

Using structural equation modeling to explore the pathways between a social norms-shifting intervention and couple communication for family planning in Kinshasa, DRC

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Abstract

Background. Approaches to shifting social norms are an increasingly common component of interventions seeking to promote family planning (FP) use. Yet, gaps remain in our understanding of how these norms-shifting interventions (NSIs) work, including how pathways to behavior change that include norms and related mediating factors work. The *Masculinité, Famille, et Foi (MFF)* intervention in the Democratic Republic of the Congo was a multi-component NSI that included a variety of activities intended to generate synergistic effects and different pathways to achieve FP behavior change.

Methods. We used structural equation modeling to assess the simultaneous relationships between: 1) the MFF intervention; 2) mediating variables, including descriptive and injunctive social norms, attitudes, and self-efficacy; and 3) couple communication for FP, which has been shown to facilitate voluntary, autonomous FP use. We assessed for aggregate, indirect, and direct effects among an endline sample of MFF participants who were newly married couples and first-time parents.

Results. Our sample included $n=435$ women and $n=356$ men from 8 experimental and 9 control Protestant congregations in Kinshasa. Our models demonstrated strong goodness of fit, indicating support for the direction of effects. We found an overall aggregate effect of the intervention on couple communication among women ($p=0.01$). We did not find any statistically significant indirect effects in either model; however, we identified several significant direct effects between descriptive norms for FP, gender equity, and intimate partner violence and injunctive norms, attitudes, and self-efficacy for men and women.

Conclusions. Our finding of aggregate intervention effects on couple communication for women confirms the need for multicomponent interventions that work simultaneously to shift norms and to modify attitudes and increase self-efficacy to achieve behavior change. A lack of comparable aggregate effects among men indicates that pathways to achieving improved couple communication may necessitate different messages or approaches for men than women. Findings also suggest that achieving shifts in descriptive norms may produce a ripple effect on other social and individual-level mediating factors. Additional intervention evaluations that account for the synergistic effects of intervention components and directed pathways to program outcomes are needed to inform the design of multicomponent NSIs.

Background

Despite increased investments in family planning (FP) programs for women and girls in low-income countries,[1] several barriers remain to improving women's ability to effectively space and time their pregnancies. These barriers are often sociocultural, including social norms or male partner disapproval for FP.[2] As such, there is increased interest in social norms-shifting interventions (NSIs), which promote positive behavior change by identifying and shifting harmful social norms, or the often unspoken rules shared by a group of individuals.[3] In recent years, NSIs have been identified as an important mechanism for improving FP outcomes, especially NSIs that address inequitable gender norms or power structures

that limit women's access to high quality FP information or products. Fostering women's empowerment[4] and reproductive agency,[5] or women's ability to make decisions and act on their fertility preferences, are seen as means to improve FP use, and one that NSIs may be helpful in addressing.

For instance, NSIs can help improve couple communication and FP outcomes. An NSI in Malawi increased the frequency and ease of couple communication as well as shared decision-making,[6] ultimately improving uptake of contraceptive use.[6, 7] In sub-Saharan Africa, spousal communication has been shown to be positively associated with use of FP methods,[8] including overt versus covert use.[9] Evidence also suggests that partner communication is an important mediating variable for FP use among adolescent girls and young women.[10] In the Democratic Republic of the Congo (DRC), the country of focus for this study, poor spousal communication and sociocultural norms surrounding decision-making and family size have been shown to be particularly salient barriers to use of modern FP methods use, despite women having knowledge of modern FP methods and where to obtain them.[11]

Masculinité, Famille et Foi: A norms-shifting intervention to improve couple communication

In Kinshasa, DRC, the Passages Project developed and implemented the *Masculinité, Famille, et Foi (MFF)* NSI, which aimed to address a range of social norms, at scale, to achieve sustained improvements in FP and reproductive health.[12] The MFF intervention is based on the Transforming Masculinities approach tested by Tearfund in Eastern DRC,[13] which conceptualized religious leaders and faith communities as powerful change agents for social norms.[14, 15] The TM and MFF interventions aimed to shift norms by mobilizing faith leaders to work closely with gender champions, who together engaged couples in community dialogues that discussed themes related to gender equity and intimate partner violence (IPV). Based on the potential for improving reproductive health outcomes in addition to IPV, the TM intervention was adapted into the MFF intervention by adding FP-related discussions.[16] One of the key components of the MFF intervention was to use dialogues and other couple-focused events to improve couple communication surrounding FP decision-making.

Research on FP-related NSIs has shown that, in addition to couple communication or decision-making, shifting normative beliefs about FP use, self-efficacy to use FP, and individual attitudes towards FP are important precursors to FP use.[17] For example, a study from Kinshasa demonstrated how post-partum FP intentions were primarily determined by attitudes, descriptive norms, and agency.[18] The MFF theory of change (TOC) is underpinned by the Theory of Normative Social Behavior, which conceptualizes normative perceptions as comprising two domains: descriptive and injunctive norms.[19] Descriptive norms are perceptions about whether others perform the behavior,[20, 21] whereas injunctive norms are perceptions of that which others approve.[20] In this theory, the relationship between descriptive normative perceptions and behavior is affected (or mediated) by several types of attributes within the behavioral, individual, and contextual domains.[19] These mediating attributes typically include items such as self-efficacy or injunctive norms.[21] Self-efficacy refers to an individual's perceived ability to overcome barriers or constraints with regard to performing the behavior.[22–24] The TOC posits that the

MFF intervention would affect attitudes, norms and self-efficacy as intermediate outcomes that would in turn affect the main behavioral outcomes, among which is improved couple communication, the focus of this analysis.

Study objectives

Despite some emerging evidence, much is still unknown about how social norms and other individual-level factors intersect to yield improvements in couple communication. In particular, the pathway linking an NSI to couple communication, as mediated by social norms, self-efficacy, and attitudes, has not yet been explored. Our paper addresses this gap by using structural equation modeling (SEM) to explore these pathways, as SEM promotes more accurate modeling of simultaneous relationships between multiple variables. SEM allowed us to concurrently examine the pathways between the MFF intervention, descriptive and injunctive social norms, attitudes, and self-efficacy, and their direct, indirect, and aggregate effects on couple communication. By decomposing the relationships between these variables and assessing their synergistic effects, our aim was to provide deeper insight into how program implementers and researchers can more effectively design, implement, and evaluate interventions that promote equitable social norms and encourage positive FP behavior change.

Methods

Study design

The MFF intervention was designed as a prospective cluster randomized control trial, with 17 Protestant congregations in Kinshasa, DRC randomly assigned to either experimental (n = 8) or control (n = 9) conditions. A two-stage stratified sampling design was used to assign congregations and ensure demographic similarity between control and experimental congregations. A baseline survey was conducted between November 2016 – January 2017, immediately prior to the 18-month implementation period of MFF. By endline, conducted between December 2018 – February 2019, the longitudinal aspect of the study was unable to be maintained, resulting in a two-group, pre-test/post-test design. Because we were interested in examining the effects of the MFF intervention on couple communication and did not have a longitudinal sample, data for this analysis comes exclusively from the endline survey. The study was approved by the institutional review board at Georgetown University in the United States and the Ethical Committee of the School of Public Health, Kinshasa University, DRC.

MFF Intervention Components

MFF was a multi-component intervention organized around three core activities: 1) community dialogues, 2) couple- and congregation-focused diffusion activities, and 3) service activities. Details of all intervention components are elaborated elsewhere.[25] The primary intervention was community dialogues conducted with congregations in the experimental group, which consisted of structured small group discussions with 10 mixed-sex newly married couples (NMC) and first-time parents (FTP). Community dialogues included up to 20 participants per experimental congregation, with some variability

by week of the cycle, and were facilitated by trained gender champions each week over an 8-week period. The intervention was repeated for up to 8 cycles per congregation.

The intervention's TOC posited that religious leaders and faith communities talking about gender, FP, and IPV would lead to behavior change, such as improved couple communication for FP, through collective/social norm change. Because the intervention aimed, in part, to understand whether faith leaders could be used to catalyze reflection about gender norms that would then contribute to FP-related behavior change, experimental congregations also participated in diffusion ideation activities at the congregation- and couple-level. This included activities such as sermons by faith leaders, couple testimonials, and community celebration events. Both experimental and control congregations also received service activities to ensure changes in outcomes could be attributed to changes in social norms rather than differences in access to quality FP services between groups. Service activities were provided by a local affiliate of PSI, *Association de Sante Familiale (ASF)*, and included health talks, referrals to health services, linkages to youth-friendly health services, and access to a youth-friendly hotline providing FP and gender-based violence service referrals.

Study Sites and Population

Endline data were collected in Kinshasa, DRC from male and female participants at experimental and control congregations. Within each congregation, we sampled NMC and FTP. NMC were couples that had been married or in a committed monogamous relationship for three years or less. These couples did not have children and were not expecting a child. Couples could self-identify as newly married and did not need to be legally married or cohabitating. The definition includes those in pre-marriage counselling or engaged to be married. FTP were couples that had their first child within the last three years (i.e., child is 3 years or younger). They could be married or unmarried. This definition includes those couples that were expecting a child for the first time. Female study participants were between 18–35 years, while male participants were at least 18 years and partnered with a woman meeting age criteria. Only one member of an eligible couple participated in the survey.

Sampling & Data Collection

The endline survey was designed to recruit 30 men and 30 women from each of the 17 congregations, totaling 1,020 participants. Congregations were randomized to the intervention and control conditions. Because congregational assessments completed during start-up indicated insufficient numbers of NMC and/or FTP in congregations, the methodology was adjusted to include a convenience sample wherein as many participants as possible were recruited, up to 30 men and women per congregation. At endline, significant loss to follow up occurred among participants in the baseline survey and the original longitudinal structure of the study could not be maintained. The sample was supplemented with additional individuals at endline in both experimental and control congregations.

Participants were recruited after a church service; all who volunteered, gave their written consent, and met the eligibility criteria were accepted. Data collectors closely monitored sampling frame lists to ensure only one member of each couple participated in the couple survey. Data collectors were matched to the

participant's gender and administered the surveys on tablets in private locations near the church using a computer-assisted personal interviewing platform.

Survey instruments & Measures

Data collection tools were developed by the Institute for Reproductive Health in consultation with MFF partners (FHI 360, Tearfund, and ASF). Survey data were designed to assess the prevalence of attitudes, behaviors, and individual and community-level norms regarding FP acceptance and use, IPV acceptance and perpetration, and positive masculinities and gender equality. The survey was developed and validated through a multi-step process. We first selected dimensions for our measures based on theoretical understanding,[26, 27] existing measures,[28–30] and guidance on how to measure norms,[28, 31–33] all of which suggested that social norms measures: a) are composed of descriptive and injunctive norms, which should be separately assessed; b) occur at the social level and should distinguish the reference group within the measure; and c) may affect multiple behaviors but often relate to/affect a single behavior and therefore necessitate a separate measure per behavior. Once dimensions and items were finalized, we conducted focus group discussions with newly married men and women in the DRC to establish face validity of the instrument. We then collected baseline data, after which we conducted exploratory factor analysis (EFA) and correlational analyses. In these EFA, we used Chronbach's alpha to examine inter-item correlation and establish reliability of measures based on the baseline data.[34] We used a Chronbach's alpha of 0.70 or higher for each measure, confirming that items included in the survey picked up on different dimensions of social norms. Finally, we tested our model on a sub-set of social norms, including couple communication, descriptive norms for FP, and injunctive norms for FP and gender equity, all of which helped establish construct validity of the norms included in this analysis.[35, 36]

Our analysis includes a combination of latent and directly observed variables. The main exposure variable, whether the participant belonged to an experimental or control congregation, is directly observed. However, the main outcome variable, couple communication, as well as mediators explored in this analysis represent several latent variables that are defined and measured as outlined in **Supplementary Materials Annex 1**. Specifically, we included three variables of descriptive social norms, one each pertaining to FP, IPV, and gender equity. We included six variables of injunctive norms, one each pertaining to FP, household gender equity regarding chores, household gender equity regarding child care, community perceptions of IPV (separate variables for men and women), and husbands' perceptions of IPV. These variables were constructed as continuous variables based on average agreement to questions on descriptive and injunctive social norms. All norms variables were scored 1 to 4 (i.e., strongly disagree to strongly agree), with higher scores representing stronger agreement. The MFF evaluation survey asked participants about their self-efficacy to use FP, which has been shown to be a critical component of agency. As such, we also included measures of FP-related self-efficacy and attitudes as mediating variables.

Analysis plan

In order to examine the effect of the MFF intervention on couple communication, we used SEM to explore the direct, indirect, and aggregate pathways between the MFF intervention, descriptive norms, injunctive norms, self-efficacy and attitudes and couple communication. SEM allows us to run all these regression simultaneously so as to decompose correlations, assess directed dependencies, and then examine the synergistic effect of the combination of regression models. Figure 1 depicts the hypothesized structure from intervention to couple communication. For clarity, this figure is a simplified model and does not depict all possible pathways examined. For example, Pathway A is represented by a single arrow in the figure; however, our analysis in reality included three arrows – one from the MFF intervention to each of the three descriptive norms. Also, in a previous analysis, we explored the direct effect of the MFF intervention on couple communication and did not find evidence of a significant direct effect. Therefore, this pathway is shown as a dotted line in Fig. 1, as it was not included in this analysis. In our models, although descriptive and injunctive norms are conceptualized and measured separately, they are all considered mediating variables, in addition to individual-level self-efficacy and attitudes. Pathway B is unidirectional from descriptive to injunctive norms following the TNSB.

In revisiting the intervention's TOC and the peer-reviewed literature, we instead hypothesized that there would be an aggregate effect (i.e., $A*B*D + A*E + C*D$) of the intervention on couple communication mediated by descriptive norms, injunctive norms, self-efficacy, and attitudes. We also explored indirect effects of the intervention, which included the effect of the intervention on descriptive norms, which were then hypothesized to have an impact on the outcome (i.e., $A*E$). We examined the pathway from the intervention to descriptive norms, from descriptive norms to injunctive norms, self-efficacy and attitudes, with those mediators ultimately affecting the outcome (i.e., $A*D*E$). We also explored the pathway from the intervention to injunctive norms, self-efficacy and attitudes, which then may affect the outcome (i.e., $C*D$).

Finally, we examined the direct effects for each of the individual pathways listed in Fig. 1, including the direct effect of: the intervention on descriptive norms (a); descriptive norms on injunctive norms, self-efficacy, and attitude (b); the MFF intervention on injunctive norms, self-efficacy, and attitudes (c); injunctive norms, self-efficacy, and attitudes on couple communication (d); and descriptive norms on couple communication (e). We modeled the descriptive and injunctive social norms as the aggregate scale measures identified in our previous work.[35] These models were run separately for women and men. We also controlled for participant age, education, number of living children with current partner, and food security as we expected these characteristics would impact our outcomes of interest. For each model, we assessed goodness of fit using the Comparative Fit Index (CFI; [37]) and the Root Mean Square Error of Approximation (RMSEA; [38, 39]) to assess model fit. To answer the question of whether our models fit the data well, we adopted a 0.95 cut off for the CFI (i.e., CFI larger than or equal to 0.95) and a cut off of 0.10 for the RMSEA with a 95% upper bound of 0.12 (i.e., RMSEA less than or equal to 0.10 with an upper bound for the 95% confidence interval less than or equal to 0.12).[40]

Results

The endline sample included men and women from Protestant congregations in Kinshasa, DRC in 2019 (Table 1). Slightly more women belonged to control congregations (53.8%), while more men belonged to intervention congregations (57.9%). More women were characterized as FTP (61.6%) than NMC (38.4%), but roughly half of men were characterized as either category. In general, the sample was devout and well-educated, with more than 80% and 90% of men and women regularly attending church and achieving greater than secondary education, respectively. Approximately one-third of women and more than one-quarter of men reported having two or more living children with their current partner, though most of both men and women reported not having any living children. At endline, among those not currently pregnant, roughly half of men and women were using some form of FP, more than 80% of whom were using a modern contraceptive.

Table 1
Demographic characteristics of men and women from intervention
and control congregations in Kinshasa, DRC at endline in 2019

	Females	Males
Total (n)	435	356
Congregation		
Intervention	201 (46.2%)	206 (57.9%)
Control	234 (53.8%)	150 (42.1%)
Group		
First-time parents	268 (61.6%)	183 (51.4%)
Newly-married couples	167 (38.4%)	173 (48.6%)
Mean age (SD)	29.32 (6.17)	32.35 (7.37)
Ethnicity		
Luba	54 (12.4%)	44 (12.4%)
Mongo	27 (6.2%)	22 (6.2%)
Bakongo	257 (59.1%)	194 (54.5%)
Other	97 (22.3%)	96 (27.0%)
Missing	0 (0.0%)	0 (0.0%)
Church attendance		
Weekly	371 (85.3%)	297 (83.4%)
Less than weekly	63 (14.5%)	59 (16.6%)
Missing	1 (0.2%)	0 (0.0%)
Education level		
< Secondary	3 (0.7%)	1 (0.3%)
Secondary	33 (7.6%)	14 (3.9%)
> Secondary	399 (91.7%)	341 (95.8%)
Missing	0 (0.0%)	0 (0.0%)
N of Living children with current partner		
None	188 (43.2%)	189 (53.1%)
1 Child	109 (25.1%)	69 (19.4%)

	Females	Males
2 + Children	135 (31.0%)	95 (26.7%)
Missing	3 (0.7%)	3 (0.8%)
Current contraceptive use		
N/A: Pregnant	72 (16.6%)	62 (17.4%)
Not using any FP	147 (33.8%)	116 (32.6%)
Using any FP	216 (49.6%)	178 (50.0%)
Of those using FP, those using MC	175 (81.0%)	150 (84.3%)
Food insecurity		
Never	287 (66.0%)	213 (59.8%)
Occasional but less than daily	127 (29.2%)	121 (34.0%)
Daily	20 (4.6%)	22 (6.2%)
Missing	1 (0.2%)	0 (0.0%)

In our models, we included all men and women at endline with complete data. Participants with missing data were dropped, resulting in a total of 418 women and 346 men included in this analysis. As shown in Table 2, the model fit statistics demonstrate strong goodness of fit for both the male and female models examining pathways between the MFF intervention and couple communication. This is indicated by the large significant chi-square and CFI of 0.95 or greater for both models. Both models also include an RMSEA below 0.10. Taken together, these statistics indicate that the models fit the data well, providing confidence that the models are appropriate.

Table 2
Goodness of fit measures for male and female structural equation models

Sample	<i>n</i>	Chi2	CFI	RMSEA
Females	418	3367.156	0.959	0.081 (0.079, 0.084)
Males	346	3083.808	0.954	0.087 (0.084, 0.090)

Aggregate and Indirect Effects

As stated previously, initial analyses did not find a direct effect of the intervention on couple communication. However, given the complex TOC, we hypothesized that the intervention would affect couple communication through mediating pathways. To test this hypothesis, we first examined the indirect and the aggregate indirect effects for men and women (Table 3). We did not find evidence of

statistically significant indirect effects among women or men. We did, however, find a statistically significant and positive aggregate effect of the intervention on couple communication for women ($p = 0.01$) but not for men. This indicates that, when taken together, the total pathway ($A*B*D + A*E + C*D$) of the intervention acting on descriptive social norms and, in turn, those influencing injunctive social norms, self-efficacy, and attitudes had a net positive effect on couple communication for women. However, the combination of these pathways did not result in a statistically significant aggregate effect among men.

Table 3
Indirect and aggregate effects of the MFF intervention on couple communication among women and men in Kinshasa, DRC 2019

	Women		Men	
Pathway	Estimate	p-value	Estimate	p-value
Indirect Effects				
A*E	-0.18	0.37	0.08	0.19
C*D	0.08	0.45	0.02	0.72
A*B*D	0.25	0.18	-0.03	0.60
Aggregate Effects				
A*B*D + A*E	0.07	0.50	0.05	0.31
A*B*D + C*D	0.32	0.12	-0.01	0.88
A*B*D + A*E + C*D	0.14	0.01**	0.07	0.25
* $p \leq 0.05$; ** $p \leq 0.01$				

Direct Effects

Our findings suggest there is a statistically significant aggregate effect of the intervention on couple communication for women, but it is not driven by indirect effects. Therefore, we assessed the effect estimates on each of the pathways A, B, C, D and E in the model to better understand the direct effects of each of these individual pathways. For ease of review, we present the direct effects of each pathway in its own table (i.e., Table 4 through 8). However, despite the separate tables, the reader should keep in mind that all results for women were generated from a single SEM model. The same is true for men.

Pathway A

Pathway A is the pathway connecting the intervention to the three descriptive norms for FP, IPV, and gender equity (Table 4). Among women, there were no statistically significant direct effects of the intervention on descriptive norms, though the effect of the MFF intervention on descriptive norms for FP was approaching significance ($p = 0.06$). Among men, there were no statistically significant direct effects of the intervention on any of the descriptive norms constructs.

Table 4
Direct Effects of the MFF intervention on descriptive norms (a) among women and men in Kinshasa, DRC 2019

Direct Effects			Women		Men	
From	To	Path	Estimate	p-value	Estimate	p-value
Descriptive norms						
MFF intervention	FP	a	0.22	0.06	-0.01	0.90
MFF intervention	IPV	a	0.05	0.38	0.05	0.63
MFF intervention	Gender Equity	a	-0.11	0.36	0.17	0.19
*p ≤ 0.05; **p < 0.01						

Pathway B

Pathway B is the pathway connecting the descriptive norms to the injunctive norms and other mediating factors (Table 5). Most direct effects in both the models for men and women were found along Pathway B. Looking first at the results for the women's model, descriptive norms for FP had a positive direct effect on injunctive norms for FP ($p < 0.00$), injunctive norms for gender equity ($p < 0.00$), self-efficacy ($p < 0.00$), and attitudes ($p < 0.00$). As the perception that others practiced FP increased, so did women's perceived approval by others of FP and household gender equity as well as their self-efficacy and attitudes related to FP.

In terms of descriptive norms for IPV for women, we observed statistically significant negative direct effects between descriptive norms for IPV and injunctive norms for FP ($p < 0.00$), self-efficacy ($p < 0.00$), and attitudes ($p < 0.00$). This inverse relationship suggests that an increase in the perception that others in the congregation practiced IPV was associated with a decrease in the perceived approval of FP as well as self-efficacy and attitudes. We also observed positive direct effects on injunctive norms for gender equity related to chores ($p < 0.00$), injunctive norms related to community's perception of IPV ($p < 0.00$), and injunctive norms related to the husband's perceptions of IPV ($p < 0.00$). The positive effect on injunctive norms for gender equity indicates an opposite relationship as would be expected. However, the positive effect on injunctive norms for IPV indicates that as the perception that others practiced IPV reduced, so did the approval for IPV.

Lastly for women, we found that descriptive norms for gender equity had a statistically significant positive direct effect on both injunctive norms for gender equity ($p < 0.00$) and attitudes ($p < 0.00$) as well as a negative direct effect on injunctive norms for IPV related to community and husband perceptions ($p < 0.00$). This indicates that as the perception that others in the congregation practiced more gender equitable practices (descriptive norms) related to chores and childcare, women's perceived approval by others for these practices generally increased while approval for IPV decreased.

In terms of results for the men's model, we also found a number of significant direct effects between descriptive norms and injunctive norms, self-efficacy, and attitudes. There was a direct effect of descriptive norms for FP on injunctive norms for FP ($p < 0.00$), injunctive norms for gender equity related to chores ($p = 0.01$), self-efficacy ($p < 0.00$), and attitudes ($p < 0.00$). Unlike for women, we did not observe a direct effect on injunctive norms for gender equity related to childcare. When examining the effect of descriptive norms for IPV on injunctive norms, we observed fewer and slightly weaker direct effects than in the female model. Nevertheless, descriptive norms for IPV had a negative direct effect on injunctive norms for gender equity related to chores ($p = 0.03$) and childcare ($p < 0.00$) as well as a positive direct effect on injunctive norms for IPV ($p = 0.05$) among men. We did not observe a direct effect on injunctive norms for FP, self-efficacy, or attitudes. Lastly, we found direct effects of descriptive norms for gender equity on six possible pathways, all significant at $p < 0.000$ and all in the anticipated directions.

Table 5

Direct Effects of descriptive norms on injunctive norms, self-efficacy, and attitudes (b) among women and men in Kinshasa, DRC 2019

Direct Effects		Women			Men	
From	To	Path	Estimate	p-value	Estimate	p-value
Descriptive norms	Injunctive norms					
FP	FP	b	1.10	0.00**	0.42	0.00**
FP	Gender Equity - Chores	b	1.01	0.00**	0.14	0.01**
FP	Gender Equity - Childcare	b	0.58	0.00**	0.09	0.18
FP	IPV-Community (Women)	b	0.31	0.08	-	-
FP	IPV-Husband (Women)	b	-0.05	0.72	-	-
FP	IPV (Men)	b	-	-	-0.01	0.88
	Other mediators					
FP	Self-efficacy	b	1.47	0.00**	0.49	0.00**
FP	Attitudes	b	0.87	0.00**	0.35	0.00**
Descriptive norms	Injunctive norms					
IPV	FP	b	-0.78	0.00**	0.07	0.10
IPV	Gender Equity - Chores	b	0.86	0.00**	-0.10	0.03**
IPV	Gender Equity - Childcare	b	0.02	0.86	-0.30	0.00***
IPV	IPV-Community (Women)	b	1.15	0.00**	-	-
IPV	IPV-Husband (Women)	b	1.16	0.00**	-	-
IPV	IPV (Men)	b	-	-	0.11	0.05*
	Other mediators					
IPV	Self-efficacy	b	-1.16	0.00**	0.01	0.90
IPV	Attitudes	b	-0.97	0.00**	-0.08	0.11
Descriptive norms	Injunctive norms					
*p ≤ 0.05; **p < 0.01						

Direct Effects			Women		Men	
Gender Equity	FP	b	0.24	0.13	0.83	0.00**
Gender Equity	Gender Equity - Chores	b	1.77	0.00**	1.38	0.00**
Gender Equity	Gender Equity - Childcare	b	1.09	0.00**	1.68	0.00**
Gender Equity	IPV-Community (Women)	b	-1.34	0.00**	-	-
Gender Equity	IPV-Husband (Women)	b	-1.21	0.00**	-	-
Gender Equity	IPV (Men)	b	-	-	-0.85	0.00**
Other mediators						
Gender Equity	Self-efficacy	b	0.26	0.23	1.08	0.00**
Gender Equity	Attitudes	b	0.39	0.02*	1.09	0.00**
*p ≤ 0.05; **p < 0.01						

Pathway C

Pathway C is the pathway connecting the MFF intervention to injunctive norms, self-efficacy, and attitudes (Table 6). Among women, we observed direct effects of the intervention on attitudes (p=0.04) but not on injunctive norms or self-efficacy. For men, we did not observe direct effects of the intervention on attitudes or self-efficacy, but there were direct effects on injunctive norms for FP (p = 0.02) and injunctive norms for IPV (p = 0.02). The directionality of these effects, however, was in the opposite direction than anticipated.

Table 6

Direct Effects of the MFF intervention on injunctive norms, self-efficacy, and attitudes (c) among women and men in Kinshasa, DRC 2019

Direct Effects			Women		Men	
From	To	Path	Estimate	p-value	Estimate	p-value
Injunctive norms						
MFF intervention	FP	c	-0.01	0.92	-0.32	0.02*
MFF intervention	Gender Equity - Chores	c	-0.05	0.88	-0.24	0.19
MFF intervention	Gender Equity - Childcare	c	-0.04	0.84	-0.33	0.16
MFF intervention	IPV-Community (Women)	c	-0.05	0.70	-	-
MFF intervention	IPV-Husband (Women)	c	0.09	0.44	-	-
MFF intervention	IPV (Men)	c	-	-	0.33	0.02*
Other mediators						
MFF intervention	Self-efficacy	c	-0.08	0.64	-0.23	0.21
MFF intervention	Attitudes	c	-0.24	0.04*	-0.23	0.19
*p ≤ 0.05; **p < 0.01						

Pathway D

Pathway D is the pathway connecting injunctive norms, self-efficacy, and attitudes to couple communication (Table 7). For women, we found that injunctive norms for gender equity related to childcare (p = 0.03) and injunctive norms for IPV related to community perceptions (p = 0.03) had a significant direct effect on couple communication, although not in the anticipated direction, and other injunctive norms, self-efficacy, and attitudes did not demonstrate direct effects on our outcome. For men, we did not find any significant direct effects of injunctive norms, self-efficacy, or attitudes on couple communication.

Table 7

Direct Effects of injunctive norms, self-efficacy, and attitudes on couple communication (d) among women and men in Kinshasa, DRC 2019

Direct Effects			Women		Men	
From	To	Path	Estimate	p-value	Estimate	p-value
Injunctive norms						
FP	Couple Communication	d	-0.20	0.35	0.14	0.10
Gender Equity - Chores	Couple Communication	d	0.90	0.19	0.03	0.80
Gender Equity - Childcare	Couple Communication	d	-0.34	0.03*	-0.29	0.15
IPV-Community (Women)	Couple Communication	d	0.63	0.03*	-	-
IPV-Husband (Women)	Couple Communication	d	0.62	0.12	-	-
IPV (Men)	Couple Communication	d	-	-	0.07	0.11
Other mediators						
Self-efficacy	Couple Communication	d	-0.19	0.37	0.06	0.36
Attitudes	Couple Communication	d	-0.26	0.22	0.12	0.13
*p ≤ 0.05; **p < 0.01						

Pathway E

Pathway E is the pathway connecting descriptive norms to couple communication (Table 8). Among women, we found that descriptive norms for IPV had a statistically significant direct effect on couple communication, indicating that as one's perception that others engage in IPV decreased, there was an increase in couple communication ($p = 0.03$). However, we did not observe a significant direct effect of descriptive norms for FP or gender equity on couple communication for women. Among men, we did not observe direct effects on couple communication for any of the descriptive norms.

Table 8
Direct Effects of descriptive norms on couple communication (e) among women and men in Kinshasa, DRC 2019

Direct Effects		Women		Men		
From	To	Path	Estimate	p-value	Estimate	p-value
Descriptive norms						
FP	Couple Communication	e	0.43	0.62	0.04	0.69
IPV	Couple Communication	e	-3.07	0.03*	0.09	0.28
Gender Equity	Couple Communication	e	1.00	0.43	0.49	0.25
*p ≤ 0.05; **p ≤ 0.01						

Discussion

As approaches to shifting social norms become an increasingly common component of interventions seeking to promote FP use, program planners are confronted with the important task of deciding which intervention elements to include, and in which order, to produce pathways to social norms and behavior change. In this analysis of the MFF multicomponent intervention, we focused on pathways to changing couple communication for FP as it has been shown to facilitate voluntary, autonomous FP use. By simultaneously assessing the effect of the intervention on social norms, self-efficacy, and attitudes, we found a positive significant effect of the intervention on couple communication for FP among women.

Distinct albeit equally important for informing future interventions, we did not find statistically significant aggregate effects of the intervention and the mediating factors in the model for men. The implication is that pathways to achieving improved couple communication for men may be different than those among women. Although the MFF intervention sought to shift norms by engaging men and women together in the same activities, including through community dialogues, community celebration events, testimonials, and public sharing, it could be that interventions tailored to the specific beliefs, ideals, and concerns of either gender will yield different results. Consequently, it may be necessary for program planners to develop distinct theories of change for men and women or to vary some intervention messaging or implementation approaches across these groups, while still allowing couples to have time to discuss key concepts together.

In the Theory of Normative Social Behavior,[19] Rimal suggests that once a behavior is perceived as being commonly practiced, individuals then: 1) come to perceive the behavior as being more acceptable in their community (injunctive norms); 2) modify their own personal attitudes towards the practice; and 3) alter the perception of their own ability to practice said behavior (self-efficacy). Our findings seem to support this conceptualization, as higher perceived levels of descriptive norms had direct effects on higher perceived levels of injunctive norms, more favorable attitudes and greater reported self-efficacy. For

program planners, this finding indicates that a focus on shifting perceptions of how common a behavior is (i.e., descriptive norms) may be the most effective place to initiate interventions (i.e., the perception that use of modern contraceptives among young women and men in a community is very rare) in anticipation of creating a ripple effect on other social and individual-level mediating factors. The approach of focusing on modifying perceptions of other's behaviors has proven successful for other behavioral outcomes; most notably, college binge-drinking in the US.[41]

The fact that self-efficacy is a significant mediating factor in our models, and that it has a significant relationship with social norms, highlights the importance of building an individual's self-efficacy to use FP methods not only to facilitate agency in method use but also to potentially alter perceptions of social norms. Some previous research has shown that the interaction of self-efficacy and norms augments behavior change.[42] However, there is also some recent evidence demonstrating the potential for unexpected interactions of agency and social norms. Specifically, a recent program focused on reducing child marriage in Somaliland and Puntland found increased agency through expanded access to technology reinforced rather than altered traditional norms of child marriage.[43] We would suggest, therefore, that interventions working to affect changes in both self-efficacy and social norms develop a rigorous monitoring plan to frequently assess for unintended intervention consequences.

Limitations

Our analysis was constrained by certain methodological limitations. For one, to examine the effect of the intervention at the individual level, it would have been preferable to use a longitudinal dataset. Although a longitudinal design was originally planned, it was not possible to retain this design. With the resulting repeated cross-sectional structure of the data, we were unable to explore the effect of the intervention over time and establish causality. However, our model, which includes the hypothesized direction of effects, fits the data well. Although not proof of causality, this reinforces our understanding of probable pathways of change (i.e., what factors need to shift, in what order, to change couple communication). Another drawback to our data is that the MFF intervention only included an 18-month study period. Given that it is generally accepted that social norms take a long time to change (i.e., social norms around smoking took generations to change), we may have observed a larger effect if the intervention had run longer. We encourage future intervention evaluations to include longitudinal panels and examine changes in social norms over time.

Our analysis was also constrained by the fact that the baseline survey consisted of a convenience sample, which are often affected by selection biases. In this case, the convenience sample of those choosing to participate may have been individuals more likely to hold certain positive social norms or engage in FP-related communication with their partners. Baseline data also suggest participants in both experimental and control congregations were highly educated, which is not as typical among the general Kinshasa population. These challenges limit our ability to generalize findings to other populations and locations. Finally, since we lack detailed information about variation of the exposure at the individual level, our intervention variable measures level of exposure at the congregation level. Messages in the intervention

were also intended to be diffused and therefore change norms at a community level; as such, we cannot rule out that some individuals in the control congregations may have been exposed to the intervention.

Conclusions

There is increasing recognition that women's agency and choice must be at the center of FP programs, and NSIs, such as MFF, have demonstrated promise in being able to shift social and gender norms affecting the context in which women are able to make FP decisions. However, multicomponent NSIs are costly and time-consuming, and we need to advance our understanding of how and if they work to inform these investments. Findings from this analysis provide useful insights into how multi-component NSIs operate and may need to be designed for greater impact on couple communication for FP and similar behavioral outcomes of interest. Our findings of sequenced pathways to and aggregate intervention effects on couple communication for women in this sample population in Kinshasa appears to confirm the need for multicomponent interventions that work simultaneously to shift norms as well as to modify attitudes and increase self-efficacy to achieve desired behavior change. Findings also point to the potential for exploring norms-shifting messages or approaches separately for men and women. Finally, these results provide some justification for the need for rigorous monitoring plans to safeguard against and document unintended outcomes and intervention evaluations that account for the synergistic effects of intervention components and directed pathways to program outcomes.

Abbreviations

CFI: Comparative Fit Index

DRC: Democratic Republic of the Congo

FP: Family Planning

FTP: First-Time Parent

IPV: Intimate Partner Violence

MFF: *Masculinité, Famille, et Foi*

NMC: Newly Married Couple

NSI: Norms-Shifting Intervention

RMSEA: Root Mean Square Error of Approximation

SEM: Structural Equation Modeling

TOC: Theory of Change

Declarations

Ethics approval and consent to participate

The study was approved by the institutional review board at Georgetown University in the United States and the Ethical Committee of the School of Public Health, Kinshasa University, DRC. Participants provided their oral informed consent prior to initiating the survey.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors contributed to the development of the initial concept for this analysis, provided feedback on the results and reviewed the final manuscript. LL, EC and AM led development of the concept and analysis plan for this manuscript. AM conducted the analysis. LL and AM created the tables and figures. LL and EC wrote the manuscript. RL served as PI and AK as Project Director of the overall project within which this study was nested. RL, CMS and FQ were involved with the development of the intervention. BS, CMS, and FQ provided project management on the MFF intervention. BS oversaw the collection of the evaluation data used in the analysis.

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Figures

Mediating Variables: Hypothesized Model

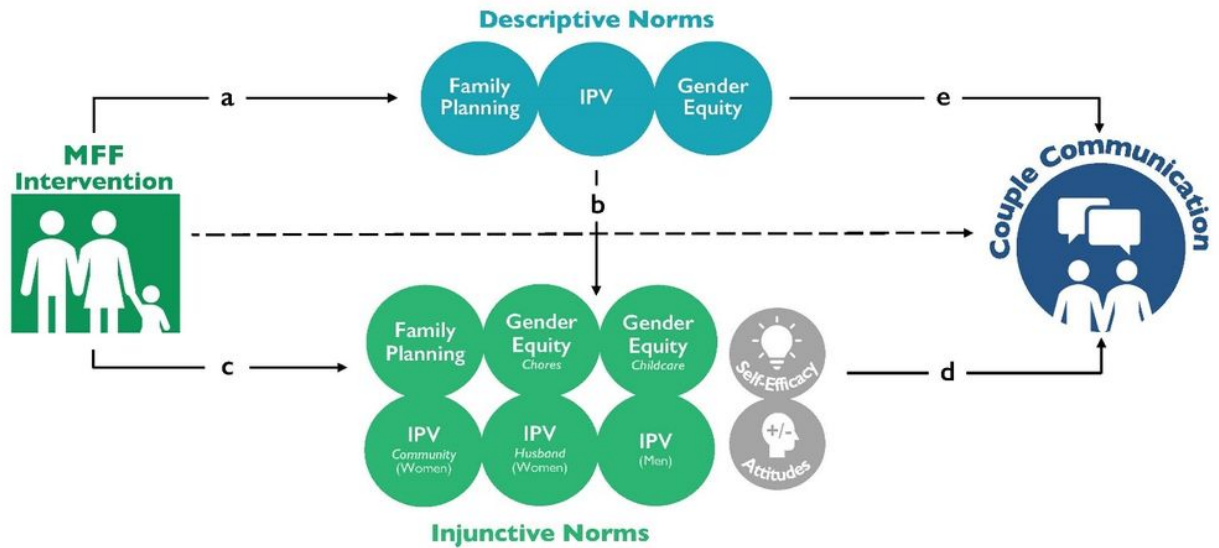


Figure 1

Hypothesized structure of the mediation model for MFF intervention in Kinshasa, DRC 2019

Supplementary Files

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