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Gender norms as a social determinant of health and well-being of
married adolescent girls and young women in South Asia

by

Lakshmi Gopalakrishnan

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

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in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Stefano M. Bertozzi, Chair

Professor Julianna Deardorff

Professor Patrick Bradshaw

Spring 2022

Gender norms as a social determinant on health and well-being of
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Abstract

Gender norms as a social determinant of health and well-being of married adolescent girls and young women in South Asia

by

Lakshmi Gopalakrishnan

Doctor of Philosophy in Health Policy

University of California, Berkeley

Professor Stefano M. Bertozzi, Chair

In South Asia, adolescent girls and young women often find themselves subordinate to men socially, culturally, and economically. Evidence suggests restrictive gender norms are most rigidly enforced for adolescent girls, which impacts their life trajectory and has intergenerational effects by influencing the health and development of these girls' future children. This dissertation conducted three studies in two South Asian countries, India and Nepal, to examine how gender inequality and restrictive gender norms undermine the health and empowerment of married adolescent girls and young women using prospective, longitudinal cohort datasets. Paper 1 examined the association between community-level collective gender norms, physical intimate partner violence, and sexual intimate partner violence. Findings indicated that physical and sexual intimate partner violence was high. Contrary to the hypothesis, the odds of women experiencing physical violence often increase 26% per unit increase in community-level equitable gender scores on a 6-point scale. We did not observe a significant association between collective gender norms and sexual IPV. Paper 2 examined the association between marriage, childbearing, and empowerment of adolescent girls and young women using panel data of unmarried and married respondents. Empowerment was operationalized using indicators assessing adolescent girls' and young women's participation in decision-making, freedom of movement, and access to economic resources. Findings indicated marriage, particularly marrying into households and co-residence with in-laws was negatively associated with the freedom of movement of married adolescent girls and young women. Motherhood was positively associated with two dimensions of empowerment, including freedom of movement and access to economic resources. Paper 3 examined the gendered norm of women eating last in the household and their depressive symptom severity. Findings suggested that eating last was associated with greater depressive symptom severity holding all covariates constant. Efforts to improve women's empowerment and transform restrictive gender norms should consider the challenges faced by newly married adolescent girls and young women. Future research should test interventions with newly married women to break the repeated intergenerational transmission of restrictive gender norms in South Asian countries.

To my late grandmother, Saraswathi Narayanan who could not fulfill her desire of getting a PhD
because of patriarchal norms.

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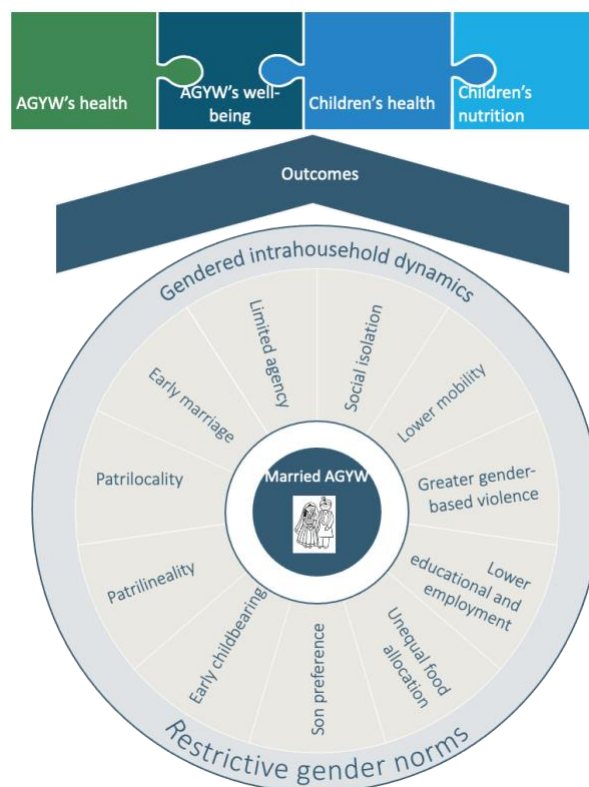
Chapter 1: Introduction

Adolescence, defined as the period between ages 10 and 19, is a complex developmental stage of life marked by rapid physiological, emotional, and psychosocial changes [1]. This second decade of life is a crucial development phase during which gender norms and identities are internalized, reinforced, and translated into behavior and cultural practices that can last a lifetime [2, 3].

Adolescence is hence considered a window of opportunity for interventions to prevent health inequities over the life course [1]. Additionally, many girls in low-income contexts experience a foreshortened transition period between childhood and adulthood. In such settings, girls are quite suddenly expected to “behave as adults even though they are not biologically, cognitively, or emotionally ready to assume adult responsibilities” [4]. Thus, although we refer to the entire second decade as “adolescence”, the idea that adolescence equals transition from childhood to adulthood does not apply in these contexts the way it does in high-income countries. Gendered norms and gender roles disproportionately impact girls during adolescence. They face higher rates of child marriage, with greater risks of early childbearing and childrearing, and more gender-based violence, particularly among the lower economic strata [5, 6]. This introductory chapter will contextualize the framework as depicted in Figure 1.

In South Asia, which is the focus of this dissertation, young women and adolescent girls (ages 15-24 years) often find themselves in a subordinate position to men socially, culturally, and economically [7–9]. Compared to adolescent boys, restrictive gender norms become particularly salient and more rigidly enforced for adolescent girls and can impact their own life trajectory and have intergenerational effects by influencing the health and development of these girls’ future children. A gamut of social vulnerabilities associated with restrictive gender norms and gendered intrahousehold dynamics can result in adverse outcomes for girls, including getting married in adolescence (Figure 1). Some of these vulnerabilities are associated with traditional cultural practices that include patrilineality, patrilocality, and preference given to sons due to their role in religious/family rituals and old age support [9–11]. Additionally, restrictive gender norms unduly disadvantage adolescent girls, resulting in lower educational attainment, early marriage, early childbearing, lower freedom of movement, eating last and unequal intrahousehold food allocation, higher risk of gender-based violence, lesser female workforce participation, and lower social connections as described in greater detail below.

Figure 1: Restrictive gender norms and gendered intrahousehold dynamics as a social determinant of married adolescent girls' and young women's health and well-being and their children's health



In much of the Global South, including South Asia, the educational trajectory for adolescent girls tends to flatten more than that for adolescent boys, especially from poorer households [12]. Evidence from India suggests that adolescent boys are favored more than adolescent girls when it comes to quality schooling and English-language education, both of which are perceived to provide better education and employment opportunities [13, 14]. A state-representative sample survey in Jharkhand (India) found that 62% of adolescent girls and young women had not received training, education, or employment, compared to only 14% of young men from the same households [15]. In India, where daughters have been traditionally undervalued, parents differentially allocate resources because sons are perceived to bring higher future economic returns [10, 16]. Girls' educational attainment is also a function of parental beliefs about the importance of girls' education and lower economic returns to girls' education than boys' education [17]. Gender norms encourage parents to discontinue their daughters' education before that of their sons [2, 18]. Gender roles assigned to girls as domestic caretakers and future wives also make parents want to invest fewer resources in girls. Parents may invest less in their daughter's education and marry them off early due to the traditional cultural practice of giving dowry (payments made by the bride's family to the groom's family), the amount of which tends to increase with girl's age [19, 20]. Such discriminatory gender norms make having daughters a financial burden to the parents, which is reflected in reduced human capital investments for girls [9, 11].

The age of marriage of the girl and the ability to choose one's spouse are determinants of marital quality [21]. Bangladesh and Nepal feature among the top 20 countries with the highest

prevalence of early marriage (defined as marriage below the age of 18), with rates at 59% and 40%, respectively [22]. In terms of absolute numbers, South Asia is home to more child brides than any global region, with India (~15 million) and Bangladesh (~4 million) having the highest number of child brides [22]. Early marriage is rooted in normative and structural factors such as internalized social norms in favor of child marriage, poverty, lack of continued schooling for girls, limited employment opportunities for girls, and lack of girls' agency to delay marriage [23, 24]. Further, in South Asian settings, patriarchal norms surrounding girls' chastity, family honor tied to girls' virginity, and religious beliefs about sex outside marriage also contribute to early marriage [24, 25].

The institution of marriage holds a near-universal status in much of South Asia, including India and Nepal, the focal countries of this dissertation. Marriages tend to be 'arranged' in this setting, where parents decide about marriage timing and choose the spouse with minimal involvement of young women [26, 27]. In such contexts where women have very low status, girls' consent may hold little meaning [28]. Many adolescent girls meet their spouses on the day of the marriage. For example, survey data collected by the Population Council in Bihar and Uttar Pradesh in 2015-16 found that nearly 70% of the 4,257 married adolescent girls (15-19) in the sample met their husbands on the day of the marriage [29].

Patrilocality, a traditional custom in which newly married brides move into the husband's household soon after their marriage and continue living with their in-laws, puts young girls in a new, unfamiliar social and household environment [30]. Typically, in patrilocal-extended family systems like those in South Asia, multiple generations of family members reside in a single household. Such patrilocal-extended living arrangements have been associated with young married women's poorer autonomy, lower decision-making power, and reduced ability to act on their health knowledge [31, 32]. Young married women living with their mothers-in-law also face severe constraints in forming social networks outside their home, adversely impacting their ability to access modern family planning methods [33].

In the South Asian context, marriage marks the initiation of sexual activity for most girls. Childbearing often follows immediately after marriage — about 60% of women under 25 were pregnant within the first year of marriage in India [34]. Women feel pressure to prove their fertility early due to the stigma of being "barren" [35]. A recent study from India found that having a child allows young married women to secure a higher status in the household hierarchy [35]. Young couples perceive the need to have a child, ideally within a year of marriage, as a sign of fertility and marital happiness [36]. Indeed, some young women face mistreatment, stress, and depression due to their inability to get pregnant or if they are unable to bear children early in the marriage [37]. Such norms may explain the low contraceptive use among married nulliparous women. Ninety-eight percent of married nulliparous women and about 70% of those with only one child reported not using a contraceptive method [38, 39]. Overall, norms around proving fertility immediately after marriage often lead to young married women having children earlier than they would have wanted, with negative effects for both the mother and the child [40].

Many newly married women are isolated in their marital homes, often losing connections with their natal kin, seldom visiting their maternal homes, and having low social support in their marital homes [41]. Newly married young women have less freedom of movement than their

unmarried counterparts or older married women. Recent estimates from India's Demographic Health Survey highlight that 30% of married women 20-24 years of age had the freedom to go alone to the market, a health facility, and places outside their village, compared to 55% in the 30-39 age group [42]. Young married women living with their in-laws face even more severe mobility constraints and have fewer peer networks to discuss health, fertility, and family planning [33]. Having fewer peers is also associated with lower usage of family planning services and fewer visits to health facilities [33].

Gendered cultural norms also limit women's access to nutrition and diverse foods in South Asia [43–45]. In patrilocal-extended family systems, newly married women occupy the lowest rank in the gender and generational hierarchy [46, 47]. These newly married women experience 'double powerlessness' [48], where their status is subordinate to men in the household and to other more senior women [44, 48, 49]. This ranking is reflected in intrahousehold food distribution and eating order [50–52]. Even though daughters-in-law have the primary responsibility to cook and serve the family, they are expected to conform to the gendered practice of eating last after men and other more senior women have finished their meals [51–53] with such practices continuing during pregnancy [54]. These practices are so entrenched that women accept eating last as a "matter-of-fact and the right thing to do" [55]. Eating last in the household can leave women with an inadequate amount of food to consume and/or may also prevent women from consuming nutrient-rich and diverse foods. Prior research from other South Asian settings suggests that the order of household eating is associated with lower quality and quantity of foods consumed [56, 57], including iron-rich foods [58].

Married women have lower labor force participation compared to married men — the percentage of married women 20-24 years of age who were employed was 17.5% compared to 93.6% of married men in the same age group in India [42]. Evidence suggests that gendered roles in the division of labor that assigns unpaid domestic care responsibilities to women within the family and lack of men's participation in domestic labor production results in lower labor force participation among married women [59–62]. It is not surprising that Pakistan (10.25) and India (9.83) have the highest female to male ratio globally in terms of time devoted to unpaid domestic chores [59, 63] (compared, for example, to industrialized countries such as the United States (1.61)) [63]. Gender norms continue to influence female employment and empowerment even in settings where male migration is high in South Asia. Emigration of husbands has not been associated with increased female employment as their wives and children continued to be under the stewardship of other male relatives such as fathers-in-law [64]. Further, male emigration also disproportionately increases women's workload by forcing them to take up more unpaid labor in the household and family farm roles [65].

Gendered power differences in marriage are reflected in husbands' attempts to closely monitor and control their wives' behaviors. The control exercised by husbands tends to be stronger when married women are the youngest (15-19 years) [66]. Twenty-four percent of married adolescent girls reported their husbands control their behaviors (such as feeling jealous when wives talk to other men, insisting on knowing where she is always, not permitting the wife to go out to meet her female friends) compared to 16.8% of married women aged 40-49 [66]. Women's mobile phone and internet usage also tend to be supervised by men, further limiting women's freedom and agency to use digital innovations [67]. According to the State of Mobile Internet

Connectivity 2021, in South Asia, women are 36% less likely than men to have access to mobile internet [68]. Lack of digital connectivity and skills can also hamper women in obtaining work, better healthcare, and education.

Newly married adolescent girls and young women are at increased risk of experiencing spousal violence [69, 70]. Compared to never-married women, physical violence tends to be higher for women who have ever been married [66]. Thirty-three percent of ever-married women have experienced some form of intimate partner violence (IPV), and about a quarter of women who faced IPV have experienced physical injuries related to IPV. A longitudinal study from India focused on IPV among young married couples found that young married women's gainful employment and husbands' loss of employment (from being employed to being unemployed at follow-up) was associated with greater odds of IPV perpetrated by the husband [71]. This difference in IPV experience again reflects the gendered intrahousehold power dynamics.

In this dissertation, we used a prospective, longitudinal cohort dataset from two South Asian countries—India and Nepal—to add to our knowledge about how gender inequality and restrictive gender norms continue to undermine the health and empowerment of married adolescent girls and young women (AGYW). A deeper understanding of gender norms and gender inequality could reaffirm the prominence of gender in influencing health outcomes from a population health perspective. India and Nepal have witnessed rapid social and economic changes in the past few decades, including increases in girls' education levels and the mean age at marriage. We posit that the analyses of data from a recent cohort of newly married girls and young women followed over time will be more relevant than prior cross-sectional studies for understanding gender norms and gender inequality as a driver of health outcomes. I aim to provide helpful information for thinking of how best to improve health in the near term and the future.

Theoretical Framework

This dissertation draws upon important theoretical perspectives from scholars in gender and social epidemiology. A conceptual framework for this dissertation is based on applying the following theories, concepts, and perspectives in the literature, all concerned with understanding gender norms and their influence on outcomes: social-ecological theory, gender theory, classic patriarchy, and the life course perspective.

Social-ecological theory

Originally developed in the 1970s [72–74], the social-ecological theory offers a framework to examine how an individual develops and interacts with the different levels of the social ecology. This theory has been adapted in the context of social norms for low-and-middle-income countries to study harmful gender-related social norms and related practices such as female genital mutilation, child marriage, and intimate partner violence [75]. The original framework and the adapted framework by Heise integrate different causal analysis levels visualized as concentric circles [73, 75]. Each encapsulating circle represents different levels of social structure. The innermost circle represents the individual domain and its associated factors like age, health status, and sex. Microsystem, the next circle, represents the immediate context, such

as family, relationships, and friendships. The third level, the exosystem, encompasses institutional and social structures such as neighborhoods, social networks, and identity groups. All these levels are surrounded by the macrosystem representing the structural factors such as social and political structures, patriarchal structures, and gender norms that permeate the culture. Additionally, another level, the mesosystem, can be considered a gender system that intersects across various levels of an individual's social environment. This model provides a conceptual foundation to help understand the multitude of factors that influence IPV.

Gender theory

Drawing on insights from sociology and anthropology, gender theory centers on how people socialize into upholding existing cultural values about gender and how gender norms reinforce prevailing inequalities of power and access to resources. This theory provides insights on gender role attitudes and ideologies and their associated norms—what boys and girls and young men and women are expected to think and do from early childhood [76]. Values and socio-cultural norms about who can speak out or make decisions also directly affect how power is distributed in society – typically to the disadvantage of children and adolescents in general and girls in particular [2, 77]. Restrictive gender norms persist because some individuals have a vested interest in upholding them as it allows them to maintain access to resources and power. These restrictive gender norms have a bearing on everyone but disproportionately disadvantage young girls in the South Asian context. Various structures, institutions, and networks may be responsible for reinforcing restrictive gender norms, including households, schools, workplaces, and other public spaces. Other structural determinants include the traditional system of patriarchy, education systems, religions, and the media.

Kandiyoti's "classic patriarchy"

South Asian women experience multiple manifestations of patriarchal order that pervade the society and culture. The South Asian region has been described as part of a geographical area where women are under a system of *classic patriarchy* [78]. This system is characterized by patrilineal descent; patrilocal residence; inheritance and succession practices that exclude women; and relationships in which the patriarch or his male relatives have authority over family members. Under the classic patriarchal system, girls are married at a very young age and move into their husband's household, which their father-in-law usually heads. These girls typically lose connections with their natal kin group. They are in subordinate positions to the men of the marital household and to the more senior women, such as their mother-in-law. In such an arrangement, to gain power and authority, women "strategize within a set of concrete constraints termed the patriarchal bargain" [78]. Under this "patriarchal bargain," women accept their current deprivation and hardship from their husbands and in-laws in exchange for economic security and a chance to have future control over their daughters-in-law and sons. Thus, for women, having a son becomes women's most important resource and is key to their access to future power (exercised through their sons).

Life course perspective

In South Asia, women have lower autonomy than men at every stage in their life. In the South Asian context, women spend phases of their lives in "double powerlessness" in which they are subordinate to men and other women who have a higher status [48]. Women spend parts of their lives in either lower or higher positions of power depending on their relationship with social, environmental, economic, and structural factors (e.g., patriarchy) over their life course [48, 79, 80]. A life-course perspective suggests that circumstances in which a woman is born, grows up, and circumstances leading to events such as early marriage and childbearing are determinants of the woman's and her children's future health [79, 80]. Further, it also postulates that overall health trajectories function from cumulative exposures to both risk and protective factors [81, 82].

Research aims

The dissertation aims to extend the literature on the importance of gender inequality and gender norms as a social determinant of the health and well-being of married adolescent girls and young women. Three specific research aims detailed below were elaborated to address the dissertation objective:

Paper 1 examined how the community-level collective gender norms were associated with physical and sexual intimate partner violence among a longitudinal cohort of married AGYW in India.

Intimate partner violence (IPV) violates women's rights and is a pervasive public health challenge. IPV prevalence in India is high, with a third of women ages 15-49 reporting having ever experienced physical and/or sexual violence. Despite a growing body of evidence on IPV, major questions remain unanswered on the relationship between community-level collective gender norms and physical and sexual IPV in India. Most of the contextual research on IPV in India has been cross-sectional with limited use of longitudinal data. Further, little is known about IPV among newly married young couples in India. Using a population-based dataset on newly married adolescents aged 15-22 years (n=3965) from a state-representative study in Uttar Pradesh and Bihar interviewed in two waves between 2015-16 and 2018-19, we examined the association between community-level collective gender norms and both women's experience of physical IPV intensity (measured as an ordinal variable) and sexual IPV (measured using as a binary variable). We fitted a multi-level ordinal logistic regression adjusted for cluster sampling, state fixed effects, secular trends, and individual and relational-level factors. We fitted mixed-effects ordinal and binary logistic regression models for physical IPV intensity and occurrence of sexual IPV, respectively, to examine their associations with community-level collective gender norms (defined by women's decision making and gender equitable attitudes at the community-level), adjusted for cluster sampling, state fixed-effects, secular trends, individual-level, and relational-level factors. Contrary to our hypothesis, we estimated that the odds of women experiencing physical violence 'often' increases 26% per unit increase in community-level equitable gender scores on a 6-point scale. However, we did not find a statistically significant relationship between women living in communities with greater equitable attitudes and sexual IPV in the multivariable models. This highlights the complex relationship between collective community-level gender norms and the types of IPV experienced. We concluded with policy implications for measuring gender norms, highlighting the need to capture the husband's and

community's gender attitudes and norms around wife-beating to allow us to understand the complete picture of what is driving IPV.

Paper 2 examined if marriage, motherhood, and having at least one son were associated with greater empowerment among adolescent girls and young women (AGYW) in India.

Early marriage is prevalent in India, with over 15 million girls below 18 getting married each year. Childbearing often follows marriage, with many AGYW conditioned to the gender norms of proving fertility immediately after marriage. Research that has empirically examined the relationship between marriage and childbearing and measures of AGYW empowerment using panel data remains virtually non-existent in the South Asian context. We operationalized social and economic dimensions of women's empowerment using indicators of AGYW's participation in decision-making, freedom of movement, and access to economic resources. Using Kabeer's framework on women's empowerment and the panel dataset that followed unmarried and married AGYW in India, we studied empowerment measures as a dynamic process over AGYW's life course by analyzing the immediate changes to empowerment resulting from marriage and attaining motherhood status. Among AGYW who get married, we also studied the moderation by marrying into a wealthier household and patrilocal residence (living with in-laws).

Further, given the prevalence of son preference in the Indian context, we also studied whether having sons confers additional advantages to AGYW's empowerment as compared to having only daughters. On average, marriage was associated with a decrease in freedom of movement, increased decision-making power, and greater access to economic resources for those who marry into household without in-laws and less wealthy households. There was a greater decrease in freedom of movement among AGYW married into a household and co-residing with their in-laws compared to AGYW who did not co-reside with their in-laws. Motherhood was associated with an improvement in two dimensions of empowerment, including freedom of movement and access to economic resources. Finally, we did not find an additional effect of having a son over only daughters. Our findings on marriage and empowerment underscore the significance of vulnerabilities associated with being newly married during adolescence, particularly how limited freedom of movement and lower decision-making power could impede newly married adolescents' access to essential services, including family planning. Our findings also point to the need to have health interventions that target both daughters-in-law and mothers-in-law together.

Paper 3 investigated whether the gendered norm of always eating last in the household was associated with depressive symptom severity among newly married young women in Nepal.

Nepal has high levels of early marriage and is a patrilocal society, with most marriages arranged by parents. Using prospective cohort data of 18–25-year-old newly married women cohabiting with mothers-in-law between 2018 and 2020 in the Nawalparasi district of Nepal, we examined the association between eating last and depressive symptom severity. Using a hierarchical mixed-effects linear regression model, we found that eating last always was associated with greater depressive symptom severity holding all covariates constant. We also explored if the association between eating last and depressive symptom severity was moderated by household food insecurity and did not observe evidence of moderation, further underscoring the significance of eating last as a woman's status indicator. Our study findings make important

contributions by highlighting the relationship between household-level restrictive gendered norms and mental health, an understudied topic except in the context of maternal mental health. The findings further underscored the need to understand the vulnerabilities faced by newly married young women in Nepal and the need for an intersectoral intervention that targets mental health, harmful gender norms such as eating last, and gendered intrahousehold dynamics.

Data sources

In this dissertation, we used two data sources collected from newly married adolescents and young women, allowing us to explore the association between gender norms, gender inequality, and the health and well-being of women. The results from this study have implications that are likely to be widely applicable in the region of South Asia due to the similarity in cultural context and status of women.

Data for Papers 1 and 2 came from a prospective cohort study, UDAYA (Understanding Lives of Adolescents and Young Adults), conducted by the Population Council, India, and funded by the Bill and Melinda Gates Foundation and the David and Lucile Packard Foundation with technical input from the Ministry of Health and Family Welfare, Government of India [29]. Wave 1 of the study took place in 2015 in two northern states of India: Bihar and Uttar Pradesh. Data for Wave 2, a follow-up of the same adolescents, was collected in 2018. The team surveyed younger adolescents (10-14 years at baseline) and older adolescents (15-19 years at baseline) to understand the factors influencing adolescents and young adulthood. The UDAYA dataset contains information about demographics, economic activity, household work and migration, mass media and social media exposure, social and peer environment, aspirations, agency, and gender role attitudes, awareness of sexual and reproductive health matters, romantic and sexual relationships, transitions to marriage and parenthood, health and health-seeking behavior, dietary habits and nutrition, and community life. The UDAYA dataset was designed to provide state-level estimates and urban and rural areas of the state for each of the five categories of respondents (see Table 1). Three hundred primary sampling units (PSUs) —villages in rural areas and census wards in urban areas —were sampled across both states. Each PSU had roughly 70 respondents.

A multi-stage systematic sampling design was adopted within each stratum (urban and rural PSU). The 2011 census list of villages and wards (each consisting of several census enumeration blocks [CEBs] of 100–200 households) served as the sampling frame for selecting villages and wards in rural and urban areas, respectively. This list was stratified using four variables:

- Region
- Village/ward size
- The proportion of the population belonging to scheduled castes and scheduled tribes
- Female literacy rate

Villages were first selected systematically from the stratified list described above in rural areas, with selection probability proportional to size. In urban areas, 75 wards were first selected systematically with probability proportional to size. CEBs were then arranged by their administrative number within each ward, and one CEB was randomly selected.

Table 1: Completed number of interviews at Wave 1 and Wave 2 of UDAYA study in Bihar and UP

	Wave 1 (2015-16)	Wave 2 (2018-19)	Follow-up response rate* (%)
Unmarried boys (10-14)	2084	1712	82%
Unmarried boys (15-19)	3885	2716	70%
Unmarried girls (10-14)	1653	1439	87%
Unmarried girls (15-19)	7766	6168	79%
Married girls (15-19)	5206	4257	82%

*Migration of boys and marriage of girls are the predominant reasons for loss-to-follow-up

Data for Paper 3 came from a smaller, longitudinal prospective cohort study of newly married women, collected between 2018 and 2020 in Nepal's Nawalparasi district, a relatively rural district in the Terai or plains region of Nepal bordering Uttar Pradesh in India. Baseline data were collected from 200 women eligible to enter the study if they were married within four preceding months of the survey, cohabiting with their mothers-in-law, and were 18-25 years of age. Of the screened 18,906 households in two municipalities (one rural and one urban), 302 eligible respondents were identified, and 200 of those eligible households were randomly selected. At baseline and three follow-up surveys conducted roughly six months apart, enumerators surveyed respondents using Nepali questionnaires about their married life, connections to natal household, nutrition, depressive symptoms, eating order, and other time-varying indicators, including taking up paid work, pregnancy, health care utilization, and food insecurity. Four trained female Nepali enumerators conducted face-to-face interviews on computer-assisted personal interview devices either at home or in a private location of the respondent's choice after obtaining written informed consent. Non-literate respondents provided thumbprints to confirm consent. Respondents were offered an incentive of 3 USD at each visit. The women were asked all the questions, including those on household details. The study received ethical approvals from the Nepal Health Research Council and the Institutional Review Board of the University of California, San Francisco.

More details relevant to the respective papers are described within the subsequent chapters.

Contribution to the literature

This dissertation consistently underscored that married adolescent girls and young women are a vulnerable group that faces unique challenges with consequences for their own health and the health of future generations. India and Nepal alone have over 22 million adolescent girls married before 18 each year, constituting a sizeable population that deserves greater attention and programming. Adolescent girls spend much of their time in the married household and face many disadvantages owing to family formation, patrilocality, and other discriminatory gendered norms described above. Many interventions developed and evaluated in South Asia have been targeted at unmarried adolescent girls and boys, primarily focused on increasing secondary schooling, life skills training, safe spaces, and microcredit awareness to delay marriage, reduce school dropout, and improve gender-equitable attitudes, self-efficacy, and awareness of sexual and reproductive health [83–87]. Interventions that increase school retention and delay marriage will certainly lead to fewer girls getting married early. But without special efforts to develop and evaluate interventions that can improve the lives of already married adolescent girls at greater risk of adverse health consequences, social isolation, and disempowerment, we will not have the empirical evidence-base to reach this vulnerable population. To our knowledge, comparatively fewer programs exist that exclusively target newly married adolescent girls and young women

except for two programs in India [88, 89]. Given the prevalence of early marriage, married AGYW spend most of their lives in marriage. Intervening early in the marital stage may potentially break the cycle of repeated intergenerational transmission of restrictive gender norms. More interventions are required that allow women to feel more supported as they transition to their married life. These interventions will need to include gatekeepers, such as husbands and mothers-in-law, and community influencers to develop gender-transformative interventions that either transform rigid norms or design gender accommodating interventions that work within the confines of restrictive norms to change practices.

Chapter 2: Longitudinal Association of Collective Gender Norms with Intimate Partner Violence (IPV) among Newly Married Adolescent Girls and Young Women (AGYW) in India: A Multilevel Analysis

Background

Sustainable Development Goal Five (SDG5) calls on countries to realize gender equality and to empower women and girls, including eliminating all forms of gender-based discrimination. A key target to achieve this is eliminating all forms of violence against all women and girls in public and private spheres [90] with a specific emphasis on intimate partner violence. The indicator under the SDG5 requires countries to regularly track and report on the “proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner” [91]. Globally, intimate partner violence is a human rights issue and a widespread public health challenge, with nearly one-third of women reporting experience of physical and/or sexual violence in their lifetime [92]. Also termed spousal violence, marital violence, or domestic violence, “intimate partner violence (IPV) refers to behaviors within an intimate partnership that cause physical, sexual, or psychological harm, including acts of physical aggression, sexual coercion, psychological abuse and controlling behaviors” [93].

IPV is the second most common risk factor for reduced disability-adjusted life years globally in women aged 20–24 years [94]. Substantial global evidence demonstrates the deleterious effects of IPV on women’s physical health [95–98] and mental health outcomes [96, 99–101]. IPV also has adverse consequences on sexual and reproductive health outcomes, including increased risk of short birth intervals, unwanted pregnancy, abortion, miscarriage, gynecological complications, sexually transmitted infections, and HIV [97, 102].

Despite stringent laws protecting women from IPV, prevalence of IPV in India mirrors the global figures, with one in three women ages 15–49 reporting experience of physical and/or sexual violence in their lifetime [42]. In terms of prevalence among adolescent girls and young women (AGYW), 25% of women aged 20–24 years and 18% of women aged 15–19 years reported experiencing any physical or sexual violence [42]. Nearly half of all women ages 15–49 years exposed to physical and/or sexual IPV reported suffering injuries, but only 14% of those who experienced IPV ever sought help [42]. It remains a silent epidemic that continues to have detrimental impacts on girls and women of all ages.

In the last two decades, numerous studies have examined the role of individual risk factors and their association with IPV. Worldwide and in India, women from lower socioeconomic status, belonging to a marginalized caste, marrying below 18 years of age, having lower educational attainment, and being employed, are strongly associated with greater risk of IPV [103–108]. In terms of relational factors (factors at the level of the husband-wife dyad), studies have shown that a greater spousal age gap is associated with a higher risk of IPV for women [106, 108]. Further, a greater gap in education or income between the husband and wife is also positively correlated with higher IPV among women [104, 106, 108, 109]. Among other factors, economic

empowerment of women, discordant employment status between husband and wife, childlessness, and longer duration of marriage also are predictors of IPV among women in India [69, 71, 104].

In addition to individual risk factors, contextual risk factors play an important role in determining IPV. Restrictive gender norms, upstream determinants of gender inequality, act as contextual risk factors. Gender norms affect health through differential exposures, health-related behaviors, and access to care, which then reinforce and reproduce gender inequalities with adverse health implications [2, 110]. Restrictive gender norms manifest in many ways— skewed sex ratio at birth, differential educational attainment for boys and girls, early marriage for girls, gender bias in employment, higher crime rate against women, and prevalence of gender-discriminatory cultural practices [9, 11, 111, 112].

Despite the importance of gender norms as contextual risk factors, few studies have examined associations with IPV risk in South Asia. Koenig and colleagues (2006) examined the association of community-level norms around wife-beating and crime rates in North India with IPV risk [106]. While permissive norms regarding wife beating were associated with physical IPV, the study did not find a significant association with sexual IPV. Further, a higher violent crime rate at the community level was positively correlated with both sexual and physical IPV [106]. In another cross-sectional study, Ackerson and Subramanian found that differences in IPV among neighborhoods and among states were partially explained by gender inequality at the state-level [109]. In examining the role of women's educational context on IPV, Ackerson and colleagues found that living in communities with high male and female literacy levels was associated with a reduction in IPV risk after controlling for individual factors [113]. Boyle and colleagues found that higher acceptance of mistreatment at the community level attenuated the protective effect of women's higher educational attainment [114]. More recently, a socio-ecological cross-sectional analysis of spousal violence emphasized that living in communities with inequitable gender norms (measured using attitudes towards wife-beating), higher crime rates against women, and more marriages of women below 18 years of age were associated with greater odds of women's experience of spousal violence. However, contrary to their hypothesis, they did not find a correlation between women's empowerment and spousal violence [104].

There has been a growing literature examining risk factors of IPV, but major questions remain unanswered on the relationship between community-level collective gender norms and IPV in India. Most of the contextual research on IPV in India has used cross-sectional data with scant use of longitudinal data. Many IPV papers combine the physical and/or sexual IPV into a single outcome, limiting our understanding of how norms influence different types of IPV. Further, we know little about IPV among newly married AGYW in resource-constrained settings. This paper builds on the literature on IPV by examining norms longitudinally, over a three-year timeframe, to better understand the relationship between community-level gender norms and both physical and sexual IPV. This paper aims to study the longitudinal association between community-level collective gender norms of newly married young women and the intensity of physical IPV and recent sexual IPV. We hypothesized that AGYW who live in more gender-equal communities, as

defined by our collective gender norms variables, will experience less physical and less sexual IPV, after controlling for individual and relational factors.

Context of study states

Uttar Pradesh (UP) and Bihar are among the most populous states accounting for nearly 28% of adolescents in India [115]. Both UP and Bihar's performance on social indicators is comparatively poor and lags behind national averages. Female life expectancy is lower than the national average, with female life expectancy being 65.4 years in UP and 68.4 years in Bihar, compared with 69.6 years in India [115]. In terms of acceptability of wife beating attitudes, in UP and Bihar, 39% of women agree that a husband is justified in beating their wife if she disrespects her in-laws, compared to a national average of 37% [42]. Both UP (38%) and Bihar (45%) have a greater proportion of women who have experienced some form of lifetime physical, sexual, or emotional violence compared to the national average of 33% [42].

Theoretical framework

The theoretical framework (*Figure 2*) for this study is grounded in an ecological perspective that emphasizes multidimensional "embedded levels of causality" [72, 75, 116]. Developed by Heise, the ecological framework of gender-based violence conceptualizes IPV as a function of the interacting influence of numerous factors at the individual, relational, contextual, and structural levels.

The four levels are visualized as concentric circles in *Figure 2*, with each circle representing different levels of social structure. The innermost individual level represents factors like age, education, engaging in paid work, social stratification (caste), and wealth, and the next circle represents the relational factors (husband-wife dyad factors) like spousal age gap, educational gap, parity, and spousal wage gap. The third encapsulating community-level includes contextual factors like neighborhoods and social networks. In our study, we adapted the community-level variables to include community-level decision making and community-level collective gender attitudes. We acknowledge the existence of a gender system that interplays across various levels of an individual's social environment. Finally, the outermost circle includes structural factors like social and political structures, patriarchal structures, and gender norms that permeate the culture. Our study tries to understand how the interplay of individual, relational, and community levels influence IPV.

Methods

We used prospective cohort data from the Population Council's UDAYA study conducted in two large northern states—Bihar and Uttar Pradesh (UP)—in India [29]. The survey collected longitudinal data in two waves — 2015-16 (Wave 1) from married AGYW (15-19 years) who were then followed-up in 2018-19 (Wave 2) selected using a multi-stage sampling strategy within 300 urban and rural primary sampling units (PSUs) representative of UP and Bihar. The survey covered various topics such as marriage and reproductive events, intimate partner violence, and measures related to women's empowerment including decision-making and gender role attitudes. The study received ethical approval from Institutional Review Boards of

Population Council USA and Center for Media Studies (CMS), India. Since we used de-identified data from a public website, the Harvard Dataverse, we were exempt from getting Institutional Review Board approval at the University of California, Berkeley.

Our analytic sample for analysis included 3,965 AGYW married in 2015-16, still married in 2018-19, and cohabiting with their husbands at both waves across 288 communities (PSUs). For the models, we omitted all communities that had only one respondent, leaving 3959 individuals from 282 communities in the final analytic dataset. We had comparable measures for AGYW across the two waves, including repeated measures of their exposure to IPV, decision-making, and gender attitudes. Our covariates/controls were selected *a priori* based on previous literature and theory represented as a directed acyclic graph later [117].

Measures

Dependent variables:

The survey used standard questions on physical violence modeled on the Demographic Health Surveys' domestic violence module [42]. Married AGYW were first asked about ever having experienced physical IPV and about recent experiences of IPV in the 12 months preceding the survey. The physical IPV questions asked the respondents if they had ever experienced any form of physical violence, including being slapped, twisted, having their hair pulled, being pushed, having something thrown at them, being punched with a fist, kicked, choked, or threatened with a gun, knife, or a weapon. For those who had ever experienced physical IPV, a follow-up question ascertained the frequency of physical IPV in the 12 months preceding the survey, the responses for which included (i) never experienced in the last 12 months, (ii) sometimes in the last 12 months, and (iii) often in the last 12 months. Combining these two questions, we created an ordinal variable for physical IPV that included four levels — never experienced physical violence coded as 0, not experienced physical IPV in the 12 months preceding the survey coded as 1, experienced physical IPV sometimes in the 12 months preceding the survey coded as 2, and experienced physical IPV often in the 12 months preceding the survey coded as 3. In the ordinal logistic regression (or proportional odds) model for this variable, we can interpret estimates as pertaining to the odds of “*experienced physical IPV often in the 12 months preceding the survey*” compared to less than often.

Sexual IPV was ascertained by asking respondents if they were ever forced to have sex against their will, including the first time they had sex. For those who had ever experienced sexual IPV, a follow-up question asked if they had experienced sexual IPV in the 12 months before the survey. We created a dichotomous variable, recent sexual IPV, based on whether the respondent had experienced sexual IPV in the 12 months or not.

Independent variables of interest:

Since there is no gold standard measure for gender norms, we relied on proxy measures of gender equality or empowerment focused on intrahousehold decision making that have been used in other research domains to explore their relationship with IPV [118, 119] and used the set of questions measuring gender role attitudes that were available in our survey. We developed our community-level measures using primary sampling units (PSUs) that denote a local geographical

area — villages in rural areas and wards in urban areas. Below we explain how we operationalized our collective gender norm variables:

(1) *Community-level decision-making index*: We used questions posed to married AGYW about who in the family mainly makes decisions related to AGYW. Women were asked who mainly decides about (i) how much education the woman should have, (ii) making major household purchases, and (iii) whether the woman should work or stay at home. For each of these variables, we assigned a score of 1 if AGYW reported making decisions solely or jointly with others and 0 if AGYW have no say in making decisions. Items were averaged to form a scale with higher scores indicating greater decision-making ability (Cronbach's alpha 0.59). The index was rescaled to range from 0 to 5. Finally, we aggregated individual women's responses at the community level for each PSU and created non-self-means by removing the index woman when averaging the responses.

(2) *Community-level equitable gender attitudes index* measures the respondents' views regarding acceptable practices and behaviors for men and women. These types of attitudinal statements are used in research as a reflection of prevailing gender norms. Five statements on gender role attitudes were asked to AGYW: (i) it is more important to educate boys than girls, (ii) girls like to be teased by boys, (iii) girls should be allowed to decide when they want to marry, (iv) husband alone/mainly should decide how household money is spent, and (v) feeding and giving kids baths is only women's responsibility. For each item, respondents indicated whether they agreed, disagreed, or "could not say." Items were coded such that a response that was deemed equitable was coded as 1 and 0 otherwise. "Could not say" responses were combined such that the absence of an affirmative response indicated inequitable gender attitudes to ensure that we erred on the side of being more conservative. Items were added to create a summative scale from 0 to 5, with higher scores representing more equitable gender attitudes (Cronbach's alpha 0.54). Like the previous two variables, we aggregated individual women's responses at the community (i.e., PSU) level. We created non-self-means by removing the index woman when averaging the responses.

Other covariates:

Other covariates known to be associated with collective gender norms and IPV were also controlled for. At the individual level, these include AGYW's age, wealth, education, individual decision-making power, and individual equitable gender role attitudes. At the relational level, confounders such as spousal age gap, spousal educational gap, and whether the respondent had ever given birth to a child were theorized to be important based on prior literature from India. We also controlled for the urbanicity of the community (urban or rural). Additionally, to allow for any secular trends, we also controlled for time by including an indicator variable for the second wave.

Analysis

The relationship between collective gender norms at the community level and IPV was examined using a three-level hierarchical random-effects model (written out as a reduced form equation) to account for the multilevel nature of the data. The three levels were waves (level 1) nested within

women (level 2) nested within communities (level 3). Multiple married women were not sampled within households; thus, we do not include a household-level random intercept. Hence, variables that reflect household characteristics such as caste and wealth index were included at the individual level. Since there were only two states, we combined the data for both states and included an indicator for the *state* as a control variable. We first descriptively reviewed the data for variables of interest and assessed the distributions of the variables. We then tested whether the means of the community-level collective gender norms variables changed from Wave 1 to Wave 2 by conducting paired t-tests. We generated proportions of AGYW experiencing violence by ever experience of physical and sexual IPV. We used chi-square tests to examine bivariate relationships between covariates and reports of IPV at Wave 1.

We fitted two separate regressions for the two outcomes of interest - physical IPV intensity and recent sexual IPV. The logit of the probability of the outcomes of interest can be modeled as follows, where i is the wave, j is the adolescent/AGYW, and k is the primary sampling unit (PSU):

$$\begin{aligned} \text{logit } P(Y_{ijk} = 1 | X_{ijk}, W_i, A_{ijk}, I_{ik}, C_k, d_k, \zeta_{jk}^{(2)}, \zeta_k^{(3)}) \\ = \beta_1 + \beta_2 \cdot X_{ik} + \beta_3 \cdot W_i + \beta_4 \cdot A_{ijk} + \beta_5 \cdot I_{ik} + \beta_6 \cdot C_k + \alpha_1 \cdot d_k + \zeta_{jk}^{(2)} + \zeta_k^{(3)} \end{aligned}$$

- Y_{ijk} = Indicator variable which is 1 for adolescent j in PSU k who experienced physical IPV¹ or sexual IPV at wave i
- X_{ik} = Vector of PSU-specific community norms in PSU k at wave i
- W_i = Indicator variable for second wave
- A_{ijk} = Vector of time varying covariates for adolescent j in PSU k at wave i
- I_{jk} = Vector of time invariant covariates for adolescent j in a PSU k
- C_k = Community-level covariates
- d_k = Indicator for Bihar (with UP being the reference group)
- $\zeta_{jk}^{(2)}$ = Adolescent-specific random intercept (level 2) assumed to be normally distributed with mean 0 and variance $\psi^{(2)}$ that captures the unobserved between-adolescent heterogeneity
- $\zeta_k^{(3)}$ = PSU-level random intercept (level 3) assumed to be normally distributed with mean 0 and variance $\psi^{(3)}$ that captures unobserved heterogeneity between PSUs

Then we built mixed-effects proportional odds (or ordinal logistic) regression [120] and mixed-effects binary logistic regression models for physical IPV intensity and recent sexual IPV, respectively, to examine the individual-level predictors first, followed by relational-level predictors, and then finally the collective gender norms variables. We also fit a model by interacting all our covariates and collective gender norm variables with time (indicator for the second wave) to test for moderation by time. We assessed the multi-collinearity of the predictors by calculating variance inflation factors (VIF). We used VIF greater than five as a criterion and found no multi-collinearity concerns. We set the level of statistical significance (Wald p-value)

¹ For physical IPV intensity (Y), since it is an ordered response variable with 4 categories, the log odds of being less than or equal to *often experiencing violence in the last 12 months* can be defined as $\log(P(Y \leq 4) / (P(Y > 4)))$ or logit ($P(Y \leq 4)$).

at 0.05 for regression models except for interaction terms where we used a significance level of 0.1. We also used cluster robust standard errors by PSU (community-level). We conducted paired t-tests and found that the mean norms at the two waves were statistically significantly different ($p < 0.05$).

Model 1 was the unadjusted model that included our main predictors of interest, the collective gender norms that included the community-level greater decision-making power index and the community-level equitable gender attitudes index. Model 2 added the individual-level covariates including age, the AGYW's education, whether the respondent belonged to a marginalized caste, wealth index, individual-level decision-making, and individual-level equitable gender attitudes. Model 3 controlled for relational-level covariates spousal age gap, spousal educational gap, and whether the respondent had ever given birth to a child as well as finally whether the community was urban or rural, and secular trends by including an indicator variable for the second wave.

We evaluated model fit using Akaike Information Criteria (AIC) with lower values signifying better model fit. All data were analyzed using Stata Version 15.1[121].

Results

We also present the sociodemographic characteristics of our analytical sample at Wave 1 ($n=3965$) in Table 2, overall and by ever experience of physical and sexual IPV. The median age of women at Wave 1 was 18.0 years (range= 15-19, IQR: 17, 19). The median number of years of formal schooling was 7 years (range 0-15, IQR: 0, 9), with nearly 27% of women having received no formal schooling. About 29% of the women belonged to a marginalized caste (Scheduled Caste/Scheduled Tribe), and 64% lived in rural communities. About 46% of the women ($n=1824$) had given birth to a child by Wave 1 of the survey. Twenty-eight percent reported ever experiencing physical IPV and 35% reported ever facing sexual IPV by Wave 1 of the survey.

Bivariate analyses suggest that AGYW belonging to a marginalized caste, experiencing parental violence during childhood, participating in paid work in the 12 months prior to the survey, and those who had given birth were more likely to experience any IPV (physical/sexual). We also found that wealth was negatively correlated with both any experience of physical and any experience of sexual IPV. Spousal education gap was positively associated with ever experiencing physical IPV but was not correlated with ever experiencing sexual IPV. Belonging to a rural community was not associated with ever experience of sexual IPV. Table 3 summarizes the variation across communities in community-level collective gender norms variables at Wave 1 and Wave 2. We also found that mean community-level collective gender norm scores increased between Waves 1 and 2, indicating that communities became more equitable and progressive towards women over time.

At Wave 1, 28% of our analytic sample of AGYW ages 15-19 years had ever experienced physical violence, which increased to nearly 48% by the second wave (*Figure 4*). During the 12 months before Wave 1, 22% of women experienced violence “sometimes”, which increased to

over a third in the second wave. For sexual IPV, 28% of the AGYW reported recent sexual IPV in the first wave, which marginally increased to 31% in the second wave.

We present results from mixed-effects ordinal logistic regression models for physical IPV intensity in Table 4. Model 3 had the lowest AIC and is therefore the final model. Controlling for individual, relational, community-level covariates, secular trends, and individual equitable gender attitudes, the estimated odds of experiencing physical IPV often increase 26% (AOR 1.26, 95% CI: 1.10, 1.46) per unit increase in community-level equitable gender attitudes. We did not observe a significant association between community-level decision-making power and physical IPV, controlling for the other variables. Table 8 in the Appendix section provides the complete set of results along with the control variables.

Table 5 presents results from our mixed-effects binary logistic regression for recent experience of sexual IPV. Model 1 estimates the unadjusted association between community-level collective gender norms and sexual IPV. Model 2 estimates the association between community-level collective gender norms and sexual IPV controlling for individual-level factors and secular trends. Model 3 adds the relational-level factors assumed to be confounding the association between community-level collective gender norms and sexual IPV. Based on the lowest AIC, we selected *Model 2 as the final model*. Controlling for individual-level covariates, secular trends, and community-level covariates, we did not find a significant association between community-level equitable gender attitudes and sexual IPV (AOR 1.00, 95%CI 0.85, 1.18) or community-level decision-making power and sexual IPV (AOR 1.03, 95%CI 0.92, 1.15) at the 5% level. Table 9 in the Appendix section displays the full set of results from the binary logistic regression examining the relationship between collective gender norms and sexual IPV.

Interaction analysis

In Tables 6 and 7, we present the results from testing for interaction between community-level collective gender norms and time (indicator for Wave 2) controlling for all covariates interacted with time for physical IPV intensity and sexual IPV, respectively. The association between community-level decision-making and women's experience of physical IPV increases over time (OR 1.17, 95%CI: 0.99,1.39, $p=0.066$). However, we did not find an association between community-level decision-making at Wave 2 and physical IPV intensity. We did not observe that the association between community-level equitable gender attitudes and physical IPV varied over time. We also did not find evidence that the association between collective gender norms and sexual IPV varied over time.

Robustness checks

As a sensitivity check, we fitted a binary logistic regression using the variable of recent physical IPV coded as a binary outcome (yes/no) and the results were not substantially different. Unlike the ordinal logistic regression, binary logistic regression (results not shown) does not assume proportional odds. Additionally, we also dropped the women ($n=264$) who were not interviewed

in the same PSU at Wave 2 which also did not change our results substantially (results not shown).

Discussion

To our knowledge, this is the first study from India to use longitudinal data to examine the association of community-level collective gender norms with physical IPV intensity and sexual IPV experience among newly married AGYW. Using prospective cohort data of young married AGYW, we found that living in a community with more equitable gender attitudes was associated with incremental increases in odds of physical IPV after controlling for individual and relational-level factors, community-level covariates, and secular trends. Community-level greater decision-making power of AGYW did not predict physical IPV. However, we did not find that the community-level collective gender norms variable measured using community-level gender equitable attitudes and community-level greater decision-making power of women was associated with sexual IPV controlling for all individual-level, relational-level, community-level covariates, and secular trends. This means that the association between gender norms and IPV differs by type of IPV being examined.

Our result that the odds of greater intensity of physical IPV increases as community-level equitable gender norms increase contradicts our hypothesis and prior studies from India that have examined this relationship. Prior cross-sectional national research from India has found that women living in communities with *inequitable* gender norms (measured as greater proportion of men and women who justified wife beating) were more likely to experience physical IPV [104]. Our results also deviated from another cross-sectional study in North India that showed that living in communities with inequitable gender norms (defined as men's attitudes towards wife beating) was associated with higher risk of physical IPV [106]. Both these studies examined community-level gender norms using men's (or husbands') attitudes towards IPV while we constructed collective gender norms variables with data only from married women because the husbands were not surveyed. Since the husbands are the perpetrators of violence, constructing the norms variables with husbands' responses would have undoubtedly brought more nuance to our analyses. Further, our collective gender norms variables are not directly comparable to the standard attitudes towards wife beating questions typically covered in Demographic Health Surveys. Future research should attempt to collect data from wives as well as their husbands to understand the community-level predictors of IPV.

Yet, plausible explanations for our finding exist. It is possible that women living in communities reporting more equitable gender attitudes feel more comfortable reporting violence. Or, perhaps they are less accepting of violence and thus more willing to acknowledge violence happening to them. Another possible reason for this result could be explained using Gender Power Relation Theory [122] and Backlash Theory [123]. Any change in gender power relations that threatens the status quo of men's control over economic and household resources can lead to resistance (backlash) to this change. This change can result in increased violence against women in the community [123–125]. Evidence from South Asia suggests that women's economic empowerment is associated with an increase in IPV [126–128]. Changes in a normative environment favoring women can disturb power relations between genders; this can sometimes

have unforeseen effects, such as men resorting to violence, especially within the relational (family) sphere, to exert their dominance and masculinity [125].

Our results do not show a statistically significant association between women's decision-making power at the community level and physical IPV. Only one study from India that focused on married women in the slums found that women's empowerment measured at the individual level using decision-making power was protective of IPV [129]. Future studies, especially qualitative work can help us understand these associations better.

The association between collective gender norms does not hold for sexual IPV in the multiple regression models controlling for secular trends and individual and relational-level factors – suggesting that the associations between the gender norms used in our study and IPV differ by the type of IPV. This finding is consistent with previous research from India that did not find a positive association between community-level inequitable gender attitudes towards wife beating and sexual IPV [104, 106].

Gender-based violence is a manifestation of factors at different socio-ecological levels, and we examined gender-based violence using an ecological framework [75]. We extended the literature on IPV and gender norms by assessing longitudinal associations between collective gender norms and physical and sexual IPV in two of the most under-resourced and patriarchal settings in the Indian context, where IPV remains a pervasive public health challenge especially among young newly married women.

This study has several strengths. First, we used a large sample of newly married young women, a population that has been relatively less researched for IPV. Second, instead of using a dichotomous physical IPV variable, we used an ordinal variable to define women's experience of physical violence intensity using four categories - never experiencing violence, not experiencing physical IPV in the 12 months preceding the survey, sometimes experiencing physical IPV in the 12 months preceding the survey and experiencing physical IPV often in the 12 months preceding the survey. Third, we used a longitudinal, prospective cohort of AGYW and communities that were followed over a three-year timeframe. Fourth, ours is one of the few studies that has examined physical and sexual IPV separately to get a more nuanced understanding of how gender norms are associated with each type of IPV.

The study has limitations worth noting. A major limitation was that the data including the community-level gender norms variables were based on one respondent: the wife. Constructing gender equitable attitudes and decision-making measures using the data from the husbands/men who perpetrate IPV would have likely allowed us to construct a richer community norm variable. There is a possibility that community-level collective gender norms constructed using only married AGYW's perceived attitudes and stated behaviors do not reflect the community's underlying patriarchal and restrictive gender norms. Further, the dataset also lacked scales that have been traditionally used in IPV literature such as the Gender Equitable Men (GEM) scale [130] and attitudes towards wife beating scale [42]. Sexual IPV was measured using a single question asking whether the respondent was forced to have sex within the 12 months before the survey. This question was not detailed enough to capture the range of sexual IPV experiences that AGYW may have faced. While our focus on newly married women (15-22 years) was a

strength, questions on IPV and norms could have been sensitive for adolescents, perhaps limiting their honest responses. Further, the study was conducted in two neighboring northern states in India that have similar socio-cultural contexts. This could have limited the heterogeneity of community-level gender norms within the sample, reducing the statistical power to understand the relationship between collective gender norms and IPV. Future longitudinal studies should collect data from more diverse socio-cultural contexts and from other community members including husbands and male members to study how restrictive gender norms predict IPV.

Policy implications

The results of this study point to future areas for investigation, particularly to disentangle pathways between different norms measures and types of IPV. Despite two decades of research on IPV, studying contextual risk factors that predict IPV remains challenging since IPV is a product of its social context. The endogeneity in the gender system makes it a complex topic to discern the impact of gender norms on IPV. The development of consistent scales and rigorous studies to understand contextual-level factors is a precursor to better understanding the interrelationships between community-level factors and all forms of gender-based discrimination and violence.

Few studies on gender norms have surveyed men and husbands in the community to measure norms. Some have used the Gender Equitable Men (GEM) scale, which captures men's attitudes towards gendered practices, including sexual and reproductive health, sexual relations, violence, domestic work, and homophobia [130]. This scale has been used in Sub-Saharan Africa to study IPV [131–133]. One study in Nepal validated and used the Partner Violence Norms Scale [134] to examine the association between gender norms and IPV. Most studies examining IPV using Demographic Health Surveys have created a social norms measure by using an additive score of attitudes towards wife beating. The scale measures acceptability of IPV using five questions regarding the conditions under which hitting or beating one's wife would be justifiable (wife going out without telling him, neglecting the children, arguing with him, refusing to have sex with him, and burning the food).

Despite the availability of these measures, measurement of gender norms remains challenging for several reasons. First, to our knowledge, there is no consensus-based scale for measuring gender norms; no standard exists for quantitatively measuring beliefs and attitudes across cultures and over time [135]. Rigorous quantitative data and measures are needed to estimate the influence of gender norms on health inequities but efforts to collect such data are at a nascent stage [112]. Second, the current measures only capture individual attitudes and perspectives on community norms without directly measuring what the target population believes are norms within the community (what others do). To accurately measure norms, it is necessary to precisely conceptualize norms and differentiate them from other social constructs like personal attitudes, intentions, and beliefs. Fishbein and Ajzen describe personal attitudes as “internally-motivated judgments that people make about something” [136]. Norms are not exclusive of attitudes as they can play a role in their formation but still differ in significant ways. For example, a personal attitude towards smoking might be ‘I do not like to smoke,’ while an injunctive social norm would be ‘My friends expect me to smoke.’ This difference is essential as there might be cases

where some people might personally believe something but behave differently due to normative injunctions [137].

Measurement of social and gender norms in public health research often relies on asking questions about behaviors and attitudes, which acts as substitutes for descriptive and injunctive norms [138]. Identifying this distinction is crucial to associate attitudes to specific health outcomes [138, 139]. With the exception of a few studies such as the Global Early Adolescence Study that captured descriptive and injunctive gender norms around intimate relationships, to our knowledge, most others do not incorporate the key theoretical constructs of social norms theory (the descriptive and injunctive norms) that have been shown to influence health behaviors [140, 141]. This limited focus on measurement could be because norms were considered too difficult to change and have been ignored in mainstream public health and global development discourse until the past two decades or so. More extensive studies on validated measures that capture descriptive and injunctive norms from both women and their husbands would make significant contributions to the literature. Further, we need longitudinal studies with multiple follow-up time points supplemented with qualitative studies. The latter should attempt to capture changing norms at the household-level from the husband-wife dyad to understand IPV from a life-course perspective.

Conclusion

Our study highlights the high prevalence of physical and sexual IPV among newly married women in Uttar Pradesh and Bihar and increases over time. We also found that the relationship between collective gender norms and IPV is different by type of IPV. More studies and validated scales to measure what the younger adult women and men believe are norms within the community (what others do) could help elucidate the relationship between gender norms and IPV. Married adolescent girls and young women (AGYW) are a vulnerable group who face high IPV early in their marriage. While improving scales and measures may take time, interventions should continue to focus on testing interdisciplinary approaches to reduce IPV, and potentially even eliminate them.

Figure 2: Socio-ecological model depicting the relationship between community collective gender norms and IPV

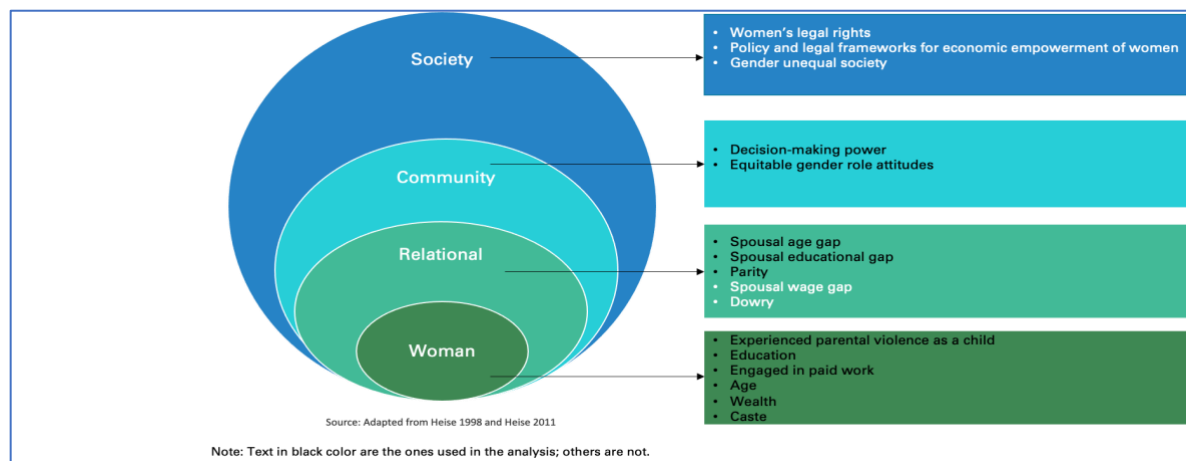


Figure 3: Directed Acyclic Graph (DAG) examining the relationship between collective gender norms at the community-level and IPV

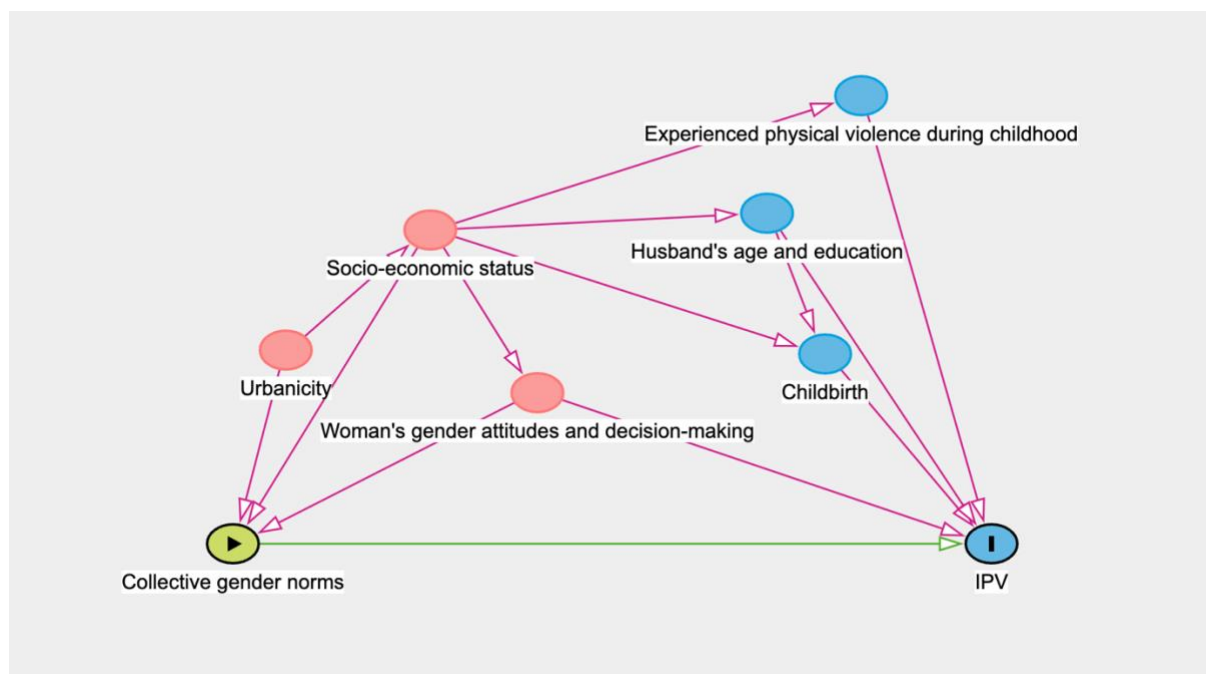


Table 2: Sociodemographic characteristics of married AGYW by ever experience of physical IPV and sexual IPV (n=3965)

	Any physical IPV by Wave 1					Any sexual IPV by Wave 1				
	No		Yes		Total	No		Yes		Total
Mean (and SD) age of women (years)	17.9 (1.05)		18.12 (1.00)			18.0 (1.03)		17.96 (1.06)		
Mean (and SD) time to onset of first violence (in months)			7.8 (8.86)					8.2 (9.50)		
	No.	%	No.	%	No.	No.	%	No.	%	No.
Belongs to marginalized caste					p< 0.001					p< 0.001
No	2,099	73.4	717	64.8	2,816	1,867	72.8	949	67.7	2,816
Yes	760	26.6	389	35.2	1,149	697	27.2	452	32.3	1,149
Experienced parental violence					p< 0.001					p< 0.001
Not physically hurt by parents	2,149	75.2	602	54.4	2,751	1,934	75.4	817	58.3	2,751
Physically hurt by parents	710	24.8	504	45.6	1,214	630	24.6	584	41.7	1,214
Education status					p< 0.001					p< 0.001
No formal education	699	24.4	389	35.2	1,088	646	25.2	442	31.5	1,088
Primary (1-8 years of schooling)	1,032	36.1	456	41.2	1,488	947	36.9	541	38.6	1,488
Secondary (9-12 years of schooling)	1,022	35.7	247	22.3	1,269	875	34.1	394	28.1	1,269
More than secondary (12+ years of schooling)	106	3.7	14	1.3	120	96	3.7	24	1.7	120
Wealth in quartile					p< 0.001					p< 0.001
Lowest	820	28.7	392	35.4	1,212	736	28.7	476	34.0	1,212
Second	850	29.7	373	33.7	1,223	775	30.2	448	32.0	1,223
Third	702	24.6	227	20.5	929	618	24.1	311	22.2	929
Highest	487	17.0	114	10.3	601	435	17.0	166	11.8	601
Recent paid work at Wave 1					p< 0.001					p= 0.026
No	2,584	90.4	953	86.2	3,537	2,308	90.0	1,229	87.7	3,537
Yes	275	9.6	153	13.8	428	256	10.0	172	12.3	428
Spousal education gap category					p= 0.022					p= 0.466
No gap in education	1,268	44.4	444	40.1	1,712	1,108	43.2	604	43.1	1,712
Husband has more education than wife	864	30.2	380	34.4	1,244	790	30.8	454	32.4	1,244
Wife has more education than husband	727	25.4	282	25.5	1,009	666	26.0	343	24.5	1,009
Children born by Wave 1					p< 0.001					p< 0.001
0	1,711	59.8	430	38.9	2,141	1,466	57.2	675	48.2	2,141
1	1,148	40.2	676	61.1	1,824	1,098	42.8	726	51.8	1,824
Residence					p = 0.343					p= 0.096
Urban	1,024	35.8	414	37.4	1,438	954	37.2	484	34.5	1,438
Rural	1,835	64.2	692	62.6	2,527	1,610	62.8	917	65.5	2,527

Table 3: Community-level collective gender norms variables at Wave 1 and Wave 2

		Wave 1				Wave 2			
Variable	n	Mean	SD	Min	Max	Mean	SD	Min	Max
Community-level mean decision making	3,959	2.32	0.752	0	5	2.55	0.73	0	5
Community-level mean gender attitudes	3,959	3.33	0.473	1	5	3.51	0.50	1	5

*Note: n=3959 because 6 PSUs have only 1 woman each and due to non-self-mean calculation, those PSUs/communities are dropped from the sample

Figure 4: Physical IPV intensity and recent sexual IPV by each wave

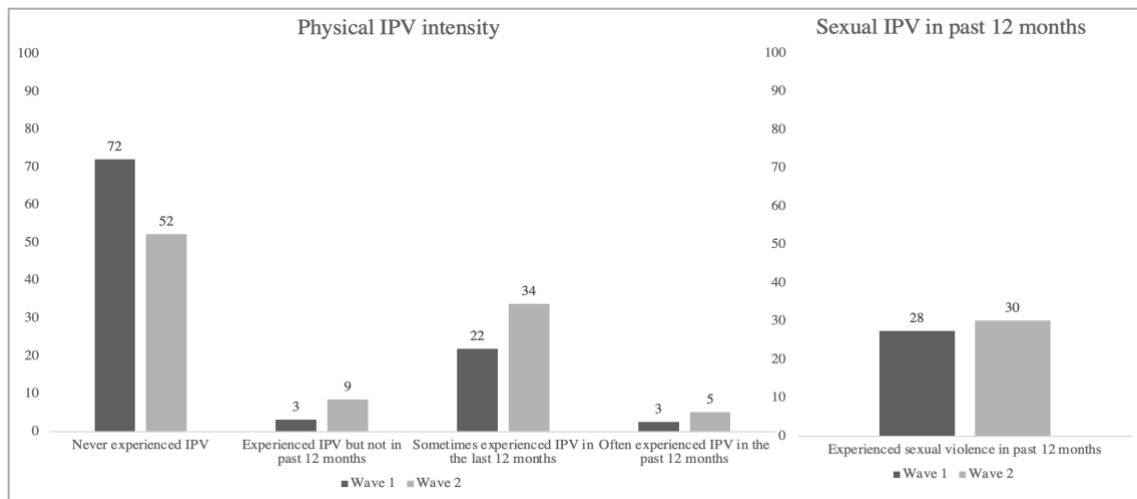


Table 4: Proportional odds ratios and robust 95% confidence intervals from mixed-effects ordinal logistic regression model for physical violence intensity among newly married AGYW (n=7,918)

Models of physical IPV intensity									
	Model 1			Model 2			Model 3		
	OR	95% CI	p-value	AOR	95% CI	p-value	AOR	95% CI	p-value
Community-level equitable gender attitudes	1.52	1.26, 1.82	<0.001	1.25	1.09, 1.44	0.002	1.26	1.10, 1.46	0.001
Community-level decision making power	1.03	0.93, 1.15	0.572	0.93	0.85, 1.03	0.177	0.93	0.84, 1.03	0.165
Akaike Information Criteria (AIC)	14776			14148			14041		

Note 1: Model 1 is the unadjusted model examining the collective gender norms and physical IPV intensity; Model 2 controlled for individual-level factors such as individual-level equitable gender attitudes, individual-level decision-making power, age of the adolescent at corresponding Wave, education at corresponding Wave, caste of the adolescent, whether respondent was physically hurt by her parents during childhood, wealth quartile at Wave 1, recent paid work at corresponding wave, urbanicity, state, and Wave 2 ; Model 3 additionally adjusted for relational factors including spousal age gap, spousal education gap, and an indicator variable for if ever child born to the adolescent.

Note 2: The table does not display the threshold parameters.

Note 3: AOR represents adjusted odds ratios.

Table 5: Odds ratios and robust 95% confidence intervals from mixed-effects binary logistic regression model for sexual IPV among newly married AGYW (n=7,918)

Models of sexual IPV									
	Model 1			Model 2			Model 3		
	OR	95% CI	p-value	AOR	95% CI	p-value	AOR	95% CI	p-value
Community-level equitable gender attitudes	1.00	0.84, 1.18	0.979	1.00	0.85, 1.18	1.000	1.00	0.85, 1.18	0.994
Community-level decision making power	1.02	0.91, 1.14	0.731	1.03	0.92, 1.15	0.608	1.03	0.92, 1.15	0.608
Akaike Information Criteria (AIC)	9334			9164			9167		

Note 1: Model 1 is the unadjusted model examining the collective gender norms and physical IPV intensity;

Model 2 controlled for individual-level factors such as individual-level equitable gender attitudes, individual-level decision-making power, age of the adolescent at corresponding Wave, education at corresponding Wave, caste of the adolescent, whether respondent was physically hurt by her parents during childhood, wealth quartile at Wave 1, recent paid work at corresponding wave, urbanicity, state, and Wave 2;

Model 3 additionally adjusted for relational factors including spousal age gap, spousal education gap, and an indicator variable for if ever child born to the adolescent.

Note 2: The table does not display the threshold parameters.

Table 6: Association between collective gender norms and physical IPV intensity moderated by Wave among newly married AGYW (n=7,918)

Models of physical IPV intensity									
	Model 1			Model 2			Model 3		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Community-level equitable gender attitudes at Wave 1	1.13	0.91, 1.39	0.268	1.16	0.94, 1.45	0.173	1.18	0.94, 1.48	0.166
Community-level equitable gender attitudes × Wave 2	1.03	0.79, 1.35	0.821	1.15	0.86, 1.53	0.355	1.15	0.85, 1.56	0.360
Community-level decision making power at Wave 1	0.82	0.71, 0.95	0.008	0.86	0.75, 0.99	0.035	0.88	0.76, 1.01	0.066
Community-level decision-making power × Wave 2	1.20	1.00, 1.43	0.048	1.21	1.02, 1.42	0.027	1.17	0.99, 1.39	0.066
Akaike Information Criteria (AIC)	14436			14051			13953		

Note 1: Model 1 is the unadjusted model examining the collective gender norms and physical IPV intensity with all exposures interacted by time (Wave 2); Model 2 controlled for individual-level factors such as individual-level equitable gender attitudes, individual-level decision-making power, age of the adolescent at corresponding Wave, education at corresponding Wave, caste of the adolescent, whether respondent was physically hurt by her parents during childhood, wealth quartile at Wave 1, recent paid work at corresponding wave, urbanicity, state with all covariates interacted by time (Wave 2); Model 3 additionally adjusted for relational factors including spousal age gap, spousal education gap, and an indicator variable for if ever child born to the adolescent (all variables interacted by time or Wave 2).

Note 2: The table omits the threshold parameters.

Table 7: Association between collective gender norms and sexual IPV moderated by Wave among newly married AGYW (n=7,918)

Models of sexual IPV									
	Model 1			Model 2			Model 3		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Community-level equitable gender attitudes at Wave 1	0.89	0.69, 1.14	0.369	0.898	0.69, 1.16	0.412	0.89	0.69, 1.16	0.408
Community-level equitable gender attitudes × Wave 2	1.13	0.80, 1.60	0.479	1.194	0.82, 1.72	0.344	1.19	0.82, 1.73	0.338
Community-level decision making power at Wave 1	0.99	0.85, 1.15	0.879	1.034	0.88, 1.20	0.665	1.03	0.88, 1.20	0.672
Community-level decision-making power × Wave 2	1.02	0.82, 1.26	0.877	1.027	0.83, 1.26	0.805	1.02	0.83, 1.26	0.815
Akaike Information Criteria (AIC)	9330			9126			9134		

Note 1: Model 1 is the unadjusted model examining the collective gender norms and physical IPV intensity with all exposures interacted by time (Wave 2); Model 2 controlled for individual-level factors such as individual-level equitable gender attitudes, individual-level decision-making power, age of the adolescent at corresponding Wave, education at corresponding Wave, caste of the adolescent, whether respondent was physically hurt by her parents during childhood, wealth quartile at Wave 1, recent paid work at corresponding wave, urbanicity, state with all covariates interacted by time (Wave 2); Model 3 additionally adjusted for relational factors including spousal age gap, spousal education gap, and an indicator variable for if ever child born to the adolescent (all variables interacted by time or Wave 2).

Note 2: The table omits the threshold parameters.

Table 8: Full set of results from the ordinal logistic regression model examining the relationship between collective gender norms and physical IPV intensity (n=7,918)

Models of physical IPV intensity									
	Model 1			Model2			Model3		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Community-level equitable gender attitudes	1.52	1.26, 1.82	0.000	1.25	1.09, 1.44	0.002	1.26	1.10, 1.46	0.001
Community-level decision making power	1.03	0.93, 1.15	0.572	0.93	0.85, 1.03	0.177	0.93	0.84, 1.03	0.165
Individual-level equitable gender attitudes				0.98	0.93, 1.03	0.350	0.99	0.94, 1.04	0.661
Individual-level decision making power				1.00	0.97, 1.04	0.845	1.00	0.96, 1.03	0.785
Age of the adolescent at the corresponding Wave				1.06	1.00, 1.12	0.044	1.01	0.95, 1.06	0.811
Education of the adolescent at the corresponding Wave				0.94	0.92, 0.95	0.000	0.93	0.91, 0.95	0.000
Caste of adolescent (Ref: General caste and Other Backwards Class)									
Adolescent belongs to marginalized caste (Scheduled Caste and Scheduled Tribe)				1.37	1.20, 1.57	0.000	1.38	1.21, 1.58	0.000
Physically hurt by parents in childhood				1.77	1.55, 2.03	0.000	1.79	1.56, 2.05	0.000
Wealth Quartiles (Ref: Lowest quartile)									
Low quartile				0.93	0.80, 1.08	0.330	0.95	0.81, 1.10	0.485
High quartile				0.73	0.60, 0.88	0.001	0.75	0.62, 0.92	0.005
Highest quartile				0.51	0.40, 0.64	0.000	0.56	0.44, 0.71	0.000
Recently done paid work				1.24	1.03, 1.50	0.024	1.30	1.07, 1.57	0.007
Bihar (Ref: UP)				1.18	1.00, 1.40	0.052	1.11	0.93, 1.31	0.252
Rural (Ref: Urbanicity)				0.81	0.68, 0.97	0.023	0.83	0.69, 0.99	0.039
Wave 2 (Ref: Wave 1)				2.24	1.84, 2.73	0.000	1.89	1.55, 2.30	0.000
Spousal education gap (Ref: Both have same education)									
Husband has more education than wife							1.01	0.87, 1.18	0.895
Wife has more education than husband							1.33	1.13, 1.56	0.001
Spousal age gap							0.98	0.95, 1.00	0.099
Ever given birth							2.12	1.80, 2.49	0.000

Community-level variance	1.22	1.11, 1.35		1.11	1.04, 1.18		1.10	1.03, 1.17	
AIC	14776			14148			14041		
Number of Observations	7918			7918			7918		

Table 9: Full set of results from the binary logistic regression examining the relationship between collective gender norms and sexual IPV (n=7,918)

Models of recent sexual IPV									
	Model 1			Model 2			Model 3		
	OR	95%CI	p-value	OR	95%CI	p-value	OR	95%CI	p-value
Community-level equitable gender attitudes	1.00	0.84,1.18	0.979	1.00	0.85,1.18	1.000	1.00	0.85,1.18	0.994
Community-level decision making power	1.02	0.91,1.14	0.731	1.03	0.92,1.15	0.608	1.03	0.92,1.15	0.608
Individual-level equitable gender attitudes				0.90	0.85,0.95	0.000	0.90	0.85,0.95	0.000
Individual-level decision making power				0.99	0.96,1.02	0.479	0.99	0.95,1.02	0.449
Age of the adolescent at the corresponding Wave				0.94	0.89,0.99	0.026	0.94	0.89,0.99	0.024
Education of the adolescent at the corresponding Wave				0.98	0.97,1.00	0.032	0.98	0.96,0.99	0.005
Caste of adolescent (Ref: General caste and Other Backwards Class)									
Adolescent belongs to marginalized caste (Scheduled Caste and Scheduled Tribe)				1.16	1.03,1.32	0.019	1.16	1.02,1.32	0.020
Physically hurt by parents in childhood				1.50	1.34,1.68	0.000	1.50	1.34,1.69	0.000
Wealth Quartiles (Ref: Lowest quartile)									
Low quartile				1.03	0.88,1.20	0.746	1.04	0.89,1.21	0.653
High quartile				0.97	0.81,1.16	0.749	0.99	0.82,1.19	0.901
Highest quartile				0.87	0.70,1.09	0.232	0.91	0.72,1.14	0.401
Recently done paid work				1.32	1.13,1.54	0.000	1.32	1.13,1.54	0.001
Bihar (Ref: UP)				1.73	1.44,2.08	0.000	1.71	1.42,2.06	0.000
Rural (Ref: Urbanicity)				1.03	0.86,1.23	0.759	1.04	0.87,1.25	0.636
Wave 2 (Ref: Wave 1)				1.37	1.10,1.71	0.005	1.35	1.09,1.68	0.006
Spousal education gap (Ref: Both have same education)									
Husband has more education than wife							0.96	0.84,1.10	0.559
Wife has more education than husband							1.13	0.98,1.31	0.094
Spousal age gap							1.00	0.98,1.02	0.967
Ever given birth							1.06	0.92,1.21	0.410
/									
Community-level variance	1.38	1.25,1.52		1.24	1.15,1.34		1.25	1.16,1.34	

Individual-level variance	1.14	0.96,1.36		1.06	0.89,1.27		1.06	0.89,1.27	
AIC	9334			9164			9167		
Number of Observations	7918			7918			7918		

Chapter 3: Marriage, motherhood, son preference, and empowerment of adolescent girls and young women: Evidence from a panel study in India

Background

Marriage is a determinant of the health and well-being of adolescent girls and young women (AGYW) aged 15-24 years and their children in low-and-middle income countries [142, 143]. In patrilocal societies such as India, the cultural practice in which women move from a natal household to their marital household puts them in a new unfamiliar social and household environment [30]. Women tend to lose ties with their natal kin and move to a household where they have subordinate status to both men and senior women of the household. Senior women, especially the mother-in-law, have control over household resources [48, 49, 78]. Further, getting married in adolescence is associated with interruption of schooling, early childbearing, loss of peer networks, fewer economic opportunities, and poor health including increased risk of sexually transmitted diseases and high maternal mortality [144]. The ability to pursue higher education, delay childbirth, or be employed depends on the wishes of husbands and in-laws, depriving newly married women of critical choices about their lives and well-being [145, 146].

The next transition that affects young women is childbearing, which often comes immediately after marriage in South Asia, especially among lower socio-economic strata [42]. About half of all pregnancies in India are unintended, with young women below 24 years having the highest rate of unintended pregnancies [42]. Evidence from India demonstrates that young married women often do not have decision-making power to use contraception [147] and lack sexual agency [148]. Early childbearing is detrimental to women and their children's nutritional status, healthcare utilization, and iron levels [149–151]. Evidence also suggests that early marriage and pregnancy can adversely impact women's education and employment later in life [152].

Intertwined with giving birth in South Asia is gender bias at birth. Son preference is one example of deep-rooted culture-specific gender norms that result in health inequities for girls and women. Women are subjected to extreme social pressure to bear a son and undergo repeated pregnancies until a son is born [9–11]. In patrilocal-patrilineal societies, sons are perceived to have greater economic, social, and religious utility compared to daughters because sons (or other male descendants) carry forward the family's name and legacy and inherit family assets, perform religious duties, and co-reside with their elderly parents caring for them during their old age [153]. A prior study that leveraged several rounds of India's Demographic Health Survey data suggested that mothers (15-49 years) who have a first-born daughter versus a son exhibit higher fertility, shorter birth spacing, and a greater risk of anemia with these outcomes worsening with successive daughters (female births) [154]. Yet, another panel study that followed women aged 15-49 years over six years found no differential impact of having sons compared to daughters on mother's status in the household measured using freedom of movement, household decision-making, access to bank account, and ownership of assets [155]. Overall, there is mixed empirical evidence on the differential impact of having sons on women's empowerment and status. Finally, no study to date from India has focused on studying son preference and empowerment measures among AGYW.

Life events such as marriage and childbirth may have an influence on empowerment as they shift household dynamics and change the life trajectory of women. However, prior empirical work examining the effects of marriage and childbirth on women's empowerment has been largely cross-sectional, with empowerment being assessed as a static measure. A limitation of this approach is that it does not acknowledge empowerment as a dynamic process in which prior and present life experiences may influence empowerment later. This study addressed these gaps by using a dataset that followed a panel of unmarried and married AGYW over a three-year period. We examined how marriage, childbearing, and specifically bearing a son affects changes in AGYW's empowerment in the early part of married life in India.

Women's empowerment

Women's empowerment is a multidimensional and complex construct. In this paper, we used Kabeer's definition of women's empowerment: "The expansion of people's ability to make strategic life choices in a context where this ability was previously denied to them" [156]. This definition also fits with the broader concept of empowerment as defined in the World Bank's empowerment sourcebook: "the expansion of choice and action to shape one's life" [157]. In both these definitions, the notion of empowerment stems from the state of disempowerment. Empowerment differs from related concepts of gender equality or women's autonomy through two distinct attributes. The first attribute is the explicit focus on the *processes of change* through which women can achieve greater equality or greater choice. The second attribute is *agency* that puts women as central actors in the process of change [156, 158]. This ability to exercise choice further helps women make second-order choices that may be consequential to their quality of life, health, nutrition, and overall well-being.

Theoretical framework

We draw upon Kabeer's seminal framework for women's empowerment that underscores women's choice as essential to their power in the household and family [156].

In Kabeer's framework, three interrelated components of empowerment determine women's choices as outlined in Figure 5. The first component is resources that enable women to develop a capacity to articulate their preferences. These include human resources such as educational attainment, life skills, self-efficacy; economic resources such as paid work, earnings, bank accounts, property ownership; and social resources such as access to peer networks, role models, and connections that allow women to improve their situation beyond what is possible alone. The second component of the framework is agency defined as "the ability to define one's goals and act upon them" [156]. Resources help women develop agency that comprises women's ability to make household decisions, freedom to move outside the house, reproductive and sexual decisions, bargaining power, and even cognitive processes such as reflection and analysis [156]. Factors such as education, employment, marriage, and childbearing can enhance or deny women's agency [156]. The third component is achievements that are outcomes achieved through increased access to enabling resources and enhanced agency. Given the interrelatedness of these three components, achievements of a particular moment can be transformed into enhanced resources and agency for a later time, improving women's capacity to make choices in the future [156]. In summary, women's empowerment is a dynamic process, in which women

acquire human, social, and economic resources that enable women to gain agency to achieve their desired outcomes or aspirations.

Women's empowerment is not unitary, it has many broad dimensions in women's lives including economic, socio-cultural, political, legal, and psychological empowerment [158]. Based on the measures available in our data, we used economic and socio-cultural empowerment measures in our study across two time points to examine empowerment as a dynamic process. We operationalized economic empowerment using indicators such as bank account ownership, having savings in the bank accounts, and ability to operate bank accounts. In our framework, economic empowerment indicators relate to enabling resources. For socio-cultural empowerment, we relied on two measures of women's empowerment that have been extensively used in the literature —women's participation in household decision-making and freedom of movement [159].

Extensive global evidence, including from South Asia, suggests that women's empowerment is associated with delayed initiation of childbearing, lower total fertility, greater birth spacing, higher contraceptive usage among women, and increased access to maternal health care [159–162], however, little is known about how marriage and fertility shape adolescent girls' and young women's (AGYW) empowerment. Examining how women's empowerment is linked with maternal and child health outcomes has been of interest to researchers trying to improve gender equality and women's health. We argue that studying women's empowerment should be an end goal because it impacts women's longer-term status and life opportunities.

Research on marriage and fertility in the South Asian context has been somewhat narrow in scope due to the paucity of panel data that longitudinally follow AGYW over time to examine the transitions in empowerment associated with life events. In a setting like India, the median age at first marriage is 19 years among women aged 20–49 years. 27% of women aged 20–24 years had a "child marriage," i.e., married before they were 18 years old [42]. Childbearing often begins soon after marriage—about 60% of women under 25 were pregnant within the first year of marriage. Women in India spend most of their lifetime in the institution of marriage [42]. It is essential to study the trajectory of AGYW empowerment through their life course especially as they transition into marriage and start their reproductive journey. Given that childbearing occurs mostly early in marriage, its impact on women's empowerment may set the stage for the rest of their life in their marital household.

We used a panel dataset that followed unmarried and married AGYW, allowing us to examine how marriage and childbearing shape AGYW's empowerment in the early part of their married life. Using Kabeer's framework, empowerment was examined as a dynamic process over AGYW's life course by studying the immediate changes to empowerment resulting from marriage and attaining motherhood status. Further, given the prevalence of son preference in the Indian context, we also studied whether having sons conferred additional advantages to AGYW's (i.e., mother's) empowerment compared to having only daughters.

Context of study states

Uttar Pradesh (UP) and Bihar are northern states belonging to India's Indo-Gangetic plain region. They are two of the most populous states of India, which together account for about a quarter of the Indian population [115]. UP and Bihar are characterized by a large rural² population, with just 22 percent and 11 percent of the population residing in urban areas, respectively [115]. Adolescents (ages 10-19 years) account for 23 percent of the population of Bihar and 24 percent of the population of UP. These two states also account for nearly 28 percent of adolescents in India [115]. Their performance on social indicators is comparatively poor and lags national averages. Both male and female life expectancy are lower than the national average, with female life expectancy being 65.4 years in UP and 68.4 years in Bihar, compared with 69.6 years in India [115]. Compared to UP and the national average, Bihar has a high prevalence of early marriage. Forty-one percent of women aged 20-24 years reported marriage before the legal age of 18 in Bihar compared to only 16 percent in UP against 23.3 percent in India [163]. Compared to India's total fertility rate (2.0), defined as the expected number of births per woman, both states have higher fertility rates, with women in Bihar having an average of three children each and women in UP having an average of 2.4 children each [163]. In terms of sex ratio at birth, measured as the number of female births for every 1000 male births, Bihar and UP had a sex ratio of 908 and 941, respectively compared to India's sex ratio of 929 [163].

Research Aims

The focus of this paper is on the following research questions and corresponding hypotheses:

- (1) Is marriage associated with a change in empowerment of AGYW? Further, does the relationship between marriage and empowerment depend on the wealth of the household (defined as above median wealth versus below) and whether the household arrangement is patrilocal (co-residence with in-laws)? Is being married into a wealthier household (defined as more than median wealth) associated with a greater change in empowerment among AGYW than being married into a less wealthy household? Is marriage into a patrilocal household (co-residence with in-laws) associated with a greater change in empowerment for AGYW compared to marriage into a household without in-laws?

Hypothesis 1A: Getting married will be associated with a decrease in empowerment (freedom of movement, decision-making power, and access to economic resources) of AGYW

Hypothesis 1B: AGYW married into a wealthier household will have a smaller decrease in empowerment compared to AGYW married into a less wealthy household.

Hypothesis 1C: Given the prior evidence on patrilocal marriages (co-residence with in-laws), AGYW married into a living arrangement of co-residence in-laws will have a greater decrease in empowerment compared to AGYW married into a living arrangement without in-laws.

- (2) Is motherhood associated with a change in empowerment of married AGYW?

² Rural area is defined as a place with population density less than 400 per square-kilometre or a place with population lower than 5000 or a place where more than 75% male work in agricultural pursuits [Census 2011].

Hypothesis 2: Considering the importance of women's fertility in the Indian context, we hypothesized that transitioning to motherhood will lead to a greater increase in empowerment across all dimensions.

(3) Is having a son associated with a greater change in empowerment among married AGYW compared to having daughters only?

Hypothesis 3: Given the long-standing social norms around son preference in the Indian context, we hypothesized that AGYW who have had at least one son will have a greater increase in empowerment compared to those AGYW who only have daughters.

Methods

Data

We used a prospective longitudinal cohort dataset of adolescents from Population Council's UDAYA (Understanding Lives of Adolescents and Young Adults) study, which was conducted in two large northern states—Bihar and Uttar Pradesh (UP)—in India [29]. Two waves of panel data were collected: Wave 1 in 2015-16 and Wave 2 in 2018-19. Wave 1 surveyed 20,594 unmarried boys and girls aged 10-19 and married girls aged 15-19 from a state-representative random sample of 300 urban and rural primary sampling units (PSUs)—villages in rural areas and census wards in urban areas. To answer our study questions, we used a sample of unmarried and married AGYW (15-19 years) at Wave 1 and those followed up at Wave 2 when they turned 18-22 years. Of the 7,776 unmarried AGYW (15-19 years) interviewed in Wave 1, the team re-interviewed 6,168 AGYW (18-22 years) in Wave 2 with a re-contact rate of 79%. Of the 5,206 married AGYW (15-19 years) interviewed in Wave 1, the team re-interviewed 4,257 AGYW (18-22 years) in Wave 2 with a re-contact rate of 82%. The re-contact rates of 79% and 82% in both these samples meet the criteria of minimum acceptable re-contact in longitudinal studies [164].

The UDAYA study was a multi-topic survey that covered different modules related to demographics, economic activity, household work and migration, mass media and social media exposure, social and peer environment, aspirations, gender role attitudes, awareness of sexual and reproductive health matters, romantic and sexual relationships, transitions to marriage and parenthood, health and health-seeking behavior, dietary habits and nutrition, and community life. The UDAYA study also covered several domains of empowerment measures, including decision-making, freedom of movement, and access to economic resources. Household surveys collected information about dwelling characteristics, household assets, and household demographics. The study received ethical approval from the Institutional Review Boards of Population Council USA and Centre for Media Studies, India. Since we used de-identified data publicly available from the Harvard Dataverse website, we were exempt from seeking ethical approvals.

Our analytical sample was restricted to the panel of AGYW who were unmarried at Wave 1 and followed up at Wave 2 to answer the first research question. Given that we are interested in understanding the relationship between transition to marriage and empowerment, we dropped adolescent girls who were married but had separated or divorced between Wave 1 and Wave 2 (n=27). We recoded the adolescent girls who were married as unmarried if they were married but

had not had *gauna*³ (effectively had not moved to their husbands' home to start a marital life) (n=26). Since we were interested in heterogeneity by wealth at the marital household, we dropped observations where the household details on assets to calculate wealth index were not collected in the second wave (n=76). Our final analytical sample for this question used a balanced panel of 12,130 observations (6,065 observations in each wave).

We used the sample of married adolescents who were re-contacted again to answer the second and third research questions. Of the 4,257 girls surveyed at Wave 1, 257 adolescent girls had still not performed *gauna*. Of the 4,000 adolescent girls who were married and cohabiting with their husbands at Wave 1, 35 were divorced or separated by Wave 2. We dropped observations where the household details were not collected at the second wave (n=24). Hence, we have a sample of 3,941 adolescent girls who were already married in 2015-16, still married in 2018-19, and cohabiting with their husbands at both waves. Our paper uses a balanced panel of 7,882 observations (3,941 observations from each wave). We had comparable measures for AGYW across the two waves, including repeated empowerment measures: decision-making, freedom of movement, and access to economic resources.

Variable definitions and operationalization

Dependent variables:

We used three measures to capture different dimensions of AGYW's empowerment: (i) freedom of movement (or mobility), (ii) decision-making power, both of which reflect AGYW's agency, and (iii) access to economic resources, which captures AGYW's access to enabling resources (Figure 1). The three main dependent variables of empowerment are further detailed below:

- (1) Freedom of movement or mobility: The survey collected information on whether and how the AGYW travelled to three types of places: (i) a shop or market or a friend/relative's place *inside* their village/ward, (ii) a shop or market or a friend/relative's place *outside* their village/ward, and (iii) to attend any program (health event, girls meeting, sports event) in their village/ward. For each of these questions, we assigned a score of 2 if girls were allowed to go alone, 1 if they were allowed to go but only with a companion, and 0 if they were not allowed to go out at all. Responses were summed to create a scale (0 to 6) with higher responses indicating a higher amount of freedom in mobility.
- (2) Decision-making power: AGYW were asked who mainly decides about: (i) how much education the respondent should have, (ii) making major household purchases, and (iii) whether the respondent should work or stay at home. For each of these variables, we assigned a score of 2 if the respondent reported making decisions solely, 1 if the respondent takes decisions jointly with others and 0 if the respondent reported having no say in making decisions. Items were summed to form a scale (0 to 6) with higher scores indicating greater decision-making ability of the respondent.

³ Gauna is a custom in northern India and the ceremony associated with the consummation of marriage often associated with early marriage of girls. Marriage is considered as a ritual union with conjugal life beginning after gauna. Until gauna is performed, married girls stay in their natal home.

- (3) Access to economic resources: Three survey questions were included on whether girls had their own bank account (*yes=1, no=0*), whether they operated their own account (*yes=1, no=0*), and whether they had savings in their bank accounts (*yes=1, no=0*). Responses were summed to create a scale (0 to 3) with higher responses indicating a greater access to economic resources.

Independent variables:

- (1) Marriage: An indicator variable for whether the adolescent girl is married or unmarried as captured by the question to ascertain the adolescent's marital status (AGYW who were unmarried at wave 1).
- (2) Motherhood: An indicator variable for whether the adolescent has experienced a live childbirth (AGYW who were married at wave 1).
- (3) Having a son: A categorical variable to indicate whether the AGYW has had daughters only, at least one son, or no children (reference category). This variable was used for the AGYW who were married at wave 1.

Covariates

Sociodemographic covariates that may be related to marriage, fertility, and empowerment were selected *a priori* based on prior literature to ensure that sociodemographic variables are not confounding the explanations for primary hypotheses. Past literature suggests that girls' education is associated with an increase in their empowerment, status, and intra-household bargaining power [155, 165]. Following Jensen's panel study which found that the introduction of satellite television was significantly associated with an increase in women's household decision-making and a decrease in her son preference, we included exposure to mass media as one of the controls [166]. The role of household-level factors such as a household wealth index, the presence of in-laws in the marital household, and family type (nuclear versus joint household) have also been associated with women's empowerment [7, 21, 33, 167].

To understand the association between the transition to marriage and changes in empowerment, we controlled for time-varying covariates such as girls' education (as a continuous score) and exposure to mass media (television, radio, and newspaper). We also controlled for whether those who were married by the second wave had already *borne a child* to disentangle the independent effects of being married on changes in empowerment. To study the heterogeneous effects of the association between marriage and changes in empowerment, we included two effect modifiers – household wealth and co-residence with in-laws. Household wealth in the marital household is a characteristic that could moderate the association between marriage and AGYW's empowerment. Using standard questions on a household's ownership of consumer items such as a television, scooter and other assets, dwelling characteristics such as flooring material, type of drinking water source, toilet facilities, and other characteristics, a household wealth index was computed using principal components analysis. Among those married, the wealth index was recoded into a binary variable with 1 being married into a household with greater wealth (*higher than median household wealth*) and 0 being married into a household with lower wealth (*lower than median household wealth*). The second effect modifier, *co-residence with in-laws*, was only

asked in the second wave of the UDAYA data. AGYW who were married into a household with in-laws were coded as 1, and 0 otherwise. Both the wealth and co-residence variables were coded as 0 in wave 1 for all AGYW and as 0 in wave 2 for AGYW who remained unmarried, so their coefficients can be interpreted as interactions with marital status. Finally, we also controlled for survey wave (Wave 2) because of the possibility of secular trends in empowerment over time.

To evaluate the hypotheses on whether motherhood and son preference is associated with change in empowerment, we controlled for four time-varying covariates including girls' education (as a continuous score), wealth index (as a continuous score), exposure to mass media (television, radio, and newspaper), household size as a proxy for household composition, and survey wave for secular trends.

Analysis

Through its panel study design, the UDAYA survey allows the opportunity to systematically examine changes in empowerment within the same individuals across time. In this paper, we use fixed effects modeling, specifically using the within-individual variation across the two survey waves, to examine how changes in an AGYW's marital status and motherhood status are associated with changes in their empowerment. A key strength of this approach is the ability to control for unobserved confounders at the individual level that do not change over time, removing much of the omitted variable bias. In our analyses, the "marriage effect" can be interpreted as the effect of marriage on changes in AGYW empowerment over time. Similarly, the "motherhood effect" can be interpreted as the effect of becoming a mother on changes in AGYW empowerment over time and the "mother of son effect" can be interpreted as the effect of bearing a son compared to having daughters only or no children on changes in AGYW empowerment over time.

As a first step in our analyses, we generated descriptive statistics for all variables of interest, by wave of data collection, that allowed us to explore the characteristics of 15-19 year-old unmarried AGYW and married AGYW at both waves.

For the first question, we used individual fixed-effects regressions to capture how a change in marital status from being unmarried to married is associated with changes in the empowerment domains mentioned previously. Since all the dependent variables are continuous, we use a linear fixed-effects model on a balanced panel to analyze the association between marital status and empowerment over time using the specification below:

$$Y_{it} = \beta_1 + \beta_2 X_{it} + \beta_3 X_{it} \times W_{it} + \beta_4 X_{it} \times I_{it} + \beta_5 Z_{it} + \theta_t + \alpha_i + \varepsilon_{it}$$

Here Y_{it} represents one of the three dependent variables including intrahousehold decision-making power, freedom of movement, and access to economic resources of adolescent i at time t (*all AGYW were unmarried at $t = 1$*) for three separate regression models;

X_{it} represents the marital status of AGYW i at time t (*all AGYW were unmarried at $t = 1$*) for those married into a less wealthy household or a household without in-laws;

$X_{it} \times W_{it}$ takes the value 1 if AGYW gets married into a wealthier household at the second wave ($t = 2$) and 0 otherwise (i.e., wave $t = 1$, unmarried at wave $t = 2$, or married into less wealthy

household at wave $t=2$) for an adolescent i and represents the interaction term between marriage and wealth;

$X_{it} \times I_{it}$ takes the value 1 if AGYW gets married into a household with in-laws at the second wave ($t = 2$) and 0 otherwise (i.e., wave $t=1$, unmarried at wave $t=2$, or married into less wealthy household at wave $t=2$) for an AGYW i and represents the interaction term between marriage and co-residence with in-laws;

$\mathbf{Z}_{it}$ is a vector of time-varying AGYW-level characteristics such as educational attainment and mass-media exposure;

θ_t is a fixed effect for time (operationalized via a dummy variable for the second wave);

α_i is a fixed subject-specific effect for AGYW i ;

ε_{it} is a random error term that follows a normal distribution with mean 0 and constant variance.

We also used the *lincom* command to calculate the effect of marriage on empowerment domains for both the interaction terms including those co-residing with in-laws compared to not co-residing with their in-laws and those married into less wealthy households compared to those married into wealthier households.

To estimate the association between the transition to motherhood and changes in empowerment, we ran similar individual linear fixed-effects regressions on the sample of married AGYW for each of the domains of empowerment over time listed previously using the specification below:

$$Y_{it} = \beta_1 + \beta_2 X_{it} + \beta_4 \mathbf{Z}_{it} + \theta_t + \alpha_i + \varepsilon_{it}$$

where the dependent variable Y_{it} represents intrahousehold decision-making power, freedom of movement, or access to economic resources for three separate regression models of AGYW i at time t of married AGYW i at time t (*all AGYW were married at $t = 1$*);

X_{it} takes the value 1 if AGYW has ever experienced a live childbirth for an adolescent i at time t , and 0 otherwise;

$\mathbf{Z}_{it}$ is a vector of time-varying controls that includes educational attainment, mass media exposure, wealth index, and household size;

θ_t is a fixed effect for time (operationalized via a dummy variable for the second wave) and takes the value 1 if $t = 2$ and 0 otherwise;

α_i is a fixed subject-specific effect for adolescent i ;

ε_{it} is a random error term that follows a normal distribution with mean 0 and constant variance.

Finally, we examined the association between having at least one son and change in empowerment by comparing married AGYW who had a son (with or without daughters) with those who had daughters only or no children. We estimate the parameter of interest using an individual panel fixed-effect regression. For this, we use the following specification:

$$Y_{it} = \beta_1 + \beta_2 D_{it} + \beta_3 S_{it} + \beta_4 \cdot \mathbf{Z}_{it} + \theta_t + \alpha_i + \varepsilon_{it}$$

where again our dependent variable Y_{it} represents intrahousehold decision-making power, freedom of movement, or access to economic resources of adolescent i at time t for each specific regression model;

D_{it} is an indicator variable that takes the value 1 if AGYW only had daughters, and 0 otherwise (at wave $t=1$ and if AGYW had no children or at least one son at wave $t=2$) for a given AGYW i at time t ;

S_{it} is an indicator variable that takes the value 1 if AGYW had at least one son, and 0 otherwise (at wave $t=1$ and if AGYW had no children or daughters only at wave $t=2$) for a given adolescent i at time t ;

Z_{it} is a vector of time-varying controls that includes educational attainment, mass media exposure, wealth index, and household size as discussed earlier;

θ_t is a fixed effect for time (operationalized via a dummy variable for the second wave) and takes the value 1 if $t = 2$ and 0 otherwise;

α_i is a fixed subject-specific effect for AGYW i ;

ε_{it} is a random error term that follows a normal distribution with mean 0 and constant variance.

After estimating the model, we used the *lincom* command in Stata to estimate the additional effect of having had a son compared to having only daughters on empowerment of AGYW. The additional effect is given by the difference ($\hat{\beta}$) between the coefficients of S_{it} and D_{it} .

Across all the models, we set the level of statistical significance (Wald p-value) at 0.05. Robust standard errors were used to relax assumptions of constant variance and constant within-subject residual correlations. All data were analyzed using Stata Version 15.1 [121].

Results

Characteristics of the sample

Table 10 (the first column) shows the demographic characteristics of unmarried AGYW ($n=6,065$) at Wave 1 across both states. At Wave 1, on average, unmarried AGYW were 16 years old. Approximately 6% of AGYW never received formal education, a little over half (55.9%) of AGYW completed some level of secondary education, and 32% of the AGYW completed some primary education. Less than one in five adolescent girls (18%) reported having undertaken paid work in the 12 months preceding the survey. Over half (55%) the girls lived in rural settings. A majority (72.9%) of adolescent girls reported being exposed to mass media, including radio, TV, and newspapers, at least once a month. One in five AGYW (21%) reported ever having received sexual and reproductive health information. Of the 6,065 unmarried girls, 24.4% ($n=1482$) got married in the interval between Wave 1 and Wave 2.

The second column of *Table 10* describes the demographics of married AGYW at Wave 1 ($n=3941$). At Wave 1, the average age of married AGYW is 18 years. Unlike the cohort of unmarried AGYW, a little over a quarter (27%) of the married AGYW did not receive any formal education, 37.6% completed some primary education and about a third (32.1%) completed some secondary education. Only one in ten AGYW (10.7%) reported doing paid work recently in the 12 months preceding the survey. Sixty-three percent of married AGYW lived in rural settings. Less than half (48.8%) of married AGYW girls reported being exposed to mass media, including radio, TV, and newspapers, at least once a month. One in ten AGYW (10.9%) reported ever having received sexual and reproductive health information. Of the 3,941 married AGYW, 46% had begun childbearing by the first Wave of the survey.

Below we summarize the regression results.

Association between marital status and empowerment domains

Table 11 presents the coefficients from the individual panel linear fixed effects regression. We examined the association between the transition to marriage among unmarried AGYW on domains of empowerment, including freedom of movement, decision-making, and access to economic resources. Controlling for having a childbirth by wave 2, girls' education, exposure to mass media, and time, we found that being married is associated with a reduction in mobility of AGYW ($\hat{\beta} = -0.45$, 95%CI= -0.63, -0.27, $p < 0.001$) for women not marrying into a wealthier household and not co-residing with in-laws. We did not find evidence that the effect of marriage depends on the wealth of the household. However, co-residence with in-laws was a significant effect modifier of the relationship between marriage and freedom of movement ($\hat{\beta} = -0.87$, 95%CI= -1.06, -0.69, $p < 0.001$) holding other covariates constant. Specifically, AGYW who marry into a household with in-laws had a more pronounced decrease in freedom of movement compared to AGYW who married and did not co-reside with their in-laws ($\hat{\beta} = -1.13$, 95%CI= -1.47, -1.20, $p < 0.001$).

On average being married was associated with greater decision-making power ($\hat{\beta} = 0.29$, 95%CI: 0.10, 0.47, $p = 0.002$) for AGYW who did not move into a wealthier household and did not move in with their in-laws, holding all else constant. Household wealth did not modify the association between marriage and decision-making but marrying into a household with in-laws is an effect modifier in the relationship between marriage and decision-making power ($\hat{\beta} = -0.39$, 95%CI: -0.57, -0.21, $p = 0.002$). Specifically, we did not observe a statistically significant association between marriage and decision-making power among AGYW who marry into a household with in-laws compared to AGYW who were married without co-residence with in-laws ($\hat{\beta} = -0.10$, 95%CI: -0.25, 0.04, $p = 0.174$).

We also found that on average, there was a positive association between marriage and increased access to economic resources ($\hat{\beta} = 0.37$, 95%CI= 0.23, 0.51, $p < 0.000$) for AGYW who did not move into a wealthier household and did not move in with their in-laws, after adjusting for time-varying covariates in the model. Surprisingly, we observed household wealth does modify the relationship between marriage and access to economic resources. Compared to AGYW marrying into a less wealthy household, AGYW marrying into a wealthier household was not associated with a change in access to economic resources ($\hat{\beta} = -0.02$, 95%CI= -0.14, 0.08, $p = 0.604$). We did not find that the association between marriage and access to economic resources varied by living arrangement (co-residence with in-laws).

Association between motherhood status and empowerment domains

Table 12 depicts the results from individual fixed effects regressions examining the association of motherhood status and empowerment domains among the panel of married AGYW. Controlling for girls' education, household size, wealth index, exposure to mass media, and time (wave), becoming a mother is associated with an increase in mobility of AGYW ($\hat{\beta} = 0.12$, 95%CI= 0.02, 0.23, $p = 0.023$). We did not find a positive association between motherhood and

intrahousehold decision-making power of AGYW ($\hat{\beta} = 0.09$, 95%CI= -0.00, 0.19, $p=0.058$) controlling for other variables and time (wave) in the model. Further, becoming a mother was also positively correlated with higher access to economic resources ($\hat{\beta} = 0.24$, 95%CI = 0.16, 0.32, $p < 0.001$) holding other variables constant.

Estimating the role of having sons on AGYW empowerment

Based on the models below in *Table 13*, holding all controls and time constant, we find evidence that having daughters only (compared with no children) is positively associated with access to economic resources. Similarly, having at least one son (compared with no children) is associated with greater freedom of movement and greater access to economic resources of AGYW. However, there is no evidence of an additional effect of having a son over and above the effect of having daughters. In other words, there is no differential change in empowerment between AGYW who have borne at least one son compared to having only daughters.

Discussion

To our knowledge, this is the first panel study of adolescents and young women (AGYW) from India to explore the changes in their social and economic empowerment associated with critical life events such as marriage, motherhood, and son preference. By leveraging data from unmarried and married AGYW across two time points, we examined empowerment as a dynamic process, overcoming a limitation of prior cross-sectional studies that examine empowerment as a static measure. Drawing on Kabeer's seminal framework, we examined how marriage and motherhood are associated with measures of AGYW's agency and enabling resources. Specifically, we tested whether marrying into a patrilocal household (i.e., co-residence with in-laws) and marrying into a household with greater than median wealth moderates the association between marriage and empowerment. Finally, we examined the effects of motherhood on empowerment and studied the effects of becoming a mother of a son over having only daughters (or no daughters) using the married AGYW dataset.

As hypothesized, our results showed that on average, marriage was associated with lower freedom of movement among AGYW controlling for covariates and time. We also found that married AGYW co-residing with their in-laws had a much lower freedom of movement compared to AGYW who do not co-reside with their in-laws. These results are consistent with prior evidence from India suggesting that co-residence with the mother-in-law was negatively associated with the daughter-in-law's mobility [168, 169] and ability to form social connections [33]. Living with in-laws means more hierarchy within the household that tends to decrease the empowerment of the youngest daughters-in-law [33, 145, 170]. Newly married women (daughters-in-law) often have the lowest status in the household compared to men and other senior women in the household especially during the early period of their marriage [48, 49]. For instance, daughters-in-law are often expected to follow gendered norms of eating last in the household and are socially isolated from their peer networks [33, 50, 144]. Recent evidence from India has found that the negative influence of mother-in-law on freedom of movement of their daughters-in-law could be a result of misalignment between the expectations of fertility and use of family planning methods between the mother-in-law and daughter-in-law [33].

Apprehensions about the use of contraception, influence of outside peers on daughters-in-law, and fear of losing authority can potentially explain the negative effects on mobility of daughters-in-law [33].

Contrary to our hypothesis, we did not find that household wealth moderated the association between marriage and freedom of movement. Marrying into a household with greater wealth was not associated with higher freedom of movement among AGYW. This could be because in North India, married women's freedom of movement is a function of household hierarchy and cultural norms surrounding loss of honor for the family and husband that restrict women's movement outside the household [7, 19, 171]. Further, women's freedom of movement has been shown to be negatively correlated with their economic class; women from poorer households have greater freedom of movement because of the economic need to go outside the household for paid work and so they cannot adhere to norms [172, 173].

We found that marriage was associated with greater decision-making power for AGYW who did not co-reside with the in-laws. However, we did not observe a statistically significant association between marriage and decision-making power among those who co-resided with their in-laws compared to those who did not co-reside with their in-laws. This finding contradicts results from an Indian cross-sectional study that noted that compared to women married into nuclear families, women ages 15-49 years married in extended family households living with in-laws had lower decision-making power [145, 168, 169].

Contrary to our hypothesis, we also found that marriage into below-median wealth households was associated with higher access to economic resources of AGYW measured in terms of bank account ownership, operating their own accounts, and having savings in the bank, for AGYW. This result was surprising and may indicate that younger women's access to economic resources maybe increasing in part due to the expansion of banking services across India [174] and conditional cash transfer programs that transfer money into adolescent girls' accounts based on conditionalities such as enrollment and retention in school [175] and programs such as *Sukanya Samridhi Yojana (Girl Welfare Scheme)* focused on improving the financial security of girls. More research on understanding how marriage may expand women's access to economic resources is needed.

Another unexpected finding was that access to economic resources did not change after marriage among AGYW married into wealthier households compared to AGYW married into less wealthy households. A plausible explanation for this could be that because women in upper economic strata are not encouraged to work outside the household and face stricter cultural restrictions on their movement, they have a reduced ability to go outside to operate bank accounts or deposit savings into their accounts [171, 172].

As hypothesized, we found that motherhood was positively correlated with greater freedom of movement, marginally higher intrahousehold decision-making power, and better access to economic resources. Our results are consistent with prior evidence from another panel study from India that found that motherhood was associated with increased freedom of movement and gaining access to a bank account [155]. Another study using retrospective data from a northern state in India also demonstrated that women in childbearing stages had higher agency and less

fear of spousal violence than those who had not yet started childbearing [176]. Our results of increased empowerment among young mothers are not entirely surprising because women's status is inherently tied to their fertility. However, this increase in women's empowerment may come at the expense of in-laws' pressures to bear children immediately after marriage, potentially reflecting the limited ability of women to control their fertility [35]. In an ethnographic study of young Nepali women, some young women reported feeling uncomfortable asserting their agency out of a desire to conform to being a "good woman and daughter-in-law" [177]. Such forms of "strategizing" by women in the 'classic patriarchal belt' (from North Africa and Middle East to South Asia) has been given the term "patriarchal bargain", in which young brides accept "hardship" as a tradeoff to gain economic security through their spouse [78]. Our results also complement the research carried out in other contexts where women's value is linked to their fertility such as the Middle East [178]. In addition to the norms surrounding fertility, childbearing brings with it practices surrounding childcare that might offer the women opportunities to step outside their homes, seek healthcare for their children, and make decisions within the household. One interpretation for increased access to economic resources could also be because of the expansion of banking services as previously highlighted. Further, conditional cash transfer programs in India targeted at pregnant women to increase institutional births might have expanded women's access to bank accounts and savings [179].

Contrary to our hypothesis, we did not find statistically significant evidence that having at least one son compared to having daughters only (or no daughters) conferred additional changes in girls' freedom of movement, intrahousehold decision-making power, and access to economic resources. Overall, these findings are consistent with another study that examined motherhood effects on a panel of Indian women (15-49 years) that did not find that motherhood effects on empowerment measures were different by sex of child [155]. However, our results deviated from two cross-sectional studies in which authors found that having more sons was associated with greater autonomy among women in Uttar Pradesh, India [7] and having a male first birth was associated with clean cooking fuels that authors assert could be due to greater intrahousehold bargaining power of women or elevated social status for women in urban India [180]. One plausible explanation for non-differential changes in AGYW's empowerment by sex composition could be progressive gender policies and national girl child focused programs such as *Beti Bachao Beti Padhao* (Save and Educate the Girl Child) that have been found to improve sex ratio at birth in one of the Indian states with the worst sex ratio at birth [181, 182]. Further, there has been an improvement in sex ratio at birth in both the study states (Bihar and UP), potentially reflecting a broader societal change in attitudes towards girl children [42]. Finally, since the participants in our study are young and may continue childbearing, more rounds of data collection in the future may allow us to continue examining differential effects on the trajectory of empowerment by sex composition of children.

Despite making some significant contributions to the literature, we acknowledge that our study has some limitations. First, we studied only two northern states in India which are similar in social and cultural norms surrounding women's status and role in the society and thus our results are not generalizable to other regions of India. Second, the data were collected in two waves in 2015-16 and 2018-19. This three-year duration between the two waves could possibly be insufficient to capture the longer-term effects of marriage and childbearing on domains of empowerment including mobility, intrahousehold decision-making, and access to economic

resources from a lifecourse perspective. While we were able to study immediate changes in empowerment following marriage and childbirth, we were not able to study lifetime influences on the process of empowerment. Further, the empowerment measures we used capture only the economic and socio-cultural dimensions of empowerment and do not capture other dimensions of empowerment such as political, legal, and psychological empowerment. Given the multidimensional nature of empowerment, empowerment in one domain may not necessarily translate into empowerment in other domains [158, 183, 184]. The analysis was also limited in its ability to unpack the mechanisms through which marriage and childbirth are associated with changes in empowerment over time.

Our study has many strengths worth noting. To our knowledge, this is one of the two studies in the Indian context that has examined the relationship between childbirth and empowerment and the first study that has longitudinally analyzed how the transition from being unmarried to married impacts AGYW's empowerment over time. Second, we were able to utilize this panel dataset that followed state-representative samples of unmarried and married AGYW at two time points to examine the process of women's empowerment immediately after their marriage and childbirth. In India, childbearing follows soon after marriage, hence by following recently married young women, we were able to study short-term changes in empowerment over time. We also were able to examine empowerment as a process over time by using panel fixed effects that remove the omitted variable bias arising from unobserved time-invariant variables. We also grounded our analysis in one of the seminal frameworks in the field of empowerment, whose underuse has been one of the drawbacks of empirical studies in the field of women's empowerment literature [184]. By using within-person fixed effects analysis, any measurement error related to different cognitive understanding or semantic meaning of empowerment questions across individuals have been minimized [185]. Third, our measures of empowerment are relevant to the context of North Indian settings and are also similar to the indicators measured in Demographic Health Surveys rendering it comparable. Finally, by controlling for wave (or time), we were able to control for secular trends and maturity the adolescents may acquire over age and time in their marriage.

Policy implications

Achieving gender equality and empowering all women and girls is the fifth goal in the 2030 agenda for the Sustainable Development Goals (SDGs). Of the nine targets under SDG Five, three of them are explicitly focused on eliminating and ending discrimination, violence, and harmful practices such as early marriage [186]. Apart from the fifth goal focused on gender equality, of the 232 indicators across all the SDGs, 53 are gender-related indicators, highlighting that gender equality is a critical policy objective to achieve a wide range of objectives [186]. Countries can achieve this goal if they understand the determinants of gender inequality and take appropriate measures.

Our findings on marriage and empowerment highlight the importance of understanding vulnerabilities associated with being newly married during adolescence, particularly how limited freedom of movement and lower decision-making power could impede newly married adolescents' access to essential services, including family planning and other health-seeking behaviors. Our findings also highlight the need to have health interventions that target both

daughters-in-law and mothers-in-law together. This is particularly important because in the Indian context childbearing follows immediately after marriage. Additionally, our findings also place importance on changing restrictive gendered cultural norms that put newly married women at the lowest status in the marital household. Empowering women has benefits not only for themselves, but also for their children as women's empowerment has been associated with many maternal and child health outcomes [162].

Childbearing was associated with greater empowerment across the dimensions chosen for the study. Since we are not able to study all the dimensions of women's empowerment, it is possible that women who have attained motherhood status may find themselves less empowered in other ways such as limited access to paid work outside their home or other dimensions of empowerment (such as psychological) that have not been studied here. Overall, our findings underscore the high value placed on childbearing in this setting and re-emphasize the need to address harmful social and gender norms that define women's status within the confines of their reproductive potential. Helping shift restrictive gender norms so that the multitude of other contributions (female labor force participation, unpaid caregiving) that women make are more highly valued is essential. Finally, while many government programs target girls across India with enabling human and financial resources, such resources (cash transfers) may not be sufficient to guarantee empowerment of girls and women until there are efforts to change the broader normative environment in which the girls grow up.

Conclusion

In this study, we examined the association between transition to marriage and childbirth on social and economic dimensions of empowerment using a panel data from two large states of India. We extended the existing literature by investigating women's empowerment over time and whether marriage, motherhood, and bearing at least one son are associated with multiple types of AGYW empowerment in India. Findings emphasize the need for interventions that target newly married young women along with key household members such as mothers-in-law to empower them. Taken together, our findings reiterate the notion that empowerment is a dynamic process impacted by life events such as marriage and childbirth.

Figure 5: Women's empowerment conceptualized using Kabeer's framework

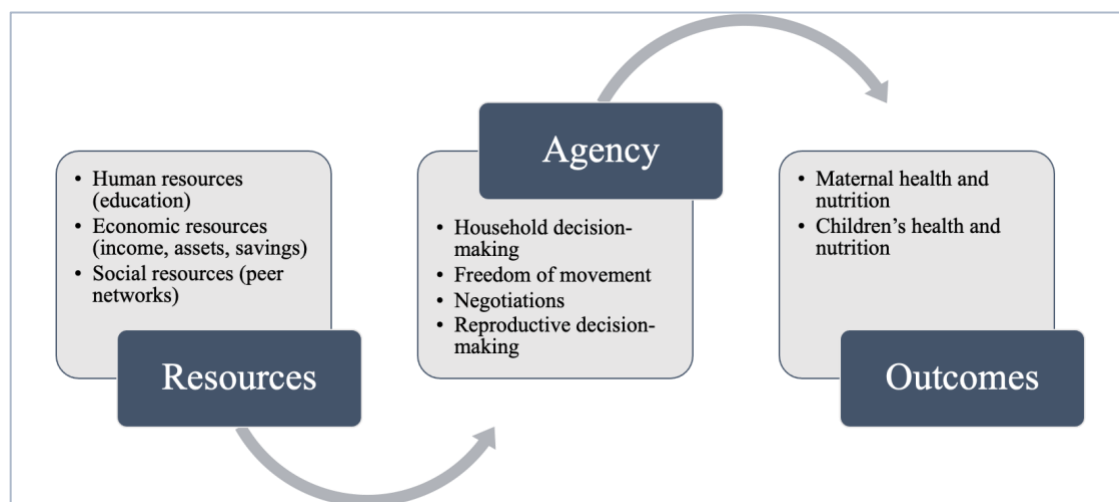


Table 10: Characteristics of unmarried and married adolescent girls interviewed at Wave 1 (2015-16), UDAYA longitudinal survey

	n (%) of AGYW-unmarried (n= 6,065) at Wave 1, 2015-16	n (%) of AGYW-married (n=3,941) at Wave 1, 2015-16
Age (mean ± SD)	16.6 ± 1.3	18.0 ± 1.0
Education		
No formal education	384 (6.3%)	1,079 (27.3%)
Completed some primary education (1-8 Grade)	1,945 (32.0%)	1,480 (37.6%)
Completed some secondary education (9- 12 Grade)	3,387 (55.9%)	1,263 (32.1%)
Completed some college education	349 (5.8%)	119 (3.0%)
Household wealth index		
Poorest	1,525 (25.1%)	991 (25.1%)
Poor	1,524 (25.1%)	981 (24.9%)
Rich	1,525 (25.1%)	993 (25.2%)
Richest	1,491 (24.7%)	976 (24.7%)
Religion		
Hindu	4,479 (73.9%)	3,336 (84.6%)
Muslim	1,562 (25.7%)	594 (15.0%)
Other	24 (0.4%)	11 (0.2%)
Caste		
Scheduled Caste / Scheduled Tribe	1,262 (20.8%)	1,181 (29.9%)
Other Backward Caste	3,444 (56.8%)	2,375 (60.2%)
General Caste	1,359 (22.4%)	385 (9.7%)
Recent paid work		
No	4,975 (82.1%)	3,516 (89.3%)
Yes	1,090 (17.9%)	425 (10.7%)
Household size (mean ± SD)	6.5 ± 2.7	5.8 ± 3.0
Exposure to mass media (TV, radio, newspaper) at least once a month		
No	1,652 (27.2%)	2,018 (51.2%)
Yes	4,413 (72.7%)	1,923 (48.8%)
Received sexual reproductive health education		
No	4,741 (78.1%)	3,512 (89.1%)
Yes	1,324 (21.9%)	429 (10.9%)
Residence		
Urban	2,729 (45.0%)	1,428 (36.2%)
Rural	3,336 (55.0%)	2,513 (63.7%)
State		
Uttar Pradesh (UP)	3,315 (54.6%)	1,299 (32.9%)
Bihar	2,750 (45.4%)	2,642 (67.1%)
Marital Status at Wave 1		
Unmarried	6,065	-
Married	-	3,941
Had a childbirth at Wave 1		
No	6,065	2,128 (54.0%)
Yes	-	1,813 (46.0%)

Table 11: Regression coefficients from individual fixed effects regressions for the association between marriage and freedom of movement, decision-making power, access to economic resources among adolescent girls and young women (AGYW) in the two study states (n=12130)

Marriage and empowerment									
	Freedom of movement			Decision-making power			Access to economic resources		
	Coeff.	95%CI	p-value	Coeff.	95%CI	p-value	Coeff.	95%CI	p-value
Being married	-0.45	-0.63, -0.27	<0.000	0.29	0.10, 0.47	0.002	0.37	0.23, 0.51	<0.000
Marriage X wealth (Ref: Being married into a less wealthy household)									
Being married into a wealthier household	-0.02	-0.19, 0.15	0.793	-0.02	-0.18, 0.15	0.855	-0.34	-0.46, -0.21	<0.000
Marriage X co-residence with in-laws (Ref: Co-residence with husband/other adults)									
Being married and co-residing with in-laws	-0.87	-1.06, -0.69	<0.000	-0.39	-0.57, -0.21	<0.001	-0.08	-0.22, 0.06	0.256
Controls									
Having had a childbirth	0.15	-0.02, 0.31	0.086	-0.02	-0.18, 0.14	0.805	0.28	0.16, 0.41	<0.001
Educational attainment of AGYW	0.02	-0.01, 0.05	0.133	-0.06	-0.09, -0.02	<0.001	0.10	0.07, 0.12	<0.001
Exposure to mass media	0.10	0.02, 0.18	0.015	0.01	-0.07, 0.09	0.874	0.06	0.00, 0.13	0.037
Wave (Ref: Wave 1)									
Wave 2	0.32	0.26, 0.39	<0.000	0.08	0.01, 0.15	0.026	0.21	0.16, 0.26	<0.001
Mean (SD) for unmarried AGYW	4.6 (1.2)			1.9 (1.5)			1.7 (1.1)		
Number of Observations	12130			12130			12130		

Notes: ¹ Husband/wife alone or with wife's parents or other relatives; Robust 95 per cent confidence intervals

Table 12: Regression coefficients from three individual fixed effects regressions for the association between motherhood and freedom of movement, decision-making power, and access to economic resources among married AGYW in India (n=7882)

Motherhood and empowerment									
	Freedom of movement			Decision-making power			Access to economic resources		
	Coeff.	95%CI	p	Coeff.	95%CI	p	Coeff.	95%CI	p
Motherhood	0.12	0.02, 0.23	0.023	0.09	-0.00, 0.19	0.058	0.24	0.16, 0.32	<0.001
Controls									
Girls' education	-0.05	-0.14, 0.04	0.271	-0.04	-0.13, 0.05	0.361	-0.19	-0.26, -0.12	<0.001
Wealth index scores	-0.03	-0.06, 0.00	0.076	-0.04	-0.07, -0.01	0.004	0.03	0.00, 0.05	0.027
Household size	-0.03	-0.04, 0.01	0.002	-0.04	-0.05, -0.02	<0.001	0.00	-0.02, 0.01	0.599
Mass media exposure	0.09	0.00, 0.19	0.048	0.09	0.00, 0.17	0.048	0.17	0.10, 0.24	<0.001
Wave 2 (Ref: Wave 1)	0.80	0.73, 0.87	<0.001	0.11	0.04, 0.17	0.001	0.55	0.49, 0.61	<0.001
Average for girls without children	3.2 (1.3)			1.6 (1.4)			1.2 (0.9)		
Number of Observations	7882			7882			7882		

Note: Robust 95 per cent confidence intervals.

Table 13: Regression coefficients from three separate individual fixed effects regressions for the association between sex composition of children and freedom of movement, decision-making power, and access to economic resources among adolescent girls and young women

Mother of sons and empowerment									
	Freedom of movement			Decision-making power			Access to economic resources		
	Coeff.	95%CI	p-value	Coeff.	95%CI	p-value	Coeff.	95%CI	p-value
Having daughters (Ref: no children)	0.10	-0.02, 0.22	0.094	0.10	-0.01, 0.20	0.075	0.23	0.14, 0.31	<0.001
Having at least one son (Ref: no children)	0.15	0.02, 0.27	0.020	0.09	-0.03, 0.20	0.134	0.25	0.16, 0.34	<0.001
Additional effect of having a son compared to daughters only	0.05	-0.07, 0.17	0.432	-0.10	-0.11, 0.09	0.848	0.024	-0.07, 0.11	0.588
Controls									
Girls' education	-0.05	-0.14, 0.04	0.287	-0.04	-0.13, 0.05	0.357	-0.19	-0.25, -0.12	<0.001
Wealth index	-0.03	-0.06, 0.00	0.078	-0.04	-0.07, -0.01	0.003	0.03	0.00, 0.05	0.026
Household size	-0.03	-0.04, 0.01	0.002	-0.04	-0.05, -0.02	<0.001	0.00	-0.02, 0.01	0.588
Mass media exposure	0.10	0.00, 0.19	0.047	0.09	0.00, 0.17	0.048	0.17	0.10, 0.25	<0.001
Wave 2 (Ref: Wave 1)	0.79	0.72, 0.87	<0.001	0.11	0.04, 0.18	0.001	0.55	0.49, 0.60	<0.001
Number of Observations	7882			7882			7882		

Note: Robust 95 per cent confidence intervals.

Chapter 4: Does the gendered norm of eating last affect newly married women's mental health in Nepal? A longitudinal study

Background

Depression is a leading cause of death and disability worldwide, with South Asian countries reporting the highest prevalence (14.2%) of common mental disorders such as depression and anxiety [187]. Among persons with common mental disorders, the prevalence of depression was 26.4% [187]. Despite a high burden of mental health disorders in the population, the mental health infrastructure and availability of specialists in the region is inadequate for the needs of the population [188]. Of those diagnosed with common mental disorders, only 24% of people in South Asia receive any form of treatment and services due to lack of facilities, professionals, and stigma in the society against seeking care for mental health [187, 189, 190].

Past research from South Asia has shown that women who are married early (defined as marriage before the age of 18) have lower decision-making autonomy, receive less support from their families and are at a higher risk of common depressive and anxiety disorders [191]. Young women report facing mistreatment, stress, and depression due to their inability to bear children early in marriage [37]. In a study of spousal pairs in Delhi, women report greater mental distress as compared to their spouses when couples were met with adverse reproductive outcomes such as the death of a child or loss of a pregnancy, revealing a strong gender gap in mental health [192]. Other risk factors contributing to depression among women in low-income settings include social stressors like poverty, gender-based violence, poor social support, lack of spousal empathy and support, and tension with in-laws [191, 193]. Multiple factors adversely affect women's mental health, but gendered risk factors such as women eating last have received less attention, particularly in strongly patriarchal countries like Nepal [78].

In Nepal, a nation that lies in the classic patriarchal belt of South Asia, gendered cultural norms often favor men in matters of household and individual-level decision making, mobility, and access to nutrition and other household resources [43, 44]. In patrilocal-patrilineal systems, a woman's status depends on her position in the household. The tradition of moving to the marital household in typical joint family systems after marriage means that the newest bride in the family often holds the lowest position in the household hierarchy [48]. Thus, newly married women face “double powerlessness” [48], where they have lower status than men and other senior women in the household [44, 48, 49].

An important indicator of gendered hierarchy within the household is inequitable intrahousehold food allocation [26, 45, 51–53]. Food preparation in the household is a gendered activity and is considered part of women's responsibility [26]. However, there is pro-male bias in food consumption and nutrition at the intrahousehold level [194–196]. Women often receive a lower quantity of food and lower nutritional intake than men [26, 50]. Senior women in the household also dictate food allocation. D'Souza and Tandon demonstrate that the absence of a mother-in-law in Bangladeshi households leads to better caloric intake for women spouses and their daughters through more equitable food allocation [197]. Young newly married women are

especially at risk of poor nutrition because patriarchal norms and customs perpetuate their subordinate position and determine their intrahousehold food allocation [45, 50].

Past research from Nepal shows that daughters-in-law cook and serve the rest of the family and eat last in the household [50, 52, 53]. Eating last is a gendered cultural norm in South Asian settings. On moving to their husbands' households, recently married women are expected to eat last to show deference to senior members in the household, including men of the household, in-laws, and more senior women [50, 52]. Qualitative research from South Asia suggests that women who eat last cut back on their food intake and prioritize other household members such as working males, senior members, and young children when serving food [55, 198]. They also are first to restrict the number of meals they eat in times of scarcity [55, 198]. Eating order can be considered as a representation of status distinction in South Asian households. Women accept eating last as a "matter-of-fact and the right thing to do" [55]. Further, younger brides in the household are always expected to eat last after everyone has been served an adequate amount of food [54, 55, 199]. A qualitative study from Nepal found that even when women became pregnant, women continued to conform to these gendered norms of eating last in the household to show deference to elders [54].

Despite evidence that the newest daughters-in-law face inequitable intrahousehold food allocation and are at risk of eating last, little is known about how the gendered cultural norm of eating last is associated with women's mental health in South Asia. The impact of eating last, conceptualized as an indicator of women's status, especially among newly married women, has received scant attention in public health research including mental health. To our knowledge, only a single study from South Asia has examined the effects of eating last on mental health [200]. Authors found that eating last was positively associated with worse mental health even after accounting for socioeconomic status [200]. Restrictive gender norms and discriminatory practices may expose women to chronic stressors and potentially more significant depressive symptoms. We extend the literature on this understudied topic by examining the relationship between women eating last and their mental health.

Intertwined with the order of household eating and intrahousehold food allocation is food insecurity. As defined by the United Nations' Committee on World Food Security, food security is where "*all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life*" [201]. Food insecurity can be a measure of economic deprivation, suggestive of inadequate economic resources to meet basic needs. The harmful psychological consequences of food insecurity (having anxiety about accessing food and skipping meals) extend beyond adverse nutritional outcomes, including low birth weight [202] and congenital disabilities among children [203] to psychological stress and poor mental health [204]. Further, food insecurity at all levels of severity, including mild, moderate, or severe, is associated with depressive symptoms [205]. A recent global meta-analysis of nineteen studies estimated that there was a positive association between food insecurity and the risk of depression (OR = 1.40, 95% CI: 1.30, 1.58) [206].

Theoretical Framework

The *stress process model* elaborated by Pearlin and colleagues [207–209] is an appropriate framework to study the relationship between eating last and depression. This model emphasizes the role of social structures – "*social stratification, social institutions, and interpersonal relationships*" – that drive an individual's experiences and life events, in turn producing stress and psychological distress [208, 209]. This framework focuses on how stress exposure has been associated with psychopathologies over time through role-related strains rather than singular life events [210]. In a patriarchal society like Nepal, women undergo gender discrimination stressors throughout their life course. Newly married women move to their husbands' households, suffer isolation from their natal families and villages, experience mobility restrictions and limited autonomy, face childbearing expectations, and must prove fertility [32, 211–213].

Women are also vulnerable to stressors originating from their household status and food insecurity that adversely impact their mental health status [214]. We adapted the *stress process model* to highlight the need to study the women's status in the household as a risk factor of depressive symptoms. We operationalized women's low status in the household using the variable on frequency of women's eating order in the household. Further, we studied a related psychosocial chronic stressor, food insecurity, that measures how deprivation and anxiety related to food could further moderate the association between eating last always and women's mental health. No known studies have tested whether household food insecurity exacerbates the relationship between the gendered norm of eating last and mental health in Nepal. Examining whether association is moderated by food insecurity is important because Nepal's food insecurity has remained high and constant from 2011 to 2016, with over 50% of households reporting some level of food insecurity [215].

Our study aims to make significant contributions by exploring the association between eating last in the household and mental health and testing moderation of this association by household food insecurity status using a longitudinal study of newly married women in Nepal, an especially high-risk population. We hypothesized that: (1) women who eat last in the household will have higher depressive symptom severity independent of demographic characteristics and household food insecurity and (2) the association between women eating last and depressive symptom severity will be greater for women who are in food-insecure households than women in food secure households.

Methods

Between 2018 and 2019, we conducted four rounds of surveys at 6-month intervals with a longitudinal cohort of 200 newly married women. At baseline, women were eligible to enter the study if they were married within four preceding months, co-habiting with their mothers-in-law, were 18-25 years of age, and living in the Nawalparasi district, which is a relatively under-resourced district in Terai or the plains region of Nepal bordering India. Of the screened 18,906 households in two municipalities (one rural and one urban), 302 eligible respondents were identified, and 200 of these eligible respondents were randomly selected. At baseline and each follow-up survey, enumerators surveyed respondents using questionnaires in Nepali about their depressive symptoms, eating order in the household, and other time-varying indicators, including

paid work, pregnancy, health care utilization, and food insecurity. Four trained female Nepali enumerators conducted face-to-face interviews on computer-assisted personal interview devices either at home or a private location of the respondent's choice after obtaining written informed consent. Non-literate respondents provided thumbprints to confirm consent. Respondents were offered an incentive of 3 USD at each visit. The women answered all the questions, including those on household details. The study received ethical approvals from the Nepal Health Research Council and the ethics committee of the University of California, San Francisco.

Measures

Dependent variable

Our dependent variable was depressive symptom severity. We used the 15-item Hopkins Symptom Checklist for Depressions (HSCL-D) that has been previously used in Nepal [216–219]. The response format comprises four categories describing to what extent the respondent was affected by a given symptom during the week prior to the survey: not at all, a little bit, quite a bit, or extremely. We coded the four categories of responses as not at all as 0, a little bit as 1, quite a bit as 2, and extremely as 3. A composite measure was calculated for each respondent by averaging their item responses, with higher scores indicating higher depressive symptom severity (worse mental health). We used it as a continuous measure for the multivariable analysis. In our study sample, Cronbach's alpha for the HSCL-15 was 0.92, indicating high internal consistency. Prior literature recommends examining depression either in terms of probable clinical diagnosis or symptom severity [220]. Hence, we used the continuous measure of depressive symptom severity as the outcome in our multivariable regression models. Based on the past studies from Nepal and other low-resource settings [221, 222], a binary variable with a mean cut-off of greater than 1.75 was used to classify respondents with probable depression.

Independent variable

Our primary independent variable of interest is women eating last in the household, which is a marker of gendered norms and status of women in the household. At each round, women were asked, "How often do you eat last in your household?". The response format consisted of five categories: never, rarely, sometimes, usually, and all the time. For the primary explanatory variable, we created an indicator variable by coding responses to eating last "*all the time*" as 1 and 0 otherwise. The rationale for doing this was that always eating last was the most extreme marker of women's low status in the household and restrictive gendered norm. We also present the original categorical variable's results in a sensitivity analysis (Table 18 in Appendix).

Covariates

We included the following time-variant and time-invariant confounders of interest chosen *a priori* based on previous research on important social, cultural, and economic factors in this setting that could influence women eating last and depressive symptom severity [45, 223].

Household Food Insecurity: We measured food insecurity in the household using the Household Food Insecurity Access Scale (HFIAS). The HFIAS is composed of nine questions specific to three domains: i) anxiety and uncertainty about food access (1 question), ii) insufficient quality

(3 questions), and iii) insufficient quantity (5 questions). Each item asks a frequency-of-occurrence question to determine if the condition in the household had happened rarely (once or twice), sometimes (3–10 times), or often (>10 times) during the 30 days prior to the survey. We coded the responses as 0 (never), 1 (rarely, 1-2 times), 2 (sometimes, 3-10 times), or 3 (often, 10+times) with higher scores indicative of greater food insecurity. The HFIAS score was constructed by adding the values of the nine questions ranging from 0 indicating low experience of food insecurity to 27, indicating high experience of food insecurity. Cronbach's alpha for this scale was 0.91, indicating high internal consistency. Following the [HFIAS](#) guidelines, households that respond affirmatively to the more severe behaviors or experience them more frequently are classified as severely food insecure. The cumulative HFIAS score was categorized into four levels of household food insecurity: food secure households, and mild, moderate, and severe food insecurity [224].

Another time-varying characteristics that could potentially confound the relationship between women's eating order and depressive symptom severity is doing *paid work*. We hypothesized that women going outside the home for paid work may have greater psychological well-being compared to women who do not go outside the home for paid work. We operationalized *paid work* as an indicator variable to denote if the woman undertook paid work in the six months prior to the survey. In Nepal, childbearing follows shortly after marriage, and pregnancy and childbearing have been associated with depressive symptoms [225, 226]. Hence, to get at the independent relationship between eating last and depression, we used an indicator variable to denote if the respondent had experienced childbirth since the previous round of the survey. We also included an indicator variable for the *survey round* to control for time-specific effects such as the seasonality patterns.

Time-invariant sociodemographic characteristics were included as potential confounders, including *women's age at baseline* (in completed years) and *education at baseline* as a continuous variable. Since Nepali society is ethnically complex, we included *ethnicity* categorized as follows: Brahmin and Chettri, upper-caste groups and the most privileged ethnic group as the reference group, indigenous group (*Terai Janajati*) as the middle group, and Dalits/religious minorities as the least privileged groups. *Household wealth* was constructed using principal components analysis from several variables, including ownership of house and land, quality of dwelling (e.g., house construction materials), access to services (water, electricity, sanitation), and a set of household assets. The wealth index was then used to categorize households into quintiles, from poorest (quintile 1) to least poor (quintile 5). In South Asia, the type of marriage can potentially affect women's status in the household, such as women's decision-making power [227]. When women had parent-arranged marriages with no choice in partner selection (arranged marriage), they were more likely to have lower decision-making power compared to women in self-choice (or love) marriages [227]. Thus, we controlled for women's type of marriage with an indicator variable for *an arranged marriage* to denote if she had an arranged marriage or not.

Analysis

We first computed sample descriptive characteristics for the baseline round of the survey and looked at trends of our primary independent and dependent variable over time. We ran random-

intercept linear regression models to account for correlation between repeated observations from the same respondents over time. We used random-effects instead of fixed effects because we expected that time-invariant characteristics of respondents could influence women's depressive symptom severity. Statistical interaction between eating last and food insecurity was assessed by including an interaction term (an indicator variable for whether the households belonged to different levels of food insecurity multiplied by whether the woman *always eats last*) in the multivariable models. In a sensitivity analysis, we refitted the primary regression models using modified Poisson regression with the binary variable for depression to estimate the association between eating last always and probable depression. In another sensitivity analysis, we refitted the primary regression models using linear regression but with the categorical variable for frequency of eating last in the household. All data were analyzed using Stata Version 15.1 [121]. We use $p < 0.05$ as statistical significance for the regression models except for interaction terms where we use a Wald $p < 0.1$. Below we indicate our empirical specification to model the expectation of the continuous outcome of interest to test our first hypothesis:

$$E(Y_{ij} | X_{ij}, R_i, I_{1j}, I_{2ij}, u_j) = \beta_1 + \beta_2 X_{ij} + \beta_3 R_i + \beta_4 I_{1j} + \beta_5 I_{2ij} + u_j$$

Y_{ij}	=	Continuous outcome variable (depressive symptom severity scores) for an individual j at round i
X_{ij}	=	A binary variable indicator whether the woman eats last in the household all the time for a woman j at round i
R_i	=	Indicator variable for rounds 2, 3, 4 (Ref: Round 1)
I_{1j}	=	Vector of time-invariant variables at the individual level such as age at baseline, education at baseline, ethnicity, type of marriage, and wealth at baseline
I_{2ij}	=	Vector of time-varying variables at the individual level such as household-level food insecurity, had a childbirth recently, and paid work undertaken by the individual
u_j	=	Individual-level random intercept, $\sim N(0, \sigma^2)$

Model 1 estimated the association of eating last and depressive symptom severity, adjusting for all the covariates. Model 2 estimated the association between eating last and depressive symptom severity after adjusting for the covariates described above and including an interaction term between household food insecurity and eating last to test whether the relationship between eating last and depressive symptom severity was moderated by level of food insecurity.

Results

Two hundred respondents completed the baseline survey, 192 completed round 2, 191 completed round 3, and 187 completed round 4, with 92% (183) of the respondents recruited at baseline completing all four surveys. We present the demographic characteristics in Table 14. The mean age of our respondents was 20.4 years (SD=1.9), with an average of 10 years of schooling at baseline. On average, the household had seven members. An overwhelming majority of the women (70.5%) had a marriage arranged by their parents, while the rest chose their partners. In

terms of ethnic/caste composition, most women (53%) belonged to indigenous groups, followed by 23% of women who belonged to Brahmin/Chhetri groups. The rest (25%, n=49) belonged to Dalit or religious minority groups. Twenty-six percent of women had engaged in paid work outside the home. Fifty-three percent (n=107) of households were categorized as food insecure. A quarter of the women (25%) reported eating last always. The prevalence of probable depression using the established cutoff was 5.5% which is consistent with worldwide prevalence of depression in the general population [228].

Table 15 presents the trend over time of our independent and dependent variables of interest. There is an increase in the number of women who eat last all the time (or always) from Round 1 through Round 4. At Round 1, 25% of the sample reported eating last always which increased to 36% by Round 4. Depressive symptom severity also increased from Round 1 through Round 3, but there was a drop between Round 3 and Round 4.

Table 16 presents our multivariable random-effects linear regression model of the association between eating last and depressive symptom severity. In Model 1, we found that eating last was positively associated with an increase in depressive symptom severity ($\beta = 0.24$, 95%CI: 0.13, 0.36), controlling for household food insecurity score, other confounders, and time. In Model 2, we test for interaction with household food insecurity levels in the household. While all levels of household food insecurity are independently associated with depressive symptom severity in food insecurity, we did not find evidence of heterogeneous effects by levels of food insecurity between eating last always and depressive symptom severity controlling for other covariates and time. A likelihood ratio test comparing models with interaction without interaction was not statistically significant ($p=0.466$) and confirmed the absence of interaction.

We also carried out sensitivity analysis using modified Poisson regression as an alternate specification with the same control variables. The results suggest that women who eat last have a greater relative risk of having probable depression than women who do not eat last controlling for household food insecurity, round of survey, and other confounders (Table 17 in Appendix). Specifically, the adjusted relative risk (ARR) for women who eat last was 3.05 (95%CI: 1.26, 7.39, $p=0.014$).

Discussion

Using prospective longitudinal data from Nepal, this study examined whether eating-last-always in the household was associated with greater depressive symptom severity among young, newly married women. Our analysis leveraged four rounds of data collection during young Nepali women's early marital lives when they have the lowest status in the household. In this sample, eating last was positively associated with greater depressive symptom severity. Results are consistent with a recent cross-sectional study from India that found that women who eat last were more likely to have worse mental health than women who did not eat last [200].

We found that household food insecurity had an independent significant association with depressive symptom severity. This is also consistent with results from a global review that found association between nutrition distress, food insecurity, and women's poor mental health [229].

Several global reviews have highlighted that food insecurity is linked to poor mental health, potentially through behavioral and biological pathways [206, 230].

Contrary to our hypothesis, we did not find evidence that the relationship between eating last and depression varied by household food insecurity. In other words, household food insecurity did not moderate the association between eating last and depressive symptom severity among this sample of newly married women. A plausible explanation for not finding moderation by food insecurity levels could be that always eating last, as conceptualized in our study, is a marker of low status of women in the household. Hence, women are treated as lower status individuals regardless of food security levels in the households and always eating last (a marker of very low social status in the household) adversely affects their mental health. Our results from the sensitivity analysis of using the eating last frequency (Table 18 in Appendix) also indicated how *always eating last (or eating last all of the time)* is associated with greater depressive symptom severity, lending credence to our characterization of always eating last as a marker of women's low social status within the household.

There are several different pathways through which eating last may impact mental health. One pathway is biological, where eating last always can affect women's mental health through poor nutrition. Prior evidence suggests that order of eating is associated with lower quality and quantity of foods consumed [52, 56, 57], including iron-rich foods [58] putting women at greater risk for poor nutritional outcomes and anemia [57, 58, 211, 231]. Persistent undernutrition can be associated with mental health disorders [232, 233]. More research using mediation analysis is required to disentangle the biological pathways from eating last to mental health.

Accumulation of chronic stressors through gender-based discrimination can negatively influence women's mental health outcomes over the life course [214, 234, 235]. Gender-based discrimination can negatively influence women's mental health outcomes [214, 234, 235]. Chronic stressors contribute to health deterioration and directly negatively affect women's mental health [214]. In patrilocal-patrilineal settings such as Nepal, gender discrimination stressors affect women throughout their life. Extensive research from South Asia demonstrates that women and girls are at a nutritional disadvantage due to son preference right from childhood resulting in poorer health and nutritional outcomes [236–241]. Nutritional deficiencies are particularly acute during adolescence and early years of marriage for women in South Asia [197, 242, 243]. Further, as newly married women move into their marital homes with their husbands and in-laws, they lose connections with their natal households and peer networks, face mobility restrictions, have lower autonomy and decision-making, and lower access to high quality food [32, 45]. They also face pressures of early childbearing to prove their fertility [35, 211].

It is important to recognize that women's status in the household is dynamic. Studies from India have found that married women gain status in the household over time with increased financial freedom and access to enabling resources such as property rights, particularly after they attain motherhood [48, 49, 155]. As daughters-in-law live up to their societal expectations and become mothers-in-law, their bargaining power increases by gaining higher status in the household [197]. In Indian households, bargaining power and allocation of non-food resources resemble an inverted U-shaped relationship with the age of the women [244]. More rounds of data collection

may allow us to document and understand the trajectory of depressive symptom severity of married women over their reproductive events and life course.

This study has several strengths that are worth noting. To our knowledge, this is the first study from Nepal and the second in South Asia to examine the association between eating last in the household and women's mental health. Unlike the prior study from India, our study uses a prospective design, and newly married women were recruited within four months of their marriage, allowing us to conduct a robust longitudinal analysis between women eating last in the household and depressive symptoms within a highly vulnerable group. Since we also had information on household food insecurity, we could assess whether this was a moderator in the relationship between eating last and depressive symptoms. We also make significant contributions to the literature by studying an under-researched topic—women's mental health. First, we focus on women's mental health outside of maternal depression, which is scarce in the South Asian context. Second, through this study, we highlighted how women's status and harmful gender norms that have been extensively studied to impede care-seeking behaviors and nutritional outcomes can also be detrimental to their mental health and well-being. Finally, we use validated scales to measure depressive symptoms and household food insecurity, though we acknowledge that these are self-reported scales prone to social desirability bias.

The study also has some limitations. The sample is relatively small (200 women followed for four rounds of survey), and all women lived in one district of Nepal. Further, the study sample comprises married women living with their husbands and mothers-in-law, so the results from this study are not generalizable to newly married women in similar contexts who do not co-reside with their mothers-in-law. Though we have a longitudinal design, we only have data from women about the first two years of their marital life, which precludes us from studying long-term trends of depressive symptoms over time. Since women's status is dynamic, future studies should attempt to explore women's status and long-term trends of status and depressive symptoms of women. It is also possible that women had depressive symptoms prior to their marriage which worsened due to their low status during the early marriage. Given the lack of access to services to identify and effectively treat depression, women may have had untreated pre-existing depressive symptoms, further worsening their status within the household, leading to a vicious cycle of worsening depressive symptoms.

Policy implications

The mental health of newly married women is vital for their functioning and well-being. In addition, poor mental health among newly married women negatively affects child health as one in two newly married women gets pregnant within the first year of marriage in Nepal [215]. The poor mental health of mothers impairs the ability to take care of their children with adverse consequences for their children's growth and development [245, 246]. Our results provide evidence that restrictive gendered norms, in this case eating last, put women at greater risk for depressive symptoms. These results highlight the vulnerabilities that newly married women face as they move away from their parents' home, adjust to their married life with in-laws and husbands, and start childbearing. Many government programs in Nepal target pregnant women to improve their nutrition and prenatal care through community outreach and mass media. In addition to regular programming for prenatal care and nutrition for women, policymakers need to

pay attention to this vulnerable group of newly married women to design and test interventions that can improve their status in the household and transform harmful gendered norms and practices, especially before married women start childbearing. While it is important to increase access to food for a household with a newborn, our results indicate that this may not be enough to benefit women if they continue to suffer from having the lowest status within the household. Moreover, limited availability of accessible mental health services in South Asia including Nepal [187, 190], makes it imperative for the policy makers to target social determinants such as women's status, restrictive gender norms, and food insecurity that can be addressed using community-level interventions alongside clinic-based interventions.

Conclusion

Assessing the influence of eating last on mental health and psychological well-being in a resource-poor context like Nepal, where newly married women lack status and autonomy to seek healthcare, is essential—and these findings suggest that gendered norms around eating, regardless of food insecurity, impact women's mental health. Given the scant attention given to mental health among newly married women previously, there is ample scope and need for more analysis on the lives of newly married women to advance our understanding of social determinants of mental health such as eating last and to test interventions that transform harmful gender norms, improve women's status and women's health and well-being.

Table 14: Socio-demographic characteristics of women at Round 1 (n=200)

Variable	n (%) or Mean (SD)
Age in years	20.4 (1.9)
Woman's education in years	10.0 (3.4)
Household size	6.9 (3.1)
Participant age at marriage	
Less than 20 years	76 (38.0%)
Equal to or greater than 20 years	124 (62.0%)
Marriage type	
Arranged	141 (70.5%)
Love	59 (29.5%)
Ethnicity/ Caste	
Brahmin/Chhetri	45 (22.5%)
Indigenous group	106 (53.0%)
Dalits/religious minority group	49 (24.5%)
Wealth quintile	
Poorest	40 (20.0%)
Poor	40 (20.0%)
Middle	40 (20.0%)
Rich	44 (22.0%)
Richest	36 (18.0%)
Paid work outside the home (yes/no)	52 (26.0%)
Household Food Insecurity Access Prevalence	
Food Secure	93 (46.5%)
Mildly Food Insecure	36 (18.0%)
Moderately Food Insecure	44 (22.0%)
Severely Food Insecure	27 (13.5%)
Frequency of Eating Last	
Never	76 (38.0%)
Rarely	17 (8.5%)
Sometimes	12 (6.0%)
Usually	45 (22.5%)
All the time	50 (25.0%)
Probable depression (Yes/No)	11 (5.5%)

Table 15: Frequency of eating last and depressive symptoms by round of survey

	Round 1		Round 2		Round 3		Round 4	
	No.	%	No.	%	No.	%	No.	%
How often respondent eats last								
Never	76	38	57	29.7	41	21.5	42	22.5
Rarely	17	8.5	21	10.9	37	19.4	42	22.5
Sometimes	12	6	18	9.4	11	5.8	14	7.5
Usually	45	22.5	26	13.5	35	18.3	22	11.8
All the time	50	25	70	36.5	67	35.1	67	35.8
Mean and SD of depressive symptoms	200	0.48 (0.56)	192	0.56 (0.61)	191	0.58 (0.64)	187	0.42 (0.55)
Prevalence of probable depression	11	5.5	11	5.7	13	6.8	6	3.2
Total sample size (n)	200		192		191		187	

Table 16: Multivariable random effects linear regression model showing association between eating last and depressive symptom severity among newly married women over four waves in Nepal, n=770

	Model 1		
	Coeff.	95% CI	p
Eat Last	0.24	0.13, 0.36	0.000
Household Food Insecurity Levels (Ref: Food Secure)			
Mild Food Insecurity	0.19	0.04, 0.33	0.010
Moderate Food Insecurity	0.48	0.36, 0.61	0.000
Severe Food Insecurity	0.31	0.14, 0.48	0.000
Eating Last × Household Food Insecurity (Ref: Food Secure)			
Eating Last × Mild Food Insecurity	-	-	-
Eating Last × Moderate Food Insecurity	-	-	-
Eating Last × Severe Food Insecurity	-	-	-
Controls			
Age at baseline	-0.03	-0.06, -0.01	0.021
Education at baseline	-0.01	-0.03, 0.01	0.190
Wealth quintile at baseline (Ref: Poorest quintile)			
Second lowest	-0.07	-0.27, 0.13	0.492
Middle	0.02	-0.19, 0.23	0.884
Second wealthiest	-0.07	-0.28, 0.14	0.528
Wealthiest	0.00	-0.28, 0.28	0.992
Had an arranged marriage (Ref: Love marriage)	-0.10	-0.21, 0.02	0.099
Ethnicity (Ref: Brahmin/Chhetri)			
Indigenous group	-0.11	-0.27, 0.05	0.162
Dalits/religious minority group	-0.12	-0.31, 0.06	0.184
Paid work outside the home	0.01	-0.08, 0.09	0.880
Gave birth recently	-0.12	-0.22, -0.03	0.013
Rounds			
Indicator for Round 2	0.05	-0.02, 0.13	0.167
Indicator for Round 3	0.16	0.06, 0.25	0.002
Indicator for Round 4	-0.03	-0.11, 0.06	0.561

Table 17: Modified Poisson regression models estimating the association between eating last and probable depression among newly married women in Nepal (n=770)

	ARR	95% CI	p
Eat Last	3.05	1.26, 7.39	0.014
Household Food Insecurity Levels (Ref: Food Secure)			
Mild Food Insecurity	5.23	0.91, 29.98	0.063
Moderate Food Insecurity	7.40	1.71, 32.06	0.007
Severe Food Insecurity	3.08	0.52, 18.15	0.213
<i>Controls</i>			
Age at baseline	0.80	0.64, 1.01	0.061
Education at baseline	0.96	0.87, 1.06	0.404
Wealth quintile at baseline (Ref: Poorest quintile)			
Second lowest	0.88	0.38, 2.02	0.760
Middle	0.75	0.30, 1.85	0.535
Second wealthiest	0.36	0.09, 1.44	0.149
Wealthiest	2.18	0.50, 9.58	0.300
Had an arranged marriage (Ref: Love marriage)	0.47	0.20, 1.09	0.077
Ethnicity (Ref: Brahmin/Chhetri)			
Indigenous group	0.47	0.11, 2.13	0.330
Dalits/religious minority group	0.38	0.08, 1.72	0.208
Works outside the home	0.77	0.29, 2.03	0.599
Gave birth recently	0.87	0.40, 1.89	0.727
Indicator variable for rounds (Ref: Round 1)			
Round 2	0.90	0.42, 1.92	0.787
Round 3	1.70	0.76, 3.77	0.193
Round 4	0.79	0.31, 2.02	0.629

Notes: ARR adjusted relative risk ratio, robust CI Confidence Interval

Table 18: Multivariable random effects linear regression models showing association between all levels of eating last and depressive symptom severity among newly married women in Nepal, n=770

	<i>Coeff.</i>	95% CI	<i>p</i>
Eat Last (Ref: Never eat last)			
Rarely	-0.11	-0.21, -0.01	0.024
Sometimes	-0.01	-0.13, 0.12	0.920
Usually	-0.10	-0.22, 0.02	0.102
All the time	0.17	0.04, 0.31	0.010
Household Food Insecurity Levels (Ref: Food Secure)			
Mild Food Insecurity	0.21	0.06, 0.35	0.005
Moderate Food Insecurity	0.48	0.35, 0.61	0.000
Severe Food Insecurity	0.32	0.14, 0.49	0.000
<i>Controls</i>			
Age at baseline	-0.04	-0.06, -0.01	0.018
Education at baseline	-0.02	-0.04, 0.01	0.150
Wealth quintile at baseline (Ref: Poorest quintile)			
Second lowest	-0.07	-0.27, 0.12	0.472
Middle	0.01	-0.20, 0.23	0.900
Second wealthiest	-0.08	-0.29, 0.14	0.471
Wealthiest	-0.01	-0.29, 0.27	0.949
Had an arranged marriage (Ref: Love marriage)	-0.09	-0.21, 0.03	0.122
Ethnicity (Ref: Brahmin/Chhetri)			
Indigenous group	-0.10	-0.26, 0.07	0.244
Dalits/religious minority group	-0.12	-0.31, 0.08	0.237
Works outside the home	0.01	-0.08, 0.10	0.861
Gave birth recently	-0.11	-0.20, -0.01	0.028
Indicator variable for rounds (Ref: Round 1)			
Round 2	0.06	-0.02, 0.13	0.148
Round 3	0.17	0.07, 0.26	0.001
Round 4	-0.01	-0.10, 0.07	0.737

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