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Social Norms and Gender-based Violence Prevention among Husbands of Adolescent Wives in Rural Niger

By

Sabrina Christine Boyce

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Epidemiology

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Associate Professor Julianna Deardorff, Co-Chair
Associate Professor Alexandra Minnis, Co-Chair
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Summer 2022

Abstract

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Doctor of Philosophy in Epidemiology

University of California, Berkeley

Associate Professor Julianna Deardorff, Co-Chair

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Gender inequity is pervasive globally and is an upstream determinant of a wide range of poor health outcomes for women and girls, including gender-based violence, HIV, reproductive health, child marriage, and female genital cutting. Social norms that uphold gender inequity are, thus, a primary upstream determinant of these poor health outcomes. Critical gaps in the research evidence exist around how to measure social norms related to gender equity, how to change these norms, and how changes in these norms may lead to change in gender equity-related behavior.

This dissertation contributes to the growing body of research on gender equity and related social norms, and how public health interventions can improve health outcomes related to gender inequity. Data from a four-arm cluster randomized control trial of the Reaching Married Adolescents in Niger (RMA) intervention conducted among married adolescent girls and their husbands in the Dosso region of Niger were utilized in this dissertation research. The RMA intervention aimed to increase modern contraceptive use and decrease intimate partner violence (IPV) via trained community health worker approaches, including household visits and small group discussions, with both married adolescent girls and their husbands.

Chapter 1 of this dissertation contributes to the field of IPV prevention an in-depth psychometric assessment of a novel scale that measures perceived social norms regarding IPV and reproductive coercion. Evidence of reliability and validity, as well as validating associations with IPV perpetration behavior, provided by this research contribute to the value and utility of this scale for monitoring and evaluating change in social norms related to IPV. Chapter 2 provides evidence that the RMA small group intervention reduced inequitable gender norms after 12 months of receiving the program, and that the RMA household visit intervention may have increased inequitable gender norms. These results from a rigorous evaluation are among very few evaluations of gender norm-focused public health interventions demonstrating effects on social norms. Furthering this finding, Chapter 3 offers a mediation analysis using modern causal inference methods that yielded evidence of social norms change being an important mechanism

behind observed reductions in IPV for the small group intervention. This chapter also raises important questions about the mechanism behind increases in modern contraceptive use associated with the RMA household visits and combination interventions, as social norms appear to have not been an important mediator. These results are one of very few, if any, studies to demonstrate social norms change as a mechanism behind an intervention's effects on IPV in low- and middle-income countries, strengthening the evidence behind theories and frameworks that postulate the importance of social norms for behavior change.

In order to meet the Sustainable Development Goals 2030 in the next eight years, there is an urgent need to expand the evidence-base on how to increase gender equity within societies. This dissertation contributes two practical tools for researchers and practitioners to work toward these goals: 1) a brief valid and reliable scale for measuring social norms related to IPV and reproductive coercion and 2) evidence that the RMA small group intervention model affects inequitable gender norms and, in turn, IPV. Such contributions offer critical evidence to further inform the promotion of gender equity via changing social norms, efforts that are essential to reducing the health burden of gender inequity on women and girls globally.

This dissertation is dedicated to my two daughters, Embry (3.5yrs) and Maira (1yr), who were my other two “babies”, besides this dissertation, that resulted from this doctoral journey. You two are the light of my life and I love you with all of my heart. I do this work so that girls, like you two, can thrive in a world in which women and girls are respected, valued for their whole-selves, and sought after to be leaders.

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II. INTRODUCTION

Gender inequity is a key social determinant of health for women and girls.

Gender inequity is pervasive globally and is an upstream determinant of a wide range of poor health outcomes for women and girls (Heise 2019). Governmental and private global leaders have set gender equity as a priority to achieving international health, education, economic, and human rights goals. Goal five of the United Nation's Sustainable Development Goals is to achieve gender equality and empower all women and girls (United Nations 2015). United States President Joe Biden issued an executive order in 2021 prioritizing gender equity as not only a matter of human rights and justice, but also as a "strategic imperative that reduces poverty and promotes economic growth, increases access to education, improves health outcomes, advances political stability, and fosters democracy." (Biden 2021). In the same year, the Bill and Melinda Gates Foundation, one of the largest philanthropic foundations in the world, committed $2.1 billion to advance gender equity globally (Bill and Melinda Gates Foundation 2021). In recent years, the rippling negative consequences of gender inequity and, therefore, the need for gender *equity* has become undeniable. Yet, research on strategies to uproot entrenched marginalization, including gender inequity, of particular groups of people via upstream determinants of health is nascent.

One of the most extreme expressions of gender inequity is violence against women and girls, yet gender-based violence (GBV) is pervasive and pernicious globally (Heise, Ellsberg, and Gottmoeller 2002). GBV includes femicide, intimate partner violence (IPV), sexual violence, reproductive coercion, female genital cutting, as well as other forms of structural and interpersonal violence (Heise, Ellsberg, and Gottmoeller 2002). IPV occurs when a romantic partner perpetrates physical, sexual, and/or emotional violence against their partner; 15 to 71% of ever-partnered women worldwide report experiencing such violence (Ellsberg et al. 2008). Reproductive coercion (RC), a related form of violence often classified as pregnancy coercion or birth control sabotage, is defined as a set of coercive behaviors enacted by a male partner or other family member (e.g., in-laws) that interfere with a woman or girl's efforts to control her fertility (Miller et al. 2010). Representative estimates of the prevalence of RC are still sparce in the literature, but to date, research has detected RC among 8.4% of women in a national sample in the US (Basile et al. 2019), 10.2% in a representative sample of Dosso, Niger (Silverman et al. 2020), 12% in a large representative sample in Uttar Pradesh, India (Silverman et al. 2019), and 18.5% in random sample of villages in rural Cote d'Ivoire (McCauley et al. 2014). IPV and RC often co-occur, with women experiencing IPV at much greater risk of RC than those who have not experienced IPV (Zakar et al. 2012, Silverman and Raj 2014). While harmful, traumatic, and violating on their own, IPV and RC are also associated with multiple negative health consequences, including unintended pregnancy (Silverman et al. 2019, Ellsberg et al. 2008), poor reproductive health (e.g., shorter interbirth intervals) (Hung et al. 2012, Silverman et al. 2019, Zakar et al. 2012), sexually transmitted infection acquisition (Capasso, DiClemente, and Wingood 2019, Decker et al. 2014), and poor mental health (Campbell 2002, Grace and Anderson 2018).

Gender inequity also expresses itself through poor reproductive and maternal health. Particularly in cultural contexts where women and girls' value in society is determined based on their fertility and their gender role is proscribed to be subservient to men, women and girls'

health, well-being, and agency over their lives are often sacrificed to achieve these ideals (Samandari et al. 2019, Williamson et al. 2009). In Niger, for example, which ranks 154th of 162 countries on the United Nations Gender Inequality Index (a ranking based on reproductive health, empowerment, and economic activity), pervasive early and frequent childbearing has taken a tremendous toll on women's health (UNDP 2020). The highest in the world, Niger has an overall birth rate of 6.7 births per woman and maternal mortality ratio of 509 (per 100,000 live births) (UNPD 2019, WHO 2019). With 76% of Nigerien girls marrying by the age of 18 and an adolescent birth rate of 177 births per 1000 adolescents aged 15-19, early marriage and childbearing create family power structures in which adolescent wives have minimal decision-making power and limited ability to control their reproductive and sexual health, including the decision to use modern contraceptive methods (The World Bank 2020, UNICEF 2018, Girls Not Brides 2015). Research from Niger, Nigeria, Burkina Faso, Togo, Benin, and Mali has found husband's approval of and attitudes about FP to be key determinants of women's contraception use (Blackstone and Iwelunmor 2017, Wulifan et al. 2017, Koffi et al. 2018, Chae 2015). Men's beliefs around FP, in turn, are shaped by their peers and their perception of what others believe about the acceptability of FP (Igras, Diakité, and Lundgren 2017). In Niger, as well as many other low and middle-income countries (LMIC), shifts in gender equity are all the more crucial for societal well-being and the health of women and girls (Heise 2019).

Gender inequity is embodied in social norms

Gender inequity is embodied in the social norms of a society. Social norms are the collective, often unspoken rules that reinforce or sanction certain behaviors within a group of people (Mackie et al. 2015, Strauss and Quinn 1997). Understood through social norms theory (Mackie et al. 2015, Cialdini, Kallgren, and Reno 1991, Cialdini and Reno 1990) and the theory of interdependent action (Strauss and Quinn 1997), social norms are the beliefs people in a given society or community hold about what is normal and appropriate behavior, and such beliefs are held in place by reciprocal expectations of the people in the group. Gender norms are a subset of social norms that define gender-based social roles and behavior (Bussey and Bandura 1999). In most cultural contexts of the world, patriarchal power structures are held up by gender norms that condone dominant forms of masculinity, female submissiveness, and male entitlement (Bussey and Bandura 1999, Connell 1987, Keleher and Franklin 2008). Multiple theoretical frameworks offer conceptual understanding of how gender inequity is expressed through social norms and how social norms, in turn, influence behavior (Pulerwitz et al. 2019, Cislaghi and Heise 2019, Heise 1998). In the Theory of Gender and Power, Connell (1987) describes how gender inequity, a hierarchical segregation between men and women's gender roles, imprints onto societal norms and relationships, that then are embedded in the institutional and societal levels of society. Gender norms permeate through every level of Brofenbrenner's socio-ecological framework, influencing the individual, social, institutional, and macro-levels of society (Bronfenbrenner 2005, Cislaghi and Heise 2019).

Social norms that uphold gender inequity are, thus, a primary upstream determinant of a wide range of poor health outcomes, including gender-based violence, HIV, reproductive health, child marriage, and female genital cutting (Mackie et al. 2015, Connell 1987, Wingood and DiClemente 2000, Pulerwitz et al. 2019). Observational evidence suggests a connection between perceived social norms regarding gender inequity and individual behavior related to these outcomes. For example, previous research suggests that men's attitudes regarding the acceptability of IPV are shared within households and with the people

with whom they regularly converse (Shakya et al. 2016, Shakya et al. 2018). In the United States, men who perpetrate IPV consistently over-estimate the percentage of their male peers who also perpetrate IPV, compared to non-perpetrating men (Neighbors et al. 2010). In Uganda, men who believed their peers approved of the use of IPV were more likely to agree themselves that IPV was justifiable (Tsai and Subramanian 2012). These signals point toward IPV being influenced by social norms and a socially learned behavior, that potentially can be unlearned (i.e., prevented) by changing the social context (Jewkes et al. 2015).

Social norms-focused interventions can help address gender inequity

Social norms-focused public health interventions have shown promising evidence of reducing poor health outcomes related to gender inequity, yet significant gaps exist in understanding how to sustainably change social norms (to reduce gender inequity) (Cislaghi and Heise 2019, Dworkin, Treves-Kagan, and Lippman 2013, Haylock et al. 2016, Heise 2019). Community mobilization, group-based discussions, and social norms campaigns to change health behavior related to inequitable gender norms have shown the most promise to date (Cislaghi and Heise 2018). These social norms-focused public health approaches are gaining considerable momentum in LMIC (Cislaghi and Heise 2019). Social norm interventions targeting both men and women, like Gender Equity Movement in Schools in India, Stepping Stones in South Africa, and Tostan in Senegal, have been shown to reduce IPV, HSV-2, and female genital cutting, among other important health outcomes (Achyut, Bhatla, and Verma 2015, Jewkes et al. 2008, Rowley E 2020). Momentum to involve or target men, often the decision-makers, gate-keepers, and perpetrators of violence against women, in such gender norm-focused interventions is gaining so that transformation of hierarchical gender roles is able to occur (Gupta 2000, Dworkin, Treves-Kagan, and Lippman 2013). Rigorous evidence demonstrating the effectiveness of these social norms-focused interventions on changing social norms, though, is often lacking, especially in LMIC settings. When such evidence is available, the results are mixed; some evaluations have indicated that only the targeted social norms changed and not the behavior (Evans et al. 2019), while others provide evidence that both changed (Abramsky et al. 2014, Abramsky et al. 2016, Verma et al. 2008, Rowley E 2020). When behavioral effects are observed, little is often understood about how such behavioral changes have come about and if social norms contributed to the mechanism of change.

Research Gaps

Understanding the mechanism of change for interventions aiming to improve the entrenched health effects of gender inequity is critical for unpacking how interventions are achieving outcomes -whether they are temporarily shifting behavior via more proximal determinants or changing upstream determinants of health. If the latter, the benefits could be long-lasting and include benefits on a wide range of health outcomes, possibly meriting prioritization of such interventions in resource-limited contexts, such as low- and middle-income countries (Heise 2019, Heymann et al. 2019).

Ideally, to support prioritization and scale-up of an intervention, rigorous evidence demonstrating 1) causal effects on the gender equity-related behavioral outcome, 2) causal effects on the targeted social norms, and 3) mediation evidence that the social norms were the mechanism behind the behavioral outcome is needed. Very few, if any, evaluations of interventions conducted in LMIC contexts provide all three kinds of evidence (IRH 2017, Cislaghi et al. 2019, Mackie et al. 2015). This is likely attributable to a variety of challenges.

First, randomized trials are resource intensive and difficult to implement, both of which are critical barriers in LMIC contexts. Second, measurement of social norms is difficult and rarely done in evaluations. Third, assessing for mediation is complex and depends on strong assumptions that are only moderately feasible to affirm in the context of an experimental design.

Few measures of social norms exist, inhibiting the collection of data on norms. Cialdini, one of the leaders in conceptualizing social norms, has distinguished social norms as either *descriptive* (i.e., beliefs about what others do), *injunctive* (i.e., beliefs about how others would respond to one's behavior), or *second order beliefs* (i.e., beliefs about what others approve and disapprove of) (Chung 2016, Mackie et al. 2015, Cialdini, Kallgren, and Reno 1991, Cialdini 1998, Cislaghi and Heise 2018). Because scales that specifically measure descriptive, injunctive, or second order beliefs are challenging to develop and therefore are rarely used, many researchers resort to aggregates of individual attitudes as a proxy measure of social norms, which fails to capture the core element of social norms: perceived social expectations around behavior (Cislaghi and Heise 2016, Abramsky et al. 2016, Kadengye et al. 2019). The few evaluations of gender norms-focused interventions in LMIC that have used measures of social norms offer important evidence about how these interventions are working, or not working, to change individual behavior (Denny, Hughes, and Nwankwo 2017, Glass et al. 2019, Evans et al. 2019), yet more research like this is needed.

As momentum to use social norm approaches in LMIC strengthens (Cislaghi and Heise 2019), it is critical for researchers and practitioners to understand whether social norms-focused interventions are actually changing the intended social norms, and if so, whether behaviors informed by these norms subsequently change as a result. Such evidence is desperately needed to support the development of future programmatic conceptual frameworks and social norm-shifting interventions, and to advance this growing approach to public health interventions.

Dissertation objectives and summary

The present dissertation aims to provide evidence that will begin to fill gaps around the effectiveness and mechanisms behind gender norms-focused interventions implemented in LMIC contexts. This research utilizes data from a four-arm cluster randomized trial (cRCT) of the Reaching Married Adolescents in Niger (RMA) intervention, a community health worker model addressing social norms and other barriers to increasing modern contraceptive use and reducing IPV among married adolescent girls and their husbands in the Dosso region of rural Niger (Challa et al. 2019). Silverman et al. previously reported effects of the RMA intervention on the primary behavioral outcomes, modern contraceptive use and IPV (Silverman et al. 2022). This dissertation seeks to open the "black box" of how these behavioral outcomes were achieved by first, improving measurement of social norms by contributing a novel social norms scale used in data collection as part of this evaluation and providing strong psychometric evidence of reliability and validity (**Chapter 1**); second, by assessing whether the RMA intervention had an effect on gender norms among husbands of adolescent wives (**Chapter 2**); and 3) assessing whether such changes in social norms mediated the observed changes in contraceptive and IPV behavior (**Chapter 3**). Such evidence aims to illuminate how the RMA intervention may create change in communities, and contributes to an in-depth understanding of a potential evidence-based approach to changing social norms in LMIC contexts. This dissertation seeks to contribute rigorous evidence to inform global efforts to promote gender equity so that such initiatives can make meaningful impact on the health and well-being of women and girls.

1 CHAPTER 1: Measuring Social Norms of Intimate Partner Violence and Reproductive Coercion: A Psychometric Assessment of the IPV/RC Social Norms Scale

1.1 Abstract

Background: The field of violence prevention researchers is unequivocal that interventions must target contextual factors, like social norms, to reduce gender-based violence, yet limited research on the social norms contributing to intimate partner violence or reproductive coercion exist. One of the driving factors is a lack of measurement tools to accurately assess social norms related to intimate partner violence and reproductive coercion.

Methods: Using an item response modeling approach, the current study psychometrically assessed the reliability and validity of the Intimate Partner Violence/Reproductive Coercion Social Norms Scale with data from a population-based sample of adolescent wives and their husbands in rural Niger (n=559 husband-wife dyads) collected in 2019.

Results: A two-dimensional Partial Credit Model for polytomous items was fit, showing strong evidence of reliability and validity. Higher scores on one of the two dimensions was statistically associated with a higher likelihood of husband perpetration of intimate partner violence, further evidencing its validity and utility in prevention.

Conclusion: This brief Intimate Partner Violence/Reproductive Coercion Social Norms Scale is a short, practical measure with strong reliability and validity evidence. This scale could contribute to researchers' ability to efficiently measure and understand social norms regarding intimate partner violence and reproductive coercion for observational or evaluative purposes.

1 CHAPTER 1: Measuring Social Norms of Intimate Partner Violence and Reproductive Coercion: A Psychometric Assessment of the IPV/RC Social Norms Scale

1.2 Introduction

Gender based violence, inclusive of IPV and RC, is pervasive and pernicious globally. IPV, which can include physical, sexual, and emotional violence perpetrated by a romantic partner, is experienced by 15 to 71% of ever-partnered women worldwide (Ellsberg et al. 2008). Prevalence of RC, when a male partner interferes with a woman or girl's efforts to control her fertility via pregnancy coercion or birth control sabotage (Miller et al. 2010), ranges from 8.4% in the US (Basile et al. 2019), 10.2% in rural Niger (Silverman et al. 2020), 12% in India (Silverman et al. 2019), and 18.5% in Cote d'Ivoire (McCauley et al. 2014). IPV and RC often co-occur, with women experiencing IPV at much greater risk of RC than those who have not experienced IPV (Zakar et al. 2012, Silverman and Raj 2014). IPV and RC have been found to lead to a variety of negative consequences for health and wellbeing, including unintended pregnancy (Silverman et al. 2019, Ellsberg et al. 2008), poor reproductive health (e.g., shorter interbirth intervals) (Hung et al. 2012, Silverman et al. 2019, Zakar et al. 2012), sexually transmitted infection acquisition (Capasso, DiClemente, and Wingood 2019, Decker et al. 2014), and poor mental health (Campbell 2002, Grace and Anderson 2018). These two forms of gender-based violence, IPV and RC, are driven in large part by male partner beliefs of dominance and entitlement over female partners (Connell 1987, Chamberlain and Levenson 2012), beliefs that are shaped and reinforced by social norms (Miller and McCauley 2013).

Reducing IPV and RC is a critical focus of the United Nations 2030 Sustainable Development Goal 5 on gender equity, and shifting social norms accepting of IPV and RC is critical to success (United Nations 2015). Social norms, understood through social norms theory and the theory of interdependent action, are the collective, often unspoken rules that reinforce or sanction certain behaviors within a group of people (Mackie et al. 2015, Strauss and Quinn 1997). Social norms are the beliefs people in a given society or community hold about what is normal and appropriate behavior, and such beliefs are held in place by reciprocal expectations of the people in the group (Mackie et al. 2015). For example, in highly patriarchal contexts, social norms, particularly gender norms, often drive behavioral expectations that males should be dominant, females submissive, and that males are entitled to women's bodies, creating a social context that reinforces men's violence against women (Cislaghi and Heise 2017, Bussey and Bandura 1999). Social norms can be descriptive, one's belief of what peers would do in a given situation, or injunctive, one's belief of what behavior is expected of them by their peers in a given situation (Mackie et al. 2015). In studies of IPV descriptive norms, men who perpetrate IPV consistently over-estimate the percentage of their male peers who also perpetrate IPV, compared to non-perpetrating men (Neighbors et al. 2010). Few studies have examined IPV injunctive norms. One study of men in Uganda found that those who believed their peers approved of the use of IPV were more likely to agree themselves that IPV was justified (Tsai and Subramanian 2012). Previous social network research suggests that men's attitudes regarding the acceptability of IPV are shared within households and with the people with whom they regularly converse (Shakya et al. 2016, Shakya et al. 2018). These signals point toward IPV being a socially learned behavior, that potentially can be unlearned (i.e., prevented) by changing the social context. Despite the limited research on IPV or RC social norms, violence prevention

researchers make clear that effective interventions need to target social and contextual factors, like social norms (Jewkes, Flood, and Lang 2015, Dworkin, Treves-Kagan, and Lippman 2013, Barker, Ricardo, and Nascimento 2007). These efforts, though, are substantially limited by the ability to effectively measure IPV and RC social norms.

Few validated measures of IPV- and RC-related social norms exist; while some scales assess social norms broadly related to IPV and RC (e.g., traditional gender norms), very few scales measure the perceived social acceptability of these behaviors, specifically, or demonstrate correlation with IPV perpetration behavior. Moreover, no identified scales contained items assessing RC social norms. One IPV social norms measure, the Partner Violence Norms Scale, assesses gender norms and acceptable responses of family to IPV (e.g., A woman who complains about her husband's violent behavior is considered a disloyal wife by her in-laws), but only contains one item that assesses social acceptability of IPV behavior itself (injunctive norm) (Clark et al. 2018). Another IPV social norms scale, Social Norms and Beliefs about Gender Based Violence Scale, was validated for the humanitarian settings of South Sudan and Somalia and is an 30-item scale primarily focused on social acceptability of sexual violence, primarily extra-marital, among people whose opinions are most important to the participant (Perrin et al. 2019). One subscale (four items) of this scale focuses on socially acceptable motivations of wife beating (e.g., showing love, a husband's right, and discipline; injunctive norms), but does not specify under what conditions would such beating be normative and socially acceptable. The relationship between this scale and reports of IPV behavior were not conducted, obscuring the utility of this scale for detecting IPV. Both scales offer a helpful measurement tool for understanding social norms that are broadly related to IPV (e.g., gender norms), yet more validated measures assessing social norms directly related to the acceptability of IPV and RC are needed.

The majority of studies attempting to measure IPV social norms have used proxy measures that aggregate individual-level beliefs and attitudes regarding the acceptability of IPV, primarily using the Attitudes about IPV (ATT-IPV) scale (James-Hawkins et al. 2018, Yount et al. 2018, Vyas and Heise 2016, Kadengye et al. 2019). The ATT-IPV is a scale that assesses individual-level attitudes regarding the justifiability of wife beating for behaviors representing a spectrum of gender transgressions (e.g., arguing with her husband, burning the food) (Yount et al. 2014), a measure that has been integrated into the core Demographic and Health Survey (DHS) with some variation across 90 countries (Croft, Marshall, and Allen). However, aggregated individual beliefs fail to capture a key component of social norms: individuals' perception of what people around them believe about the acceptability of these behaviors (Mackie et al. 2015). Such injunctive norms shape what an individual believes is expected of them by their community and define social norms. Recognizing this gap between aggregated attitudes and accurate measurement of social norms related to the ATT-IPV scale, one study adapted the ATT-IPV scale to measure social norms by asking participants about the number of people in their village that would agree with each of the statements in the original ATT-IPV scale (Tsai et al. 2017). This adaptation of the ATT-IPV items to social norms items was not assessed for reliability or validity as a scale, but could be a very useful measure if shown to be valid. Scales that accurately measure social norms of IPV and RC behaviors that have evidence of validity and reliability are needed to better understand risk for IPV and RC perpetration, and to inform the design and evaluation of prevention approaches that address these norms.

The current study seeks to assess the reliability and validity of a new measure of IPV and RC social norms (IPV/RC Social Norms scale). Using data from a population-based sample of husbands of adolescent wives in rural Niger, we assessed IPV and RC social norms by adapting the preamble of the items in the ATT-IPV scale to transform them into a scale of injunctive social norms about situations in which IPV and RC are perceived to be socially acceptable. We used an item response modelling approach to evaluate the evidence of reliability and validity of this measure, and to test the ability of the scale to differentiate between husbands who had and had not perpetrated IPV. This measure maximizes efficiency, given that it builds on the commonly used ATT-IPV scale in the DHS questionnaire, contains a concise number of items, and is primed for scalability. Such a measure, if shown to be valid, could be one of the only to assess RC-specific social norms and provide a useful and feasible tool for understanding IPV behavior and evaluating impact of programs targeting IPV and RC social norms.

1.3 Methods

Setting

The present psychometric analysis utilizes data from a cRCT, called the RMA study, that took place in the Dosso region of Niger. The Dosso region is made up of rural villages that identify as either culturally and linguistically Zarma or Hausa, each led by a male chief, where Islam and polygamy are widely practiced. While both Hausa and Zarma people are typically Islamic, patrilineal, and engage in agriculture-related subsistence, Hausa represent the majority cultural group in Niger and have younger ages at marriage for females relative to Zarma people (Shakya et al. 2020). In Niger, poverty, early and frequent childbearing, and gender inequity are pervasive. These factors have likely contributed to an overall birth rate of 7.6 births per woman, maternal mortality ratio of 553 (per 100,000 live births), and 76% of women marrying by the age of 18, some of the highest in the world (WHO 2015, DHS Niger 2013, UNICEF 2017). Girls who marry early have less decision-making power in their relationships and ability to control their reproductive and sexual health, making them highly vulnerable to IPV and RC (Nour 2006, Raj et al. 2010). Lifetime prevalence of physical IPV, sexual IPV, and RC are reported by 8.2%, 5.3%, and 10.2% of adolescent wives in the RMA study, respectively (Silverman et al. 2020).

Sample and data collection

Cross-sectional data were collected as part of the third wave of data collection of the four-arm RMA cRCT, which evaluated multiple community-based family planning interventions conducted from 2016-2019 to promote healthy birth spacing among married adolescents. Participants included husband and adolescent wife dyads; the present study primarily utilizes data from husbands. A two-staged random sampling procedure was used at baseline in which 16 villages were randomly selected from the Dosso, Loga, and Doutchi districts of the Dosso region and within these selected villages, 25 households were randomly selected from a list of married adolescent girls provided by each village chief (n=1042 husband-wife dyads at baseline). Inclusion criteria for villages included being Hausa or Zarma-speaking and having at least 1000 residents. Married adolescents were eligible for inclusion if they were 1) between the ages of 13-19 years at baseline, 2) fluent in Hausa or Zarma, 3) planning to live in the village for the next 18 months and not be away >6 months, 5) not currently sterilized, and 6) willing and able to provide informed consent. Men were eligible if they were married to one of the eligible and successfully

recruited girls. Selected households were visited up to three times; a randomly selected household replacement was used if unavailable. Due to low literacy, verbal informed consent was obtained from all participants in accordance with the Niger Ministry of Health recommendation. Guidelines from the World Health Organization on the ethical conduct of research on violence against women were used to develop study protocols (Ellsberg and Heise 2005). More details on the study protocols have been published elsewhere (Challa et al. 2019).

Research assistants from Niger who were trained, fluent in French, Hausa, and Zarma, and gender-matched collected self-report quantitative data via interviews using pre-programmed tablet devices. Interviews were conducted in private locations of the participants' choosing out of earshot from their spouse or other residents and required 40-60 min to complete. The third wave of data collection occurred in 2019, three years after baseline. The retention rate for male participants in the third wave was 52% relative to baseline, and attrition was associated with the husband traveling away from the village for more than 3 months in the past year (i.e., migrant worker), being younger in age, being younger at marriage, having a nulliparious wife, having a wife who was older at marriage, and having less education at baseline. The retention rate for female participants in the third wave was 77% relative to baseline, and attrition was associated with having greater familial asset ownership at baseline. Participants received no compensation for their participation as any monetary amount was perceived as potentially coercive.

Measure development

Based on a review of the literature and the expertise of the research team in IPV and RC, social norms, and social norms measurement, a 6-item scale was developed by adapting a common version of the ATT-IPV 5-item scale (Yount et al. 2014). Items within the ATT-IPV scale were adapted by adding a stem for injunctive social norms that read, "People in my community believe that a husband is justified in hitting or beating his wife if …" to replace the original items. An additional item for the scale was developed and included that assessed the social acceptability of a husband hitting or beating his wife if she uses a family planning method without his permission (item 1 in the new IPV/RC Social Norms scale in Table 1), a form of RC. All items in this new IPV/RC Social Norms scale were polytomous with response options of "disagree", "somewhat agree", and "agree", a reduced Likert scale due to the extremely low literacy of the sample.

[INSERT TABLE 1]

All six items were reviewed by the in-country family planning intervention providers and the team of data collectors for contextual applicability and acceptability. The items were pilot tested with residents of the villages in which data collection took place and no difficulties in understanding the items or negative impact were reported.

In addition to measuring the IPV/RC Social Norms scale among husbands, the current analysis included wives' reports of IPV victimization, measured using items adapted from the DHS domestic violence module based on the WHO multi-country study (Garcia-Moreno et al. 2005). IPV victimization was dichotomously assessed as an affirmative response to any of eight questions about whether their current husband has ever 1) pushed you, shook you, or thrown something at you, 2) slapped you, 3) twisted your arm or pulled your hair, 4) hit you with his fist or with something that could hurt you, 5) kicked you, dragged you, or beat you up, 6) tried to choke you or burn you, 7) physically forced you to have sexual intercourse with him when you

did not want to, and 8) physically forced you to perform any other sexual acts you did not want to. Wives were all adolescents at baseline and when married, and had an average marriage length of 3.1 years (range: 0-9 years), suggesting that IPV was recent in most cases and their current husband was likely their only husband. Participants responding, "Don't know", "Decline to answer", or had missing data for all items were considered missing.

Analysis

Wave 3 data from husbands on the IPV/RC measure, wave 3 data from wives on IPV victimization, and Wave 1 demographic and cultural identifiers (e.g., Hausa, Zarma; differential item functioning analysis) were used in this analysis. Our assessment of the IPV/RC Social Norms measure is grounded in item response theory, or item response modelling (IRM), which is an approach used in measurement science to assess scales intending to capture unobserved, or latent, constructs that cannot be directly measured, such as attitudes and beliefs (Hambleton, Swaminathan, and Rogers 1991). IRM assumes that a response to an item in a scale is determined by the item and person's response and together can be used to predict the individual's level, or location, within the continuum of a latent construct. IRM also provides insight on the performance of each item of the scale in order to optimize the scale for future use. This approach contrasts with Classical Test Theory (CTT) approaches which assume a raw score directly measures an individual's level within a latent construct, without considering how participants responded to these items, and that measurement precision is uniform across all items of the scale. An IRM approach is well-suited for understanding latent perceived social norms that cannot be directly observed yet are intended to be measured via responses to such a scale as the one included in this study.

We fit a Rasch model for polytomous items, called a Partial Credit Model (PCM)(Masters 1982), to assess the reliability and validity of the IPV/RC Social Norms scale using ConQuest 4 software (Adams et al. 2016). The PCM used marginal maximum likelihood estimation to provide parsimonious estimates of item location parameters, based on item difficulties and step parameters for k-1 response categories for each item. The relative values of item location parameters are mapped relative to individuals' scores centered at 0. Such item and option locations can be directly and consistently interpreted relative to person locations, both of which are functions of the probability of a respondent endorsing a given response option for that item, for those items fitting the model.

To assess the reliability of the measure, we calculated the expected a-posteriori (EAP) reliability index based on the point estimates for each participant's location within the continuum of perceived social acceptability of IPV, using a threshold of >0.70 to indicate acceptable reliability (Mislevy et al. 1992). Internal structure validity was assessed in multiple ways. Content validity was assessed based on a review of the meaning of items to ensure that, based on content expertise and familiarity with the study context, adequate coverage and spread of the items across the construct existed. At the instrument level, we used Wright Maps to plot the participant's overall scores against each item's difficulty threshold to see if overall scores were approximately normally distributed and the spread of the item difficulty thresholds spanned the distribution of scores. Using a PCM model, we obtained parameter estimates for each item's difficulty threshold and weighted mean squared error fits, which we assessed to see if they fell within the acceptable range of 0.67 and 1.33 indicating adequate model fit (Wright and Masters 1982). For a reference point to a conventional method of assessing reliability within public

health, we also summed item responses into scores and evaluated the distribution, calculated item-total and point biserial correlations for each item, and calculated the Cronbach's alpha for the model. Considering Zarma and Hausa-speaking groups of participants to represent importantly distinct social and cultural groups within our sample, we expanded the PCM by including item by group interaction terms to assess for differential item functioning (DIF) across Zarma and Hausa-speaking groups and considered a logit difference value greater than 0.426 as evidence of item bias, a common threshold used in IRT (Paek and Wilson 2011). Given the data were collected as part of a four-arm intervention study, we also assessed for DIF across treatment arms.

Based on content expertise, the research team hypothesized that the scale contained items representing two subdimensions of the construct (Figure 1). One dimension (items 1, 2, 3) represented the social acceptability of husband IPV if the wife does not fulfill the expected familial role around procreation ("Wifely procreation duties"), via denying her husband sex when he wanted it or preventing a pregnancy by using a family planning method. Another dimension (items 1, 4, 5) represented the social acceptability of husband IPV if the wife challenged the authority of her husband ("Challenges husband authority"). The RC item, justifying violence if the woman used a family planning method without informing her husband, was included in both due to its relevance to both dimensions. To simultaneously estimate item and person locations across two subdimensions of the latent IPV/RC social norms construct, we fit a multidimensional PCM, which is a special case of more general multidimensional random coefficients multinomial logit (MRCML) model (Adams, Wilson, and Wang 1997). A MRCML framework—also known as a Rasch framework—allows one to simultaneously estimate item and participant characteristics, as well as incorporate measurement error into the estimation of more complex models in secondary analyses by providing estimated plausible values (Wu 2005). We chose this framework for its interpretational advantages and model parsimony. We assessed using a likelihood ratio test whether the two-dimensional PCM was a better fit to response data than the unidimensional model. We also fit consecutive unidimensional PCMs separately for each dimension to see if they performed better as separate scales and compared the EAP reliabilities for each dimension with those given by the two-dimensional PCM (Briggs and Wilson 2003). Using the same methods described above for the unidimensional model, we evaluated weighted fits of the item parameters and assessed for DIF. A correlation between the two dimensions ranging from 0.60 to 0.90 indicates appropriate relatedness of the subdimensions without suggesting unnecessary overlap.

[INSERT FIGURE 1]

Lastly, to obtain validity evidence based on relations to other variables, we hypothesized that male participants whose wives reported their ever perpetration of IPV would be likely to perceive social norms that were more accepting of IPV/RC, compared to male participants whose wives did not report IPV. To test this hypothesis, we fit a latent regression model (Zwinderman 1991) by including wife reports of IPV victimization by her current husband as an observed predictor and evaluated whether the association was significant at an alpha level of 0.05. Specifically, we allowed the means of the latent variable to vary across IPV groups. To assess this further we ran a multiple-group multidimensional model that built on the previous latent regression model by also allowing each group to have its own variance and correlations between dimensions. In the multiple-group multidimensional analysis, a third group was included consisting of those dyads with missing data on IPV victimization. To ensure accurate

comparisons across groups, we used the delta dimensional alignment technique so that all parameter estimates—across groups and dimensions—would be on a common metric (Schwartz, Ayers, and Wilson 2017).

1.4 Results

The sample contained 559 husband-wife dyads. The majority of participant households were culturally and linguistically Zarma (66%) (Table 2). At the third wave of data collection, husbands were on average 29.9 (range: 18-66) years old and wives were 21.2 (range: 16-22) years old. Most husbands had at least one child (range: 0-16 children) and one wife, however, 17% had more than one wife. Among wives, 9% reported ever having experienced IPV victimization by their current husband. A majority (79%) reported no victimization, and data were missing for 12%.

[INSERT TABLE 2]

Unidimensional Partial Credit Model

Many husbands did not perceive social norms accepting of IPV in any of the circumstances included in the scale (40%). Crude scores on the scale ranged from the minimum to maximum scores (0 to 12) with a mean of 2.8 (SD: 3.20). When the unidimensional PCM was fit, husband participant levels across the IPV/RC social norms construct fell roughly in a normal distribution. Items and response category thresholds spanned across levels of higher perceived social acceptability of IPV and did not adequately capture lower levels of the construct (See online supplement materials, Appendix A. Unidimensional 6-Item PCM Wright Map). The easiest item to endorse was Item 1 (family planning use without informing the husband). The two hardest items to endorse were Item 6 (IPV for burning the food) and Item 3 (forcing sex if the wife refuses sex). Ease of endorsement refers to the likelihood of endorsing a given item relative to other items, given an individual's overall latent score; for example, if the majority of participants, including those with very low perceived social acceptability of IPV/RC endorse a particular item, this item would be considered "easy" to endorse. In the calibration, item response data were missing for 0.36% of the sample.

[INSERT TABLE 3]

The DIF assessment across cultural/linguistic groups revealed that the most difficult item to endorse, IPV for burning the food, showed statistical bias (difference in item difficulty: 1.104) such that it was much more difficult for Zarma participants to endorse this item, given their overall perceived social acceptability of IPV/RC, compared with Hausa participants (Table 3). Therefore, it was dropped from all subsequent analyses. We recalibrated the unidimensional model with the remaining five items and found the same ordering of item difficulty (Table 4). No remaining items met the threshold for identification of DIF (logit difference value greater than 0.426) based on Hausa and Zarma ethnicity. Additionally, using a DIF model that allowed for step category structures to vary across groups, we found no evidence of DIF based on intervention arm (See Online Supplementary Materials, Appendix B. Item Difficulty Estimates by Study Treatment Arm). While measures of reliability are susceptible to being weak for scales with few items, the EAP reliability for this brief 5-item measure was 0.74 and the Cronbach's alpha was 0.82, both indicating good reliability. Point-biserial correlations for each response

category of each item followed a logical ordering, as would be expected. Item-total correlations were strong (>0.70) for all items except for Item 3, which had a correlation of 0.62, likely reflecting the slightly different wording structure of this question.

[INSERT TABLE 4]

Multidimensional Partial Credit Model

Based on our hypothesis that the scale contained two dimensions, we fit a two-dimensional PCM, as well as two consecutive unidimensional models for each dimension. In comparing the unidimensional model to the multidimensional model, we found that the latter resulted in the better fit (significant at $p<0.01$) (Table 5). Moreover, the EAP reliabilities for each dimension in the two-dimensional model were improved from those of the consecutive models (Table 6), confirming our hypothesis and motivating the use of the two-dimensional model for subsequent analyses. Dimension 1 (Wifely procreation duties) had an EAP reliability of 0.72 and variance of 3.75 (standard error (SE): 0.22) and Dimension 2 (Challenges husband authority) had an EAP reliability of 0.74 and variance of 4.85 (SE: 0.29). The correlation between the two dimensions was 0.85, indicating highly related yet distinct subconstructs. All items in the MRCML had adequate weighted mean squared error fits and no remaining DIF was detected (Table 7). Participant levels of perceived social norms condoning IPV appear roughly normally distributed and the spread of the items and response category thresholds remained similar to those of the unidimensional model (See online supplement materials, Appendix C. Multidimensional 5-Item PCM Wright Map). The most difficult item to endorse was Item 3 (forcing sex if the wife refuses sex) (location: 2.4 logits) and the easiest item to endorse was Item 1 (family planning use without informing the husband) (location: 0.56 logits) (Table 7).

[INSERT TABLE 5]

[INSERT TABLE 6]

[INSERT TABLE 7]

The results of the latent regression two-dimensional PCM revealed that levels of participant endorsement of IPV/RC social norms varied significantly based on whether the husband's wife reported he had or had not ever perpetrated IPV against her. We found that while IPV perpetration did not make a difference for Dimension 1 (Wifely procreation duties) (0.120 logits, 95% confidence interval [CI]: -0.42, 0.66), the difference was statistically significant for Dimension 2 (Challenges husband authority); husbands who perpetrated IPV had 0.703 logits (95% CI: 0.11, 1.30) higher perceived social acceptability of IPV compared to those who did not perpetrate IPV, which is about one third of a standard deviation. When we calibrated the model for three subgroups (those who had perpetrated IPV, those who had not, and those with missing data), the statistically significant differences between the intercept for Dimension 2 of those who had perpetrated IPV and that of the other two groups was confirmed (Table 8). For Dimension 2, those who perpetrated IPV had an average logit score of 0.768 (95% CI: 0.44, 1.10) and those who had not perpetrated IPV had an average logit score of -0.275 (95% CI: -0.51, -0.04), demonstrating IPV perpetrators to have significantly higher (i.e. more acceptable of IPV) scores

than non-perpetrators; this difference was not observed for Dimension 1. To test whether a shorter version of the scale predicted IPV behavior better than the full version, we also fit a latent regression unidimensional PCM for Dimension 2 alone and found weak ability to differentiate between those who had perpetrated IPV and those who had not (0.597 logits, 95% CI: -0.02, 1.22), indicating the importance of including all five items in this scale to representing the construct of IPV/RC social norms.

[INSERT TABLE 8]

1.5 Discussion

The IPV/RC Social Norms scale measures the latent construct of social norms regarding the acceptability of husbands perpetrating IPV and RC against their wives. In all models, the scale demonstrated strong reliability, as well as internal structure and external validity. The items showed acceptable fit with the two-dimensional PCM, in which two subconstructs of IPV/RC social norms were represented: social acceptability of husband-perpetrated IPV if a wife is 1) not fulfilling her wifely procreation duties, and 2) challenging her husband's authority. Based on these findings, this brief 5-item IPV/RC Social Norms scale has strong potential for enhancing measurement of IPV and RC social norms within public health research.

The IPV/RC Social Norms scale was associated with husband's perpetration of IPV against their wives, providing further evidence of validity and confirming the utility of this scale for understanding IPV behavior. As social norms are understood to be a primary factor shaping patterns of IPV and RC behavior within populations (Jewkes, Flood, and Lang 2015, Shakya et al. 2016), the IPV/RC Social Norms scale could be a critical tool for understanding contextual risk for IPV and RC in a community and for evaluating the impact of programs intending to change IPV or RC social norms. Specifically, Dimension 2 (Challenges husband authority), varied by IPV perpetration. This finding suggests that in this cultural and social context, the norms that sanction wives for behaviors that challenge her husband's authority are more closely tied to the social norms that condone IPV and RC, a finding that could be explored further as an opportunity for IPV and RC prevention. It may be that wife behaviors that deviate from the norm of obedience to husbands are perceived as more threatening to the current gender norm structure and are therefore seen as more deserving of violent punishment from husbands to discipline this behavior (Connell 1987). In contrast, social expectations of wives to procreate, by being sexually available to their husbands and fertile, may be perceived as less threatening to current social power structures and less tied to the norms that condone IPV and RC. While fertility and procreation are highly prized in this culture and a very important part of social expectations of females (Potts et al. 2011), there may be less communal consensus on whether there are certain circumstances when it is acceptable for a wife to refuse sex or use family planning (e.g., if she already has had multiple or male children) or whether such a transgression warrants violence. Previous qualitative research in Sub-Saharan Africa has documented that wife beating is most acceptable for purposes of discipline, findings that are reflected by the stronger association between the challenging authority dimension of this scale and IPV (Baffour Adjei 2015, Monkam Tchokossa et al. 2018). Future qualitative work could help shed additional light on the types of gender norm transgressions that are perceived to merit IPV-related punishment and the mechanisms shaping these norms within villages. Statisticians using this scale to understand how

the latent construct of IPV/RC social norms relates to IPV behavior will benefit from using a two-dimensional PCM.

An additional key contribution of this scale is that it directly measures social acceptability of IPV and RC behaviors and does so among men, those most likely to perpetrate these forms of violence. One previously identified IPV social norms scale, the Partner Violence Norms Scale, has shown an association with women who have experienced IPV victimization. That scale aims to measure the construct of traditional gender role expectations with only one item reflecting norms acceptable of IPV perpetration, a set of social norms more distally related to IPV. Additionally, the scale was assessed only among women and related to their IPV victimization, rather than among the men perpetrating violence. The IPV/RC Social Norms scale in the current study measures norms accepting of IPV and RC perpetration directly and was assessed among those whose behavior is most relevant (i.e., those who perpetrated IPV), providing strong evidence of validity and utility.

The RC item was an addition to the original ATT-IPV scale from which this IPV/RC Social Norms scale was developed. This item was the only item to be included in both dimensions of the scale, including the one predictive of IPV behavior. Our results demonstrate that the addition of this item is highly useful in understanding IPV/RC norms in this context and is likely an item worth including in subsequent use of this scale. Previous research in the region has identified covert use of family planning by women to be a strategy many young wives use to manage the conflict they may experience between their desire to delay pregnancy on the one hand and on the other, the strong social taboos against family planning use (Silverman et al. 2020). While commonly practiced, covert use of FP may be particularly risky in terms of potential husband perpetration of IPV, as evidenced by the way the perceived social norms accepting of violence in such a situation so clearly contributes to predicting IPV behavior. Research from Niger and other settings has demonstrated a strong link between RC and IPV, stressing the importance of considering RC in understanding IPV (Pearson et al. 2017, Genet, Abeje, and Ejigu 2015, Silverman and Raj 2014).

Item bias, or differential item functioning, was identified in one item, “People in your community believe that a husband is justified in hitting or beating his wife if she burns his food” across Hausa and Zarma tribes. This item was less likely to be endorsed among Zarma men relative to Hausa men, even among men who had the same overall score on the scale. DIF is sometimes identified when an item in a scale is measuring a different subconstruct (e.g., dimension) than the other items in the scale (Ackerman 1992). This item was unlike the others in that it measured the acceptability of IPV when a wife was fulfilling her gendered role in the household, but she made a mistake in doing so. None of the other items in the scale could be categorized in this way, so the identified DIF is likely due to it belonging to a different subconstruct. We hypothesize, though, that such a subconstruct, one that captures a woman being obedient but doing so poorly, would be less tied to IPV behavior, as it is likely less threatening to current hierarchical power structures.

While results support that the IPV/RC Social Norms scale is a strong measure with utility in IPV research, its primary limitation is that it does not include enough items to assess across the continuum of the latent construct of IPV/RC social norms. The test information function graph suggests that the scale is best for populations of men with average and high perceived social acceptability of IPV and RC (i.e., a location between about -0.5 and 2 logits). Measure

development research to expand this scale to cover more levels of the construct's continuum would be useful to improve this scale. Given the brevity of the current version of this scale, however, it may have greater utility in studies where participant burden is already high or in epidemiological studies, where measures typically need to be limited in length. For example, the current number of items is similar to the widely used ATT-IPV scale, suggesting that the current length would be feasible to implement in large scale health surveys, like the DHS.

1.6 Conclusion

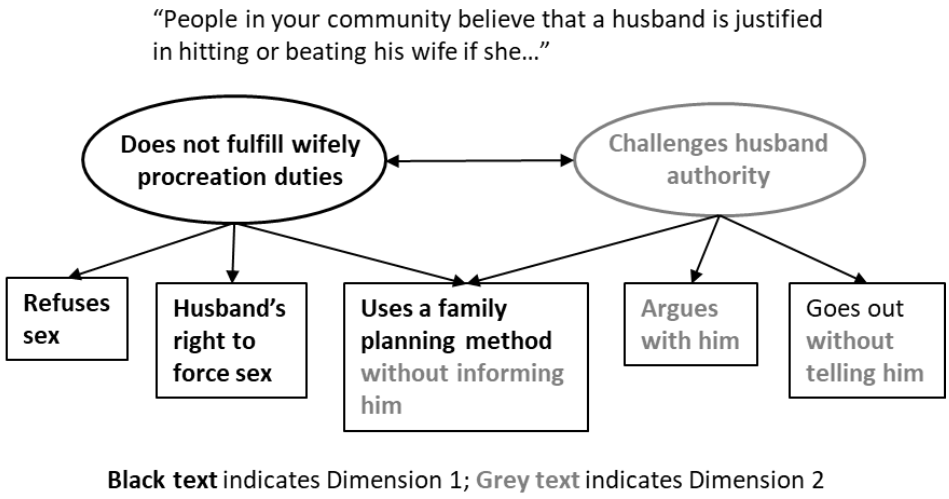
This IPV/RC Social Norms scale is a short, practical measure with strong reliability and validity evidence and is associated with men who perpetrate IPV. This scale can contribute to researchers' ability to efficiently measure and understand social norms regarding IPV and RC for observational or evaluative purposes. To date, very few measures of IPV social norms are available, and far fewer for RC social norms, and none, to our knowledge, have shown statistically significant associations with male IPV perpetration. This scale is concise and builds on a widely accepted and utilized measure of individual attitudes about justification for IPV (ATT-IPV) included in the DHS, and, with additional testing in other cultural contexts, could be a natural and useful addition to DHS-related efforts to understand the context of IPV and to include RC in those efforts. Enhancing current approximations of IPV social norms that simply aggregate individual attitudes, this scale directly measures social norms of IPV and RC behavior and could help elucidate pathways through which social norms may be impacting IPV and RC behavior. Moreover, as social norms are increasingly becoming the focus of IPV and RC prevention efforts, especially given the UN's Sustainable Development Goal 5 on gender equity, the IPV/RC Social Norms scale could be used to examine areas of high need for social norms-focused prevention and to measure the impact of such efforts.

1.7 Tables and figures

Table 1. Intimate Partner Violence & Reproductive Coercion Social Norms Scale (Reaching Married Adolescents, 2016-2019)

	Original ATT-IPV Scale	New Adapted IPV/RC Social Norms Scale
		Preamble: People in your community believe that…
Item 1	N/A	...a husband is justified in hitting or beating his wife if she uses a family planning method without informing him.
Item 2	A husband is justified in hitting or beating his wife if she refuses to have sex with him.	...a husband is justified in hitting or beating his wife if she refuses to have sex with him.
Item 3	If a woman refuses to have sex with her husband when he wants her to, he has the right to use force and have sex with her.	...if a woman refuses to have sex with her husband when he wants her to, he has the right to use force and have sex with her.
Item 4	A husband is justified in hitting or beating his wife if she argues with him.	...a husband is justified in hitting or beating his wife if she argues with him.
Item 5	A husband is justified in hitting or beating his wife if she goes out without telling him.	...a husband is justified in hitting or beating his wife if she goes out without telling him.
Item 6	A husband is justified in hitting or beating his wife if she burns his food.	...a husband is justified in hitting or beating his wife if she burns his food.
Response options for all items: 0="Disagree", 1="Somewhat agree", 2="Agree"		

Figure 1. Hypothesized Multidimensional Taxonomy of the IPV/RC Social Norms Scale



Black text indicates Dimension 1; Grey text indicates Dimension 2

Table 2. Demographics (*Reaching Married Adolescents*, n=559)

	Mean (range)	n (%)
Cultural/Linguistic Group[a]		
Hausa		368 (66%)
Zarma		186 (34%)
Fula		2 (0%)
Intervention participants[b]		412 (74%)
Husband Age	29.9 (18-66)	
Husband age at marriage [a]	22.5 (12-53)	
Wife age	20.4 (16-22)	
Wife age at marriage [a]	14.2 (10-19)	
Length of marriage (yrs)[a]	3.1 (0-9)	
Husband Education[a]		
Any government school		263 (47%)
Any Koranic school		203 (36%)
Both		79 (14%)
Neither		160 (29%)
Any paid work in past 12 months		
Husband		311 (56%)
Wife		104 (19%)
Wife number of children[a]	1.0 (0-5)	355 (64%)[c]
Husband number of children[a]	1.6 (0-16)	393 (70%)[c]
Husbands with >1 wife		96 (17%)
Family Planning Use		260 (47%)
Wife reported IPV victimization (ever)		50 (9%)

[a]Data collected at baseline
[b]Data were collected as part of a 4-arm cluster-randomized trial
[c]Number and percent who have at least one child

Table 3. DIF Parameter Estimates for Item-by-Group Interactions for Unidimensional 6-item Partial Credit Model of the IPV/RC Social Norms Scale (*Reaching Married Adolescents, 2016-2019,* n=559 husbands)

Item	Difference in item difficulty for Zarma vs. Hausa*
1. Use family planning	-0.098
2. Force sex	-0.318
3. Refuse sex	-0.088
4. Argue	0.190
5. Go out	-0.060
6. Burn food	1.104

*negative values: easier for Zarma respondents

Table 4. Unidimensional 5-Item Partial Credit Model Scale Reliability and Properties (*Reaching Married Adolescents, 2016-2019,* n=559)

	Item Response Theory (EAP Reliability: 0.74)				CTT (Cronbach's α: 0.82)
Items	Item difficulty (SE)	Weighted Mean Square Error Fit (CI)	DIF: Zarma (vs. Hausa)	Point-biserial (Response 0, 1, 2)	Item-total correlations
1. Use family planning	0.59 (0.07)	0.88 (0.86, 1.14)	-0.04	-0.65, 0.01, 0.68	0.85
2. Force sex	2.42 (0.09)	1.20 (0.84, 1.16)	-0.23	-0.43, 0.18, 0.40	0.62
3. Refuse sex	1.82 (0.08)	0.93 (0.86, 1.14)	-0.03	-0.64, 0.23, 0.59	0.80
4. Argue	1.46 (0.08)	1.11 (0.86, 1.14)	0.25	-0.58, 0.11, 0.57	0.77
5. Go out	1.41 (0.08)	0.93 (0.87, 1.13)	-0.01	-0.67, 0.20, 0.62	0.82
	Variance (SE): 3.74 (0.22)				

SE: standard error; CI: confidence interval

Table 5. Comparison of Model Fit between Unidimensional and Multidimensional Models (*Reaching Married Adolescents, 2016-2019*, n=559)

Model	AIC	G^2	# of parameters	LR Test[b]	p-value[c]
Unidimensional	5960.51	5938.51	11	2133.04	<0.01
Multidimensional	3831.47	3805.47	13	0.0	1.0

[a]Lowest AIC/G^2 shown of the two consecutive models.

[b]Likelihood ratio test to compare with the multidimensional model

[c]P-value based on Chi Square test

Table 6. Comparison of EAP Reliabilities for Each Dimension across Consecutive and Multidimensional Partial Credit Models (*Reaching Married Adolescents, 2016-2019*, n=559)

Dimensions	Consecutive Reliability	Multidimensional Reliability	Consecutive Variance (SE)	Multidimensional Variance (SE)
1. Wifely procreation duties	0.68	0.72	3.71 (0.22)	3.71 (0.22)
2. Challenges husband authority	0.72	0.74	4.47 (0.27)	4.85 (0.29)

Unidimensional reliability: 0.74

Table 7. Multidimensional 5-Item Partial Credit Model Scale Reliability and Properties (*Reaching Married Adolescents, 2016-2019,* n=559)

	Item Response Theory			
Items	Item difficulty (SE)	Weighted Mean Square Error Fit (CI)	DIF: Zarma (vs. Hausa)	Point-biserial (Response 0, 1, 2)
1. Use family planning	0.56 (0.05)	1.16 (0.83, 1.17)	0.21	-0.65, 0.01, 0.68
2. Force sex	2.43 (0.09)	1.08 (0.84, 1.16)	-0.28	-0.42, 0.19, 0.39
3. Refuse sex	1.81 (0.08)	0.87 (0.86, 1.14)	-0.02	-0.64, 0.25, 0.57
4. Argue	1.59 (0.08)	1.21 (0.85, 1.15)	-0.03	-0.57, 0.11, 0.57
5. Go out	1.54 (0.08)	0.87 (0.85, 1.15)	-0.32	-0.70, 0.22, 0.63
Dimension correlation: 0.85				

SE: standard error; CI: confidence interval

Table 8. Multiple Group Multidimensional Partial Credit Model with Delta Dimensional Alignment for Intimate Partner Violence Perpetration (*Reaching Married Adolescents*, n=559)

	Yes IPV (n=51)		No IPV (n=443)		Missing IPV (n=66)	
Dimension 1 (Wifely procreation duties)	**β**	**95% CI**	**β**	**95% CI**	**β**	**95% CI**
Intercept	0.32	(-0.02, 0.67)	0.04	(-0.15, 0.22)	0.30	(-0.25, 0.85)
Model Variance	1.57	(0.96, 2.18)	3.95	(3.43, 4.47)	5.23	(3.45, 7.01)
Dimension 2 (Challenges Husband Authority)						
Intercept	0.77	(0.44, 1.10)	-0.28	(-0.51, -0.04)	0.39	(-0.17, 0.95)
Model Variance	1.42	(0.87, 1.97)	6.32	(5.49, 7.15)	5.35	(3.52, 7.17)
Correlation of dimensions	0.89	(0.80, 0.93)	0.80	(0.77, 0.84)	0.89	(0.83, 0.93)

CI=confidence interval; IPV=intimate partner violence

2 CHAPTER 2: Effect of a gender-synchronized family planning intervention on inequitable gender norms in a cluster randomized control trial among husbands of married adolescent girls in Dosso, Niger

2.1 Abstract

Background: Gender inequity is pervasive globally and has severe consequences for health and well-being. Evidence suggests that public health interventions that change inequitable gender norms, alongside other elements in the socioecology, can reduce the harmful health effects of gender inequity, but significant gaps exist in understanding what intervention approaches and programs work to change social norms. The current study assesses effects of the RMA intervention, which aimed to increasing modern contraceptive use and reducing IPV among married adolescent girls and their husbands in rural Niger, on gender norms among husbands.

Methods: Using baseline (T1) and 24-month follow-up (T2) data from the 4-arm factorial cluster randomized control trial of the RMA intervention, we assessed for intervention effects on social norms regarding the gender inequity. To do this, we used a hierarchical difference-in-difference linear regression model, adjusting for covariates, accounted for village-level clustering in the study design and multiple observations, and used inverse probability of censoring weighting to account for loss to follow-up.

Results: The mean SN-GEMS score at T1 was 4.1 [n=1,055; range: 0-5; standard deviation (SD): 1.1] and T2 was 4.0 (n=768; range: 0-5; SD: 1.1), indicating high perceived social acceptability of inequitable gender norms across study arms. Assignment to the RMA small groups intervention was associated with a 0.62 lower score on the Social Norms GEMS scale (95% CI: -1.05, -0.18) relative to controls at T2, after adjustment for baseline differences. In contrast, assignment to the RMA household visits was associated with a 0.32 higher score on the Social Norms GEMS scale (95% CI: -0.16, 0.80) relative to controls, but this finding was not significant. No effects on gender norms were detected for the RMA combination intervention (β: -0.08, 95% CI: -0.42, 0.27).

Conclusion: The present study is one of a very limited number of cRCTs and quasi-experimental evaluations of social norm-focused interventions in LMIC contexts that have shown direct effects on changing social norms. These results provide preliminary evidence that the RMA small group intervention is effective at reducing inequitable gender norms. As a low-cost, simple, scalable, and transferrable intervention with evidence of being able to change such gender norms, this community health worker-based small group intervention could be extremely valuable to the field of public health for reducing the negative impact of inequitable gender norms on health and wellbeing in similar settings.

2 CHAPTER 2: Effect of a gender-synchronized family planning intervention on inequitable gender norms in a cluster randomized control trial among husbands of married adolescent girls in Dosso, Niger

2.2 Introduction

Gender inequity is pervasive globally and has severe consequences for health and well-being (Heise 2019). The relationship between gender inequity and related poor health may be especially clear in Niger, which ranks 154th of 162 countries on the United Nations Gender Inequality Index, based on reproductive health, empowerment, and economic activity (UNDP 2020). With 76% of Nigerien girls marrying by the age of 18 and an adolescent birth rate of 177 births per 1000 adolescents aged 15-19, pervasive early and frequent childbearing has contributed to an overall birth rate of 6.7 births per woman and maternal mortality ratio of 509 (per 100,000 live births) in Niger (The World Bank 2020, UNPD 2019, WHO 2019, UNICEF 2018). Early marriage and childbearing create family power structures in which adolescent wives have minimal decision-making power and limited ability to control their reproductive and sexual health, including the decision to use modern contraceptive methods (UNICEF 2014, Girls Not Brides 2015). In Niger, as well as many other LMIC, shifts in gender equity are viewed as crucial for societal well-being (Heise 2019).

Gender inequity is embodied in the social norms of a society, which are expressed across all levels of Brofenbrenner's socio-ecological framework (individual, social, institutional, and macro) (Bronfenbrenner 2005, Cislaghi and Heise 2019). Understood through social norms theory, social norms are the unspoken rules in a society about what behavior is acceptable and unacceptable (Mackie et al. 2015). In highly patriarchal contexts, gender norms, a subset of social norms that define gender-based social roles and behavior, often condone dominant forms of masculinity, female submissiveness, and male entitlement to control of women's bodies, even when these norms do not yield the best outcomes for the people involved (Cislaghi and Heise 2017, Keleher and Franklin 2008, Bussey and Bandura 1999). The centrality of social norms, particularly gender norms, in shaping gender inequity and related practices is emphasized in multiple conceptual frameworks that inform behavioral interventions (Pulerwitz et al. 2019, Cislaghi and Heise 2019, Heise 1998). Gender norms and power simultaneously shape and are shaped by the institutions, resources, social and individual systems of a society (Cislaghi and Heise 2019).

Evidence suggests that public health interventions that change social norms, alongside other elements in the socioecology, can reduce the harmful health effects of gender inequity, but significant gaps exist in understanding what intervention approaches and programs work to change social norms (Cislaghi and Heise 2019, Dworkin, Treves-Kagan, and Lippman 2013, Haylock et al. 2016, Heise 2019). In multiple settings, including where violence against women has persisted despite strict laws against such violence, social norms change interventions have successfully reduced violence against women (Gidycz, Orchowski, and Berkowitz 2011, Haylock et al. 2016, Abramsky et al. 2014, Easton, Monkman, and Miles 2003, Bourey et al. 2015). There is growing interest in investing in these types of public health approaches that target social norms to reduce the health consequences associated with gender inequity (e.g., gender-based violence, child marriage, female genital cutting), especially in low- and middle-income countries (Cislaghi and Heise 2019). For example, social norm interventions targeting both men and women, like Gender Equity Movement in Schools in India, Stepping Stones in

South Africa, and Tostan in Senegal, have been shown to reduce IPV, and HSV-2, female genital cutting, among other important health outcomes (Achyut, Bhatla, and Verma 2015, Jewkes et al. 2008, Rowley E 2020). Increasing interest in the involvement of men, often the decision-makers, gate-keepers, and perpetrators of violence against women, in gender norm-focused interventions is motivated by the enhanced potential their involvement enables for the disruption and transformation of traditional power imbalances between men and women (Gupta 2000, Dworkin, Treves-Kagan, and Lippman 2013). Synthesizing many of these learnings, the Social Norms Learning Collaborative (IRH 2017) has proposed ten key attributes for social norm-shifting interventions based on this growing public health approach; however, very little rigorous evidence exists that demonstrates social norms-focused interventions actually changing the targeted social norms, even when the primary health outcomes are observed to improve.

Measurement of social norms is difficult and contributes to why program impact on social norms is rarely assessed (Mackie et al. 2015, Cislaghi and Heise 2016). Cialdini et al.'s pivotal work around social norms has defined social norms as either *descriptive* (i.e., beliefs about what others do), *injunctive* (i.e., beliefs about how others would respond to one's behavior), or *second order beliefs* (i.e., beliefs about what others approve and disapprove of) , all of which require careful consideration for accurate measurement (Chung 2016, Mackie et al. 2015, Cialdini, Kallgren, and Reno 1991, Cialdini 1998). In the rare cases when effects on social norms are considered, aggregates of individual attitudes are often used as a proxy measure of social norms, which fails to capture the core element of social norms: perceived social expectations around behavior (Cislaghi and Heise 2016). The evaluation of Sasa! is justifiably acclaimed as one of few cRCTs to assess and observe program effects on both social norms and behavioral outcomes, yet measurement of community-level social norms relied on aggregates of individual attitudes (Abramsky et al. 2014). The quasi-experimental evaluations of Voices of Change in Nigeria assessed program effects on social norms using measures that include social acceptability of behavior, but effects were not detected (Denny, Hughes, and Nwankwo 2017). The Saleema Initiative in Sudan and Communities Care programme in Somalia showed quasi-experimental evidence of changing social norms, with robust measurement, yet effects on the intended behaviors (female genital cutting and IPV, respectively) behavior were not detected (Glass et al. 2019, Evans et al. 2019). As momentum to use social norm approaches in LMIC strengthens (Cislaghi and Heise 2019), it is critical for researchers and practitioners to understand whether social norms-focused interventions actually change their intended social norms, and if so, whether behaviors informed by these norms subsequently change as a result. Such evidence is critical to supporting the development of future programmatic conceptual frameworks and of social norm-shifting interventions, and to advance this burgeoning field of public health interventions.

The RMA intervention, implemented by Pathfinder International starting in April 2017, aimed to address social norms and other barriers to increasing modern contraceptive use and reducing IPV among married adolescent girls and their husbands in the Dosso region of rural Niger. These primary behavioral outcomes were measured after receipt of one year of program implementation and evidence of positive effects on both outcomes and diffusion of the contraceptive use effects among social network members have been reported elsewhere (Shakya et al. 2021, Silverman et al. 2022). The current study assesses intervention effects on gender norms among husbands, the primary decision-makers around contraceptive use and perpetrators of IPV. Findings will help to close the gap in evidence on what works to change gender norms in LMIC contexts.

2.3 Methods

Intervention

The RMA intervention is a gender-synchronized (i.e. concurrent programming for men and women), community-based program, developed and implemented by Pathfinder International among adolescent wives (ages 13-19) and their husbands in the Dosso region of Niger to increase healthy birth spacing via use of modern contraceptive methods. Program elements, which were randomly assigned, were household visits or small group discussions; community-level dialogues were held in all intervention arms. Household visits were conducted by gender-matched trained community health workers (CHWs) via 12 monthly visits to individual households for both married adolescent girls and their husbands. Household visits, provided to wives and their husbands separately, provided information and counseling on healthy timing and spacing of pregnancies and on access to and use of modern contraceptive methods. Small group discussions, held separately by gender, were conducted by gender-matched CHWs trained to facilitate small groups and were held twice monthly for wives and monthly for their husbands. Content delivered in these groups included general health and life skills, reproduction anatomy and health, use of modern contraceptive methods to accomplish healthy timing and spacing of pregnancies, gender norms that impede contraceptive use and female autonomy, couples' communication regarding fertility decisions, and gender-based violence. Community dialogues were convened at the village-level each month by two trained facilitators to engage community gatekeepers and key influencers (e.g., traditional and community leaders, parents and in-laws) in creating an environment supportive of healthy timing and spacing of pregnancies and contraceptive use among married adolescent girls and their husbands (more details on the intervention, sample, and trial design are available elsewhere)(Challa et al. 2019). Implementation of the intervention was 12 months.

Research Study Design

We conducted a 4-arm factorial cRCT to evaluate the impact of receiving one year of the RMA intervention in 48 villages in the Loga, Doutchi, and Dosso districts in the Dosso region of rural Niger. A two-staged, stratified randomization strategy was utilized to accommodate the districts approved by the Niger Ministry of Health for inclusion and the limited feasibility of implementing more than one intervention model within a district. In the first randomization step, each of the three districts were randomly assigned a treatment condition (1:1:1). Arm 1 received household visits (Loga), Arm 2 received small group discussions (Doutchi), Arm 3 received both (Dosso). All intervention arms also received community dialogues.

In the second randomization step, randomly selected villages within each district were assigned to either the treatment assigned to that district or the control group. Within each district, 16 villages were randomly selected for inclusion from villages meeting inclusion criteria: 1) having at least 1000 permanent inhabitants; 2) primarily Hausa or Zarma-speaking (the two major languages of Niger); and 3) not receiving any intervention specific to contraceptive use or gender equity in the past two years. Within each district, four of the 16 randomly selected villages were randomly assigned to the control group and the remaining 12 to the intervention condition assigned to that district, such that 12 villages were assigned to each study arm (1:1:1:1). Arm 4 therefore consisted of the four control villages in each district (12 villages total). Random allocation was done by US-based study staff, with limited familiarity of the

region, by assigning numbers sequentially to an alphabetical list of the 16 villages and using a computer-generated random selection of four of those numbers for assignment to the control arm. The chief in each village provided a complete list of all households in which a married adolescent aged 13-19 years lived and from this list, 25 wife-husband dyads were randomly selected for recruitment to the study, using a similar computer-generated random number selection process by US-based study staff. Local, trained research assistants visited the selected households to confirm eligibility (being Hausa or Zarma speaking; not planning to move away from the village in the next 18 months; not planning to travel away from the village for more than 3 months during that period; not sterilized; and providing informed consent) and random replacement was used if a household was not eligible or available.

The number of villages and wife-husband dyads selected for inclusion in the study was based on a power calculation for a minimum effect size on the main outcome, modern contraceptive use, of 2.0 or greater odds associated with the intervention arms. This calculation accounted for four arms with 12 clusters of equal size nested within each arm, time-by-treatment effects, an intra-class correlation kappa value of 0.05, attrition of 10%, and 80% power to detect an association of this power (Challa et al. 2019).

Data utilized in this analysis were collected at baseline (T1; May-June 2016) and 24-month follow-up (T2; April-June 2018). Full implementation of the intervention began 12 months after baseline data were collected and T2 was conducted after 12 months of exposure to the intervention. At both time points, local research assistants who spoke Hausa or Zarma (depending on the village's language) conducted data collection using questionnaires programmed on tablet computers. Gender-matched research assistants interviewed adolescent wives and husbands separately in a location deemed audibly private. The survey took 45-60 minutes to complete.

This trial was pre-registered on clinicaltrials.gov (NCT03226730), with social norms regarding gender equity defined as a secondary outcome. Ethics review boards of the University of California, San Diego School of Medicine and the Niger Ministry of Health approved all study protocols.

Sample

There were 48 villages in the sample, with an average of 21 wife-husband dyads per village (range: 18 - 27 dyads). Only data provided by husbands were included in this analysis [data from wives have been previously reported (Silverman et al. 2022)].

Measures

Perceived social norms regarding gender inequity (henceforward, *SN-GEMS*) was measured using a 5-item scale among husbands (Cronbach's alpha at T1 and T2: 0.62). This social norms measure was created for this study, adapted from the Gender Equitable Men Scale (GEMS), which has been used in more than 20 countries to assess male attitudes regarding gender equity (Singh, Verma, and Barker 2013). We adapted this scale by adding a stem to each dichotomous item that read, "People in my community think that…," in order to measure second order beliefs. The items then proceeded as, 1) "…a woman's most important role is to take care of the home and cook for the family"; 2) "…a man should have the final word about decisions in the home"; 3) "…there are times when a woman deserves to be beaten"; 4) "…a woman should never question her husband's decisions even if she disagrees with them"; 5) "…it is natural and

right that men have more power than women in the family." Response options included "agree", "disagree", "don't know", and "decline to answer". Responses of "don't know" and "decline to answer" were treated as missing for that item. Scores were calculated by adding up the number of affirmative responses a participant gave to the five items, with missing items assigned a zero value (range: 0-5); a higher score indicates higher perceived social acceptability of inequitable gender norms.

Covariates included husband and wife education level, husband migration, household assets, and district. Covariates were included in adjusted models to control for baseline socio-demographic differences between intervention and control arms. Factors considered were those that were identified to be associated with at least one intervention arm, via unadjusted multinomial logistic regressions for each factor ($p<0.05$). Those that were selected were hypothesized, based on content expertise and theory, to also be related to the outcome. Because intervention assignment was randomized at the district level, district was also included as a covariate. *Wife* and *husband education* were categorically measured as having ever received any modern/government school, any coranic school (Muslim religious education), or no schooling (reference category). *Total household assets*, a measure of wealth, was measured as a count of how many of six listed items (e.g., mobile phone, bike, animal-drawn cart) any member of the household owned and included as a continuous variable (range: 0-6). *Husband age* at baseline and *husband migration* were included, the latter dichotomously assessed as whether the husband spent more than 3 months away from the village in the past 12 months. In calculating IPCW weights to minimize possible selection bias due to loss to follow-up, we also included covariates representing baseline differences between husbands retained and those lost to follow-up at T2: husband age, husband age at marriage, husband parity, husband and wife education, and husband migration.

Data Analysis

To account for the two-step randomization process, imbalances at baseline, and loss-to-follow-up, we assessed the intention-to-treat effect of the RMA intervention on husbands' perceived social norms regarding gender inequity (SN-GEMS) using a hierarchical difference-in-difference linear regression. The primary model adjusted for covariates, accounted for village-level clustering in the study design and multiple observations, and used inverse probability of censoring weighting to account for loss to follow-up. The model used robust standard errors to account for possible misspecification of the covariance structure.

Inverse probability of censoring weights (IPCW) were constructed by taking the inverse of the predicted probability of being retained in the study based on baseline demographic characteristics (Robins, Rotnitzky, and Zhao 1995). Predicted probabilities were estimated using a logistic regression model that regressed study retention on covariates associated with loss to follow-up (covariates indicated for weights above). Missing weights were replaced with median weight value. In the model, these weights rebalance the sample such that follow-up participants who had low predicted probabilities of being retained in the study are upweighted and those participants who had high predicted probabilities are down-weighted.

All analyses used STATA 15.1 (StataCorp 2017). Significance was set at $p<0.05$ for statistical testing and estimates with 95% confidence intervals (CIs) are reported throughout.

2.4 Results

At baseline, 1080 of 1351 eligible husbands completed surveys (79.9% male participation) and 773 participated in data collection at T2 (71·6% male retention) (Figure 1. CONSORT Participant Flow) (Silverman et al. 2022). On average, husbands were 25.6 (SD=5.3) years old at baseline (Table 1). About one-third of husbands (29.4%) had never received any schooling. Husbands had 1.5 children on average and 67.2% migrated for more than three months in the past year, primarily for work. Households reported owning 2.1 (SD=1.2) of the listed 6 assets.

[INSERT FIGURE 1]

Participation

Participation in 12 household visits and/or small groups (one per month for one year) represents full receipt of the possible RMA interventions. Among husbands in Arm 1 (household visits; n=205 at T2), 36.6% engaged in four or more visits, 34.6% one to three visits, and 28.8% no visits. Among husbands in Arm 2 (small groups; n=194 at T2), 30.4% engaged in four or more groups, 34.0% one to three groups, and 35.% no groups. Among husbands in Arm 3 (combination; n=177 at T2), 26.0% engaged in four or more visits, 35.0% one to three visits, and 39.0% no visits and 34.5% engaged in four or more groups, 31.6% one to three groups, and 33.9% no groups. In Arm 1, 71.2% of husbands participated in at least one program element, 64.4% in Arm 2, and 75.7% in Arm 3; about one-third (29.7%) of the sample assigned to an intervention did not receive any intervention. An analysis of variance indicated non-significant differences between participation in at least one program element across intervention arms ($p=0.06$).

Baseline differences across study arms

In comparing each intervention arm to the control arm, demographic characteristics varied (Table 1). Levels of education among husbands and wives was significantly different in all arms relative to controls. Arm 1 had lower coranic education for men and women ($p<0.001$), Arm 2 had higher government and coranic education ($p<0.001$), and Arm 3 had lower coranic education for women ($p<0.05$). Total assets were relatively lower in Arm 1 and 3 ($p<0.01$ and $p<0.05$, respectively) and Arm 2 had lower levels of husband migration ($p<0.001$), relative to controls. Relative to controls, wives in Arm 2 were younger when married (13.8 years in Arm 2 vs. 14.3 years in control arm, $p<0.01$) and at baseline (17.0 years in Arm 2 vs. 17.4 years, $p<0.01$) and husbands were older at baseline (26.5 years in Arm 2 vs. 25.5 years, $p<0.05$; *results not shown*). In terms of the outcome, perceived inequitable gender norms were substantially lower at baseline in Arm 1 ($p<0.001$) (Table 1).

[INSERT TABLE 1]

Baseline differences by study retention

Male retention in the study was associated with a variety of baseline factors. Husband study participants were more likely to be retained if they were older (25.9 years among those retained vs. 25 years among those not retained at T2, $p=0.01$), had more children with any wife (1.56 children vs. 1.26; $p=0.02$), and did not migrate outside the village for more than three months in the previous 12 months (66.0% migrated vs. 77.6%; $p<0.001$) [*results not shown*].

Husbands were also more likely to be retained in the study if their wives had received government or coranic education (34.0% with education vs. 22.4%; ($p<0.001$) and if the age difference between husband and wife was larger (8.54 years difference vs. 7.72; $p=0.01$). Study retention did not differ significantly by study arm (Arm 1: 71.0%, Arm 2: 72.9%, Arm 3: 64.4%, Arm 4: 70.3%, $p=0.15$; data not shown).

Time trend

The mean SN-GEMS score at T1 was 4.1 [n=1,055; range: 0-5; standard deviation (SD): 1.1] and T2 was 4.0 (n=768; range: 0-5; SD: 1.1), indicating high perceived social acceptability of inequitable gender norms. Scores did not significantly differ between T1 and T2 overall or among controls (mean score at T1: 4.2 vs. at T2: 4.2), such that no temporal trend was detected (unadjusted β: 0.01, 95% confidence intervals (CI): -0.25, 0.28, $p=0.92$) (Table 1 and 2).

[INSERT TABLE 2]

Multilevel Modeling

In both unadjusted and adjusted difference-in-differences models, we found assignment to the small group RMA intervention (Arm 2) to be associated with a significant decrease in perceived social acceptability of inequitable gender norms at follow-up (Table 2). The household visit intervention (Arm 1) was associated with an increase in inequitable gender norms, but this estimate was imprecise with wide confidence intervals (Table 2). Assignment to RMA small groups among husbands within a given village was associated with a 0.62 lower score on the Social Norms GEMS scale (95% CI: -1.05, -0.18) relative to controls, after adjustment for baseline differences. Assignment to the RMA household visits among husbands within a given village was associated with a 0.32 higher score on the Social Norms GEMS scale (95% CI: -0.16, 0.80) relative to controls, after adjustment for baseline differences. No significant effects on gender norms were detected for the RMA combination intervention (β: -0.08, 95% CI: -0.42, 0.27). The residual intraclass correlation for the within-village clustering is 0.55; 55% of the variance in Social Norms GEMS scores was estimated to be attributable to within village differences.

2.5 Discussion

Results from this cRCT suggest that the small group RMA intervention decreased social norms supporting gender inequitable behavior among husbands of adolescent wives in the Dosso region of Niger. Only a limited number of cRCTs and quasi-experimental evaluations of social norm-focused interventions in LMIC contexts have shown direct effects on changing social norms (Abramsky et al. 2014, Rowley E 2020). Even fewer have demonstrated direct effects on both social norms and behavioral outcomes (Abramsky et al. 2014). The present study builds on evidence provided by Silverman et al. (using the same evaluation data) indicating that the small group RMA intervention reduced IPV among married adolescent girls (Silverman et al. 2022). The present study is the first to demonstrate that the RMA small group intervention also reduced gender inequitable social norms.

Despite the entrenched, deeply held nature of social norms, the RMA small group intervention was successful in creating significant positive shifts in these norms. The small group

model, facilitated by local community health workers, aimed to provide education and a space for men to gather, discuss, and shift one another's thinking around gender roles. The resulting shifts in norms observed in this study provides empirical evidence to support current theoretical understanding of how social norms change; social norms are socially constructed concepts of acceptable behavior within a community and are most amenable to change in social contexts. Other interventions that have been shown to change social norms or aggregated individual attitudes, like Sasa!, also utilize male discussion groups to shift social norms, but typically also engage the wider community through mobilizing efforts (Abramsky et al. 2014, Cislaghi and Heise 2018). The RMA intervention offers a simple approach to social norms change that is feasible to implement in one of the most resource-limited settings among LMICs.

Social norms are rarely changed in individual-level or couple-based interventions because they do not allow for the exchange of ideas across social groups. It aligns, then, that receipt of RMA household visits, an intervention delivered to each individual of a married couple, did not change perceived inequitable gender norms. The RMA intervention, including household visits, was designed with the aim of increasing contraceptive use (i.e., social norms were not the primary outcome) and evidence indicates household visits were effective at doing so (Silverman et al. 2022). The non-significant observed increase in perceived inequitable gender norms, though, suggests that social norms accepting of inequitable gender norms may have actually been reinforced in the process of trying to increase contraceptive use in the household visits, as men's authority and male dominated decision-making in the household may not have been disrupted, and may have even been strengthened (Dworkin, Treves-Kagan, and Lippman 2013). This may have especially been true if other family or household members who help maintain the status quo of power were present during the visits. As the combination arm offered two intervention components with opposing effects on social norms, these effects likely counter-balanced one another, resulting in no effect on social norms in this arm.

This study is not without limitations. First, despite treatment randomization, baseline differences in treatment and control arms exist because the first level of randomization was tied to district. This design decision was due to real-world constraints of randomization, which, in this case, came from the Ministry of Health's requirement that randomization be conducted at the district level. Baseline differences likely resulted from important social, economic, and cultural differences among district residence. To address this, control villages were randomly selected from all of the three intervention districts such that each district is represented by a third of control villages. We also utilized a difference-in-difference analytical approach and controlled for district and other baseline differences, mostly related to randomization at the district level. Still, unmeasured confounding may obscure these results. For example, at baseline, Arm 1 had significantly lower levels of coranic schooling relative to controls, which contributed to lower overall proportions of men and women receiving any schooling and may suggest lower levels of religiosity in this arm relative to the others, which was not measured. Importantly, this arm also had significantly lower scores on the SN GEM scale at baseline relative to controls, which could be related to the lower levels of educational attainment and/or religiosity (especially if religious beliefs support inequitable gender norms) relative to other arms and may contribute to the imprecise estimation of effects on social norms for Arm 1. More scrutiny of these and other factors that may have contributed to unmeasured confounding is needed to confirm these results, especially before concluding that RMA household visits perpetuated inequitable gender norms.

Second, there was notable loss to follow-up among husband participants at T2. To minimize selection bias due to this loss, we utilized IPCW in our models to re-weight the data so

that it more closely approximates the data had those participants not been lost. Third, interpretation of random intercept models is the change in score between individuals receiving treatment and those receiving control *within a cluster*. In this study design, all residents in a village received either treatment or control, never a mix of the two. Therefore, the random effects model interpretations reflect a theoretical within village effect that was not possible in reality. Finally, these results only represent the effects of the RMA intervention on inequitable gender norms in a probability sample of husbands of adolescent wives in the rural Dosso region of Niger. The setting is extremely impoverished and resources are limited. While these results are not representative of other regions in sub-Saharan Africa, they do suggest that if positive impact can be achieved in this setting, the small groups elements of the RMA intervention may be promising in other similarly resourced, culturally-related settings. Future research in other settings is needed to assess if effects can be replicated.

2.6 Conclusion

These results provide preliminary evidence that the RMA small group intervention is effective at reducing inequitable gender norms, one of very few interventions in LMIC demonstrating such effects. While further careful investigation of unmeasured confounding is needed, these results also suggest that the household visit RMA intervention reinforced perceptions of inequitable gender norms, possibly due to the lack of facilitated social exchange. Inequitable gender norms are understood to be an important, though difficult to change, upstream risk factor for a variety of health concerns, including IPV, RC, child marriage, and maternal mortality. The potential ripple effect of an intervention that decreases inequitable gender norms among this high priority population of young men married to adolescents in Niger could provide long term benefit across multiple related health outcomes. Moreover, as a low-cost, simple, scalable, and transferrable intervention with evidence of being able to change such gender norms, this community health worker-based small group intervention could be extremely valuable to the field of public health for reducing the negative impact of inequitable gender norms on health and wellbeing in similar settings.

2.7 Tables and figures

Figure 1. CONSORT Participant Flow for the Reaching Married Adolescents in Niger cluster randomized control trial (2016-2019)

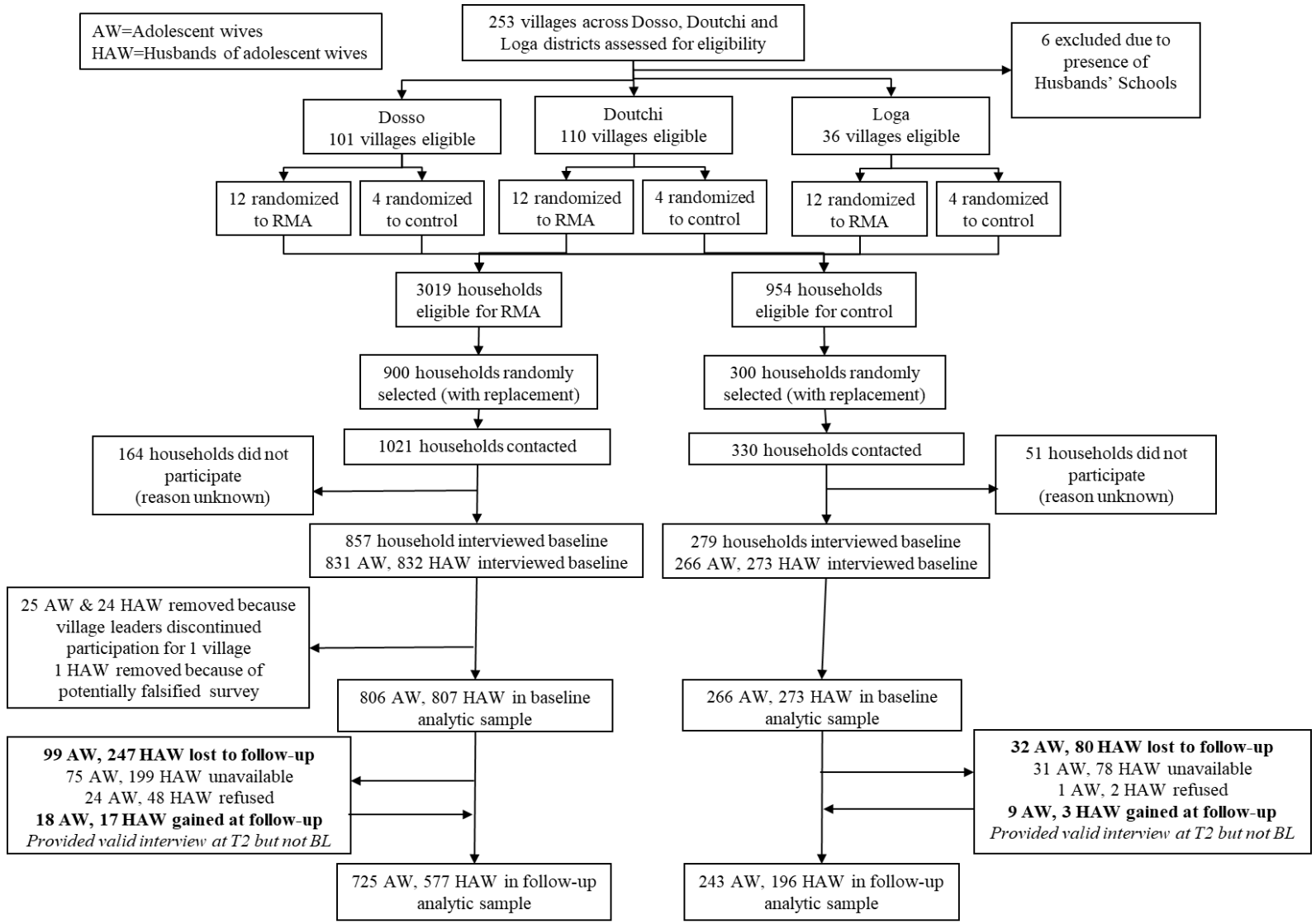


Table 1. Baseline sociodemographics and perceived inequitable gender norms among married adolescents girls and their husbands participating in the Reaching Married Adolescents Study in Dosso, Niger (n=1,080 husbands; n=1,062 wives)

	Overall (n=1,062 wives; n=1,080 husbands)		Arm 1 (Household visits; n=282)		Arm 2 (Small groups; n=258)		Arm 3 (Combined; n=267)		Control Arm (n=273); reference group	
	mean (SD)	n (%)	mean (SD)	n (%)	mean (SD)	n (%)	mean (SD)	n (%)	mean (SD)	n (%)
Husband age	25.6 (5.3)		25.7 (5.3)		26.5 (5.5)		24.9 (5.0)		25.5 (5.4)	
Wife age	17.3 (1.5)		17.4 (1.5)		17.0 (1.6)**		17.4 (1.5)		17.4 (1.5)	
Husband age at marriage	22.4 (5.0)		22.4 (4.7)		23.1 (5.4)		21.9 (4.8)		22.4 (5.0)	
Husband Education										
Government school		522 (48.3)		149 (52.8)		136 (52.7)**		126 (45.8)		111 (40.7)
Coranic school		224 (20.7)		25 (8.9)**		80 (31.0)**		54 (19.6)		65 (23.8)
No school		326 (30.2)		108 (38.3)		40 (15.5)		83 (30.2)		95 (34.8)
Wife Education										
Government school		382 (35.4)		89 (31.6)		109 (42.3)**		103 (37.5)		84 (30.8)
Coranic school		176 (16.3)		7 (2.5)**		84 (32.6)**		31 (11.3)		54 (19.8)
No school		514 (47.6)		185 (65.6)		63 (24.4)		137 (49.8)		134 (49.1)
Husband parity	1.5 (2.0)		1.6 (1.8)		1.4 (1.8)		1.4 (2.2)		1.43 (2.2)	
Total household assets (0-6)	2.1 (1.2)		1.9 (1.1)*		2.1 (1.2)		2.0 (1.2)*		2.2 (1.1)	
Husband migration (3+ months/year)		746 (69.1)		211 (74.8)		146 (54.9)		188 (70.4)		201 (73.6)
Husband Social Norms GEMS score (range: 0-5)										
T1	4.1 (1.1)		3.7 (1.4)**		4.3 (1.0)		4.2 (1.1)		4.2 (0.9)	
T2	4.0 (1.1)		4.0 (1.2)		3.7 (1.3)**		4.1 (1.0)		4.2 (0.9)	

Abbreviation: SD, standard deviation; GEMS, Gender Equitable Men Scale; T1, baseline data collection; T2, 23-month follow-up data collection

*p<0.05, **p<0.001; significance testing conducted to detect baseline differences across study arms using an unadjusted multinomial logistic model regressing each study arm (reference group: control) on baseline characteristics using robust standard errors.

Table 2. Difference-in-differences effects of the Reaching Married Adolescents Intervention on perceived inequitable gender norms among husbands in Dosso, Niger (2016-2019)[a]

	Husbands (n=1,090)					
	Unadjusted Model with IPCW			Adjusted Model with IPCW		
	β	95% CI	p-value	β	95% CI	p-value
Treatment Arm x Time Interaction						
Arm1 (Household visits)*T2	0.34	-0.13, 0.81	0.16	0.32	-0.16, 0.80	0.19
Arm2 (Small groups)*T2	-0.59	-1.02, -0.17	0.01	-0.62	-1.05, -0.18	0.01
Arm3 (Combined)*T2	-0.03	-0.38, 0.32	0.85	-0.08	-0.42, 0.27	0.67
Treatment Arm						
Arm1 (Household visits)	-0.54	-0.96, -0.11	0.02	-0.74	-1.13, -0.35	<0.001
Arm2 (Small groups)	0.07	-0.24, 0.39	0.66	0.32	-0.09, 0.72	0.12
Arm3 (Combined)	-0.04	-0.38, 0.29	0.81	-0.04	-0.38, 0.30	0.83
Time (T1 to T2)	0.01	-0.25, 0.28	0.92	0.03	-0.23, 0.30	0.80
District (ref: Dosso)						
Doutchi	--	--	--	-0.26	-0.57, 0.06	0.11
Loga	--	--	--	0.22	-0.005, 0.43	0.05
Household Assets	--	--	--	0.01	-0.05, 0.06	0.8
Husband Education (ref: no schooling)						
Government	--	--	--	0.0	-0.12, 0.14	0.88
Coranic	--	--	--	0.06	-0.08, 0.20	0.38
Wife Education (ref: no schooling)						
Government	--	--	--	0.08	-0.05, 0.21	0.23
Coranic	--	--	--	0.05	-0.12, 0.21	0.58
Husband Migration	--	--	--	0.04	-0.08, 0.17	0.50
Husband Age				-0.01	-0.02, 0.00	0.05
Village-level Standard deviation	0.10	--	--	0.11	--	--
Husband-level standard deviation	0.55	--	--	0.54	--	--
Residual intraclass correlation	0.57	--	--	0.55	--	--
log pseudo-likelihood	-4395.51	--	--	-4291.54	--	--

Abbreviations: IPCW, inverse probability of censoring weights; CI, confidence interval; T1, baseline data collection; T2, 24-month follow-up data collection

[a]Unadjusted and adjusted difference in differences effects were estimated using random intercept linear regression models with an interaction term for time*study arm and inverse probability of censoring weighting.

3 CHAPTER 3: Mediating effects of inequitable gender norms in a cluster randomized control trial of the Reaching Married Adolescents in Niger intervention: A causal inference mediation analysis

3.1 Abstract

Background: Gender inequity, a deeply-rooted driver of poor health globally, is expressed in society through gender norms, the unspoken rules that govern gender-related roles and behavior. The development of public health interventions focused on promoting equitable gender norms are gaining momentum internationally, but there remain critical gaps in the evidence about how these interventions are working to change behavioral outcomes.

Methods: A four-arm cluster randomized control trial was conducted to evaluate the effects of the Reaching Married Adolescents in Niger intervention on married adolescent girls and their husbands in Dosso, Niger (T1: 1042 dyads; 24 mos. follow-up: 737 dyads). This study sought to understand if changes in social norms were the mechanism behind RMA's effects on modern contraceptive use and IPV. We assessed for mediation via these gender norms utilizing a modern causal inference approach called inverse odds weighting. An intention-to-treat approach and a difference-in-differences estimator in a hierarchical linear probability model was used to estimate prevalence differences, along with bootstrapping to estimate confidence intervals.

Results: The total effects of the RMA small group intervention (Arm 2) is estimated to be an 8% reduction in prevalence of IPV [95% CI: -0.18, 0.01]. For this arm, the indirect pathway through gender inequitable social norms is associated with a 2% decrease in IPV (95% CI: -0.07, 0.12), accounting for 22.3% of this total effect, and the direct pathway with a 6% decrease in IPV (95% CI: -0.20, -0.02). The total effect of the RMA household visit intervention (Arm 1) and to combination (Arm 3) on contraceptive use is associated with an approximately 20% increase in current modern contraceptive use (Arm1: adjusted prevalence difference (aPD) 0.20, 95% CI: 0.03-0.36; Arm 3: aPD 0.19, 95% CI: 0.07, 0.34). Indirect effects on contraceptive use were through gender inequitable social norms is associated with a 11% decrease (95% CI: -0.18, -0.01) for Arm 1 and a 9% decrease (95% CI: -0.20, 0.02) for Arm 3. Direct effects on contraceptive use were estimated to be a 32% increase (95% CI: 0.13, 0.44) for Arm 1 and a 28% increase (95% CI: 0.12, 0.46) for Arm 3.

Conclusion: The present study contributes experimental evidence that the small group RMA intervention reduced IPV partially via decreasing perceived inequitable gender norms. Not only do these results open the "black box" around how the RMA small group intervention may create behavior change to help inform its future use, they provide evidence supporting behavior change theories and frameworks that postulate the importance of changing underlying social norms in order to reduce IPV.

3 CHAPTER 3: Mediating effects of inequitable gender norms in a cluster randomized control trial of the Reaching Married Adolescents in Niger intervention: A causal inference mediation analysis

3.2 Introduction

Gender inequity is a deeply-rooted driver of poor health, including violence against women and poor reproductive health, globally (Heise 2019). This pattern is clear in countries like Niger, which ranks 154th of 162 nations on the United Nations (UN) Gender Inequality Index and has some of the highest rates of maternal mortality (509 per 100,000 live births), fertility (6.8 births per woman), and girl child marriage (76% of girls) in the world (UNDP 2020, WHO 2019, UNPD 2019, UNICEF 2018). The United Nation's Sustainable Development Goals, as well as many of the most influential international development leaders, have included gender equity and empowerment of women and girls as critical to improving global health, well-being, and development (United Nations 2015, Bill and Melinda Gates Foundation 2021). Gender inequity is considered to be social determinant of health that, if changed, could have long-term, expansive impact across a wide range of health outcomes (Heise 2019). The development of public health interventions addressing structural and social determinants of gender inequity are gaining momentum internationally, but there remain critical gaps in the evidence about what works to change gender inequity (Cislaghi and Heise 2019).

Social norms are a critical pathway through which gender inequity constrains health (Heise 2019). Gender inequity is often expressed through gender norms, a subset of social norms that constitute the unspoken and unwritten rules that govern gender-related roles and behavior (Keleher and Franklin 2008). Violation of these rules triggers social sanctions and rewards to motivate adherence (Keleher and Franklin 2008). Understood through social norms theory, the theory of gender and power, and feminist theory, gender norms are upstream, culturally-bound determinants of many health behaviors, including those related to gender-based violence, HIV, reproductive health, and female genital cutting, to name only a few (Mackie et al. 2015, Connell 1987, Wingood and DiClemente 2000, Pulerwitz et al. 2019). Various conceptual frameworks for addressing health outcomes related to gender inequity position gender norms as central to improving health (Pulerwitz et al. 2019, Cislaghi and Heise 2019, Heise 1998). Correlational evidence suggests a strong relationship between social norms and various gender inequity-related health outcomes, but does not causally demonstrate that inequity-related health outcomes are reduced by shifting toward gender equitable norms (Dynes et al. 2012, Agha et al. 2021, Weber et al. 2019).

Randomized evaluations have the potential to produce causal evidence to understand if social norms-focused public health interventions successfully change entrenched norms and if changes in these norms are one mechanism through which health outcomes are achieved. Understanding the mechanism of change behind interventions aiming to improve the entrenched health effects of gender inequity is critical for unpacking how interventions influence outcomes. Moreover, clarifying the mechanisms of change may shed light on whether they are temporarily shifting behavior for a short period via more proximal determinants or changing norms themselves, an underlying, upstream determinants of health. If the latter, the benefits could be long-lasting and include a wide range of health outcomes, possibly meriting prioritization of such interventions in resource-limited contexts, such as

LMIC (Heise 2019, Heymann et al. 2019). Very few program evaluations conducted in LMIC contexts, however, provide this evidence (IRH 2017, Cislaghi et al. 2019, Mackie et al. 2015). While interventions seeking to shift social norms, often via community mobilization, small group or community discussions, and/or social norms campaigns, have demonstrated positive effects on either social norms or gender-inequity related health outcomes, very few have assessed the mechanism through which these health changes have occurred (Cislaghi and Heise 2018, Heise 2011, Bourey et al. 2015, Rowley E 2020, Abramsky et al. 2014, Achyut, Bhatla, and Verma 2015, Denny, Hughes, and Nwankwo 2017). No identified randomized evaluations of gender norm-focused interventions in LMIC have both assessed for mechanistic effects and provided evidence of health improvements occurring via change in the targeted social norms.

This study provides an opportunity to understand whether change in gender norms is a mechanism through which the RMA intervention reduced IPV and increased modern contraceptive use among married adolescents and their husbands. The RMA intervention included two main components – household visits and small group discussions - and was evaluated using a 4-arm factorial cRCT in the Dosso region of Niger. Previous work has demonstrated evidence of an effect of the RMA household visit intervention on inequitable gender norms and modern contraceptive use and of the RMA small group intervention on inequitable gender norms and IPV (Silverman et al. 2022, Boyce et al. 2022). This study aims to examine changes in inequitable gender norms as a pathway through which household visits increased modern contraceptive use, as well as through which small group discussions reduced IPV, using a causal inference mediation approach.

3.3 Methods

Intervention

The RMA intervention is a gender-synchronized (i.e., concurrently delivered to husbands and wives), community health worker intervention developed by Pathfinder International and implemented by Laffia Matassa in Dosso, Niger from 2017-2019. Male and female community health workers were trained to facilitate individual-level household visits (delivered monthly to husbands and wives separately) and single-sex small group discussions (delivered bimonthly for wives and monthly for husbands) that provided information about and access to a range of family planning methods and focused on the benefits of healthy birth spacing. Content delivered included: general health and life skills; reproduction anatomy and health; use of modern contraceptive methods to accomplish healthy timing and spacing of pregnancies; gender norms that impede contraceptive use and female autonomy; couples' communication regarding fertility decisions; and gender-based violence. Additionally, village-level community dialogues with leaders and gatekeepers were implemented to create a supportive community environment around healthy birth spacing, including modern contraceptive use among married adolescent girls and their husbands. Details on the intervention and research protocols have been published previously (Challa et al. 2019).

Study Design

A four-arm cRCT was conducted to evaluate the effects of the individual and combined intervention components. The four arms included 1) individual household visits

(Arm 1), 2) small group discussions (Arm 2), 3) both household visits and small group discussions (combination; Arm 3), and 4) control (Arm 4), with all intervention arms also receiving community dialogues. Contraceptive products were stocked at local health centers in all study arms. The study was conducted in a rural region of Niger called Dosso. Three health districts within Dosso were selected by the Ministry of Health for inclusion in the study: Dosso, Doutchi, and Loga. Each district was randomly assigned one of three treatment conditions (stage 1 of randomization; 1:1:1). Within each district, 16 eligible villages [having at least 1000 residents; primarily Hausa or Zarma-speaking (the two major languages of central southern Niger); located within 5km of a health center; and having received no intervention specific to contraceptive use or gender equity] were randomly selected for inclusion in the study; 12 were randomly assigned to receive the designated treatment condition for that district and 4 to control based on computer-generated random selection of sequential numbers assigned to villages (stage 2 of randomization; 1:1:1:1). Within each village, village leaders provided a registry of all households including a married female adolescent age 13-19 years old and 25 of these households were randomly selected for recruitment using a similar computer-generated random number selection process. Additional participant eligibility included: 1) being Hausa or Zarma speaking; 2) not planning to move away from the village in next 18 months; and 3) not planning to travel away from the village for more than 3 months during that period; 4) not sterilized (though sterilization is illegal in this setting); and 5) providing informed consent. Those households that did not meet these additional criteria or were unavailable after three attempts were replaced by another household randomly selected from the registry. Baseline data were collected May through July 2016 (T1) and the same households were revisited at 24 months (April through June 2018; T2), after 12 months of intervention implementation (April 2017-February 2018).

Sex-matched trained research assistants who spoke Hausa and/or Zarma recruited participants at their household and conducted the interviewer-administered 40-60 minute survey with participating husbands and wives separately, in locations determined by the participants and research assistant to provide auditory privacy. Responses were entered into tablet computers where data were securely uploaded at regular intervals to a secure network.

This trial was pre-registered on clinicaltrials.gov (NCT03226730), with contraceptive use defined as the primary outcome and IPV and social norms regarding gender equity defined as secondary outcomes. Study protocols were approved by the ethics review boards of the University of California San Diego School of Medicine and the Niger Ministry of Health.

Sample

At T1, 1351 eligible husband-wife dyads were invited to participate in the research. Surveys were collected from 1072 adolescent wives (79.3% female participation), 968 of whom also provided survey data at T2 (90.3% female retention), and from 1080 husbands (79.9% male participation), of whom 773 also participated in data collection at T2 (71.6% male retention). In Arm 1, 50.3% of husbands participated in at least one program element, 47.0% in Arm 2, and 48.7% in Arm 3 (Boyce et al. 2022).

We previously reported baseline imbalances across study arms (Boyce et al. 2022). Arm 1 had lower levels of coranic education, total household assets, perceived inequitable gender norms by husbands relative to controls (score of 3.7 out of 5 for Arm 1 vs. 4.3 for control arm; $p<0.001$, *data not shown*). Arm 2 had higher levels of government and coranic

education, lower levels of husband migration; husbands were older and wives younger at baseline, and wives were younger when married relative to controls. Arm 3 had lower levels of coranic education and total household assets relative to controls.

Measurements

Outcomes

Outcomes were measured at T2. Current modern contraceptive use was reported by wives and measured as an affirmative response to currently using an intrauterine device, injectable, implant, contraceptive pill, male condom, female condom, emergency contraception, and/or lactational amenorrhea to delay or limit their number of pregnancies. Women who were currently pregnant were excluded from models using this outcome; we did not exclude women who reported they were trying to get pregnant because strong social expectations of fertility among young, nulliparous women in Niger may obscure any distinction among these adolescent wives and their willingness to use contraception (Samandari et al. 2019). IPV, physical and/or sexual violence from husbands, in the past 12 months was also reported by wives and measured using eight items from the DHS domestic violence module (DHS Niger 2013). Physical violence items included a) pushed her, shaken her or thrown something at her; b) slapped her; c) twisted her arm or pulled her hair; d) hit her with his fist or something that could hurt her; e) kicked her, dragged her, or beat her up; f) choked her or tried to burn her. Adolescent wives were also asked whether their husband had physically forced them to a) have sexual intercourse when she did not want to, or b) to perform any other sexual acts she did not want to. An affirmative response by wives to one or more items was dichotomously categorized as having experienced past 12-month IPV. Study protocols followed the World Health Organization's guidelines for conducting research on violence against women (e.g., only one woman or girl per household was asked these questions, men were not asked these questions, and audio privacy was provided) to protect the safety and confidentiality of women and girls participating in the study (WHO 2001).

Mediator

Social norms regarding gender equity were measured with husbands at T2 using an adaptation of the Gender Equitable Men Scale (GEMS), a validated scale to assess individual attitudes about gender that has been used in over 20 countries (Singh, Verma, and Barker 2013). The question stem, "People in your community think that…" was added to five items from the GEM scale to assess second order beliefs social norms. The items then proceeded as, 1) "…a woman's most important role is to take care of the home and cook for the family"; 2) "…a man should have the final word about decisions in the home"; 3) "…there are times when a woman deserves to be beaten"; 4) "…a woman should never question her husband's decisions even if she disagrees with them"; 5) "…it is natural and right that men have more power than women in the family." Response options were coded dichotomously as 1 if "agree" or "somewhat agree" and 0 if "disagree", and missing for "don't know"/"decline to answer"/missing responses. Response values were summed across all 5 items to create a score (Cronbach's alpha = 0.62, range: 0-5), with missing responses to an item contributing a score of 0. A total score of five indicated some or full agreement with all 5 items. Scores were dichotomized as having a score of 5 (high inequitable gender norms) vs. less than 5 (lower inequitable gender norms) in order to provide insight on shifts in very high levels of

social acceptability of gender inequity. Social norms were measured contemporaneously with outcomes. Because no data were collected between T1 and T2, temporality was preserved between the exposure and the mediator, but not between the mediator and outcomes.

Covariates

Covariates were included in all analytic models to control for factors related to baseline imbalances across study arm that could create confounding associations and factors related to couple loss-to-follow-up to reduce selection bias. In the total and direct effects models that assessed mediation, covariates were included that were associated with baseline socio-demographic imbalances across the study arms (assessed via univariate multinomial regression that accounted for clustering, $p<0.05$) and hypothesized, based on content expertise and theory, to also relate to the outcomes. These covariates included district, wife age, husband and wife education (modern, coranic, or no education), husband migration for three or more months in the previous year (yes, no), and total household assets. Total household assets were assessed as a count of six household items, a measure of wealth used by the Niger Demographic and Health Survey (DHS Niger 2013). In the model used to develop mediation weights, we included covariates that were associated with baseline imbalances across the study arm ($p<0.05$) and hypothesized, based on theory and content expertise, to also relate to the mediator, husband perceived inequitable gender norms at T2. These included husband and wife education, husband migration, and total household assets (Boyce et al. 2022). In the model used to develop inverse probability of censoring weights to account for loss-to-follow-up, covariates were included that were associated with loss-to-follow-up for husband-wife dyadic pairs (assessed via t-tests for continuous variables and fisher's exact for categorical variables, $p<0.10$): husband current age, husband and wife ages at marriage, husband and wife parity, wife education, and husband migration.

Statistical Analysis

Main Effects

Previously reported results provide evidence that receipt of the RMA household visits (Arm 1) and combination (Arm 3) were associated with an increase in current modern contraceptive use, and receipt of the RMA small group visit (Arm 2) was associated with a decrease in IPV (Silverman et al. 2022). Therefore, in this analysis, only results of the mediation analyses for Arm 1 and 3 will be reported for the contraceptive use outcome and those of Arm 2 for the IPV outcome (Figure 1). For this analysis, total effects for each outcome were assessed using an intention-to-treat approach and a difference-in-differences estimator to further account for baseline imbalances across study arms. A mixed-effects linear probability model was utilized to estimate prevalence differences with clustering at the village level and to account for multiple observations on each couple. Inverse probability of censoring weights (IPCW) were included to reduce selection bias related to couple loss-to-follow-up (Robins, Rotnitzky, and Zhao 1995).

[INSERT FIGURE 1]

Mediation

Previously, we reported that assignment to the RMA small group intervention was associated with a reduction in perceived inequitable gender norms and that no effects were observed for the other intervention arms (Boyce et al. 2022). To assess for mediation via these gender norms in this analysis, including natural direct and indirect effects, we utilized a modern causal inference approach called inverse odds weighting (Robins and Greenland 1992, Tchetgen Tchetgen 2013). First, we estimated the natural direct effect, which is the pathway between the RMA intervention and outcome that does not include the mediator. Using the inverse odds weighting approach, which utilizes the invariance property of the odds ratio, a model for creating mediations weights was developed by estimating the odds of being included in each study arm based on the mediator and potential confounders of the exposure-mediator relationship using a multinomial regression model that included the IPCW weights (Nguyen et al. 2015). The inverse of the predicted probabilities from this model were then used to create the mediation weights, which were included in the same total effects model to block the pathway between the RMA intervention and the mediator, thus blocking the natural indirect pathway. The estimates from the total effects model that included the mediation weights provided the natural direct effect estimates.

Natural indirect effects estimate the hypothesized pathway between the RMA intervention and outcome that travels through the mediator, inequitable gender norms (Figure 1). Because the natural direct and indirect effect estimates sum to equal the total effects, the natural indirect effect is calculated by subtracting the natural direct effect estimate from that of the total effect. The nonparametric bootstrap accounting for village-level clustering was used to calculate 95% Wald-type confidence intervals for all effect estimates (n=1,000).

All analyses were conducted using RStudio, version 2022.02.1 build 461 (RStudio Team 2022).

3.4 Results

Sociodemographic characteristics of the husband-wife dyads, overall and by the two outcomes, are presented in Table 1. For this analysis, 1042 husband-wife dyads were included from T1 and 737 husband-wife dyads from T2. At baseline, husbands were 25.6 years and wives were 17.3 years on average. Husbands reported having 1.5 children, while adolescent wives reported 1.0, the difference related to polygamous marriages. Among husbands, 45.2% perceived high levels of gender inequitable social norms at T1 and 37.9% at T2. In this sample, 10.0% of married adolescent girls reported experiencing IPV from their husbands in the past 12 months and 37.8% reported currently using a form of modern contraceptive at T2.

Baseline imbalances of outcomes across study arms

At baseline, wives in Arm 3 reported significantly higher levels of IPV relative to those in the control arm (14.8% vs. 6.9%, p=0.01); no significant differences were observed for other study arms. Also at baseline, wives in Arm 1 and 3 reported significantly lower levels of current modern contraceptive use relative to control (Arm 1: 5.7%, Arm 3: 7.0%, Control: 14.2%, p<0.01); no significant difference was observed for Arm 2. Other imbalances in sociodemographic characteristics across study arms are reported elsewhere (Boyce et al. 2022, Silverman et al. 2022).

Baseline characteristics associated with couple retention at T2

Several statistically significant sociodemographic differences were observed between couples retained at T2 and those loss-to-follow-up, however, the magnitude of these differences was modest and likely not practically relevant. Couples retained in the study at T2 were more likely to have husbands who were older at the time of the study (25.9 years among those retained vs. 25.0 years among those not retained, p=0.01) and older when married (22.6 year vs. 22.1 years, p=0.09), with wives who were younger when married (14.1 years vs. 14.3 years, p=0.05), relative to those couples not retained at T2 (data not shown). Retained couples also had significantly more children at baseline compared to non-retained couples, with wives from retained couples reporting a mean of 0.99 children (vs. 0.87 among non-retained, p=0.07) and with husbands reporting a mean of 1.6 children (vs. 1.26 among non-retained, p=0.01) (data not shown).

[INSERT TABLE 1]

Main effects

Estimates of the total effects of the RMA intervention suggest assignment to the small groups (Arm 2) is associated with an 8% reduction in prevalence of IPV [adjusted prevalence difference (aPD): -0.08, 95% CI: -0.18, 0.01] (Table 2). Additionally, assignment to the household visits (Arm 1) and to combination (Arm 3) is associated with an approximately 20% increase in current modern contraceptive use (Arm1: aPD 0.20, 95% CI: 0.03-0.36; Arm 3: aPD 0.19, 95% CI: 0.07, 0.34) (Table 3).

Mediation effects

The mediation pathway through gender inequitable social norms appears to have contributed to the observed association between the small group RMA intervention and reductions in IPV prevalence (Table 2). In contrast, this mediation pathway seems to have potentially counter-acted the positive association between the household and combination RMA interventions and the increase in current modern contraceptive use.

Specifically for IPV in the small group arm, the estimated direct effect of the RMA intervention on IPV, considering gender inequitable social norms as a mediator, was a 6% reduction in IPV (95% CI: -0.20, -0.02). The estimated natural indirect effect via the pathway including these social norms was associated with a 2% reduction (95% CI: -0.07, 0.12) in IPV. This indirect effect suggests that 22.3% of the total effect between the RMA small group intervention and prevalence of IPV was explained by the mediator.

[INSERT TABLE 2]

Significant direct effects for Arm 1 and 3 and indirect effects for Arm 1 were observed for current modern contraceptive use (Table 2). In both Arm 1 and 3 of the study, the natural direct pathways appear to have accounted for the majority of the estimated total effects. For the RMA household visits (Arm 1), the estimated natural direct effects of RMA were a 32% increase (95% CI: 0.13, 0.44) in current contraceptive use, 60% higher than the total effect.

The estimated natural indirect effects via gender inequitable norms were an 11% decrease in contraceptive use (95% CI: -0.18, -0.01), suggesting that this pathway may have reduced the total effects of this intervention on contraceptive use. Similarly in the combination intervention (Arm 3), the estimated natural direct effect was a 28% increase (95% CI: 0.12, 0.46), 47% higher than the total effect for this arm, and the estimated natural indirect effect via gender inequitable norms was a 9% decrease (95% CI: -0.20, 0.02) in contraceptive use.

3.5 Discussion

This study examined the mechanistic role of inequitable gender norms on the observed total effects of the RMA intervention components on reductions in IPV and increases in current modern contraceptive use using data from a cRCT in Niger. Silverman et al. previously reported the estimated main effects of each RMA component on these outcomes, and Boyce et al. on the estimated effects of RMA components on inequitable gender norms (Silverman et al. 2022, Boyce et al. 2022). This study extends this line of inquiry by providing evidence that reductions in perceived inequitable gender norms in the small groups RMA intervention may account for about one-quarter (22.3%) of the 8% reductions in IPV prevalence associated with assignment to this intervention component. Such results suggest that husbands' perceptions of inequitable gender norms are an important part of the causal pathway between the small group intervention and behavior change around IPV perpetration among husbands. In contrast, findings for modern contraceptive use underscored that increases in contraception associated with assignment to the household visits or combination study arms were achieved through other mechanisms that did not include reducing inequitable gender norms.

To our knowledge, this study is one of the first to provide rigorous evidence from an experimental evaluation of an intervention suggesting social norms change was one of the mechanisms behind reductions in IPV. Sasa!, a social norms-shifting intervention that reduced IPV and HIV in Uganda, is one of very few interventions with evidence from a cRCT of both improving gender norms (measured by aggregating individual attitudes at the community level, a proxy of social norms) and health outcomes, suggesting that health outcomes changed via shifts in social norms, notwithstanding limitations of the social norms measurement used (Abramsky et al. 2014, Abramsky et al. 2016). Similarly, Program H implemented in India demonstrated positive shifts in gender equity and IPV perpetration in a quasi-experimental trial (Verma et al. 2008). Neither of these studies, however, assessed for mediating effects of these social norms. In contrast, the Tostan model in Senegal both improved social norms and reduced female genital cutting, and while quasi-experimental evidence suggests messaging diffused through social networks, the final evaluation did not support the hypothesis that changes in social norms drove reductions in FGC (Rowley E 2020). The present study, in consideration of our previously published results, contributes experimental evidence that the small group RMA intervention reduced IPV partially via decreasing perceived inequitable gender norms (Silverman et al. 2022, Boyce et al. 2022). Not only do these results open the "black box" around how the RMA small group intervention may create behavior change to help inform its future use, they provide evidence supporting behavior change theories and frameworks that postulate the importance of changing underlying social norms in order to reduce IPV (Connell 1987, Wingood and DiClemente 2000, Cislaghi and Heise 2019, Pulerwitz et al. 2019, Heise 1998).

These findings also raise important questions about the other mechanisms through which the RMA intervention components decreased IPV and increased contraceptive use. Especially for household visits and the combination arms, reductions in inequitable gender norms do not appear to be an important mechanism behind effects on current modern contraceptive use. Changes in norms may have actually modestly diminished otherwise larger increases in contraceptive use associated with receipt of the intervention; the estimated direct effects were stronger than the total effects for the household and small group arm, indicating that other mechanisms may have contributed to greater increases in contraceptive use if social norms had not been changed. Other potential mechanisms for contraceptive use that warrant further study include social norms more proximal to acceptability of modern contraceptive use, husband and wife attitude change around acceptability of contraceptive use, husband and wife communication around contraceptive use, or improved access to products, all of which were goals of the intervention. Using data from this cRCT, Challa et al. found that assignment to the RMA intervention was associated with increases in spousal communication about contraceptive use and offers preliminary evidence that spousal communication may be a mechanism behind increases in contraceptive use (Challa 2020). The mediation analysis combined all intervention arms into one group, so further assessment is needed to explore how this mechanism functions for each intervention arm, as each arm's association with contraception use varied (e.g., no relationship with small groups, Arm 2) and this study suggests mediators also vary drastically by arm. Other potential mechanisms for IPV to consider include social norms more proximal to the social acceptability of IPV, individual attitudes regarding justification of IPV, and family and peer IPV behavior, all of which were targeted by the RMA intervention. Additional mediation analyses exploring these factors would be useful to furthering understanding of how the RMA components are impacting IPV and contraceptive use behavior.

The large direct effect on contraceptive use found for the household visits and combination arms suggests that maintenance of the status quo of male-dominated decision-making social norms (i.e., the absence of change in inequitable gender norms) may have been part of what made the household visit and combination arms successful in increasing contraceptive use. Male-dominated fertility decision-making is extremely common in Niger, such that adolescent wives rarely communicate with their husbands about contraceptive use (Challa et al. 2020, Perlman and Chaibou 2018, Samandari et al. 2019, Challa 2020). While both direct and indirect effects for the household visit arm's effect on contraceptive use were significant, the lack of precision of these estimates obscures how important these potentially opposing effects are for understanding their mechanistic role. Moreover, there is a possibility of remaining uncontrolled confounding in these estimates given that both these intervention arms reported significantly lower levels of contraceptive use at baseline. More research using the data from this cRCT is needed to understand whether the RMA household visit and combination interventions increased female agency in these decisions and whether husbands' decisions, wives' decisions, or joint decision-making between them resulted in increases in contraceptive use at T2.

The main (i.e., total) effects reported by Silverman et al. for the RMA intervention components indicates that the small groups (Arm 2) had statistically significantly reduction on the relative risk for IPV and that the household visits (Arm 3) and the combination (Arm 3) had statistically significant effects on contraceptive use. These associations were estimated as relative risks and are larger effects than observed in this study, which estimated

effects on the linear scale to provide prevalence differences. These estimates of absolute measures of association provide a more conservative estimate of these relationships, and yet, the associations still remain (though diminished), further demonstrating the effects of the RMA intervention components on these outcomes.

These results should be considered in light of limitations. First, measurement of social norms is an emerging field and is rarely done in gender equity-related research. As such, the scale used in this study is new and has not been widely tested. It has, however, had adequate reliability (alpha=0.73) and is one of the only scales available that measures gender norms, rather than a proxy based on individual attitudes, and therefore contributes to this nascent area of scientific research (Mackie et al. 2015). Secondly, there is a lack of precision in the total effect and natural direct effect estimates and limited power to detect natural direct and indirect effects, particularly for IPV, despite the moderate sample size for this cRCT. The inverse odds ratio weighting approach using bootstrapping is known to provide less precise estimates than parametric approaches to mediation, yet this approach was chosen because it could accommodate the difference-in-differences regression model without violating assumptions (Nguyen et al. 2015). Finally, this mediation analyses assumes no uncontrolled confounding between 1) the exposure and outcome, 2) the exposure and mediator, and 3) the mediator and outcome. Verifying and upholding these assumptions is difficult in most mediation analysis, including this one. While the exposure assignment is theoretically ignorable given it was randomized, baseline imbalances across study arms were detected. While models controlled for these baseline imbalances that were also hypothesized to relate to the mediator and outcomes, it is possible there remains some uncontrolled confounding of the exposure-outcome and exposure-mediator relationship, especially given it was not feasible to measure the mediator more temporarily proximal to the exposure (Nguyen et al. 2015).

3.6 Conclusion

This study offers critical evidence to support theoretical hypotheses that reductions in inequitable gender norms are a potential mechanism behind interventions that reduce risk for IPV. In particular, these results provide a window into one way that the RMA intervention may have achieved reductions in IPV in the small group arm by reducing perceived inequitable gender norms among husbands of adolescent wives. In contrast, these results underscore the need for further mechanistic research to understand how the household visits and combination arms increased modern contraceptive use among married adolescent girls and their husbands, as these results indicate it was not via changes in gender norms. The results from this study may help inform further scale up of the RMA model in Niger or contexts with similar social norms, and offer potential opportunities for further reducing IPV by enhancing the social norm-changing components of the intervention. This is among the first cluster RCTs implemented in a LMIC that provides evidence suggesting that changes in inequitable gender norms were on the causal pathway to reductions in IPV. Additional research is needed to understand how men can be engaged in efforts to improve upstream inequitable gender norms in a way that leads to improvements in IPV and modern contraceptive use, as well as a wide range of other downstream gender equity-related health outcomes.

3.7 Tables and figures

Figure 1. Hypothesized mediation pathway between the Reaching Married Adolescents in Niger (RMA) Intervention, gender inequitable social norms, and two outcomes, intimate partner violence and modern contraceptive use (Dosso, Niger; 2016-2019)

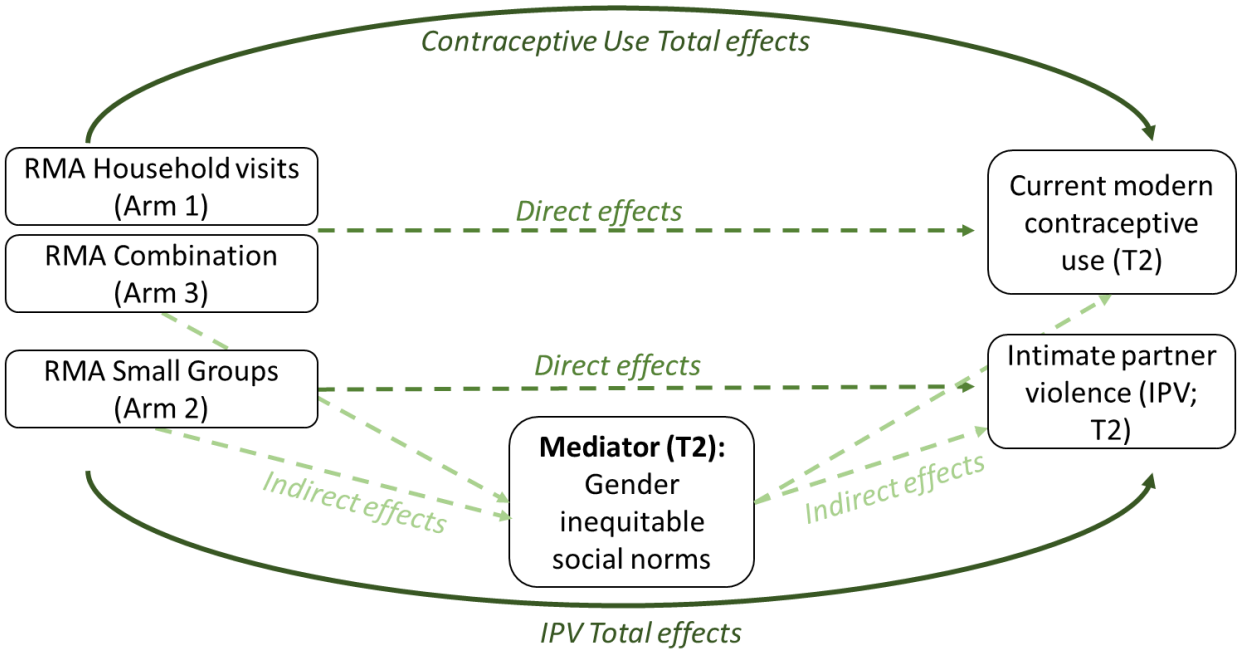


Table 1. Baseline covariates and husband perceived social norms (T2) by past 12-month intimate partner violence and current modern contraceptive use (T2) among female married adolescent girls and their husbands in Niger (Dosso, Niger; 2016-2019)

	Overall	Intimate Partner Violence (Past 12 months; T2)[a]		Current Modern Contraceptive Use (T2)[a]	
	(n=1042)	Yes (n=92)	No (n=825)	Yes (n=301)	No (n=496)
Study arm (%)					
Household Visits (Arm 1)	279 (26.8)	23 (25.0)	223 (27.0)	81 (26.9)	129 (26.0)
Small Groups (Arm 2)	247 (23.7)	16 (17.4)	199 (24.1)	75 (24.9)	112 (22.6)
Combination (Arm 3)	256 (24.6)	26 (28.3)	201 (24.4)	85 (28.2)	118 (23.8)
Control	260 (25.0)	27 (29.3)	202 (24.5)	60 (19.9)	137 (27.6)
District (%)					
Dosso	342 (32.8)	35 (38.0)	269 (32.6)	100 (33.2)	170 (34.3)
Doutchi	335 (32.1)	26 (28.3)	268 (32.5)	96 (31.9)	157 (31.7)
Loga	365 (35.0)	31 (33.7)	288 (34.9)	105 (34.9)	169 (34.1)
Baseline Covariates	**mean (SD)**	**mean (SD)**	**mean (SD)**	**mean (SD)**	**mean (SD)**
Husband age	25.6 (5.4)	25.2 (5.0)	25.7 (5.4)	26.2 (5.6)	25.4 (5.2)
Husband age at marriage	22.5 (5.0)	22.5 (4.7)	22.4 (5.0)	22.8 (5.3)	22.3 (4.8)
Husband parity	1.5 (2.0)	1.4 (2.1)	1.5 (2.0)	1.7 (2.1)	1.3 (2.0)
Husband education (%)					
Any modern	502 (48.5)	45 (48.9)	396 (48.4)	170 (57.0)	222 (45.0)
Coranic only	215 (20.8)	20 (21.7)	174 (21.3)	49 (16.4)	111 (22.5)
No schooling	318 (30.7)	27 (29.3)	248 (30.3)	79 (26.5)	160 (32.5)
Husband migration for >3 months (%)	722 (69.8)	67 (73.6)	560 (68.4)	193 (64.8)	356 (72.2)
Wife age	17.3 (1.5)	17.4 (1.4)	17.3 (1.6)	17.4 (1.5)	17.2 (1.6)
Wife age at marriage	14.2 (1.9)	14.5 (1.9)	14.1 (1.9)	14.1 (1.8)	14.2 (1.9)
Wife parity	1.0 (1.0)	0.9 (0.9)	1.0 (1.0)	1.1 (1.0)	0.9 (1.0)
Wife education (%)					
Any modern	364 (35.1)	46 (50.0)	275 (33.6)	137 (45.7)	150 (30.4)
Coranic only	171 (16.5)	15 (16.3)	142 (17.3)	36 (12.0)	96 (19.5)
No schooling	501 (48.4)	31 (33.7)	402 (49.1)	127 (42.3)	247 (50.1)
Total household assets	2.1 (1.2)	2.0 (1.1)	2.1 (1.2)	2.0 (1.2)	2.1 (1.2)
Mediator	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
High perceived inequitable gender norms					
T1 (n=1042)	460 (45.2)	48 (53.3)	359 (44.5)	127 (42.8)	229 (47.6)
T2 (n=737)	275 (37.9)	36 (46.8)	231 (37.4)	81 (32.4)	151 (42.3)

Abbreviations: T1, baseline; T2, 24-month follow-up; SD, standard deviation

[a]Intimate partner violence and modern contraceptive use based on wife reports at T2

Table 2. Estimated total, natural direct and indirect effects[a] of the Reaching Married Adolescents in Niger intervention on past 12-months intimate partner violence and current modern contractive use via perceived inequitable gender norms among husbands of married adolescents (Dosso, Niger; 2016-2019)

	Total Effect		Natural Direct Effect		Natural Indirect Effect	
	aPD[b]	95% CI[c]	aPD[b]	95% CI[c]	aPD[b]	95% CI[c]
Intimate partner violence (past 12-months) (n=1000 couples)						
Arm 2: Small Groups	-0.08	-0.18, 0.01	-0.06	-0.20, -0.02	-0.02	-0.07, 0.12
Current modern contractive use (n=970 couples)						
Arm 1: Household Visits	0.20	0.03, 0.36	0.32	0.13, 0.44	-0.11	-0.18, -0.01
Arm 3: Combined	0.19	0.07, 0.34	0.28	0.12, 0.46	-0.09	-0.20, 0.02

Abbreviations: aPD, adjusted prevalence difference; CI, confidence interval

[a]Natural direct and indirect effects were estimated using a modern causal inference approach, inverse odds weighting (Tchetgen, Tchetgen 2013).

[b]aPD estimated using a mixed effects difference-in-difference linear regression with inverse probability of censoring weights and adjusting for household assets, husband education, wife education, and husband migration with clustering based on village and multiple observations

[c]Wald-type 95% CI estimated using nonparametric bootstrap with 1000 repetitions

III. CONCLUSION

The results from this dissertation respond to a critical global need to shift social norms toward gender equity in order to address a key social determinant of poor health among women and girls. Social norms that uphold gender inequity create an environment in which women and girls are at high risk of IPV, sexual assault and harassment, child marriage, sex trafficking, female genital cutting, maternal mortality, and poor reproductive health (Heise 2019). In order to meet the Sustainable Development Goals 2030 in the next eight years, there is an urgent need to expand the evidence-base on how to increase gender equity within societies, requiring attention to rigorous evaluations of interventions designed to shift gender-inequitable norms to support sustained changes linked to improved reproductive health and violence outcomes. While policy and representation of women in leadership positions are critical structural strategies for promoting gender equity, social norms change is essential for sustainable and societal shifts to end masculine hegemony (UNFPA 2021). Evidence of how to address inequitable gender norms for improving the health of women and girls is at a nascent stage, especially in a way that has a ripple effect on the variety of downstream health outcomes negatively impacted by gender inequity. Using representative data from a cRCT conducted in rural Niger among married adolescent girls and their husbands, this dissertation research contributes high-quality evidence to the paucity of research available on what works to change social norms related to gender inequity in LMIC.

Responding to the need for better measurement of social norms, the first chapter in this dissertation presents results from an in-depth psychometric analysis of the brief 5-item Intimate Partner Violence/Reproductive Coercion (IPV/RC) Social Norms scale assessed among husbands of married adolescent girls, which measures social norms regarding the acceptability of husbands perpetrating IPV and RC against their wives. Using an item response modeling approach, we provided evidence that the scale had strong reliability as a two-dimensional scale, as well as internal structure and external validity. Husbands' scores on this scale were associated with husbands' IPV perpetration behavior against their wives (reported by wives), providing further evidence of validity and confirming the utility of this scale for understanding IPV behavior. Very few scales of this type have been created and validated, highlighting the contribution of this research to providing accessible tools for researchers and practitioners to efficiently measure social norms related to IPV and RC for observational or evaluative purposes. Given the increasing focus on promoting gender equity via social norm-focused public health interventions, the need for social norms scales, like this IPV/RC Social Norms scale, is growing and could be used to examine areas of high need for social norms-focused prevention and to measure the impact of such prevention efforts.

The second chapter presents evidence from the RMA cRCT indicating that the small group RMA intervention decreased inequitable gender norms among husbands of adolescent wives, while the other two intervention arms (household visits and combined small group and household visits) did not. We also provide preliminary evidence that the household visits intervention may have increased inequitable gender norms, though this was an imprecise estimate that warrants further investigation. This research is accompanied by only a small

handful of evaluations in LMIC contexts that assess impact of a social norms-focused intervention on the social norms themselves (Abramsky et al. 2014, Rowley E 2020). Even fewer have utilized an experimental design and/or demonstrated effects on social norms (Abramsky et al. 2014). This preliminary evidence supporting the effectiveness of the RMA small groups intervention in reducing inequitable gender norms has great potential value to the field of gender equity practice, providing an evidence-based model that is simple and scalable. The potential ripple effect of an intervention that decreases inequitable gender norms among this high priority population of young men married to adolescents in Niger could provide long term benefit across multiple related health outcomes.

The third chapter provides mechanistic evidence from the same cRCT that suggests that the observed effects on IPV observed among married adolescent girls assigned to the small group RMA intervention are partially attributable to reductions in inequitable gender norms among their husbands. To our knowledge, this study is one of the first to provide rigorous evidence from a experimental evaluation of an intervention suggesting social norms change was one of the mechanisms behind reductions in IPV. In contrast, evidence from this chapter indicates that social norms were not the mechanism behind effects on modern contraceptive use observed among married adolescent girls assigned to the household visits and combination RMA interventions. These findings, for all RMA intervention components, raise important next steps in our research to understand other mechanisms through which the RMA intervention components decreased IPV and increased contraceptive use.

Conclusion

This research is among the first experimental evaluations of a social norms-focused gender equity intervention in LMIC that has been assessed for 1) main effects on behavioral outcomes (Silverman et al. 2022), 2) effects on social norms, and 3) mediation effects of the social norms on the behavioral outcomes. This evidence contributes two practical tools for researchers and practitioners: a brief valid and reliable scale for measuring social norms related to IPV and RC and evidence that the RMA small group intervention model affects inequitable gender norms and, in turn, IPV. Such contributions help to fill major evidence gaps in understanding social norms and how gender norm-focused interventions may be creating change in communities. To further the contribution of this work, more research is needed to explore other potential mechanisms behind effects observed on IPV and contraceptive use, and to understand the long-term impact of changes in norms on behavioral outcomes in these villages. Further work to strengthen the social norms impact of the RMA small group intervention may yield stronger effects on IPV, a potential that could be explored via hypothetical interventions on the data from the present study using modern causal methods. The present dissertation offers critical evidence to further inform the promotion of gender equity via changing social norms, efforts that are essential to reducing the health burden of gender inequity on women and girls globally.

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