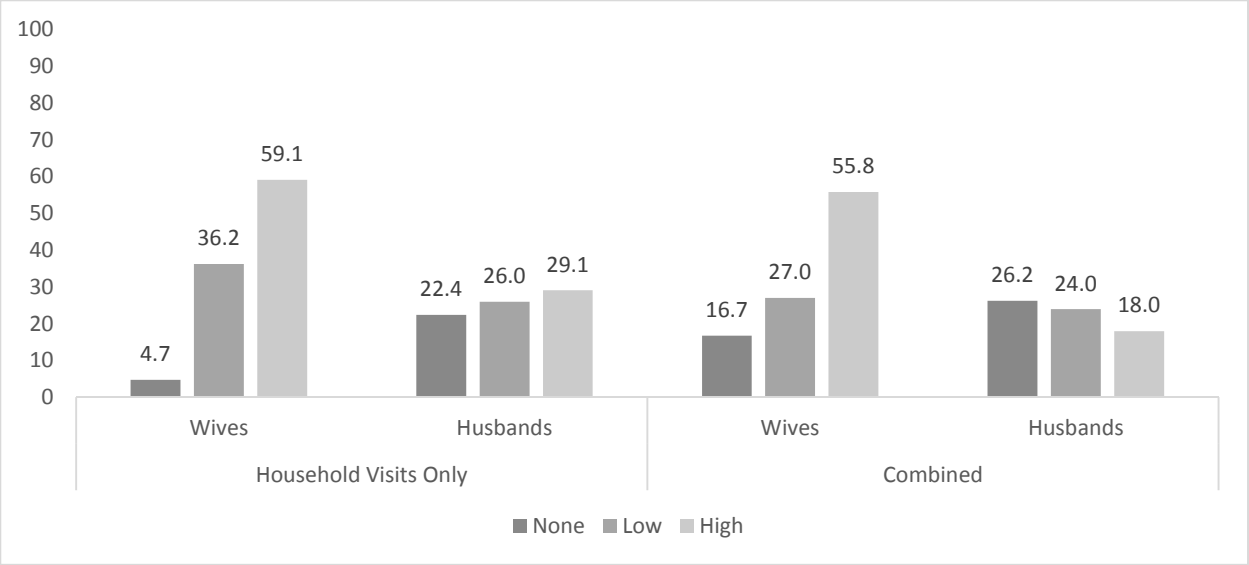
	Past 12 Months Communication about Contraception		
	AOR	**95% CI**	**p-value**
Treatment vs. Control[c]			***<0.001***
Effect of Intervention at Follow-up	2.41	1.51 - 3.84	***<0.001***
Study Arm vs. Control[c]			***<0.001***
Effect of Small Groups at Follow-up	2.36	1.09 - 5.08	***0.029***
Effect of Household Visits at Follow-up	2.21	1.01 - 4.83	***0.046***
Effect of Combined at Follow-up	2.66	1.25 - 5.66	***0.011***
Study Arm vs. Study Arm[d]			***<0.001***
Household Visits vs. Combined	0.76	0.43 - 1.34	*0.34*
Small Groups vs. Combined	2.83	1.56 - 5.12	***<0.001***
Small Groups vs. Household Visits	2.15	1.20 - 3.87	***0.01***

[c]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration, district

[d]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration

Note: all models include village-level and nested random effects of participant within village

Graph 2.2 Proportion of Participants Receiving Household Visits



Graph 2.3 Proportion of Participants Receiving Small Group Discussions

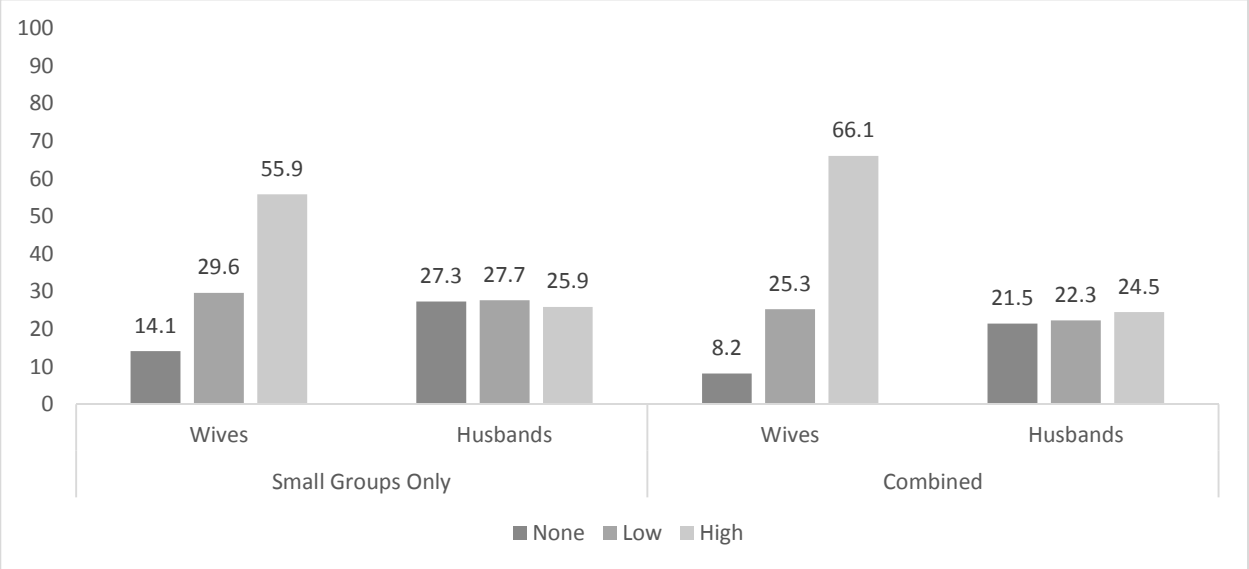


Table 2.4 Effects of Dose Received (None vs. Low vs. High) on Spousal Communication about Contraception

	Past 12 Months Communication about Contraception	
	AOR(95% CI)	***p-value***
Household Visits[e]		
Time X Male Dose		*0.640*
Time X Female Dose		***0.040***
High vs. No Visits	**10.86(1.26 - 93.26)**	***0.030***
Low vs. No Visits	5.88(0.68 - 51.12)	*0.110*
High vs. Low Visits	**1.85(1.03 - 3.32)**	***0.041***
Small Group Sessions[e]		
Time X Male Dose		*0.86*
Time X Female Dose		*0.19*
Combined[f]		
Household Visits		
Time X Male Dose		*0.61*
Time X Female Dose		*0.33*
Small Groups		
Time X Male Dose		*0.12*
Time X Female Dose		*0.38*

[e]No covariates or nested random effects of participant within village included
[f]No covariates or random effects included
Note on Dose Definition: Husbands' dose: low - 1-3 household visits or group sessions, high - 4+ household visits or small groups; Wives' dose: low - 1-6 household visits or group sessions, high - 7+ household visits or group sessions

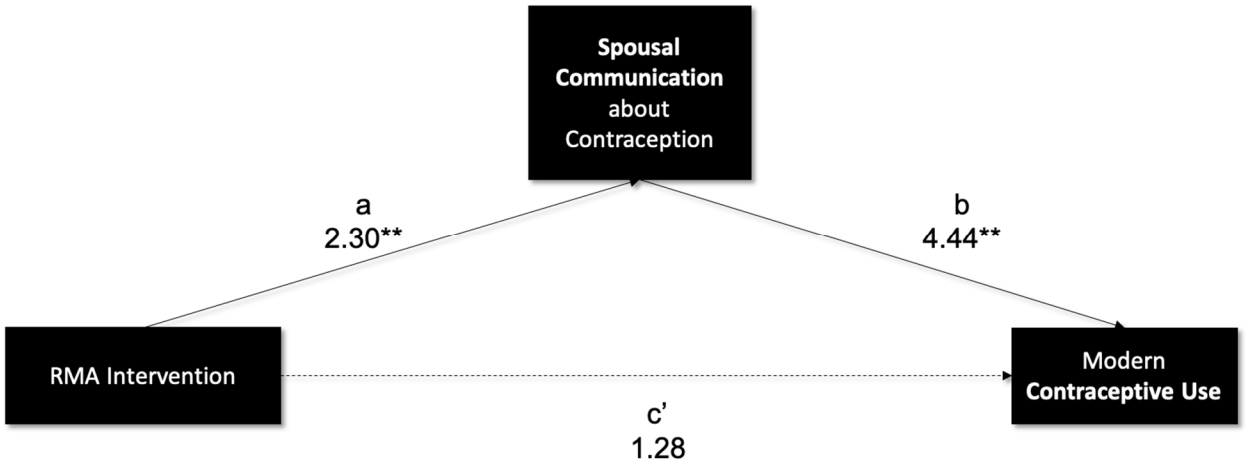


Figure 2.1 Mediation without Covariates

**significant p<0.05

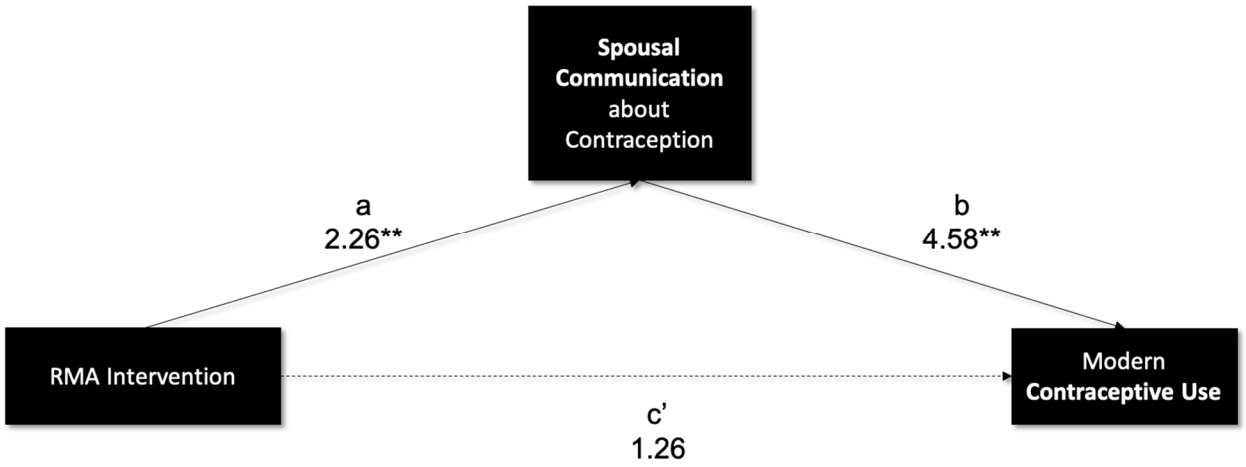


Figure 2.2 Mediation with Covariates

**significant p<0.05

Table 2.5 Results of Causal Mediation

	Not Adjusted for Demographics[g]			Adjusted for Demographics[h]		
	Direct and Indirect Effects			**Direct and Indirect Effects**		
	AOR	**95% CI**	***p***	**AOR**	**95% CI**	***p***
Total Natural Indirect Effect	1.34	1.19 - 1.54	0.002	1.23	1.05 - 1.46	*0.071*
Pure Natural Direct Effect	1.25	0.74 - 2.22	0.61	1.24	0.67 - 2.34	*0.67*
Total Effect	1.66	0.95 - 3.12	0.36	1.53	0.77 - 3.06	*0.49*
	Mediator Variable Model: Effects on Spousal Communication about Contraception[g]			**Mediator Variable Model: Effects on Spousal Communication about Contraception[h]**		
	AOR	**95% CI**	***p***	**AOR**	**95% CI**	***p***
Intervention (Treatment vs. Control)	2.30	1.50 - 3.53	0.010	2.26	1.43 - 3.56	*0.016*
Communication at Baseline	2.10	1.40 - 3.16	0.010	1.95	1.21 - 3.14	*0.046*
	Dependent Variable Model: Current Modern Contraceptive Method Use[g]			**Dependent Variable Model: Current Modern Contraceptive Method Use[h]**		
	AOR	**95% CI**	***p***	**AOR**	**95% CI**	***p***
Intervention (Treatment vs. Control)	1.28	0.62 - 2.65	0.56	1.26	0.56 - 2.81	*0.62*
Communication at Follow-up	4.44	3.12 - 6.33	<0.001	4.58	3.08 - 6.82	*<0.001*
Communication at Baseline	1.39	0.87 - 2.55	0.24	0.94	0.56 - 1.57	*0.80*
Contraceptive Use at Baseline	1.32	0.69 - 2.53	0.76	1.07	0.52 - 2.20	*0.86*

[g]Covariates: district

[h]Covariates: husband's age, husband-wife age difference, wife's age at marriage, parity, husband's number of wives, wife's education, husband's migration, district

CHAPTER 3: Characterizing Nigerien men's social networks and their influence on family planning-related attitudes and behaviors

3.0 Abstract

In Niger, men hold decision-making power over matters of family planning (FP). However, little is known about the influence of men's social networks and how FP messages spread through them, affecting social structures and ultimately impacting contraceptive use. This work uses data from a novel social networks study allowing for characterization of the composition of men's social networks and assessment of how men's attitudes and behaviors relate to those of key network members (alters). Analyses compared men's attitudes, behaviors, and perceptions to alters' own attitudes and behaviors. Key results showed that men's networks comprised primarily male friends. Additionally, treatment condition was associated with men's perceptions of their alters. Associations were also found between men's attitudes supporting FP and their perceptions of alters' FP attitudes with these perceptions then found to be associated with men's FP-related behaviors. Results also showed that alters' attitudes were related to men's attitudes and FP-related behaviors, but that alters' and men's FP-related behaviors were not associated. These findings may indicate men's limited discussions about fertility topics and pressure men feel to conform to what is deemed acceptable to their alters. Importantly, analyses are exploratory and small sample sizes make it difficult to draw strong conclusions. However, findings are compelling to suggest a pattern of social influence within these networks. Future research should involve larger sample sizes and longitudinal data to help inform programmatic efforts to involve not only men, but members of their social networks to accelerate social change around FP and fertility.

3.1 Introduction

Niger, with a population of roughly 23 million people, has the highest total fertility rate in the world (over 7.0 births per woman).[1] Coupled with the continued high desired family size throughout the region, it becomes clear that population growth is an important issue.[72] In fact, the rate of population change in Niger is 3.8 – higher than the 2.7 change rate seen across the West African region.[10] Consequently, the Population Reference Bureau estimates that Niger's population could surpass 66 million by mid 2050, making it second only to Nigeria's population in West Africa. Viewed alongside the environmental issues

that plague the Sahel and the resulting food insecurity, it becomes apparent that the health and wellbeing of Niger's population is at risk.[73]

A major contributor is the high prevalence of early marriage with three-fourths of girls married by age 18 years.[49] Ethnographic work has demonstrated that subsequent to marriage, adolescent wives face pressure to bear children as a way to prove their fertility and fulfill the responsibility it is believed God intended for them.[11] In this context where gender segregation is the norm and men are seen as the heads of household, adolescent wives' decision-making power and couple communication are diminished.[10, 74] In the face of this division of power and labor, contraceptive use continues to be very low as husbands remain key facilitators of family planning (FP) behaviors.[10, 52] As decision-makers, men's involvement may be key to promoting FP-related behaviors to slow population growth in Niger. In fact, the United Nations Population Fund has implemented the Husbands' Schools, aimed at involving men with more gender equitable attitudes in discourse with their peers around social norms related to fertility.[70] These programs have demonstrated positive effects on women's access to health care and use of contraception but there is a lack of understanding of how these men came to hold more accepting and equitable FP attitudes and who may have had a hand in shaping these beliefs. Significantly, this understanding may be key to uncovering more about the context surrounding the FP decision-making processes.

To fill this gap, FP and SRH studies should include ecological approaches and analysis of social networks data that would allow for consideration of the broader social environment.[75-77] Research posits that key actors or early adopters of innovations (i.e. FP and contraceptive use) endorse new thoughts/actions and spread them through their social networks.[78] Diffusion of these innovations may occur through social learning (adoption of an attitude/behavior based on observation of others' engagement in this behavior or information acquisition) or social influence (adoption of an attitude/behavior because of its perceived acceptability or pressure to conform).[79, 80] The former process relates to the spread of *descriptive norms* or beliefs about what others do while the latter process relates to the spread of *injunctive norms* or beliefs about others' approval or disapproval.[80, 81] Utilizing a social network approach has important potential to illuminate how FP messages diffuse through communities to influence behavior.

While few studies or programs related to FP focus on men and their networks, there is a small body of evidence demonstrating that these relationships are important to men's FP-related attitudes and behaviors. One study in Malawi demonstrated that men's FP behaviors were informed by whether they perceived their network members to also engage in these behaviors.[82] Another study in Ghana demonstrated that with encouragement from network members, men are more likely to report spousal communication about contraception and subsequently, contraceptive use.[83] Results of a study in Kenya suggested positive effects of an increasing number of network members who use contraception on men's own reported contraceptive use.[84] However, gaps in research with men's social networks research around fertility and FP remain. These gaps include a lack of focus on husbands of adolescent girls, whose support may be more critical to engagement in FP-related behaviors compared to husbands of older women.

In seeking to better understand the complex social dynamics that contribute to the high fertility, low contraceptive use context of Niger where early marriage remains prevalent, a novel social networks study was carried out in parallel to the *Reaching Married Adolescents in Niger* (RMA) Study, an evaluation of an FP promotion program. The RMA and social networks studies included adolescent wives (ages 13-19), their husbands, and their important social contacts (alters). Building on findings from analysis of the adolescent wives' social networks data completed by Shakya et al. (2016), the present study aims to characterize the social networks of husbands married to adolescent wives, to understand how men's attitudes, behaviors, and perceptions are related to the attitudes and behaviors of their alters, and to describe the social dynamics that may spur the spread of FP messages to better inform programmatic efforts.[85]

3.2 Methods

3.2.1 Reaching Married Adolescents Program and Study

To address the high fertility and low contraceptive use in Niger, the RMA program was developed and implemented to increase FP, contraceptive use, and gender equity among adolescent wives and their husbands in the Dosso region of Niger. The program included gender-segregated household visits to provide knowledge and promote attitudes supporting FP, and gender-segregated small group discussions

to encourage conversations and social cohesion around SRH topics. To assess the effectiveness of the program in promoting contraceptive uptake, the RMA study is a four-arm randomized controlled trial (ClinicalTrials.gov NCT03226730) comparing the effects of the household visits, small group discussions, and a combination of the two against a control condition.

Across the Dosso, Doutchi, and Loga districts, 48 villages were randomly selected with 12 randomly assigned to treatment condition and 4 to control. To be eligible, men needed to be married to an adolescent wife between the ages of 13-19. Baseline data were collected in 2016 while follow-up data were collected in 2018. Data were collected by gender-matched research assistants who obtained men's verbal consent and administered the survey orally in a private location of the participants' choice using pre-programmed tablets. Surveys took 45-60 minutes to complete in either Hausa or Zarma depending on the participants preference. More details on the intervention, study design, and data collection protocol can be found in Challa et al., 2019.[56]

3.2.2 Social Networks Study

At follow-up in 2018, a parallel social network study was carried out with participants in the Dosso district (16 villages – 12 intervention and 4 control). The Social Network Module of the main participant survey included three questions to obtain the names of alters including: 1) Who do you trust to talk to about personal and important matters, 2) With whom do you discuss decisions about family, including decisions around fertility and family planning, and 3) Are there any additional people who help you make decisions about delaying or spacing pregnancy. Using these types of name generator questions is an established procedure in studying social networks through survey data.[86, 87] For each question, participants could name up to three alters (up to nine total). Criteria for alters included being over the age of 13 years and residing in the village (so that they could be located for participation in a short alter survey). For each alter nominated who resided in the village, participants were asked follow-up questions including the alters' place of residence, gender, relationship to the participant, number of children, marital status, age, and participants' perceptions of alters' FP-related attitudes. Participants were finally asked to rank all nominated alters in order of their level of influence.

Then, one alter per participant was approached, recruited, and consented (verbally) for participation. Primary alters (most influential) were approached first followed by secondary (second most influential) in cases where the primary alters were unavailable or refused to participate. The alter survey comprised a subset of questions from the main participant survey including those related to FP attitudes and behavior (actual use and spousal communication about contraception). The alters were themselves asked to nominate alters but these people were not interviewed. Importantly, it was never disclosed to interviewed alters who had nominated them. Since their data would have already been recorded, any nominated alter that was a main survey participant had their demographic information noted but was not re-interviewed. All consent and data collection procedures were approved by the Institutional Review Board of the University of California San Diego and the Ethics Committee of the Ministry of Health of Niger.

3.2.3 Measures

From the main participant survey, we measured men's perception of their alters' attitudes by asking what their alters would think of a man listening to his wife's fertility preferences and what their alters would think of their FP use. Response options included 'good', 'bad, 'neither good nor bad, 'don't know', and 'decline'. Analyses were completed by excluding 'decline' responses and combining 'neither good nor bad', and 'don't know' responses with 'bad'. We also included several men's demographic variables that could impact their relationships and have been demonstrated in the literature to be associated with FP-related beliefs and behaviors. These included continuous measures of men's ages and their number of children, a categorical measure of their educational attainment (attendance at government school, attendance at Quranic school, or no schooling), and a binary measure of their migration status (whether in the past year they had left their village for a period of three months or more for work).

In both the main participant and alter surveys, men and alters were asked about their attitudes generally supporting FP. For analysis, this measure comprised three items to which responses included 'agree', 'disagree', 'don't know', or 'decline'. All 'don't know' responses were combined with 'disagree' and 'decline' responses were made missing. Only those with valid observations on all items were retained.

Responses were summed for a score ranging from 0-3 with a higher score representing more supportive FP attitudes.The three items included: 1) It is acceptable for a couple to try to limit the number of children they have, 2) It is acceptable for a couple to use a family planning method so they can have fewer children, and 3) It is acceptable for a couple to use a family planning method to space or delay pregnancy. We also studied men's and alters' FP-related behaviors. These included ever use of contraception, a binary variable capturing whether they had ever done something or used any method to space or delay pregnancy, and ever having spousal communication about contraception, a binary variable capturing whether they had ever discussed using a contraceptive method to space or delay pregnancy with their wives.

3.2.4 Analysis

First, we examined the sample descriptively to understand the demographic characteristics of the men and both nominated and interviewed alters. We next analyzed an egocentric dataset that contained men's reported attitudes, behaviors, and perceptions. Using this dataset, we first explored what demographic characteristics were linked to nomination of any and nomination of multiple alters. Then, we assessed associations between men's perceptions of their alters and men's own FP-related attitudes and behaviors, including actual contraceptive use and spousal communication about contraception. We excluded any alters who lived outside the village (N=16) as follow-up questions were not asked about those that could not be tracked outside the village. We used Generalized Estimating Equations (GEE) to account for the possibility of multiple alter nominations. These models adjusted for men's ages, education, number of children, migration status, number of alters nominated, and treatment condition.

Finally, we analyzed a dyadic dataset, which comprised unique dyads of men and their interviewed alters. This dataset thus included men's data alongside alters' own self-reported data and allowed for direct assessment of associations between alters' FP-related attitudes and behaviors and men's FP-related attitudes and behaviors. For these analyses, we utilized Generalized Linear Mixed Models (GLMM) because only one alter was interviewed per male participant and included village-level random effects to account for clustering. We desired to specifically understand male participants'

relationship with their male alters (a vast majority of alters interviewed) and thus, excluded female alters interviewed (N=7).

3.3 Results

3.3.1 Description of the Men and Alters

In this sample there were 237 men in the Dosso district who could have participated in the Social Network Module and nominated alters. Of these men, 206 (87%) nominated at least one alter while 31 (13%) did not nominate anyone. There were a total of 342 nominations, an average of 1.4 nominations per male participant. After excluding those nominated outside the village, there were 326 nominated alters included in the egocentric dataset. Men were on average 27 years of age (Table 3.1) and had, on average, 2.5 children with 52% having attended government school. Additionally, 41% reported ever having used contraception while 56% reported ever having spousal communication about contraception. When asked about their alters, men reported that they were on average 29 years of age while 25% stated they did not know their alters' ages. Of all alter nominations, there were only 20 women including mothers, sisters, and other family members. A majority of nominations were men, including a high proportion of male friends (67%), followed by brothers (12%), and other family members (11%). A majority of men perceived their alters to be supportive of both a man listening to his wife's fertility preferences (76%) and supportive of their FP use (76%).

In the dyadic dataset, there were 157 unique men-interviewed alter dyads. Alters themselves reported being on average 30 years of age and having 2.9 children (Table 3.2). Reflective of the nominations, a majority of alters interviewed were male friends (74%). Half of alters (49%) had attended government school while 27% reported having no schooling. Regarding their behaviors, 28% reported ever having used contraception while 38% reported ever having spousal communication about contraception.

3.3.2 Who Nominated Alters

When assessing how demographic characteristics relate to nomination of alters in the egocentric dataset, we did not find demographic characteristics to be associated nomination of any alters (Table

3.3). However, government schooling was associated with greater odds of nominating more than 1 alter (AOR: 5.32, 95% CI: 1.93, 14.70), as was Quranic schooling (AOR: 6.71, 95% CI: 2.17, 20.75). Additionally, men being in the treatment group of the RMA Study had higher odds of nominating more than 1 alter (AOR: 2.25, 95% CI: 1.02, 5.00).

3.3.3 Men's Perception of Alters and Associations with Men's Attitudes and Behaviors

Using the egocentric dataset, we found that men in the treatment group (Graph 3.1) were more likely to perceive their alters would support a man listening to his wife's fertility preferences (AOR: 4.22, 95% CI: 1.72, 10.35) and to perceive their alter would support their FP use (AOR: 4.36, 95% CI: 1.83, 10.35) than those in the control group. Further, men's attitudes supporting FP were associated with both their perception of alters' support for a man listening to his wife's fertility preferences (AOR: 2.66, 95% CI: 1.73, 4.08) and perception of alters' support for their FP use (AOR: 2.79, 95% CI: 1.77, 4.39) (Table 3.4). Men's perceptions of their alters' support for a man listening to his wife's fertility preferences were associated with men ever having used contraception (AOR: 10.43, 95% CI: 2.40, 43.58) as were men's perceptions of alters' support for their FP use (AOR: 12.76, 95% CI: 2.55, 63.81) (Graph 3.2). Similarly, men's perception of alters' support for a man listening to his wife's fertility preferences were associated with men ever having spousal communication (AOR: 8.71, 95% CI: 3.06, 24.83), as were men's perceptions of alters' support for their FP use (AOR: 9.06, 95% CI: 3.01, 27.26) (Graph 3.3).

3.3.4 Alters' Self-Reported Attitudes and Behaviors and Men's Attitudes and Behaviors

Using the dyadic dataset, we found that a 1-unit increase in alters' attitudes supporting FP was associated with a 0.32-unit increase in men's attitudes supporting FP (95% CI: 0.18, 0.46). Additionally, there was evidence of association between alters' attitudes supporting FP and men's ever use of contraception (AOR: 1.36, 95% CI: 0.98, 1.88) as well as their reports of ever having spousal communication about contraception (AOR: 1.35, 95% CI: 0.98, 1.88) though these associations did not reach significance. However, when examining associations of alters' and men's FP-related behaviors, neither their ever use of contraception nor their reports of ever having spousal communication about contraception were found to be associated (Graph 3.4).

3.4 Discussion

This study aimed to describe the social networks of a sample of men married to adolescent wives and to explore how key network members' attitudes and behaviors relate to those of the men to better understand the establishment of norms among these networks. Men in our sample mainly nominated their male friends as key network members. Many men perceived these alters to support men listening to their wives' fertility preferences and to support their FP use, which was associated with men's treatment condition. Men's FP-related attitudes were related to these perceptions with these perceptions found to be associated with men's own FP-related behaviors (including contraceptive use and spousal communication). Alters' own self-reported attitudes supporting FP were associated with men's attitudes supporting FP and with men's FP-related behaviors. However, alters' and men's FP-related behaviors were not found to be associated.

Regarding the composition of men's networks, a majority of men's nominations included their male friends who appear to be close in age to them. This is in contrast to results from a study of the social networks of their adolescent wives by Shakya et al. (2020) who, to a much greater degree, nominated female relatives, including sisters, other members of their natal family, and in-laws.[85] Research has demonstrated that adolescent wives lack mobility and in being largely confined to their homes are likely precluded from forming relationships outside the family.[10, 11] In comparison, men's higher status, their involvement in community life, and their attendance at school may allow them to form meaningful ties with those in the broader community.

In the egocentric dataset, treatment condition was associated with greater odds of men perceiving their alters to support a man listening to his wife's fertility preferences and to support their own FP use. The RMA program was aimed at improving support for FP and gender equity so men who participated and experienced these improvements may have overestimated their alters' support for gender equitable FP in efforts to ascribe to their alters what they view as positive attitudes. In fact, research has shown that homophily, or the desire to maintain ties to those with similar characteristics, is a mainstay of many social networks, and has been observed to be a factor in network influence on contraceptive use.[88-91] However, more work would be needed to ascertain whether within their networks,

men are choosing to align their attitudes and behaviors with network members or whether they are selecting or modifying their network composition so network members' attitudes and beliefs align with their own. Further, men's FP-related attitudes were associated with their perceptions of their alters. What this indicates is that men's perceptions of their alters' support for gender equity and FP may be informed by their own beliefs (possibly attributable to treatment effects). Importantly, these perceptions were associated with men's own FP-related behaviors, suggesting that regardless of how men's perceptions were formed, men do heavily weight alters' approval to determine their own behaviors.

Results from the dyadic dataset may demonstrate the possible boundaries of men's discussions about sensitive topics such as fertility with network members. Research has shown that men have more indirect discussions with their network members which, in the context of fertility, FP, and contraception, may mean discussions generally about the utility of FP for the safety and health of their families.[82] Through these more indirect or general conversations on fertility topics, men may be inferring their alters' support for FP and seek to hold attitudes or engage in behaviors their alters would deem appropriate. This is supported by present findings that alters' attitudes were associated with men's own attitudes and FP-related behaviors. On the other hand, alters' and men's FP-related behaviors were not found to be associated, perhaps because men are not explicitly discussing these behaviors. This can be compared to findings from social networks analysis with women which suggest women engage in much more detailed discussions within their networks including on topics such as contraceptive methods used, side effects, etc.[82, 92] Again, if we look to the work of Shakya et al., the adolescent wives in this sample did report contraceptive use that was found to be associated with their alters' use, with these associations varying based on the wives' relationship to their alters. Understandably, the historical focus of FP promotion programs on women has spurred interest in studying the influence of women's social networks. However, with increased male involvement in these programs, and the apparent differences between women's and men's social relationships, specific attention should be paid to the study of men's networks, particularly in light of their decision-making power in this context.

Taken together, the findings in the egocentric and dyadic datasets that highlight the importance of men's perceptions of their alters and alters own self-reported attitudes to men's attitudes and behaviors, suggest a pattern of social influence in men's networks. This social conformity pressure has been shown

to be a characteristic of denser, more isolated, and more homogenous networks and since acting outside normative behavior may mean facing harsh repercussions, norms in such networks may be very difficult to change.[93] In this case, FP promotion programs that motivate early adoption of new beliefs or behaviors breaking from the norm, may result in the imposition of social sanctions thereby causing a disruption in networks. Thus, programs that engage broader networks of men in such contexts may have more success due to wider acceptance of FP-related attitudes and behaviors.

Our results should be considered in light of several limitations. First, the sample size of this study is quite small and thus limits the strength of the conclusions that can be drawn. Second, cross-sectional data prevent us establishing temporality and thus from causal interpretation of findings. Third, we used men's reports of contraceptive use which precludes us from any understanding of the social dynamics that contributed to couple's interactions leading to adolescent wives' decisions to use contraception covertly. Additionally, these data were self-report and topics related to SRH, FP, and contraceptive use are considered sensitive in rural Nigerien communities, introducing the possibility of social desirability bias. Finally, since the Social Networks Module was administered at follow-up, there is some chance of response bias due to RMA participants understanding the aim and intention of the program. However, findings are compelling, particularly given the novel nature of these data. Future research on men's social networks should include larger samples and also longitudinal data to strengthen understanding of network relationships and to assess how observations of others' family planning shape men's decisions over time. Given the dearth of SRH and FP research with social networks in Francophone West Africa, these results will be fundamental to informing not only future studies on networks, but also FP promotion programs that seek to engage them.

3.5 Conclusion

Our findings provide new and important and insight into Nigerien men's social dynamics. Critically, social influence may be the driving force behind network influence on men's FP-related attitudes and behaviors in this context. Future research with larger sample sizes and longitudinal data will help to understand these mechanisms more clearly including clarifying the formation of men's networks, whether social influence differs by relationship type, and how interventions modify social ties. As men are

often decision-makers around FP in the Nigerien context, these findings provide important evidence that in designing and implementing effective and efficient programs to promote FP, we should not only consider inclusion of broader social networks. In this environment of high fertility and low contraceptive use, promoting the acceptability and uptake of FP and contraception through social networks will enhance the process of social change around timing and spacing of pregnancy, ultimately improving the health and wellbeing of young married women in Niger.

Table 3.1 Characteristics of men and alters – reported by men

	Mean	SD	N(%)
Participants (N=237)			
Age	27.4	5.2	
Number of Children	2.5	2.8	
Education			
No Schooling			48(20.3)
Government			123(51.9)
Quranic			66(27.9)
Ever Used Contraception (Modern or Not)			97(40.9)
Ever Communicated with Wife about Contraception			133(56.1)
Migration Status (traveled from village for >3 months in past 12 months)			140(59.1)
Treatment Group			177(74.7)
Alters Nominated	1.4	0.9	
No Nominated Alters			31(13.1)
Alter (N=326)			
Age (25% don't know)	29.2	8.4	
Number of Children	2.3	2.1	
Relationship with Participant - Female			
Mother			4(1.2)
Sister			3(1.0)
Other Family Member			5(1.5)
Other			8(2.5)
Relationship with Participant - Male			
Friend			219(67.2)
Brother			40(12.3)
Other Family Member			37(11.4)
Other			10(3.1)
Support for Contraceptive use (10% don't know)			247(75.8)
Support for Men Listening to Wives' Fertility Preferences (9% don't know)			249(76.4)
Participated in a Survey			164(48.0)

Table 3.2 Alter characteristics – reported by alter

	Mean	SD	N(%)
Alter (N=157)			
Age	30.4	8.6	
Number of Children	2.9	2.9	
Relationship with Participant			
Friend			116(73.9)
Brother			21(13.4)
Other Family Member			18(11.5)
Education			
No Schooling			43(27.4)
Government			77(49.0)
Quranic			35(22.3)
Ever Used Contraception (Modern or Not)			44(28.0)
Ever Communicated with Wife about Contraception			60(38.2)
RMA Participants			27(17.2)

Table 3.3 Associations of demographics and nomination of alters

	Probability of 1 or More Nominations vs. No Nominations (n=206, n=31)			**Probability of More than 1 Nomination vs. Only 1 Nomination (n=107, n=99)**		
	AOR	**95% CI**	***p***	**AOR**	**95% CI**	***p***
Government School vs. No School	2.35	0.70 - 7.96	*0.17*	**5.32**	**1.93 - 14.70**	***0.001***
Quranic School vs. No School	3.45	081 - 14.74	*0.095*	**6.71**	**2.17 - 20.75**	***<0.001***
Number of Children	1.19	0.96 - 1.48	*0.12*	1.01	0.89 - 1.13	*0.93*
Age	0.94	0.87 - 1.02	*0.13*	1.01	0.94 - 1.08	*0.87*
Migration	0.33	0.095 - 1.11	*0.073*	0.53	0.25 - 1.11	*0.091*
Treatment vs. Control	0.5	0.11 - 2.38	*0.38*	**2.25**	**1.02 - 5.00**	***0.046***

Graph 3.1 Association of treatment group and perception of alters

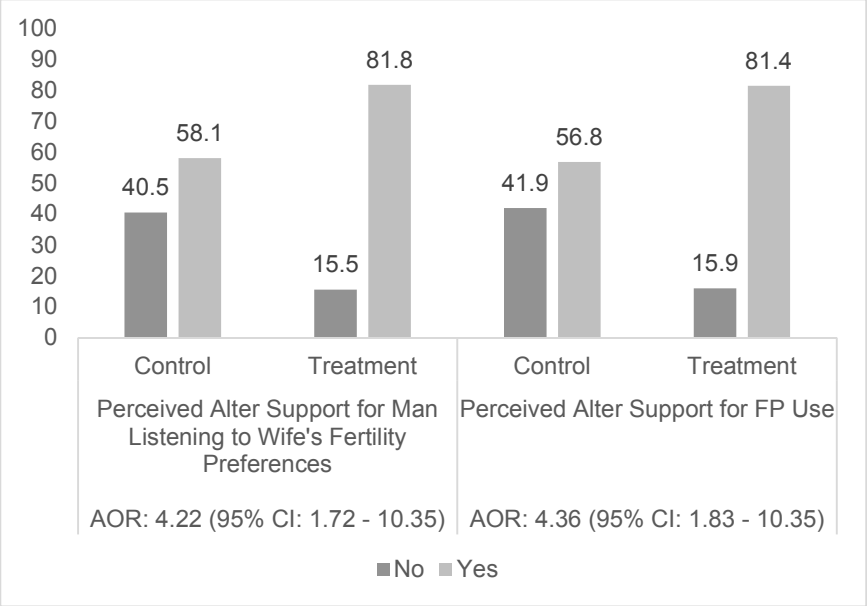
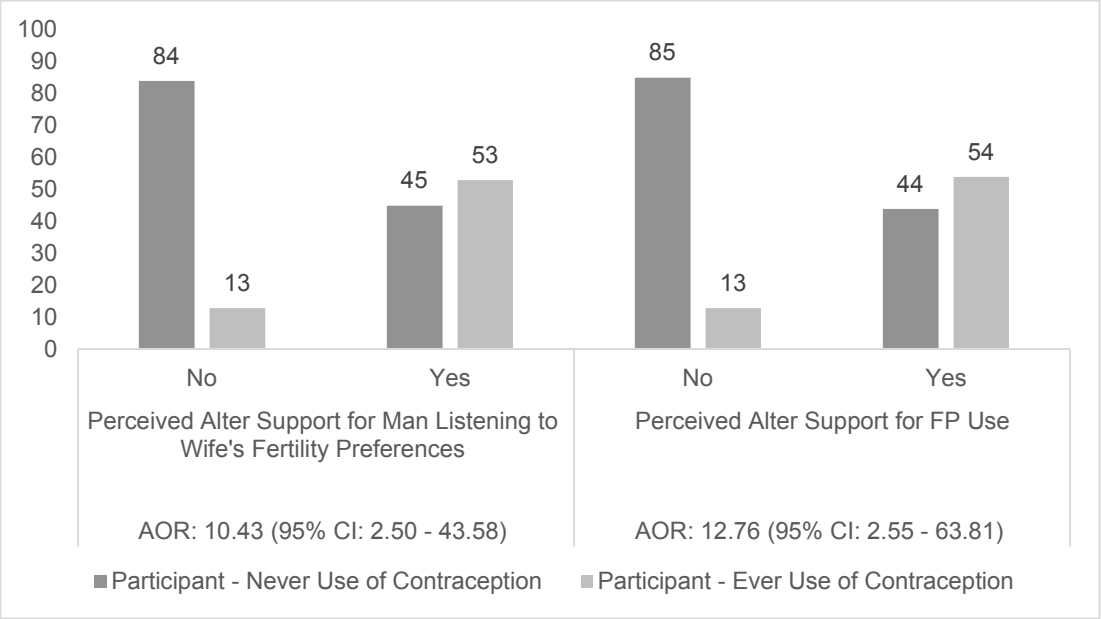


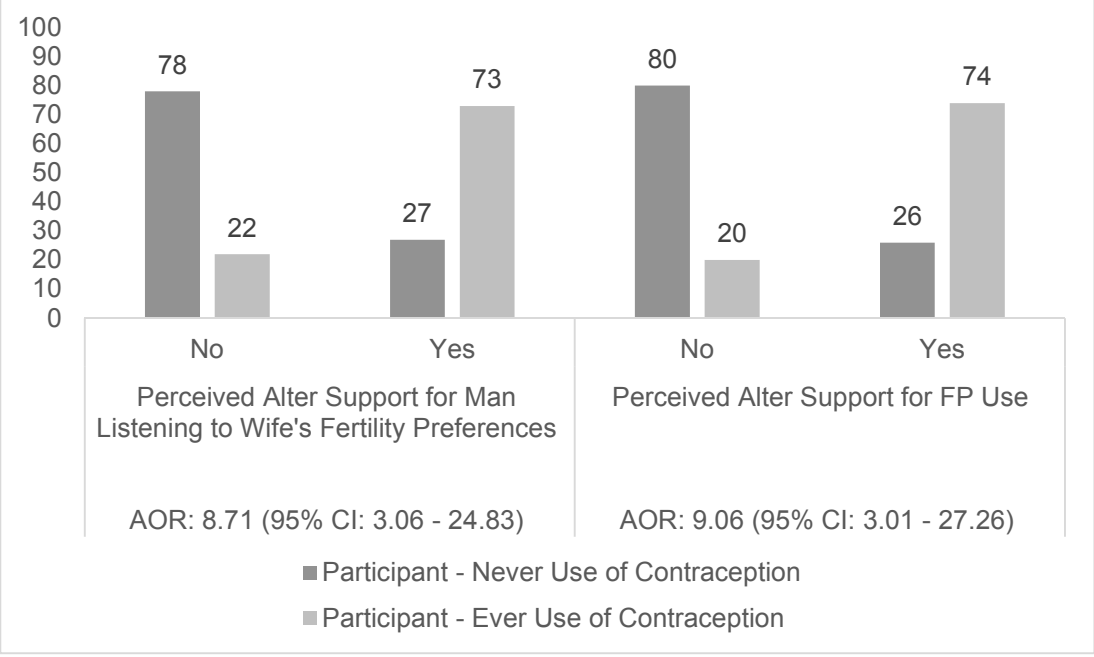
Table 3.4 Men's FP attitudes and perception of alters' attitudes stratified

	Perception of Alter Support for Man Listening to Wife's Fertility Preferences			**Ego Perception of Alter Support for FP Use**		
	AOR	**95% CI**	***p***	**AOR**	**95% CI**	***p***
FP Attitudes	**2.66**	**1.73 - 4.08**	***<0.001***	**2.79**	**1.77 - 4.39**	***<0.001***
Government School vs No School	1.45	0.31 - 6.91	*0.64*	1.78	0.36 - 8.85	*<0.001*
Quranic School vs No School	0.86	0.19 - 3.96	*0.85*	0.9	0.19 - 4.33	*0.48*
Number of Children	1.01	0.83 - 1.21	*0.96*	1.00	0.83 - 1.21	*0.99*
Age	1.01	0.94 - 1.09	*0.73*	1.02	0.94 - 1.10	*0.70*
Migration	0.97	0.38 - 2.43	*0.94*	0.93	0.36 - 2.41	*0.87*
Alter Number	1.92	1.06 - 3.48	*0.033*	1.85	1.02 - 3.33	*0.041*
Treatment	3.20	1.24 - 8.22	*0.016*	3.02	1.14 - 8.00	*0.026*

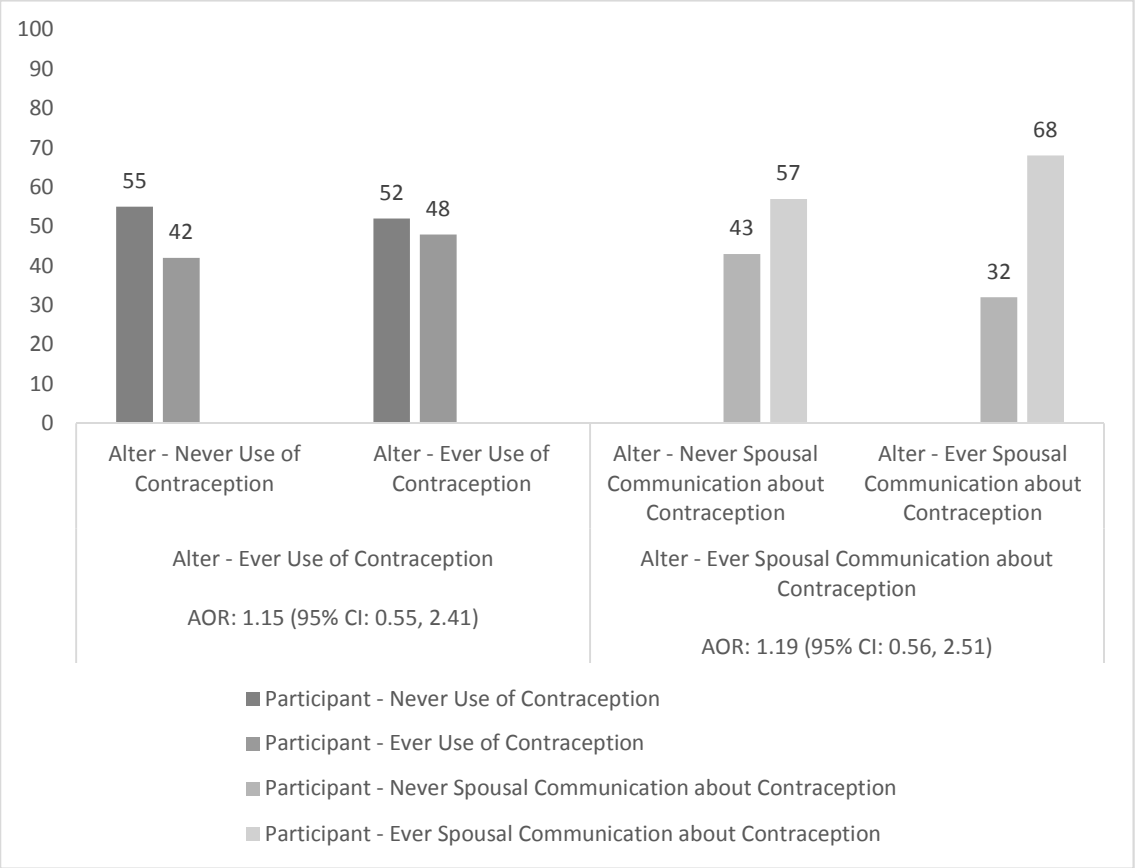
Graph 3.2 Perception of alters' FP attitudes and men's use of contraception



Graph3.3 Perception of alters' FP attitudes and spousal communication about contraception



Graph 3.4 Alters' FP-related behaviors and men’s FP-related behaviors stratified



CONCLUSION

In Niger, early marriage is highly prevalent among girls. Coupled with low rates of contraceptive use, adolescent girls in Niger also experience very elevated fertility rates, impacting their health and the trajectory of their lives. Much of this is perpetuated by gender norms that dictate the division of power, labor, and roles for women and men. In the face of these norms, young girls' power and autonomy to make decisions about their health and fertility are diminished. Instead, men remain the decision-makers and more programs are seeking to encourage men's support for family planning (FP) as their support is often critical to their young wives' engagement in contraceptive use. However, the body of research focused on understanding how relationship dynamics such as couple communication influence FP decision-making process is limited. This understanding is particularly important when considering adolescent wives who are particularly vulnerable to the consequences of early and infrequently spaced births. To fill this gap, this body of work sought to understand the multilevel determinants of spousal communication about contraception as well its effects on actual contraceptive use to inform and improve design and implementation of gender-synchronized FP promotion programs.

Chapter one used longitudinal data to study couples' individual attitudinal determinants of recent spousal communication about contraception, including who initiated the most recent discussion and a most recent discussion for the purpose of the wife's desire to use contraception. Results showed that adolescent wives' accepting/equitable FP attitudes were associated with recent discussions, wife-initiated discussions, and discussions for the purpose of her desire to use contraception. Husbands' accepting/equitable FP attitudes were independently associated with recent discussions and discussions for the purpose of their wives' desire to use contraception, but were found to be associated with husband-initiated recent discussions. An important finding was that in accounting for both adolescent wives' and husbands' attitudes, wives' attitudes related to recent spousal communication, including women-led discussions, but husbands' attitudes only associated with husband-initiated discussions. This may indicate that while lacking control over many household decisions, wives may be seeking to claim some measure of power in the FP domain. Wives' and husbands' accepting/equitable FP attitudes were not found to interact to determine spousal communication outcomes, possibly due to the entirely separate nature of their lives. These findings point to the importance of wives' attitudes to engagement in

discussions around FP. More research is needed to understand husbands' role in these discussions, particularly as most seem to be wife-initiated, allowing for better understanding of couples' FP decision-making processes.

Chapter two included results from the evaluation of a gender-synchronized FP promotion program, including household visits and small group discussions, on spousal communication about contraception and the mediating effects of this communication on the programs effects on contraceptive use. Results showed that the intervention overall had positive effects on spousal communication and specifically, that positive effects were found among participants in the small group discussions relative to the other approaches. Additionally, there was evidence that spousal communication about contraception mediated the intervention effects on actual contraceptive use. These findings are important to understanding that group-based approaches may be more salient to gender equity outcomes such as spousal communication. Within peer groups of adolescent wives and husbands group discussions may help to normalize discourse around contraception, allowing these adolescent wives and husbands to then engage in such discussions with one another. The significant indirect effects of the program on contraceptive use through spousal communication about contraception lend important insight into how FP promotion programs that engage both members of a couple may operate by encouraging communication about contraception thereby increasing engagement in related behaviors. Future research should explore the context and content of couples' discussions to ensure safe, mutually respectful, and equitable FP-related decision-making.

Chapter three focused on characterizing men's social networks and understanding how men's attitudes and behaviors are shaped by relationships with their key network members (alters). Results demonstrated that, likely due to their mobility outside the home, men's networks mainly comprise their friends. Men's participation in an FP promotion program was associated with greater likelihood of men perceiving their alters to support gender equity and FP while these perceptions were related to men's own FP-related behaviors. Participation in this program may change men's attitudes and, in seeking to attribute what they believe to be positive attitudes to their alters, men may overestimate alters' approval for gender equity and FP. However, these perceptions, regardless of their source, are key to men's engagement in FP-related behaviors. Further, alters' attitudes were related to men's own attitudes and

behaviors but behaviors themselves were not related. Men's discussions around fertility topics may be very general, only allowing for inference of approval for FP but not explicit knowledge of engagement in related behaviors. Overall, findings possibly indicate that men feel it important to hold beliefs or act in accordance with their alters' approval lest they face the social sanctions placed upon them for breaking with custom. Further studies would benefit from larger sample sizes and longitudinal data to further explicate the relationships uncovered in this analysis. This is one of very few studies to examine men's social networks, contributing significant insight to the understanding of how men's FP-related attitudes and behaviors are formed and highlighting the importance of ecological approaches to FP promotion.

The goal of this work was a better understanding of the social and relationship dynamics that surround contraceptive use among adolescent wives and their husbands in rural Niger, a population particularly vulnerable to early childbearing, and the adverse outcomes that result. Results highlighted the importance of wives' individual attitudinal determinants of spousal communication about contraception, the utility of group-based approaches to promoting these interactions, and the value of engaging networks to encourage social change to increase FP-related behaviors. Overall, this body of work demonstrates that multiple levels of the social environment influence relationship dynamics, such as spousal communication, which are key to contraceptive uptake. Future directions for research may include studies to improve understanding of communication patterns and the context of discussions around contraception to determine appropriate methods to engage couples in discussions around sensitive fertility topics. Mixed methods studies would aid in providing qualitative data to further our contextual understanding of how discussions around contraception unfold. Additionally, as no measures of couple communication around contraception have been created and validated, measure development would help unify comprehension of these interactions. Programs designed to encourage communication should focus on promotion of wives' FP attitudes at the individual level, and norms supportive of equitable decision-making by not only involving both members of couples at high risk of unintended or infrequently spaced births, but by also reaching their networks to drive broader community-level change. Employing such multi-level strategies will serve to improve couples' interactions and ultimately encourage equitable and woman-centered decision-making around contraception to ensure healthy lives for young girls in Niger.

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