Gender-sensitive determinants of poor mental health among rural Indian women

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List of abbreviations

CFA	Confirmatory factor analysis
CFI	Bentler Comparative Fit Index
CMDs	Common mental disorders
CTS	Conflict Tactics Scale
DHS	Demographic and Health Survey
GHQ-12	Twelve item General Health Questionnaire
EFA	Exploratory factor analysis
ICDS	Integrated Child Development Scheme
IPV	Intimate partner violence
ILO	International Labour Organization
ITT	Intention-to-treat
LMICs	Low- and middle-income countries
NFHS	National Family and Health Survey
PCA	Principal component analysis
RMSEA	Root Mean Square Error of Approximation
SDGs	Sustainable Development Goals
SDG-5	Sustainable Development Goal 5
TLI	Tucker Lewis Index

Abstract

Women disproportionately suffer from common mental health problems, including anxiety and depression, compared to men. Determinants of mental health predominantly experienced by women – such as intimate partner violence and low agency – might contribute to these gender inequalities in mental health. However, extant research is commonly characterized by inadequate conceptualization and measurement, and there is a dearth of survey data from low- and middle-income countries measuring women's mental health. These limitations impede empirical investigation into the gender-sensitive determinants of, and potential interventions for, women's mental health. The objectives of my thesis are to address these knowledge gaps in one context: rural Rajasthan, India. My thesis uses information from approximately 3200 women who completed comprehensive interviews as part of a cluster-randomized trial of an affordable daycare program.

The first objective developed a set of best practices for measuring women's empowerment and then implemented these best practices to measure empowerment in our study population. These best practices were developed through a critical review of common measurement approaches. Using my findings as a guide, I developed a tool to measure women's agency, which is the core component of women's empowerment. This tool was developed in consultation with local experts, and I evaluated the tool using confirmatory factor analysis. I identified a conceptual model of agency, composed of 23 indicators, which measured the domains Household Decision-Making, Freedom of Movement, Participation in the Community, and Attitudes and Perceptions.

Next, I investigated two potential gender-sensitive determinants of poor mental health. Symptoms of mental distress were measured with the Hindi version of the 12-item General Health Questionnaire. In the first analysis, I estimated the cross-sectional association between women's work demands and mental distress. A structured questionnaire captured the amount of time women spent on various activities in the last

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24 hours, and I used this information to measure women's total work time, nature of work (e.g., housework), and type of work (e.g., cooking). Using negative binomial regression models, I estimated the association between work demands (amount, nature, type) and mental distress. I found that high amounts of housework were associated with higher distress, whereas paid work and farm work amount were not. In the second analysis, I estimated the longitudinal association between exposure to intimate partner violence (IPV) and changes in women's mental distress. Using individual-level fixed effects regression models, I found that changes in psychological abuse and controlling behaviour were associated with higher distress scores, whereas changes in physical abuse were not.

Finally, I evaluated the effect of one potential intervention that may improve women's mental health by reducing women's exposure to these gender-sensitive factors, an affordable daycare program. A total of 160 communities lacking access to daycare were randomized to the offer of an affordable daycare program (n=80) or not (n=80). Approximately one year later, 3042 women were re-interviewed regarding their mental distress, work demands, IPV, and agency. Daycare resulted in modest improvements in mental distress, and we found some evidence that daycare shifted women's work burden patterns and reduced IPV, although we found virtually no change in women's agency.

This thesis has advanced knowledge on the measurement of gender-sensitive determinants, estimated the relation between gender-sensitive determinants and women's mental health, and evaluated the effect of a potential intervention to improve women's mental health. Our results highlight the potential importance that gender-sensitive factors may have in the development of mental health problems. Further research on additional interventions that expand the rights of women – or mitigate the effects of these gender-sensitive determinants – are urgently needed to improve the mental health of women in resource-poor settings.

Résumé

Par rapport aux hommes, les femmes souffrent disproportionnément de problèmes communs de santé mentale comme l'anxiété et la dépression. Des déterminants qui affectent principalement les femmes, par exemple la violence du partenaire intime (*IPV*) ou le libre arbitre partiel, peuvent contribuer à ces inégalités de genre en santé mentale. Cependant, la recherche existante est communément caractérisée par une conceptualisation et des dispositifs de mesure inappropriés. Par ailleurs, il existe un manque de données de pays à revenu faible ou intermédiaire sur la santé mentale des femmes. Ces limitations freinent la recherche empirique des déterminants sensibles au genre de la santé mentale des femmes et de potentielles interventions. Les objectifs de ma thèse sont de combler ses déficiences dans un contexte, celui du Rajasthan rural en Inde. Ma thèse utilise les informations d'environ 3200 femmes qui ont participé à des entretiens complets dans le cadre d'un essai randomisé par grappes d'un programme de garderie abordable.

Dans le premier objectif, un ensemble de pratiques exemplaires a été défini pour mesurer l'autonomisation des femmes, puis cet ensemble a été mis en place pour mesurer l'autonomisation de notre population à l'étude. Ces pratiques exemplaires ont été définies par une revue critique des approches courantes de mesure. En utilisant mes résultats comme guide, j'ai établi un outil pour mesurer le libre arbitre des femmes, qui est un composant central de l'autonomisation des femmes. Cet outil a été mis au point en consultation avec des experts locaux. Je l'ai évalué à l'aide d'une analyse factorielle confirmatoire. J'ai identifié un modèle conceptuel de libre arbitre, composé de 23 indicateurs qui mesurent les domaines suivants : les Prises de décision du foyer, la Liberté de mouvement, la Participation dans la communauté et les Attitudes et perceptions.

Puis, j'ai étudié deux déterminants sensibles au genre potentiels de mauvaise santé mentale. Des symptômes de détresse mentale ont été mesurés avec la version hindi de

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12-item General Health Questionnaire. Dans la première analyse, j'ai estimé l'association transversale entre les exigences de travail des femmes et la détresse mentale. Un questionnaire structuré a capturé le temps passé par les femmes à faire différentes activités lors des dernières 24h, puis j'ai utilisé cette information pour mesurer le temps total de travail des femmes, la nature du travail (par exemple, le ménage) et le type de travail (par exemple, la cuisine). Grâce à l'utilisation d'un modèle de régression binomial négatif, j'ai estimé l'association entre les exigences de travail (durée, nature et type) et la détresse mentale. J'ai trouvé que de longues durées de travaux ménagers étaient associées avec une plus grande détresse, tandis que le travail payé et de la ferme ne l'étaient pas. Dans la deuxième analyse, j'ai estimé l'association longitudinale entre l'exposition à la violence du partenaire intime (par exemple, comportement dominant, violences corporelles, abus émotionnel) et les changements de détresse mentale chez les femmes. Grâce à l'utilisation de modèles de régression de niveau individuel à effets fixes, j'ai trouvé que des changements d'abus psychologiques et un comportement dominant étaient associés à des résultats de détresse plus importants, tandis que les changements de violence corporelle ne l'étaient pas.

Enfin, j'ai évalué l'effet d'une intervention potentielle qui pourrait améliorer la santé mentale des femmes en réduisant leur exposition à ces facteurs sensibles au genre, il s'agit d'un programme de garderie abordable. Au total 160 communautés manquant d'accès aux garderies ont été randomisées pour offrir un programme de garderie abordable (n=80) ou non (n=80). Environ un an plus tard, 3042 femmes ont passé un entretien au sujet de leur détresse mentale, des attentes de travail, de la violence du partenaire intime et de leur libre arbitre. La garderie est à l'origine d'améliorations modestes quant à la détresse mentale. Nous avons également trouvé des indications selon lesquelles la garderie modifiait le fardeau de travail des femmes et réduisait la violence intime du partenaire, mais nous n'avons trouvé pratiquement aucun changement au niveau du libre arbitre des femmes.

Cette thèse a avancé les connaissances sur la façon de mesurer les déterminants sensibles au genre. Elle a estimé la relation entre les déterminants sensibles au genre et la santé mentale des femmes et évalué l'effet d'une intervention potentielle pour améliorer la santé mentale des femmes. Nos résultats soulignent l'importance potentielle que les déterminants sensibles au genre peuvent avoir sur le développement de problèmes de santé mentale. Davantage de recherche sur des interventions additionnelles qui encouragent le droit des femmes ou réduisent les effets de ces déterminants sensibles au genre est nécessaire pour améliorer la santé des femmes vivant dans des milieux pauvres en ressources.

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Contribution of Authors

Manuscript 1

Richardson RA. Measuring women's empowerment: a critical review of current practices and recommendations for researchers. *Social Indicators Research*. June 2018. Volume 137, Issue 2, pp. 539-557.

Manuscript 2

Richardson RA, Schmitz N, Harper S, Nandi A. Development of a tool to measure women's agency in India. Under review at *Journal of Human Development and Capabilities*.

Manuscript 3

Richardson RA, Nandi A, Jaswal S, Harper S. Are work demands associated with mental distress? Evidence from women in rural India. *Social Psychiatry and Psychiatric Epidemiology*. November 2015, Volume 50, Issue 11, pp. 1641-1656.

Manuscript 4

Richardson RA, Nandi A, Jaswal S, Harper S. The effect of intimate partner violence on women's mental distress: a prospective cohort study of 3010 rural Indian women. In preparation for *International Journal of Epidemiology*.

Manuscript 5

Richardson RA, Harper S, Schmitz N, Nandi A. The effect of affordable daycare on women's mental health: evidence from a cluster randomized trial in rural India. In preparation for *Lancet Global Health*.

As the first author of the manuscripts in this thesis, I developed the research questions for each manuscript; conducted all analyses; interpreted results; and wrote the first draft of all manuscripts.

Sam Harper is an Associate Professor in the Department of Epidemiology, Biostatistics, and Occupational Health at McGill University. As my thesis co-supervisor, Dr. Harper was involved in all stages of my research, from the development of my research protocol to the submission of manuscripts for publication. He provided substantial guidance on study design (manuscripts 2,3,4,5), gave data analysis feedback (manuscripts 3,4,5), provided feedback on software code (manuscript 3), and provided constructive feedback on manuscript drafts (manuscripts 2,3,4,5).

Arijit Nandi is an Associate Professor in the Department of Epidemiology, Biostatistics, and Occupational Health at McGill University. As my thesis co-supervisor, Dr. Nandi was involved in all stages of my research, from the development of my research protocol to the submission of manuscripts for publication. He provided substantial guidance on study design (manuscripts 2,3,4,5) and data analysis (manuscripts 2,3,4,5), provided constructive feedback on manuscript drafts (manuscripts 2,3,4,5), and provided guidance on contextualizing results (manuscript 1).

Norbert Schmitz is a Professor in the Department of Psychiatry at the Douglas Mental Health University Institute and an Associate Member in the Department of Epidemiology, Biostatistics, and Occupation Health at McGill University. Dr. Schmitz provided substantial guidance on study design (manuscripts 2,5) and data analysis (manuscripts 2,5), and provided constructive feedback (manuscripts 2,5). He also provided guidance on a few measurement-related questions (manuscript 1).

Surinder Jaswal is Professor and Dean of the School of Social Work at the Tata Institute for Social Sciences in Mumbai, India. She provided guidance on the framing of research questions, study context, and provided critical feedback (manuscripts 3,4).

Statement of Originality

The work contained in this thesis represents original contributions to the study of gender-sensitive determinants of poor mental health among women in low- and middleincome country (LMIC) settings. This work advances knowledge about measurement of gender-sensitive determinants by developing specific recommendations to improve current practices to measure women's empowerment and by developing a tool to measure the core component of empowerment, agency, in rural India. To my knowledge, this is the only measurement tool specifically designed to measure agency in this context.

This thesis also contributes to knowledge about two potential determinants of poor mental health among Indian women, work demands and IPV. To my knowledge, this work represents the first time that work demands are investigated as a determinant of poor mental health in a LMIC. In addition, although IPV is consistently associated with worse mental health, partner controlling behaviour and emotional abuse are neglected aspects of IPV, especially among research originating from LMICs. My thesis provides some of the only evidence for its effect on mental health in this setting.

Finally, this thesis advances knowledge of affordable daycare as one potential intervention to improve women's mental health. To my knowledge, this is the first randomized study to investigate the effect of affordable daycare on women's mental health.

My thesis committee members and co-authors gave guidance on substantive, methodological, statistical, and interpretative aspects of this thesis. However, the conception, execution, and drafting of the work are my own.

1 I Introduction

Gender refers to socially constructed identities, roles, and behaviours of men, women, boys, girls, and gender diverse people.¹ Ideas about gender vary by context and shape an individual's opportunities and treatment in society, their perception of themselves and other people, and can significantly shape their lifecourse.^{1,2} There is growing recognition that gender impacts an individual's exposure to certain factors (i.e., gender-sensitive determinants) that may have important consequences for their mental health.³ Differential exposure to certain gender-sensitive determinants may be one contributing factor to gender inequalities in common mental disorders (CMDs).

Research on gender-sensitive determinants in LMICs is in its infancy. Pioneering work on gender and mental health has been conducted primarily in Europe and North America, which has brought to light the importance of gender-sensitive factors in health research. However, gender-sensitive determinants may be especially relevant in patriarchal societies where gender norms severely constrain women's freedom, such as sub-Saharan Africa and South Asia. The effect of gender-sensitive determinants on mental health is largely unknown in these contexts because there is a dearth of survey data from LMICs measuring mental health, and accurately measuring gender-sensitive determinants can present difficulties to researchers even when survey data exists. For example, women's empowerment has emerged as a potentially important gender-sensitive determinant in LMICs, yet approaches to measure this concept vary widely,^{4,5} and many measurement approaches have come under scrutiny as insufficient to comprehensively and accurately measure this concept.⁶⁻⁹

The overall aim of my thesis is to generate evidence on gender-sensitive determinants of poor mental health among women in one LMIC context where gender constrains women's freedom, rural Rajasthan, India. India consistently ranks as one of the world's worst performing countries with respect to women's economic participation and opportunity,¹⁰ and among Indian states, Rajasthan ranks as one of the lowest in regards

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to women's empowerment.¹¹ My thesis will use data from a cohort of approximately 3200 women who completed structured interviews as part of a cluster-randomized trial that evaluated the effect of an affordable daycare program on the well-being of women and children. My thesis uses both observational and experimental aspects of this study.

1.1 Research objectives

The specific objectives of my doctoral thesis are to:

- Develop a set of best practices to measure women's empowerment and to implement these best practices to develop a tool to measure women's agency, the core component of empowerment (Chapter 4).
- 2. Investigate potential gender-sensitive determinants of poor mental health among women, including work demands and intimate partner violence (Chapter 5).
- 3. Estimate the effect of provision of affordable daycare on women's mental distress and investigate potential intermediate factors linking daycare to mental distress, including intimate partner violence, work demands, and agency (Chapter 6).

1.2 Organization of the thesis

This manuscript-based thesis is organized around three core chapters (4-6) comprised of five manuscripts. Chapter 2 provides background information regarding gendersensitive determinants of mental health, and Chapter 3 describes the study population and methodology used in this thesis. Chapter 4 contains two manuscripts that address the measurement of women's empowerment. The first manuscript, "Measuring women's empowerment: a critical review of current practices and recommendations for researchers", critically reviews current measurement practices and offers a set of best practices for measuring empowerment. The second manuscript, "Development of a tool to measure women's agency in India", uses many of the best practices in the first paper to develop a tool to measure women's agency in rural India. Chapter 5 investigates the effect of two gender-sensitive determinants, work burden and IPV, on women's mental health in two manuscripts: "Are work demands associated with mental distress? Evidence from women in rural India" and "The effect of intimate partner violence on women's mental distress: a prospective cohort study of 3010 rural Indian women". Chapter 6 contains one manuscript, "The effect of affordable daycare on women's mental health: evidence from a cluster randomized trial in rural India", which assesses the effect of offering access to an affordable daycare program on women's mental distress. Finally, Chapter 7 summarizes the main findings from the core research chapters, discusses implications for research and public health, and suggests directions for future research.

2 | Background

2.1 Burden of common mental disorders among women

Common mental disorders (CMDs) encompass anxiety and depressive disorders, which are commonly experienced in both community and clinical settings.¹² CMDs encompass many disorders, including major depressive disorder, dysthymia, generalised anxiety disorder, panic disorder, social anxiety disorder, phobias, obsessive-compulsive disorder, and post-traumatic stress disorder.¹³ CMDs affect a large proportion of women worldwide. For instance, a recent systematic review and meta-analysis of 157 studies conducted in 59 countries estimated that 14% of women will experience a mood disorder and 18% will experience an anxiety disorder in their lifetime.¹⁴

Large-scale population-based surveys consistently show that women disproportionately suffer from CMDs compared to men.^{14,15} For example, an analysis of data from 5 LMICs and 10 high-income countries (which was collected for the World Mental Health Surveys) found that women experienced a higher burden of CMDs, including major depressive disorder, post-traumatic stress disorder, generalized anxiety disorder, and panic disorder.¹⁵ Overall, women had an almost two-fold greater prevalence of any mood disorder or anxiety disorder compared to men.¹⁵

2.2 Common mental disorders among Indian women

India, like many LMICs, does not routinely collect mental health information in population-based surveys. The prevalence of CMDs is not well known, and there is wide variation in the few extant population-based estimates. The most ambitious study to date included 34,802 Indian adults and adolescents from 12 Indian states. This study estimated that 3% of Indian women currently had a depressive disorder, and that 6% had experienced a neurotic or stress-related disorder in her lifetime.¹⁶ Another large

study of 9,938 women from seven sites in India estimated that 40% of women currently had a CMD,¹⁷ while another population-based study of 5703 women living in four Indian states estimated that 11% of women currently had a CMD.¹⁸

These large differences in estimates are likely due to different sampling strategies, mental health categorizations (e.g., major depressive disorder versus CMD; current versus lifetime prevalence), survey instruments (e.g., Mini International Neuropsychiatric Interview versus screening tools such as the Self Report Questionnaire or General Health Questionnaire), and study protocols (e.g., presence of others during interviews, skill of interviewers, selection criteria, etc.). Therefore, although precise prevalence estimates are not known, CMDs likely affect many Indian women. In addition, studies comparing the prevalence of CMDs among Indian men and women find that women have a higher prevalence of mental distress,¹⁸ depressive disorder,¹⁵ and anxiety disorders.¹⁵ Thus, consistent with research from other settings, Indian women have a higher prevalence of CMDs than men.

2.3 Gender & development of mental health problems

Regional differences in the prevalence of CMDs^{14,15} indicate that societal differences, including the status of women, may be important contributors to the development of CMDs. One study using data from the World Mental Health Surveys found that women's lower status in society (measured as a country-level aggregate score composed of labor force participation, education, age at marriage, and use of modern contraception) was associated with higher inequalities in the prevalence of major depressive disorder between men and women.¹⁵

A social causation perspective theorizes that an individual's position in society impacts exposure to intermediate factors that affect health.¹⁹ These intermediate factors can be broadly classified as material factors (e.g., physical environment, housing, physical working conditions, income), psychosocial factors (e.g., lack of social support, stressful

living or working conditions, negative life events), and behavioural factors (e.g., exercise, diet, and smoking).^{19,20} These intermediate factors are unequally distributed in populations,^{19,20} which puts certain demographic groups at higher risk of mental health problems.²¹ Strong evidence links social and economic disadvantage with an elevated risk of CMDs such as depression.²²⁻²⁵

Gender shapes a woman's life in fundamental ways – such as her ability to earn an income, to make her own reproductive choices, and to live free from discrimination and violence. Women's position in society might contribute to acute and chronic stressors over the lifecourse that negatively impact mental health (e.g., poverty, violence, genderbased discrimination²⁶) and women may have reduced material and psychological resources (e.g., money, leisure time, self-esteem, sense of control over life) to deal with these stressors.^{21,27} In this thesis, factors that show strong patterning by gender are referred to as gender-sensitive determinants.

An important distinction is between sex, which refers to biological characteristics of being male or female, and gender, which is a social construction of the roles, expectations, and opportunities attributed to men and women in society.²⁸ This thesis is concerned with gender-based determinants and not sex-based factors.

2.4 Gender & gender bias in India

India consistently ranks as one of the world's worst performing countries with respect to women's status. For instance, in 2014 the World Economic Forum ranked India 114 out of 142 countries in women's empowerment based on a composite score of key indicators, with especially low rankings for women's health and survival (141st) and economic participation and opportunity (134st).¹⁰

These stark numbers reflect substantial gender bias, which persists from birth until death. A traditional patriarchal social structure contributes to widespread preference for

males. Traditional marriage practices require women to leave their natal family to live with their husband's family, and the impending 'loss' of a daughter may lead to less investment in female children than male children. The practice of dowry – where the bride's family is expected to give large sums of money or gifts to the groom's family as part of the marriage agreement – is a widespread practice throughout India,²⁹ despite the fact that dowry has been illegal since 1961. Having male children has other financial benefits; males are expected to contribute to the family income, and are expected to financially support their elders in old age and during illness.³⁰ Finally, many traditional Hindu religious practices can only be performed by males, such as lighting the funeral pyre during the cremation of deceased parents.³⁰ Especially in North India, traditional practices do not permit women to inherit property, which is instead transferred to sons or other male family members.³¹

This male preference manifests most starkly in 'missing women' in India, which is a lower proportion of women than would be expected if there was no gender bias. This measure is calculated by comparing the natural gender ratio (1.05 males for every female), and comparing this ratio to population estimates.³² Using this approach, the Indian government estimates that as of 2014, there are 63 million missing women.³² These women are generally believed to be missing due to sex-selective abortions, neglect, and delayed and inadequate medical care.³² This gender preference also manifests in fertility patterns, which show that families will continue to have children until the desired number of sons is achieved, which is exemplified by sex ratios of last-born children, which are highly skewed towards males (1.82 sons : 1 daughter).³² Applying this ratio, the Indian government estimates approximately 21 million women are 'unwanted' because families desired a male child instead of a female child.³²

2.5 Gender-sensitive determinants of common mental disorders

Socially constructed ideas about gender and gender biases shape women's lives and can lead to substantial inequalities over the lifecourse. There is growing recognition that

gender is an important determinant of poor mental health.^{3,27} Many potential gendersensitive determinants have been identified and discussed in the literature, and this section provides a brief review of the most commonly identified and investigated determinants. I have included evidence from India when it is available.

Intimate partner violence

Intimate partner violence (IPV) is "any behavior within an intimate relationship that causes physical, psychological or sexual harm to those in the relationship".³³ Worldwide, approximately 30% of women over the age of 15 experience physical or sexual abuse during their lifetime by an intimate partner.³⁴ IPV is perhaps the most researched and strongest determinant of poor mental health among women; a recent systematic review of longitudinal studies concluded that IPV was associated with incident depressive symptoms.³⁵

In India, nationally representative surveys estimate that, among ever-married women between the ages of 15-49, 48% report that their husband has demonstrated at least one controlling behavior (e.g., tries to limit her contact with her family), and 31% of women reported experiencing physical, sexual or psychological abuse by an intimate partner in their lifetime.³⁶ Longitudinal evidence from four Indian states (Bihar, Jharkhand, Maharashtra, Tamil Nadu) found that women exposed to IPV (physical, sexual, or psychological abuse) had higher risk of CMDs,³⁷ and a cross-sectional study among women from Goa found that exposure to forced sex in marriage was associated with a higher prevalence of CMDs.³⁸

Childhood sexual abuse

Sexual abuse is more common among girls than boys,^{39,40} and a recent meta-analysis estimated that 18% of women worldwide experienced child sexual abuse.⁴⁰ Child sexual abuse can have devastating effects on mental health. It is linked with higher risk of depression, anxiety, and suicide attempts.⁴¹

Sexual violence by a non-intimate partner

In adulthood, women are also at much higher risk of being victims of sexual violence than men.⁴² Sexual violence by a non-intimate partner affects an estimated 8.5% of Indian women aged 15-49.⁴³ Sexual assault in adulthood is linked with higher risk of depression, post-traumatic stress disorder, and attempted suicide.⁴⁴

Human trafficking & forced labour

The majority of people involved in forced sexual exploitation and labour are women.⁴⁵ The International Labour Organization estimates that between 2002-2011, approximately 4.5 million women and girls were involved in forced sexual exploitation, and 7.4 million were involved in forced labour.⁴⁵ In India, a 2016 survey estimated that 18 million men, women and children are currently enslaved due to intergenerational bonded labour, forced child labour, commercial sexual exploitation, forced begging, forced recruitment into armed groups, and forced marriage.⁴⁶

The mental health effects of forced labour and exploitation are not well known, although a study of people trafficked in England found that among women, 51% screened positive for depression, 49% for anxiety, 59% for post-traumatic stress disorder, and more than half (51%) expressed suicidal ideation.⁴⁷

Unpaid work and caregiving

In many societies, traditional gender roles relegate domestic and childcare work to women.⁴⁸ This work is largely invisible. When these duties are counted as work, women throughout the world have both higher amounts of unpaid work and higher amounts of total work compared to men.⁴⁹⁻⁵⁵ High amounts of work are associated with more mental distress.^{56,57}

Responsibilities for caring for the ill, disabled, or frail falls primarily upon female family members,⁴⁸ and this burden can be particularly bad for mental health. Many caregivers provide around the clock care, which infringes upon their ability to earn their own

income⁴⁸ and to have time to promote their own well-being (e.g., leisure activities, socializing, exercise). Informal caregiving by a family member or friend is consistently associated with poor mental health.⁵⁸ For example, data from over 37,000 women involved in the Nurses' Health Study show that those who cared for their ill or disabled spouse for 36 hours a week or more had almost a 6 times greater odds of experiencing symptoms indicative of depression or anxiety compared to those who did not provide care.⁵⁹

Education

Gender-based discrimination can limit women's educational opportunities. Women may receive less encouragement to receive an education, and familial demands placed upon women and girls – such as household chores and childrearing – may limit women's educational aspirations. Low educational attainment can result in lower social status, fewer employment opportunities, and lower income, which can have many implications over the lifecourse. Within India, a 2015/2016 population-based survey found that 31% of adult women and 15% of adult men never attended school.³⁶

Within India, educational attainment may affect women's mental health in ways that are counter to patterns observed in high-income countries. In contexts where the education of girls is not the norm, achieving high levels of educational attainment may come with significant personal sacrifices that could contribute to life stressors and negatively impact mental health.⁶⁰ In addition, educational attainment may not translate into higher status because women may not be able to successfully parlay their education into successful employment when jobs are scarce.⁶⁰ Upon marriage, women may revert to traditional gender roles and experience lower status, which may be especially distressing after experiencing a higher status before marriage.⁶⁰ In India, educational attainment is associated with a twofold *greater* risk of suicide among women.⁶¹

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Poverty

Women are more likely to experience poverty than men across the lifecourse.⁶² Despite major advances in women's rights in the workforce, women's wages are still substantially lower than men's, and a lower proportion of women enter the workforce.⁶² This is especially true in India, where only an estimated 27% of women are in the labour force. Gender norms and assumptions shape employment opportunities for men and women, which results in many women working in lower paying sectors, such as domestic work and street vending.¹⁹ Lower wages and lower labour force participation can be especially detrimental when women are the sole parent; single-mother households have substantially higher poverty rates than two parent households.⁶² Strong evidence links poverty with poor mental health.⁶³ Within India, cross-sectional evidence found severe economic difficulties (i.e., hunger) associated with CMDs among women.³⁸

Agency

Agency, the ability to make decisions and then act upon them,⁷ can be low in contexts where traditional gender roles constrain women's freedom. Low agency might be another determinant of poor mental health, although only a few studies have investigated this determinant and the evidence is mixed. Low agency is associated with CMDs³⁸ and anxiety,⁶⁴ although one study found higher agency associated with higher risk of depression.⁶⁵ Measuring agency accurately presents many challenges,⁶⁶ and it is perhaps the most difficult gender-sensitive determinant to measure.

Reproductive health-related determinants

The social context in which women live can shape the consequences of reproductive health outcomes. In societies with a strong emphasis on childbearing or a strong preference for boys over girls, infertility or giving birth to girls can negatively impact mental health. In India, women may be blamed for giving birth to a girl instead of a boy,⁶⁷ and in societies that prefer boys over girls – such as Pakistan and India – the birth of a daughter is linked with maternal depression.^{67,68} In India, infertility may be

grounds for stigmatization, divorce, or for husbands taking on a second wife.⁶⁹ Infertility has been linked with more psychological distress in a number of settings.⁷⁰⁻⁷²

2.6 Identifying structural interventions to improve women's mental health

Despite the great burden of CMDs experienced by women, only a minority of women with mental health problems in LMICs will ever receive treatment. An analysis of 6 LMICs (China, Colombia, Lebanon, Mexico, Nigeria, Ukraine) that participated in the World Mental Health Surveys found that more than 75% of people with serious mental health problems did not receive any mental health care.⁷³ This is likely due to limited access to mental health care – mental health treatment accounts for less than 3% of healthcare spending in LMICs, and the majority (73%) of this funding is allocated to mental hospitals⁷⁴ – as well as stigma about mental health that prevents many people from accessing care.

Many experts call for addressing the political, social, and economic factors (i.e., structural factors) that impact mental health, which holds promise for sizeable improvements in population mental health.⁷⁵⁻⁷⁸ A structural approach moves beyond interventions targeting individuals to one that targets social conditions.⁷⁹ Thus, addressing structural factors offers 'upstream' opportunities to change social conditions that may impact exposure to factors that negatively impact mental health.

A 2010 World Health Organization report identified many potential structural interventions to reduce health inequalities, many of which could positively impact the lives of women. Identified interventions include policies to reduce income inequality; free and universal access to education and health services; policies that promote a healthy and safe work environment; and social protection policies for the unemployed and single mothers.¹⁹ Examples of structural interventions with specific implications for Indian women include enforcement of the illegal practice of dowry, domestic abuse

protection laws, enforcement of laws granting women rights to inherit property, and policies that expand access to affordable daycare.

Although potential structural determinants are readily identifiable, few interventions have been implemented with the explicit intention of addressing social determinants of health.¹⁹ And, where evidence does exist (such as with poverty alleviation programs), mental health outcomes are rarely investigated.⁸⁰

2.7 Summary

Indian women experience a high burden of CMDs, and social constructions about gender and gender bias likely contribute to the development of CMDs. Some promising research identifies gender-sensitive determinants of poor mental health among Indian women (e.g., IPV, poverty), although there are likely many more unidentified gendersensitive determinants. These determinants may operate in different ways in different contexts, and thus a nuanced approach is needed to carefully measure gender-based factors and tease out the effect of these factors on women's mental health. In addition to identifying determinants, there is an urgent need to find interventions to confront structural factors that contribute to gender inequalities in mental health, which offers great promise in improving the mental health of Indian women.

3I Overview of the study context, data source, and measurement approach

3.1 Study context

This thesis uses data collected from women living in rural tribal communities (predominantly Bhil and Garasia tribes) in the Udaipur District of Rajasthan, India. Tribal groups face many forms of discrimination and social exclusion, and they are generally considered the most socially disadvantaged group in India.⁸¹ People originating from these disadvantaged tribal groups are officially recognized by the Indian government as members of Scheduled Tribes.⁸¹ Relatedly, people belonging to low-status castes are referred to as members of Scheduled Castes.⁸¹ Scheduled Tribes lag far behind other groups in India (including Scheduled Castes) in regards to health and education,^{82,83} and reducing these inequalities has been the focus of development organizations and Indian government schemes (e.g., political and academic reservations for Scheduled Tribes).

Rajasthan ranks as one of the worst performing states in regards to the status of women; a 1999 study ranked it 24th among 26 states in terms of women's empowerment.¹¹ Many Rajasthani women report that they are not involved in decisions regarding their own health care (27%), visiting friends or relatives (29%), or making household purchases (31%).³⁶ Compared with urban Indian women, rural women report less agency on indicators such as freedom to travel, and both rural men and women report more permissive attitudes towards IPV.³⁶ Thus, rural Rajasthani women face many forms of gender disadvantage, and studying the effects of gender-sensitive determinants in this setting may be particularly relevant. However, it should be noted that patriarchy and son preference is generally less pronounced in tribal communities than in other Indian populations. For example, research originating from Uttar Pradesh (another disadvantaged Indian state) found that families belonging to lower castes were more equitable in providing medical treatment to boys and girls.⁸⁴

3.2 Data source

The data used in this thesis comes from a cluster-randomized control trial conducted in rural Rajasthan, India. The main purpose of this trial was to evaluate the effect of access to affordable daycare on the health and well-being of women and children. This study was conducted in partnership with Seva Mandir, a grassroots non-governmental development organization (Udaipur, India) and the Institute for Financial Management and Research (Bangalore, India), an academic research institution.

Participant selection

Village hamlets (i.e., a cluster of houses that share a community center and constitute a separate entity) that had not previously established a daycare with Seva Mandir located in five blocks in the Udaipur District were invited by Seva Mandir to participate in the study. Communities expressing interest in participating had to fulfill the following criteria to be considered for inclusion, established a priori: 1) there was no readily accessible government-operated daycare; 2) at least 25 children between the ages of one and six lived in the hamlet; 3) hamlets had an existing structure suitable for daycare; 4) a woman qualified to operate the daycare lived in the study hamlet or nearby; and 5) the village council indicated adequate demand for daycare. To reduce potential spillover effects between treatment and control villages that might occur if women in control villages enrolled their children in daycares in treatment villages, control hamlets were constrained to be at least 1.5 kilometers from treatment hamlets. Hamlets tended to be geographically isolated. Between December 2014 and January 2015, a total of 160 hamlets meeting the eligibility criteria were selected by Seva Mandir. Within each of these 160 village hamlets, field staff enumerated all households that had at least one eligible woman (specifically a mother or female guardian with a child between one and six years of age) and randomly selected one eligible woman in each household to participate in the study. A total of 3557 potentially eligible women were identified, and 3177 women completed baseline interviews.

Treatment assignment

Following baseline interviews, village hamlets were randomized to either receive assistance in setting up a community-run affordable daycare program (treatment group) or no assistance (control group). Since there was substantial heterogeneity across blocks, clusters were stratified by block (n=5) and within blocks hamlets were randomly selected to receive the affordable daycare program or serve as control hamlets using a 1:1 allocation ratio. Eighty village hamlets were randomized to affordable daycare, and 80 hamlets were randomized to control conditions. Treatment assignment was conducted at McGill University by one of the principal investigators using a random number generator in Stata. The treatment assignment was communicated to Seva Mandir, who implemented the daycare programs.

Intervention

The intervention was access to a full-time, community-run, affordable daycare program (*balwadi*). Balwadis were set up by Seva Mandir in collaboration with local communities. Although Seva Mandir provided comprehensive training, financial assistance, and oversight, the balwadis were managed by the local communities and were operated by women from these communities. Each balwadi provided childcare, nutritious meals, preschool education, and linkage to health services (e.g., immunizations) to children between one and six years of age.

The balwadis were available to any child between the ages of one and six living in the community. Families using the daycare facility were charged a small yearly fee per child (i.e., 150 rupees or about \$2.30 USD), which was deposited in a collective fund and used to purchase items for the children attending the daycare (e.g., shoes, sweaters). Seva Mandir successfully operates similar daycare programs in other villages in rural Rajasthan and has extensive experience setting up and monitoring daycare programs.

Data collection

Trained interviewers conducted structured, computerized surveys in women's homes. Baseline interviews were conducted between December 2014 and June 2015 by 3177 women (response rate = 89%). Village hamlets were assigned to treatment or control group after baseline interviews were completed. Follow-up interviews were completed by 3042 women between June and October 2016 (response rate = 96%), approximately one year after implementation of the daycare programs. Interviewers collected information about household composition and socio-demographic factors, and detailed information about women's time-use, IPV, mental health, and empowerment.

All women underwent an informed consent process and, at the completion of each interview, respondents were given an in-kind compensation for their time, valued at 100 rupees (Rs.). Interviewers completed comprehensive training, including human subjects certification. A comprehensive protocol outlined the ethical treatment of research participants, as well as required training of research and field staff. Basic quality control procedures, such as monitoring the quality of the data by interviewer and treatment village, were also performed on an on-going basis by project staff. This study was approved by the Institutional Review Board of McGill University's Faculty of Medicine and the Human Subjects Committee of the Institute for Financial Management in Chennai, India.

3.3 Approach to measuring mental health

This thesis measured symptoms of mental distress. Although mental health and mental distress are not synonymous, they are closely related. Screening tools that ask about symptoms of mental distress, such as the General Health Questionnaire, have been shown to be highly related to experiencing CMDs in validation studies.^{85,86}

Mental distress was measured with the 12 item General Health Questionnaire (GHQ-12).⁸⁷ The GHQ-12 measures symptoms of CMDs with 12 questions about an individual's mental distress symptoms recently, and respondents are given four response options. For example, one item asks, "have you recently been able to enjoy your normal day-to-day activities?", and response options include "more so than usual", "same as usual", "less so than usual", and "much less than usual". The GHQ-12 items, in both English and Hindi, are shown in Appendix A.

Each item of the GHQ-12 is typically dichotomized so that potential scores range from 0 to 12, with higher scores denoting more distress. A few different schemes for dichotomizing each item are commonly used, and validation work comparing three different scoring methods found that the 0-0-1-1 scoring system had the best classification properties.⁸⁸ This method classifies people as having some versus no distress. For example, for the item "have you recently been able to enjoy your normal day-to-day activities?", the response categories "less so than usual" and "much less than usual" would receive a score of 1 (denoting some distress), and "more so than usual" and "same as usual" would receive a score of 0 (denoting no distress). This scoring system is commonly employed in India.^{18,86,89,90}

Within epidemiologic research, GHQ-12 scores are commonly used as either continuous scores derived by dichotomizing each item and then summing responses (e.g., score range: 0-12) or using pre-determined cut-points to classify someone as having a CMD. I chose to use a continuous score in this thesis for two reasons. First, I am not aware of validation work conducted among women in tribal communities, and thus the optimal cut-point in this population is not known. Validation work indicates that specific cut-points for classifying a CMD can vary considerably among different populations, even within India.^{86,89} Second, it is widely acknowledged that mental health disorders fall upon a continuum and schemes to classify people as having or not having a mental health disorder, such as depression, rely on arbitrary cut-points.⁹¹ Many have argued against classification schemes in the study of mental health problems,⁹²⁻⁹⁵ and some advocate for use of continuous measures of CMDs or distress.³⁸ This approach most accurately reflects the distribution of mental distress within a population and aligns

with a population health approach to studying the distribution of disease within a population.

The GHQ-12 has undergone extensive psychometric evaluation, and a recent systematic review of mental health measurement tools in LMICs found that it demonstrated some of the strongest psychometric properties among the roughly 20 assessed instruments.⁸⁵ The GHQ-12 is commonly used to measure mental health problems in India.^{18,86,89,90} Within India, validation studies indicate the GHQ-12 performs well in a number of different populations and settings,^{90,96-99} and a comparison of 5 screening tools found that the GHQ-12 had among the strongest psychometric properties.⁸⁶

We also conducted some validation work of the GHQ-12 in our study population. We assessed the face validity of the GHQ-12 among local experts, and the GHQ-12 was pilot tested on approximately 200 women living in communities adjacent to the study communities to assess comprehension and suitability. I assessed the construct validity of the GHQ-12 with confirmatory factor analysis (CFA), which is a method for testing the validity of a hypothesized measurement model. I used GHQ-12 responses from the baseline survey (n= 3177 women), and I dichotomized distress items using the 0-0-1-1 scoring system. I modeled a one factor latent variable 'distress' that was measured with the 12 dichotomized GHQ items. Model fit was assessed with three fit statistics: the Root Mean Square Error of Approximation (RMSEA), the Bentler Comparative Fit Index (CFI), and the Tucker Lewis Index (TLI).^{*} My analysis found that this hypothesized measurement model fit the observed data well (RMSEA = 0.041; CFI = 0.97; TLI = 0.96), which indicates that these 12 separate items tap into the same latent concept.

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^{*} The RMSEA is a badness-of-fit index where 0 indicates best fit,¹⁰⁰ and values close to 0.06 or below are generally considered to indicate good fit.¹⁰¹ The CFI and TLI are relative fit statistics. Values can range from 0 to around 1, with higher values denoting better fit; values of 0.90 or above are considered to have at least acceptable fit,¹⁰² and values close to or above 0.95 indicate good fit.¹⁰¹

These validation activities indicate the GHQ-12 is suitable to use in this study population, and that this scoring system (0-0-1-1) shows strong psychometric properties.

Although the GHQ-12 is one of the best tools to measure mental distress in India, it has limitations. There is growing recognition that mental health symptoms may be described or manifest differently in different contexts and cultures.^{103,104} One study among depressed Indian women, for instance, found that women described their mental health symptoms as physical complaints, such as body aches and gynecological symptoms.¹⁰⁵ Thus, the GHQ-12, which was initially developed for Europeans, may miss some symptoms of distress in India.

4I Measuring women's empowerment

4.1 Preface to manuscripts 1 and 2

As I began my thesis work and delved into potential gender-sensitive determinants, women's empowerment emerged as one of the most promising. The empowerment of women has garnered considerable attention in the feminist and development literature, and in 2015, achieving gender equality and empowering all women and girls was identified as one of 17 Sustainable Development Goals (SDGs).

Despite considerable attention, what empowerment is and how to measure it remain perplexing problems. As I read through a vast body of literature encompassing development economics, feminist studies, psychiatry, social work, demography, and epidemiology, I saw that authors from these disparate fields had different conceptualizations of empowerment and used different approaches and methods to measure it. This led me on a long process in order to understand the main empowerment concepts and how they may best be measured quantitatively. Manuscript 1 is a culmination of this work, which is presented as best practices for researchers. In Manuscript 2, I use many of the best practices identified in my first manuscript to develop a tool to measure one aspect of women's empowerment, agency, in my study context.
4.2 Measuring women's empowerment: a critical review of current practices and recommendations for researchers

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Abstract

Background: Women's empowerment is an intrinsic human rights goal that has implications for the health and well-being of women and their children. Poor measurement hampers current research efforts, and improving empowerment measurement is a frequently identified research priority. However, a discussion of specific steps researchers can take to improve upon common measurement practices is lacking. The purpose of this paper is to provide quantitative researchers with recommendations to measure women's empowerment in a theory-based, precise, and comprehensive way.

Methods: This paper reviewed key theoretical concepts of women's empowerment and critically reviewed common measurement approaches.

Results: Three broad recommendations for measuring empowerment emerged from this critical review, and specific suggestions to meet these recommendations are discussed. First, researchers should draw upon theory to construct measurement models (e.g., using theory to construct dimensions of empowerment and selection of indicators). Second, researchers should use analytic methods that minimize implicit judgments and bias (e.g., not classifying women as empowered using specific criteria). Third, researchers should collect comprehensive empowerment information (e.g., supplementing quantitative measures with qualitative interviews to learn how and why changes took place).

Conclusion: Measuring empowerment poses a number of challenges, and this review provides researchers with suggestions to improve upon common measurement practices. Improved measurement will strengthen research efforts on the causes and consequences of poor empowerment, which has the potential to improve the well-being of women and their children.

INTRODUCTION

Women's empowerment, the process of women enhancing their ability to make strategic life choices,¹ is an intrinsic human rights goal. Low empowerment also has important implications for the well-being of women and their children: it is linked with a number of adverse economic and health consequences for women²⁻¹⁵ and their children.¹⁶⁻²³

Women's empowerment is a popular topic among researchers and development organizations, and in 2015 the United Nations identified achieving gender equality and empowering all women and girls as the 5th of 17 Sustainable Development Goals (SDGs).²⁴ However, measuring women's empowerment poses significant challenges to researchers.^{1,25,26} Poor measurement hampers efforts to find the causes and consequences of low empowerment²⁷ and to assess the impact of social policies aimed at increasing empowerment.²⁸ Improving current measurement practices is essential to studying this important concept and assessing progress towards achieving Sustainable Development Goal 5 (SDG-5).

Three main sources of poor empowerment measurement are commonly discussed in the literature. First, many empirical studies do not fully integrated theory into their conceptualizations of empowerment²⁸ and selection of indicators.¹ Second, many studies use analytic methods that can lead to imprecise or biased measurement models.^{29,30} Third, some studies use information that is too narrowly focused to fully capture empowerment.¹ In addition, researchers define, operationalize, and measure empowerment in different ways, which makes comparison of results among studies difficult.^{12,31}

Although improving empowerment measurement is a commonly identified research priority,^{1,31,32} a discussion of specific steps researchers can take to improve upon current measurement practices is lacking. This paper aims to fill this research gap by providing researchers with suggestions to measure empowerment in a theory-based,

precise, and comprehensive way. The paper is organized as follows: Section 1 reviews key theoretical concepts of empowerment, many of which have important implications for measuring empowerment. A number of papers discuss these concepts and their implications for measurement in great detail, and this paper briefly highlights key concepts. Section 2 critically reviews common measurement approaches and provides researchers with specific suggestions to improve upon many common measurement practices. This is the main contribution of this paper; although improving measurement is an identified priority, a comprehensive discussion of *how* to improve measurement is lacking.

SECTION 1: KEY EMPOWERMENT CONCEPTS

A clear conceptualization of empowerment is essential before attempting to measure it. A large and robust body of theoretical work over the past 30 years developed definitions of empowerment and conceptual models of the empowerment process. This work can provide the foundation for sound empowerment measurement.

1.1 Definition

There are a number of definitions of women's empowerment.^{1,28,33,34} Perhaps the most influential definition is provided by Nalia Kabeer who defines it as the process by which women increase their ability to make life choices.¹ Although there are a number of definitions of empowerment, most scholars agree on a few core concepts. First, women's empowerment is separate from the empowerment of other disadvantaged groups due to issues specific to women, such as household and familial dynamics²⁷ and the power relations between men and women.³³ Second, agency—the ability to make choices and act upon those choices—is a central component of empowerment.^{1,27} Third, empowerment is a process occurring over time.¹ Some aspects of empowerment happen quickly, while others may take decades.²⁷ For instance, changing ideas about

women's role in society is a transformational process that may develop over decades, whereas increasing educational attainment for women can happen more quickly.

1.2 Conceptual model

A few authors have proposed conceptual models of the empowerment process.^{1,28,35} This basic model, adopted from Kabeer's description of the process,¹ is shown in Figure 1. Conceptual models distinguish three steps in the empowerment process: resources, also referred to as pre-conditions¹ or opportunity structures;²⁸ agency, also referred to as autonomy;³⁶ and *achievements*, also referred to as outcomes.^{1,28} *Resources* encompass material resources (e.g., money, education),¹ human and social resources (e.g., social capital),¹ and institutional environments.²⁷ Resources facilitate the empowerment process by providing conditions in which women's agency may be increased. Agency is the ability to identify one's goals and act upon them.¹ Agency includes internal qualities such as critical thinking skills and making independent decisions,^{33,37} and the ability to carry out those decisions.¹ Decisions might be carried out outright or by navigating relational and societal dynamics through processes such as negotiation, deception, and manipulation.¹ Achievements are the realizations of one's goals. Achievements might include educational attainment, increased labour market participation, or good health. Agency provides direct evidence of empowerment. whereas resources and achievements are indirect (i.e., proxv) measures.^{27,38,39}

1.3 Key measurement concepts

A seminal paper by Nalia Kabeer¹ discussed the conceptualization of empowerment and implications for its measurement, and additional theoretical and empirical work bolstered and expanded upon these ideas. This work is summarized below.

Agency is multi-dimensional

Women's agency is a multi-dimensional concept.^{27,29,32,40} Women may have high agency in certain dimensions yet not in others.⁴¹⁻⁴³ For example, in some Indian contexts women have high levels of household decision-making yet do not have much freedom to travel alone.⁴²

Many dimensions of agency are identified in the literature. Studies conducted by different authors and in different settings have delineated dimensions slightly differently. The most commonly identified dimensions are household decision-making (e.g., decisions about children's schooling, decisions about small household purchases) ^{7,42,44-52} and freedom of movement (e.g., ability to travel to various destinations).^{7,42-45,47,49,50,52-59} However, many other dimensions of agency are identified, such as involvement in political activities, ^{50,56,57,60} political and legal awareness, ⁵⁰ gender preferences, ⁴² attitudes about women's economic roles, ⁵¹ self-efficacy, ⁵¹ control over income, ^{7,49,58} economic security, ⁵⁰ involvement in the community, ^{51,59} involvement in fertility decisions, ⁴³ attitudes about IPV, ^{30,42} and experiencing IPV. ^{43,58}

Not all life choices are equal

Some life choices have larger implications for women's agency than others.¹ Theoretical work proposes a decision-making hierarchy, which can be parsed out into policy decisions and implementation decisions.^{1,61} Examples of policy decisions include how many children to have, when to have children, where to live, and who to marry; these decisions can shape a woman's life trajectory.¹ Implementation decisions are smaller-scale decisions that may enhance quality of life but do not shape a person's life trajectory.¹ In some contexts men make large-scale policy decisions and delegate implementation decisions to women. For example, an Egyptian survey found that many women were involved in decisions regarding use of family planning methods, but fewer women were involved in the policy decision of having another child.⁶²

Empowerment is contextual

Empowerment is contextual.^{1,26,27,40} How women define empowerment may differ by context. Western ideals of men and women having equal status in society and women being autonomous from men may not resonate with women in some settings. Rather, women may want respect and equality but not autonomy from men.⁶³ A study of Bangladeshi women, for instance, found that women desired more equality within their families instead of greater independence outside of the family.⁶⁴ These nuances may impact how empowerment is defined in certain contexts.

Indicators that denote empowerment may also be context-specific.⁶⁵ Freedom to visit the market alone is a common indicator of agency in many contexts,^{42,44,45,47,52-57} yet in some settings in Bangladesh visiting the market alone is seen as an indicator of low social class (e.g., a sign that there are no males in the home to visit the market) and is not a sign of agency.⁶³ Indicators also change over time. For example, a study of Bangladeshi women compared indicators of agency developed in the early 1990s and assessed their relevance in interviews conducted in 2007.⁵⁷ Making small purchases without the permission of their husbands was an indicator of agency in the mid-1990s, but in 2007 this indicator was no longer relevant because almost all women had the freedom to make these purchases.⁵⁷

SECTION 2: RECOMMENDATIONS FOR QUANTITATIVE RESEARCHERS

Translating concepts of empowerment into study measures that effectively capture it poses a number of challenges. Three main sources of poor empowerment measurement are commonly identified in the literature. First, many empirical studies do not fully integrate the rich body of theoretical work conceptualizing and defining women's empowerment into their measurement models. For instance, many studies do not use theory in their conceptualization of empowerment²⁸ and selection of indicators.¹ This problem appears to be widespread: a 2014 review of women's economic empowerment intervention studies found that most did not use an explicit theoretical framework.⁶⁶ Second, many studies use analytic methods that can lead to imprecise or

biased measurement models,^{29,30} some of which may inadvertently introduce a researcher's own values.¹ Third, empowerment is nuanced and contextual, and some studies use information that is too narrowly focused to fully capture empowerment.¹

This section provides specific suggestions to quantitatively measure empowerment in a theory-based, accurate, and comprehensive way. These suggestions were distilled from a comprehensive search and review of women's empowerment measurement approaches and critiques of measurement approaches. The search included women's empowerment reviews, relevant journals, and "snowball" searches of included articles. This section is organized around measurement recommendations, and uses examples from the literature to illustrate specific measurement approaches. These recommendations are summarized in Table 1.

The aim of this paper is not to review all empirical studies on empowerment. The empowerment literature is vast, spanning disciplines such as demography, sociology, economics, and epidemiology. A simple PubMed search of women's empowerment and related concepts such as autonomy, agency, and choice revealed over 30,000 studies. The aim of this paper is also not to tally measurement approaches used in the literature; other recent reviews have summarized measurement approaches used in a sub-set of empowerment studies, such as those related to economic empowerment interventions,⁶⁶ child nutrition,³¹ and maternal and child health.¹² Therefore, such a review would be redundant. Rather, this review discusses common measurement approaches and draws upon the vast empirical literature to extract specific examples, with the aim of providing recommendations for improving upon current measurement approaches.

2.1 Use theory to inform study measures

Explicitly describe conceptual model

Many studies do not explicitly describe their conceptual framework,⁶⁶ and providing such a framework can clarify a researcher's conceptualization of empowerment. This framework should state the aspects of empowerment researchers are attempting to measure (i.e., resources, agency, achievements), and if investigating an exposure or intervention that may impact empowerment, the mechanisms by which women may become empowered. For example, a study of Bangladeshi women investigated the association between empowerment resources (e.g., media exposure, educational attainment) and women's agency.⁶⁷ The study provided a detailed conceptual framework of how these resources may increase agency, thus clarifying the authors' conceptualization of empowerment.

The distinction between different aspects of empowerment and the mechanisms in which empowerment may operate are nuanced, and explicitly stating this information can help clarify these relationships. The role that IPV might play in the empowerment process provides one example of the need for clear conceptualization. Evidence on the link between aspects of empowerment and IPV is mixed.^{10,11,36,55,68} Studies have conflicting conceptualizations of how IPV fits into the empowerment process. Some studies conceptualize absence of IPV as a resource that impacts agency,³⁶ as a component of agency,⁵⁵ or as a consequence of women's agency.^{10,11,68} A number of potential mechanisms linking agency to IPV have been proposed, some of which lead to either higher or lower risk of IPV.^{11,68} Additionally, these relationships appear to be influenced by context.^{10,55} Studies that clearly state their conceptualization of IPV and proposed mechanisms (some of which may be contextual) can help clarify IPV's role in the empowerment process.

Use indicators relevant to a specific context

The core ideas of empowerment are universal, although indicators of empowerment may differ across contexts.²⁷ Behaviours and attitudes that in one context indicate empowerment may not in another. For example, having freedom to visit a doctor without a male household member's permission may be a sign of empowerment in rural

Bangladesh where purdah restricts women's movements but not in urban Peru where women routinely travel alone.²⁷ Whenever possible, researchers should use context-specific indicators.

There is a strong temptation to identify indicators of empowerment that are relevant to all contexts, and some studies propose universal indices.^{32,46} However, to be applicable to all contexts, indicators tend to be broad and likely miss some nuances of empowerment in certain contexts.⁵⁷ For example, Alkire et al.⁴⁶ developed the Women's Empowerment in Agriculture Index, which measures women's empowerment in five domains, including leadership. The leadership domain measures whether a woman is involved in at least one economic or social group and whether she is comfortable speaking up in public. However, opportunities to participate in groups are context-specific: some women may live in locations where there are no groups to attend, whereas other women may live in communities with many groups. All women from settings without groups will be classified as not empowered for the group membership indicator, although in reality some women may have a high degree of empowerment. Thus, group membership is one example of a context-specific indicator that may provide less than optimal empowerment measurement across contexts.

A few different approaches can balance the contextual nature of empowerment with the need to compare empowerment across contexts. One study compared women's empowerment in five Asian countries using the same empowerment indicators but varied them slightly to reflect different contexts.^{40,69} For example, one question asked women who decides on making major purchases, and the example of a major purchase varied by country.⁴⁰ Another approach identifies common dimensions of empowerment and allows specific indicators to vary depending on their relevance in different settings. Although rarely done in practice, the Women's Empowerment in Agriculture Index provides an example of this approach.⁷⁰ The index compared women's empowerment in Uganda, Bangladesh, and Guatemala, and questionnaire modules were added or subtracted depending on their relevance in certain contexts. In Bangladesh, for

instance, an additional module pertaining to decision-making in aquaculture was added because aquaculture is common in Bangladesh but not in Uganda and Guatemala.⁷⁰

Use direct indicators of empowerment (i.e., agency) when possible

Whenever possible, researchers should use direct measures of empowerment (i.e., agency). Use of indirect indicators (i.e., resources, achievements), especially with cross-sectional information, can be problematic. Many indirect indicators, including education, land ownership, employment, age of first marriage, and participation in microcredit, are used as evidence of women's agency,^{39,71} yet there is a growing consensus that these indicators provide inadequate evidence.^{41,71} First, although resources can facilitate women gaining more agency, it does not ensure it.¹ Second, the directionality of many of these relationships is not clear; these factors may be resources for empowerment, achievements of the empowerment process, or both.

Age at first marriage is one indirect measure of women's empowerment that illustrates the difficulties with using indirect measures to infer changes in agency. Cross-sectional evidence indicates that married women who married at an older age have greater agency.⁷²⁻⁷⁴ However, cross-sectional information makes it impossible to discern if women who marry at an older age already possess greater agency or if marrying at a later age facilitates the development of high agency. Both conceptualizations of age at marriage have been put forth, either as an empowerment resource⁷²⁻⁷⁴ or achievement.⁷⁵ Thus, using age at marriage as a proxy for empowerment with cross-sectional data provides ambiguous evidence of whether women *have* high agency or if they *might develop* high agency.

In addition, using indirect indicators can lead to different conclusions than measuring agency directly. This issue is exemplified in a study investigating the effect of microcredit on women's empowerment.⁷⁶ Microcredit increased women's employment, and thus focusing on this outcome indicated a positive effect. However, an examination of the loan process portrayed a negative effect: the majority of women's loans were

used for goods or services related to family farms and businesses, yet only 10% of women had access to profits from these assets. Several women initiated paid work to repay these loans.⁷⁶ Measuring agency directly—such as with indicators related to control over income and family decision-making—might reveal no change in women's agency due to microcredit.

Some research uses community, regional, or societal level empowerment indicators. These studies generally measure empowerment indirectly with empowerment resources or achievements. In fact, some aggregate indicators are not measureable at the individual level, and therefore it may not be possible to collect direct empowerment indicators. One example of an aggregate measure is the United Nations Development Programme's Gender Inequality Index, which uses country-level information on female political representation and the proportion of women with at least some secondary education to construct a measure of empowerment.⁷⁷ The indictors used in this index may be either resources or achievements of empowerment, thus providing a snapshot of the status of women, but do not measure empowerment directly.

Construct dimensions of agency based upon theory

There is a large body of theoretical and empirical work on women's empowerment, and this information should be integrated into measurement models. When enough information is available, indicators of agency should be grouped into dimensions based on prior conceptual or empirical work. For example, one study measured women's agency in India by constructing three dimensions of agency based upon prior empirical evidence from India and related settings, and the validity of these dimensions was then empirically tested.³⁰

Exploratory factor analysis (EFA) is another approach to identify dimensions of empowerment, but this method should be avoided if enough information on potential dimensions is available. EFA is a data-driven measurement method that uses the correlation among indicators to identify dimensions,⁷⁸ which may result in groups of

indicators that are counter-intuitive and have no conceptual basis. For example, a study of Indian women measured two dimensions of agency, freedom of movement and the ability to make decisions regarding household spending.³⁶ An analysis employing EFA indicated that agency should be measured with only one dimension, and these two dimensions were combined into one. However, most conceptual and empirical research suggests these are two distinct dimensions,^{7,42-47,49,50,52-59} and thus this measurement model does not align with the majority of the evidence.

2.2 Use analytic methods that minimize implicit judgments and bias

Avoid combining different levels of decision-making into the same category Surveys commonly collect multiple response levels about decision-making, and some studies combine these responses into the same categories. For example, one study lumped a women decides alone, jointly with her husband, or jointly with other household members into one category, and constructed a second category if the decision was made by her husband alone or only by others in the household.⁴⁹

Lumping together categories has the potential to introduce a researcher's own biases about decision-making into the study, and thus should be avoided when possible. There are conflicting ideas about how joint decision-making should be conceptualized. Some studies see it as disguised male decision-making, whereas other studies see it as evidence of cooperation.⁶³ For example, in a study of control over loans, joint control was conceptualized as male dominance in decision-making,⁷⁹ whereas another study concluded that joint decision-making may provide evidence of equitable decision-making.⁸⁰ These decisions can affect study results. One expert noted that studies evaluating the effect of credit on empowerment tended to find positive or negative results based on how joint decision making was categorized.⁶³ In addition, categories of decision-making may have different meanings in different contexts,⁸⁰ and a lack of contextual knowledge may lead to collapsing categories incorrectly. Without clear evidence indicating how to collapse categories, researchers should avoid this practice.

Use methods that do not equally weight each indicator of empowerment The most common way to measure empowerment is with summary scores constructed by adding together responses to each indicator.^{7,40,45,49,54,55,71,81} These scores are calculated by assigning each response a value (e.g., no=0, yes=1) and then adding together these values to calculate a summary score.

Although very popular, this method should be avoided when possible. Summary scores rely on the untested assumption that each indicator contributes equally, and if this assumption is not true the measurement model will be biased. One study, for example, used eight indicators to measure household decision-making, including questions about who had control over what to cook and who had control over having a baby.⁴⁵ A summary score assumes these two indicators carry equal weight in measuring a woman's control over her life, which is highly unlikely. Empirical research comparing summary scores with more accurate measurement models that do not equally weight indicators (e.g., confirmatory factor analysis (CFA)) find that summary scores can produce less accurate and potentially biased scores.^{29,30} In addition, the relative importance of indicators used to construct empowerment scores might differ across contexts.²⁹ Using CFA, one study compared the same measurement model in Pakistan and India.²⁹ The study found that even among these two similar contexts, the importance of indicators (i.e., factor loadings) differed between these two countries.²⁹

Other analytic approaches do not assume each indicator is weighted equally, and therefore are preferable. One approach is to estimate the relationship between each indicator and exposure or outcome separately. However, if using many indicators, interpretation of results can be difficult with this approach due to a large number of estimates. A more complex approach is CFA. CFA uses theory to group indicators into dimensions, and then empirically tests that the hypothesized measurement model corresponds to the study data. CFA calculates summary scores for each dimension of empowerment using the correlation among indicators, thus avoiding the problem of

giving equal weight to each indicator. Despite the advantages of using CFA, it is rarely used in empirical studies. For instance, a recent systematic review of the association between women's empowerment and health outcomes found that only 1 of 67 studies (2.5%) used CFA.¹² EFA is another approach that does not give equal weight to each indicator; however, as previously discussed, EFA should be avoided when possible because it may lead to groupings of indicators with no conceptual basis.

Use global empowerment measures cautiously

Global empowerment measures provide a single summary statistic of women's empowerment. These should be used cautiously because they may obscure particular dimensions of a woman's life in which she is disempowered or empowered. For example, women might have a high degree of freedom to travel where they desire, yet low control over household income: a global measure obscures these differences. Therefore, it is advisable to use global empowerment measures in conjunction with dimension-specific information.

Global measures should be constructed carefully because some dimensions may be more important to women's overall empowerment than others. For example, involvement in family decision-making might be more (or less) relevant to women's overall empowerment than views on gender norms. Global scores are sometimes constructed by giving equal weight to each dimension, which may result in biased measurement models. For example, one study standardized four dimension-specific scores so that each ranged from 0 to 1, and then added together these four scores to compute a global empowerment score.⁵⁵ Some indices construct global measures using weights provided by the authors,⁴⁶ although without clear rationale and evidence for these weights, this method may also lead to a biased global score.

A better approach to construct global scores is to weight dimensions according to their potential importance according to study participants or to use specific analytic methods. One study conducted qualitative interviews with rural Bangladeshi women to determine

how important each dimension of agency was in relation to other dimensions, and these rankings were applied to survey data to create an overall, weighted empowerment score.⁸² Weights can also be determined with analytic methods such as CFA. However, due to the contextual nature of empowerment, weights derived from one population likely do not apply to another.

Avoid classifying women as empowered using cut-points

Some studies calculate summary scores and then classify women as empowered based upon certain cut-points or criteria. Determining what constitutes an adequate level of empowerment may involve subjective, unverified judgments. For example, the Women's Empowerment in Agriculture Index classifies women as empowered using cut-points at both the indicator and global empowerment levels.⁴⁶ Participant feedback or expert opinions might mitigate unverified judgments of certain cut-points; however, this feedback is likely highly contextual and may only be relevant to the experiences of individuals in certain geographic locations or demographic groups.

2.3 Collect comprehensive information

The nuances of the empowerment process may not be effectively captured with focused quantitative data. For example, one Kenyan study found that women state men have most of the formal decision-making power in the household, although in practice decision-making played out differently.⁸³ Men decided where crops were planted, and if a woman disagreed with her husband, she would not contradict him but would plant crops in a different location. If confronted by her husband, she would offer an excuse such as the seeds did not germinate in the location selected by her husband.⁸³ Although such nuances are difficult to capture in quantitative studies, researchers can undertake a number of steps to ensure that their study portrays the process of empowerment as accurately as possible.

Talk with study participants, community leaders, and local experts

Talking with local informants can greatly improve study measures. These discussions can help design survey tools and identify indicators of empowerment that can subsequently be used in large-scale surveys. This approach was used in an impact evaluation of a women's development program in Ethiopia, which interviewed community leaders, men, and women from the community to inform development of a survey.³⁵ If resources allow, an even better approach is to identify indicators of empowerment through extensive observation and ethnographic interviews with women, which has been done in a few select studies.⁵⁰

Supplement quantitative information with qualitative information

Interviews can shed light on how and why changes took place, and may identify unintended consequences of an intervention. This approach was used to evaluate savings and credit groups for Malian women.⁸⁴ The quantitative evaluation found that women chose to invest their surplus money in livestock. In this context livestock is a high risk investment due to the risk of disease and famine, and it appeared counter-intuitive that women would chose this option instead of putting money in a more secure place such as a savings account.⁸⁴ Interviews with women revealed that investment in livestock made it easier for women to turn down demands for money from their husband and friends; they could state they had no cash, thus making it easier to accrue wealth.⁸⁴

Qualitative interviews may also clarify what study variables are actually measuring. One study investigated patterns of decision-making among husbands and wives by surveying husbands and wives separately and asking them who had the "final say" in a number of decisions.⁸⁰ In-depth interviews revealed that even in situations where husbands had the final say, women were somewhat involved in the decision-making process through communication and consultation with their husbands.⁸⁰ The authors conclude that conducting qualitative interviews is important to understand these decision-making definitions in specific settings.⁸⁰

Measure many aspects of empowerment, including closely related concepts

Interventions may empower or disempower women in unexpected ways. For example, some credit programs for women might not only increase economic security(e.g., income) but might also lead to greater decision making authority in the home or increased mobility.⁵⁰ Each of these dimensions of agency may impact women's lives differently. For example, increased control over income is linked with increased spending on health and nutrition-related expenses,⁸⁵ whereas increased mobility is linked with more antenatal care.⁷ Measuring many dimensions of agency may reveal the factors that impact each dimension of agency, as well as show how each dimension may affect other areas of women's lives.

Interventions might also have unintended consequences. For instance, in some contexts economic empowerment interventions have increased women's risk of IPV.⁸⁶ Overly narrow measures of empowerment may miss these important dynamics, and studies should strive to measure other aspects of women's lives that may be affected by empowerment.

Collect information from men

Men's power over women, and the attitudes of men wielding this power, could have a profound impact on women's empowerment. This power dynamic may be especially salient at the household level. A study in Bangladesh found that women's participation in the labour force was strongly associated with the educational level of husbands (which some theorize is a proxy for more progressive attitudes), even more so than a women's own educational level.⁸⁷ Men's attitudes and behaviours are important barriers and facilitators of the empowerment process, yet men are rarely interviewed.⁸⁸

Men can also provide direct information on women's empowerment indicators. One Bangladeshi study asked husbands if their wives made purchases without their permission and if they could travel to locations unaccompanied, and these responses were integrated into measures of women's empowerment.⁸⁹ Surveying men may also uncover nuanced differences in the perception of household power dynamics. Studies that ask husbands and wives the same questions about decision making authority in the household find that some answers conflict considerably.^{65,90}

DISCUSSION

This paper critically reviewed common approaches to measuring women's empowerment and provided researchers with suggestions to comprehensively and accurately measure it. Many common measurement approaches have high risk of biased measurement due to not fully integrating theory into their measurement models, using methods that could introduce implicit biases, and collecting information that is too narrowly focused. Although these shortcomings are identified in the literature, a specific discussion of how researchers can measure empowerment accurately was lacking. This paper helps to fill that research gap.

The suggestions synthesized through this review may be especially relevant to researchers investigating the causes and consequences of empowerment or to those conducting impact evaluations of social policies with implications for the empowerment of women. Monitoring SDG-5, to achieve gender equality and empower all women and girls, deserves specific mention. This goal is a major achievement in recognizing the intrinsic value of women's equality and empowerment as stand-alone development goals.⁹¹ SDG-5 has the ambitious targets of 1) ending all forms of discrimination against all women and girls everywhere, 2) eliminating all forms of violence against all women and girls, 3) eliminating all harmful practices, such as child, early and forced marriage and female genital mutilation, 4) recognizing and valuing unpaid care and domestic work, 5) ensuring women's full and effective participation and equal opportunities for leadership, and 6) ensuring universal access to sexual and reproductive health and reproductive rights. These targets can be conceptualized as predominantly structural resources of the empowerment process (e.g., ending all forms of discrimination, eliminating child marriage) that promote gender equality and may facilitate the process of empowerment. However, being exposed to favorable conditions is no guarantee that

women will become empowered.¹ Thus, collecting additional information pertaining to women's agency, using the suggestions highlighted in this review, can clarify the effectiveness of the SDG-5 targets to empower women.

Few studies fully implement the suggestions highlighted in this review. Recent efforts to measure women's agency in Egypt^{73,92,93} provide an illuminating case study of some of the best practices for measuring empowerment. Yount et al.⁷³ drew upon prior conceptual, ethnographic, and empirical work to develop a definition of women's agency and identify dimensions of agency relevant in an Egyptian context. The validity of this theory-based model of women's agency was empirically tested with exploratory and confirmatory factor analysis. This measurement model was subsequently used by Crandall et al.,⁹² who investigated the association between a woman's age at first marriage and her post-marital agency. The authors explicitly described the theorized relationship between an Egyptian woman's age at marriage and her post-marital agency, and they employed analytic methods that minimized implicit judgments; specifically, the authors estimated the association between age at first marriage and agency using a multiple-indicators multiple-causes model, which is a type of model that estimates agency as a latent variable. This model allows different indicators to be more or less relevant to a woman's overall agency (i.e., the model estimates factor loadings for each indicator). Thus, this measurement model does not assume each indicator contributes equally to agency, nor are researchers' own subjective judgments about the relative importance of each indicator integrated into the measurement model. This example makes clear that accurate empowerment measurement requires diligence, careful integration of prior research, and a sustained commitment to developing contextspecific measurement models.

This review has limitations. First, this review describes basic concepts of empowerment and is not an exhaustive discussion of empowerment conceptualizations. There is a large and robust literature on conceptualizing empowerment, and various authors from different disciplines have developed different ideas on what empowerment is. This

review provides an overview of basic ideas of empowerment generally agreed upon in the literature, although empowerment conceptualizations are not monolithic. Second, this review focused on discussing common measurement approaches. Although a comprehensive search for studies was undertaken, it is possible that some less common measurement approaches were excluded from the discussion. Third, this review discusses improving the validity of measurement approaches, yet developing reliable indicators is equally important. There is a dearth of research on the reliability of empowerment indicators, which is an important area of future research. Reliability and validity are the cornerstones of sound measurement, and verifying both will enable researchers to truly measure what they intend to measure.

CONCLUSION

Women's empowerment is a complex concept, and accurately measuring it poses a number of challenges to researchers. Currently, few empirical studies fully integrate theory into their measurement models, and many studies employ analytic methods and measurement choices with high risk of bias. These choices hamper efforts to understand this important concept and may lead to erroneous conclusions. This paper offers researchers suggestions to improve upon current measurement approaches. Improved measurement could greatly advance research efforts into the causes and consequences of poor empowerment and will strengthen evidence on social policies to increase empowerment. Women's empowerment is a critical human rights issue with implications for the well-being of women, their families, and society, and it should be measured with the utmost care.

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author was supported by the Spencer Foundation (242794), Canadian Institutes of Health Research Operating Grant TO3-120314: From Association to Causation: Using Natural Experiments to Evaluate the Impact of Population Health Interventions on Health Inequalities, and a fellowship from the Regroupement Stratégique Santé Mondiale du Réseau de Recherché en Santé des Populations du Québec. The funding sources had no role in the conceptualization or writing of this paper. Figure 1. Conceptual model of empowerment process*

Resources

Favorable conditions for empowerment (indirect measure)

Agency

Ability to identify goals and act upon them (direct measure)

Achievements

Realization of goals (indirect measure)

*adopted partially from Kabeer (1999)

Table 1

Recommendations for quantitative researchers studying empowerment

Use theory to inform study measures

 Explicitly describe conceptual model
 Use indicators relevant to a specific context
 Use direct indicators of empowerment (i.e., agency) when possible
 Construct dimensions of agency based upon theory

 Use analytic methods that minimize implicit judgments

 Avoid combining different levels of decision-making into the same category
 Use methods that do not equally weight each indicator of empowerment
 Use global empowerment measures cautiously
 Avoid classifying women as empowered using cut-points

 Collect comprehensive information

 Talk with study participants, community leaders, and local experts
 Supplement quantitative information with qualitative information
 Measure many aspects of empowerment, including closely related concepts

Collect information from men

References

- 1. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change.* 1999;30(3):435-464.
- 2. Mabsout R. Capability and health functioning in Ethiopian households. *Social Indicators Research.* 2011;101(3):359-389.
- 3. Hindin MJ. Women's power and anthropometric status in Zimbabwe. *Soc Sci Med.* 2000;51(10):1517-1528.
- 4. Yount KM, Dijkerman S, Zureick-Brown S, VanderEnde KE. Women's empowerment and generalized anxiety in Minya, Egypt. *Soc Sci Med.* 2014;106:185-193.
- 5. Basu AM, Koolwal GB. *Two concepts of female empowerment: some leads from DHS data on women's status and reproductive health.* Calverton, MD: ORC Macro;2005.
- 6. Haile ZT, Chertok IRA, Teweldeberhan AK. Determinants of utilization of sufficient tetanus toxoid immunization during pregnancy: evidence from the Kenya Demographic and Health Survey, 2008–2009. *Journal of Community Health.* 2013;38(3):492-499.
- 7. Bloom SS, Wypij D, Das Gupta M. Dimensions of women's autonomy and the influence on maternal health care utilization in a north Indian city. *Demography.* 2001;38(1):67-78.
- 8. Corroon M, Speizer IS, Fotso JC, et al. The role of gender empowerment on reproductive health outcomes in urban Nigeria. *Maternal and Child Health Journal.* 2014;18(1):307-315.
- 9. Fapohunda BM, Orobaton NG. When women deliver with no one present in Nigeria: who, what, where and so what? *PLoS One.* 2013;8(7):e69569.
- 10. Koenig MA, Ahmed S, Hossain MB, Mozumder ABMKA. Women's status and domestic violence in rural Bangladesh: individual- and community-level effects. *Demography.* 2003;40(2):269-288.
- 11. Hindin MJ, Adair LS. Who's at risk? Factors associated with intimate partner violence in the Philippines. *Soc Sci Med.* 2002;55(8):1385-1399.
- 12. Pratley P. Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review of evidence from the developing world. *Soc Sci Med.* 2016;169:119-131.
- 13. James-Hawkins L, Peters C, VanderEnde K, Bardin L, Yount KM. Women's agency and its relationship to current contraceptive use in lower-and middle-income countries: A systematic review of the literature. *Global Public Health.* 2016:1-16.
- 14. Upadhyay UD, Gipson JD, Withers M, et al. Women's empowerment and fertility: a review of the literature. *Soc Sci Med.* 2014;115:111-120.
- 15. Kabeer N. Women's economic empowerment and inclusive growth: labour markets and enterprise development (Discussion Paper 29/12). London, UK:

Centre for Development Policy and Research, School of Oriental & African Studies;2012.

- 16. Malhotra C, Malhotra R, Ostbye T, Subramanian SV. Maternal autonomy and child health care utilization in India: results from the National Family Health Survey. *Asia-Pacific Journal of Public Health.* 2014;26(4):401-413.
- 17. Egata G, Berhane Y, Worku A. Predictors of acute undernutrition among children aged 6 to 36 months in east rural Ethiopia: a community based nested case control study. *BMC Pediatrics.* 2014;14(1):91.
- 18. Lépine A, Strobl E. The effect of women's bargaining power on child nutrition in rural Senegal. *World Development.* 2013;45:17-30.
- 19. Shroff MR, Griffiths PL, Suchindran C, Nagalla B, Vazir S, Bentley ME. Does maternal autonomy influence feeding practices and infant growth in rural India? *Soc Sci Med.* 2011;73(3):447-455.
- 20. Brunson EK, Shell Duncan B, Steele M. Women's autonomy and its relationship to children's nutrition among the Rendille of northern Kenya. *American Journal of Human Biology.* 2009;21(1):55-64.
- 21. D'Souza RM, Bryant JH. Determinants of childhood mortality in slums of Karachi, Pakistan. *Journal of Health & Population in Developing Countries.* 1999;2(1):33-44.
- 22. Chakraborty P, Anderson AK. Maternal autonomy and low birth weight in India. *Journal of Women's Health.* 2011;20(9):1373-1382.
- 23. Thorpe S, VanderEnde K, Peters C, Bardin L, Yount KM. The influence of women's empowerment on child immunization coverage in low, lower-middle, and upper-middle income countries: a systematic review of the literature. *Maternal and Child Health Journal.* 2016;20(1):172-186.
- 24. United Nations General Assembly. *Transforming our world: the 2030 agenda for sustainable development.* New York, NY: United Nations;2015.
- 25. Kishor S. Introduction. Calverton, MD: ORC Macro; 2005.
- 26. Mason KO. The status of women: conceptual and methodological issues in demographic studies. *Sociol Forum.* 1986;1(2):284-300.
- 27. Malhotra A, Schuler SR. Women's empowerment as a variable in international development. In: Narayan D, ed. *Measuring empowerment: cross-disciplinary perspectives*. Washington, DC: The World Bank; 2005:71-88.
- 28. Alsop R, Heinsohn N. *Measuring empowerment in practice: structuring analysis and framing indicators (Policy research working paper No. 3510).* Washington, DC: The World Bank;2005.
- 29. Agarwala R, Lynch SM. Refining the measurement of women's autonomy: an international application of a multi-dimensional construct. *Soc Forces.* 2006;84(4):2077-2098.
- 30. Sandberg J, Rafail P. Measurement models of women's autonomy using the 1998/1999 India DHS. *Journal of Population Research.* 2013;30(4):367-381.
- 31. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Maternal & Child Nutrition.* 2015;11(4):452-482.

- 32. Ibrahim S, Alkire S. Agency and empowerment: a proposal for internationally comparable indicators. *Oxford Development Studies*. 2007;35(4):379-403.
- 33. Mosedale S. Assessing women's empowerment: towards a conceptual framework. *J Int Dev.* 2005;17(2):243-257.
- 34. Batliwala S. The meaning of women's empowerment: new concepts from action. In: Sen G, Germain A, Chen LC, eds. *Population policies reconsidered: health, empowerment, and rights*. Boston, MA: Harvard Center for Population and Development Studies; 1994:127-138.
- 35. Legovini A. *Measuring women's empowerment and the impact of Ethiopia's women's development initiatives project (Working paper No. 88496).* Washington, DC: World Bank Group;2005.
- 36. Allendorf K. Women's agency and the quality of family relationships in India. *Popul Res Policy Rev.* 2012;31(2):187-206.
- 37. Kim JC, Watts CH, Hargreaves JR, et al. Understanding the impact of a microfinance-based intervention on women's empowerment and the reduction of intimate partner violence in South Africa. *American Journal of Public Health.* 2007;97(10):1794-1802.
- 38. Kishor S. Empowerment of women in Egypt and links to the survival and health of their infants. In: Presser H, Sen G, eds. *Women's empowerment and demographic processes: Moving beyond Cairo*. New York, NY: Oxford University Press; 2000.
- 39. Samman E, Santos ME. *Agency and empowerment: a review of concepts, indicators and empirical evidence.* Oxford: Oxford Poverty and Human Development Initiative, University of Oxford;2009.
- 40. Mason KO, Smith HL. *Women's empowerment and social context: results from five Asian countries.* Washington, DC: Gender and Development Group, World Bank;2003.
- 41. Malhotra A, Mather M. Do schooling and work empower women in developing countries? Gender and domestic decisions in Sri Lanka. *Sociological Forum*. 1997;12(4):599-630.
- 42. Gupta K, Yesudian PP. Evidence of women's empowerment in India: a study of socio-spatial disparities. *GeoJournal.* 2006;65(4):365-380.
- 43. Mason KO, Smith HL. Husbands' versus wives' fertility goals and use of contraception: the influence of gender context in five Asian countries. *Demography.* 2000;37(3):299-311.
- 44. Ahmed AU, Quisumbing AR, Nasreen M, Hoddinott JF, Bryan E. *Comparing food and cash transfers to the ultra poor in Bangladesh.* Washington, DC: International Food Policy Research Institute;2009.
- 45. Al Riyami A, Afifi M, Mabry RM. Women's autonomy, education and employment in Oman and their influence on contraceptive use. *Reproductive Health Matters.* 2004;12(23):144-154.
- 46. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. The women's empowerment in agriculture index. *World Development.* 2013;52:71-91.

- 47. Chakrabarti S, Biswas CS. An exploratory analysis of women's empowerment in India: a structural equation modelling approach. *Journal of Development Studies*. 2012;48(1):164-180.
- 48. Rahman M, Hoque MA, Makinoda S. Intimate partner violence against women: is women empowerment a reducing factor? A study from a national Bangladeshi sample. *J Fam Violence*. 2011;26(5):411-420.
- 49. Mistry R, Galal O, Lu M. Women's autonomy and pregnancy care in rural India: a contextual analysis. *Soc Sci Med.* 2009;69(6):926-933.
- 50. Hashemi SM, Schuler SR, Riley AP. Rural credit programs and women's empowerment in Bangladesh. *World Development.* 1996;24(4):635-653.
- 51. Fuller R. *Guatemala highlands value chain development alliance: project effectiveness review.* Oxford: Oxfam Great Britain;2012.
- 52. Morgan SP, Niraula BB. Gender inequality and fertility in two Nepali villages. *Pop Dev Rev.* 1995;21(3):541-561.
- 53. Dharmalingam A, Philip Morgan S. Women's work, autonomy, and birth control: evidence from two south Indian villages. *Population Studies.* 1996;50(2):187-201.
- 54. Hadley C, Brewis A, Pike I. Does less autonomy erode women's health? Yes. No. Maybe. *American Journal of Human Biology.* 2010;22(1):103-110.
- 55. Jejeebhoy SJ, Sathar ZA. Women's autonomy in India and Pakistan: the influence of religion and region. *Popul Dev Rev.* 2001;27(4):687-712.
- 56. Schuler SR, Hashemi SM, Riley AP. The influence of women's changing roles and status in Bangladesh's fertility transition: evidence from a study of credit programs and contraceptive use. *World Dev.* 1997;25(4):563-575.
- 57. Schuler SR, Islam F, Rottach E. Women's empowerment revisited: a case study from Bangladesh. *Development in Practice.* 2010;20(7):840-854.
- 58. Lee-Rife SM. Women's empowerment and reproductive experiences over the lifecourse. *Soc Sci Med.* 2010;71(3):634-642.
- 59. Kabeer N, Mahmud S, Tasneem S. *Does paid work provide a pathway to women's empowerment? Empirical findings from Bangladesh (Working paper No. 375).* Brighton, United Kingdom: Institute of Development Studies;2011.
- 60. Deininger K, Liu Y. Economic and social impacts of an innovative self-help group model in India. *World Dev.* 2013;43:149-163.
- 61. Pahl J. *Money and marriage.* London: Macmillan; 1989.
- 62. El-Zanaty F, Way A, Kishor S, Casterline J. *Egypt indepth study on the reasons for nonuse of family planning: results of a panel survey in Upper Egypt.* Calverton, MD: National Population Council & Macro International Inc.;1999.
- 63. Kabeer N. Conflicts over credit: re-evaluating the empowerment potential of loans to women in rural Bangladesh. *World Dev.* 2001;29(1):63-84.
- 64. Kabeer N. Between affiliation and autonomy: navigating pathways of women's empowerment and gender justice in rural Bangladesh. *Development and Change.* 2011;42(2):499-528.
- 65. Ghuman SJ, Lee HJ, Smith HL. Measurement of women's autonomy according to women and their husbands: results from five Asian countries. *Social Science Research.* 2006;35(1):1-28.

- 66. Taylor G, Pereznieto P. *Review of evaluation approaches and methods used by interventions on women and girls' economic empowerment.* London, United Kingdom: Overseas Development Institute;2014.
- 67. Mahmud S, Shah NM, Becker S. Measurement of women's empowerment in rural Bangladesh. *World Development.* 2012;40(3):610-619.
- 68. Green EP, Blattman C, Jamison J, Annan J. Women's entrepreneurship and intimate partner violence: a cluster randomized trial of microenterprise assistance and partner participation in post-conflict Uganda. *Soc Sci Med.* 2015;133:177-188.
- 69. Mason KO. Measuring empowerment: a social demographer's view. Workshop on "Measuring empowerment: cross-disciplinary perspectives"; February 4 and 5, 2003., 2003; The World Bank, Washington, DC.
- 70. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. *The women's empowerment in agriculture index.* Oxford: Oxford Poverty and Human Development Initiative, University of Oxford;2013.
- 71. Jejeebhoy SJ. Women's autonomy in rural India: its dimensions, determinants, and the influence of context. In: Presser H, Sen G, eds. *Female Empowerment and Demographic Processes*. Oxford: Clarendon Press; 2000:204-238.
- 72. Jensen R, Thornton R. Early female marriage in the developing world. *Gender & Development.* 2003;11(2):9-19.
- 73. Yount KM, VanderEnde KE, Dodell S, Cheong YF. Measurement of women's agency in Egypt: a national validation study. *Social Indicators Research*. 2016;128(3):1171-1192.
- 74. Heaton TB, Huntsman TJ, Flake DF. The effects of status on women's autonomy in Bolivia, Peru, and Nicaragua. *Population Research and Policy Review.* 2005;24(3):283-300.
- 75. Desai S, Andrist L. Gender scripts and age at marriage in India. *Demography.* 2010;47(3):667-687.
- 76. Garikipati S. Microcredit and women's empowerment: have we been looking at the wrong indicators? *Oxford Development Studies.* 2013;41(Sup 1):S53-S75.
- 77. United Nations Development Programme. *Human Development Report 2015.* New York, NY: United Nations Development Programme;2015.
- 78. Brown TA. *Confirmatory factor analysis for applied research.* New York, NY: Guilford Publications; 2006.
- 79. Montgomery R, Bhattacharya D, Hulms D. Credit for the poor in Bangladesh. In: Hulme D, Mosley P, eds. *Finance Against Poverty.* Vol 2. London: Routledge; 1996:86-158.
- 80. Mullany BC, Hindin MJ, Becker S. Can women's autonomy impede male involvement in pregnancy health in Katmandu, Nepal? *Soc Sci Med.* 2005;61(9):1993-2006.
- 81. Kritz MM, Makinwa-Adebusoye P, Gurak DT. The role of gender context in shaping reproductive behaviour in Nigeria. In: Presser H, Sen G, eds. *Women's Empowerment and Demographic Processes: Moving beyond Cairo*. New York, NY: Oxford University Press; 2000.

- 82. Parveen S. Empowerment of rural women in Bangladesh: a household level analysis. In: Doppler W, Bauer S, eds. *Farming and Rural Systems Economics.* Vol 72. Weikersheim, Germany: Margraf; 2005.
- 83. Silberschmidt M. Have men become the weaker sex? Changing life situations in Kisii District, Kenya. *The Journal of Modern African Studies.* 1992;30(2):237-253.
- 84. Bureau of Applied Research in Anthropology (BARA) & Innovations for Poverty Action (IPA). *Final impact evaluation of the Saving for Change program in Mali, 2009–2012.* Tuscon, AZ: University of Arizona;2013.
- 85. Thomas D. Incomes, expenditures, and health outcomes: evidence on intrahousehold resource allocation. In: Haddad L, Hoddinott J, Alderman H, eds. *Intrahousehold resource allocation in developing countries*. Baltimore and London: The John Hopkins University Press; 1997:142-164.
- 86. Vyas S, Watts C. How does economic empowerment affect women's risk of intimate partner violence in low and middle income countries? A systematic review of published evidence. *Journal of International Development.* 2009;21(5):577-602.
- 87. Khandker SR. Determinants of women's time allocation in rural Bangladesh. *Economic Development and Cultural Change.* 1988;37(1):111-126.
- 88. Pereznieto P, Taylor G. A review of approaches and methods to measure economic empowerment of women and girls. *Gender & Development*. 2014;22(2):233-251.
- 89. Pitt MM, Khandker SR, Cartwright J. Empowering women with micro finance: evidence from Bangladesh. *Economic Development and Cultural Change*. 2006;54(4):791-831.
- 90. Story WT, Burgard SA. Couples' reports of household decision-making and the utilization of maternal health services in Bangladesh. *Soc Sci Med.* 2012;75(12):2403-2411.
- 91. Chopra D, Müller C. Introduction: Connecting perspectives on women's empowerment. *IDS Bulletin.* 2016;47(A1):1-10.
- 92. Crandall A, VanderEnde K, Cheong YF, Dodell S, Yount KM. Women's age at first marriage and postmarital agency in Egypt. *Social Science Research*. 2016;57:148-160.
- 93. Salem R, Cheong YF, Yount KM. Is women's work a pathway to their agency in rural Minya, Egypt? *Social Indicators Research.* 2017:1-25.

4.3 Development of a tool to measure women's agency in India

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Abstract

Background: Agency is an essential component of promoting the rights and well-being of women, and increasing women's agency has received sizeable interest as an essential development goal. However, inadequate measurement hampers monitoring and research into achieving this goal.

Methods: In this study, we developed a theory-based measurement tool of women's agency. We developed a conceptual model of agency through a review of the literature, and then used this model to identify potential indicators of agency. These indicators were asked as part of a population-based household survey that was completed between July and November 2016 by 3042 women in rural Rajasthan, India. We tested the construct validity of the hypothesized measurement model using confirmatory factor analysis.

Results: We identified a conceptual model of agency, composed of 23 indicators, which measured the domains Household Decision-Making, Freedom of Movement, Participation in the Community, and Attitudes and Perceptions. This conceptual model fit the study data well (CFI = 0.974, TLI = 0.970, RMSEA = 0.031).

Conclusion: Our measurement tool can be used by researchers studying women's agency in rural India.

Introduction

Agency is the ability to identify one's goals and act upon them.¹ Agency is the central component of women's empowerment,^{1,2} which is the process of women increasing their ability to make life choices.¹ Empowering women is widely acknowledged as an important development goal. In 2015, the United Nations identified empowering women as one of seventeen Sustainable Development Goals (SDGs).

Women's empowerment is an essential component of promoting the rights and wellbeing of women. Research evidence indicates that low empowerment is associated with many adverse consequences for women, including higher risk of Intimate partner violence (IPV),^{3,4} lower utilization of antenatal care,⁵ less likelihood of use of a skilled health care professional at birth,⁵⁻⁷ worse nutritional status,^{8,9} increased anxiety,¹⁰ and less contraceptive use.¹¹

However, poor measurement hampers research efforts into the health and social consequences of low empowerment² and the ability to monitor progress towards increasing women's empowerment.¹² Empowerment is inherently difficult to measure because it is a latent concept and there is no gold standard for measuring it. Researchers struggle with how to define empowerment,¹³ how to select indicators that truly measure empowerment,¹ and how to measure empowerment in ways that reflect the contexts in which women live.¹⁴ Theory can help operationalize empowerment and guide measurement. However, theory is rarely fully integrated into measurement approaches,¹⁵ and few studies use theoretical justification to select indicators.^{1,12,16} Due to these difficulties, measurement approaches vary considerably among studies.^{11,17} Improving measurement, especially using approaches that integrate more theory and are reflective of local contexts, is an identified research priority.^{1,12,16,18-20}

The goal of this study was to develop and test a tool for measuring women's agency in one lower-income context with pronounced gender inequalities: rural India. First, we

developed a conceptual model of women's agency through a review of the theoretical and empirical literature pertaining to women's agency in South Asia. Next, using our conceptual model as a framework, we identified potential indicators of agency. These indicators were integrated into a population-based survey of women living in rural Rajasthan, India. We then evaluated our proposed measurement model using confirmatory factor analysis (CFA), which is a method for assessing a hypothesized measurement model.

Measurement of women's agency

Agency concepts

Agency is the ability to identify one's goals and act upon them.¹ It is composed of internal qualities, such as critical thinking skills,²¹ and the ability to carry out decisions.¹ In instances where women meet opposition to their goals, they might work through alternative means such as manipulation, negotiation, or deception.¹

Most scholars agree on a few core characteristics of agency, namely, that it is multidimensional^{2,16,22,23} and contextual.^{1,2,23} Multidimensionality refers to the idea that agency is composed of multiple distinct life domains, and women may have high agency in one domain of her life but not others.^{24,25} For instance, women may have freedom to travel outside the home but may have limited involvement in household decisions. Agency is also contextual and indicators that denote agency are not universally applicable to all contexts. For example, freedom to work outside the home is a common indicator of agency.^{26,27} However, in Bangladesh working outside the home is strongly enmeshed in social status and women of higher economic status often opt to remain at home, not because they have less agency, but as a matter of family honour and propriety.²⁸

Domains of agency

Research originating from South Asia commonly investigates distinct domains of agency, although the names of the specific domains and the specific indicators used to measure these domains, vary considerably by study. Below we summarize frequently investigated domains.

- 1) Household Decision-Making refers to a woman's involvement in household decisions and is a frequently identified dimension of agency.^{5,22,24-27,29-36} It is measured by indicators such as control over household purchases³⁵ and decisions about the education of children.³³ Some studies consider Control over Household Income and Household Decision-Making as separate domains^{107,130} or only measure the domain Control over Household Income.^{115,122}
- 2) Freedom of Movement refers to women's freedom to travel outside of the home. It is perhaps the most consistently measured domain.^{5,24,26,27,31-37} This domain may be especially relevant in some South Asian contexts where the tradition of purdah restricts women's freedom to travel and engage in public life.³⁸
- Participation in the Community refers to women's involvement in the community. It is measured by indicators such as involvement in political activities or protests,^{30,32,37} participation in groups,^{30,39} or consultation by others in the community.³⁰
- 4) Attitudes and Perceptions encompasses women's views on issues, their opinions about themselves, and how they believe they are perceived by other people.³⁰ There is less agreement about what this domain encompasses. Some authors include indicators pertaining to a woman's view on gender norms, such as acceptability of women working outside of the home and her perceived life

control.³⁰ Other studies define this domain more narrowly, such as with indicators assessing preference for giving birth to sons.²⁴

5) Views about Intimate Partner Violence is another measured domain of agency.^{22,24,29,34,35} This domain is frequently measured by asking women if they believe a husband is justified beating his wife in certain scenarios, such as if she does not cook food properly.³⁵

Prior measurement research

Although many studies investigate these domains, only three have assessed the validity of a comprehensive measurement model of women's agency in a South Asian context. Three studies previously assessed the validity of women's agency measurement.^{22,34,35} These studies provide some promising evidence that agency is a multi-dimensional concept that can be captured using survey indicators. However, these studies have some limitations.

First, these studies focused only on some domains of agency, and in some instances distinct domains were combined. For example, one study constructed the domain Community Involvement, which was composed of women's freedom to go to various locations and exposure to the media.²² However, more recent research has delineated a woman's freedom to travel as a distinct domain.^{27,32}

Second, these measurement studies likely excluded important indicators of agency. Two of the three studies were not specifically designed to measure agency.^{34,35} The third study used data from a survey investigating women's status, however the authors noted that some indicators they believed measured agency were not collected, specifically in regards to political participation.²² In addition, these surveys were not conducted recently (i.e., 1993/1994,²² 1998/1999,³⁴ and 2005/2006³⁵), and thus more recently identified indicators of women's agency could not be integrated. For example,
the Demographic and Health Survey's (DHS) Women's Status Module was implemented around 2000, and includes questions about women's perceptions about gender norms. Our study builds upon and improves these earlier efforts in South Asia by integrating more recent concepts about the measurement of women's agency and evaluates this measurement model using recently collected data from a populationbased household survey.

Methods

Study design

Our measurement study is part of an on-going cluster-randomized impact evaluation conducted in rural tribal communities in Rajasthan, India.⁴⁰ The study is assessing the impact of a community-based daycare intervention on women's well-being and empowerment. India consistently ranks as one of the world's worst performing countries with respect to women's empowerment,⁴¹ and among Indian states, Rajasthan ranks one of the lowest.⁴²

Study participants came from 160 rural communities in Rajasthan, India. Women eligible for the study resided in these communities and had a child between one and six years of age. A total of 3177 women completed baseline interviews between January and May 2015, with a participation rate of 89%. Approximately 1.5 years later, 3042 women (96%) were re-interviewed. We used responses during the follow-up interviews in our analysis because additional items about women's agency were added to this survey round.

Trained interviewers (n=22) conducted computerized, structured interviews in participants' homes in Hindi. All women underwent an informed consent process and were offered a small gift for participation in the study. Further information on the study procedures and design is available elsewhere.⁴⁰ This study was approved by the

Institutional Review Board of McGill University's Faculty of Medicine and the Human Subjects Committee of the Institute for Financial Management in Chennai, India.

Selection of indicators

We used the domains of agency identified in our literature search as the framework for our measurement model. We identified specific agency indicators from the DHS, Phase 7; the DHS's Women's Status Module; and the National Family Health Survey (NFHS), Phase 3. The DHS is a large population-based survey conducted in over 90 countries around the world, and it includes many items pertaining to women's agency. Although the DHS offers standard questions, countries can use and modify questions at their own discretion. India's version of the DHS is called the NFHS. The NFHS includes unique agency questions, such as asking women under which conditions they believe IPV is justified. The DHS and NFHS do not include many indicators for the domain Participation in the Community, and we adopted additional items from other sources.^{30,32,43}

Potential items were reviewed by a local advisory committee to assess face validity. These items were then pilot-tested on 200 women living in communities neighbouring the study communities to assess comprehension and suitability. Some items were modified or excluded based upon the pilot test or feedback from the study advisory committee. For instance, the NFHS asks when a woman is justified in refusing sex with her husband in different scenarios. The advisory committee determined that asking sexrelated questions was not culturally appropriate, and these items were excluded.

An examination of potential indicators suggested that two were not relevant in our study because they did not apply to the majority of women in our study population. Women's control over the income they earn is one indicator of agency used in the NFHS, yet in our study population few women earned an income. Women's involvement in community groups is another indicator of agency;^{30,39} however the majority of

communities did not have formal groups for women to attend. Thus, these indicators were excluded. A total of 40 agency indicators were selected. Appendix 1 lists each item and its source.

Statistical analysis

For all study variables, we assessed the proportion of missing responses and calculated frequencies for each response category. Our hypothesized measurement model was empirically tested using CFA. CFA is a statistical method for evaluating a hypothesized measurement model of latent variables. CFA is an appropriate method when there are strong empirical or conceptual reasons to guide the number of domains and there is information on which measured indicators may inform measurement of these latent variables.⁴⁴ Due to the empirical and theoretical work originating from South Asia in regards to domains and indicators of agency, CFA is an appropriate method. We used robust weighted least squares CFA, which is a type of CFA that models categorical and dichotomous indicators.⁴⁴ We accounted for correlated observations within hamlets by estimating standard errors clustered at the hamlet level. All measurement models were estimated in Mplus 7.4.⁴⁵ In the few instances where data was missing (i.e., <7% for any variable), Mplus estimated these missing values as a function of the observed variables.⁴⁵ For simplicity of interpretation, we coded all items so that higher item scores denoted higher agency.

We developed potential measurement models *a priori*. However, in instances where the models identified *a priori* did not fit the data well, we tested whether the inclusion of additional model parameters (e.g., allowing measurement errors to covary among specific items) improved the model fit. We identified the best fitting model using the Bentler Comparative Fit Index (CFI),⁴⁶ the Tucker Lewis Index (TLI),⁴⁷ and the Root Mean Square Error of Approximation (RMSEA).⁴⁸ The CFI and TLI are relative fit statistics that compare the proposed model to the baseline model. Although similar, the defining difference is that the TLI includes a model parsimony parameter that penalizes

more complex models.⁴⁹ CFI and TLI values can range from 0 to around 1, with higher values denoting better fit. Values of 0.90 or above are considered to have at least acceptable fit,⁴⁶ and values close to or above 0.95 indicate good fit.⁵⁰ The RMSEA is a badness-of-fit index where 0 indicates best fit.⁴⁴ RMSEA values close to 0.06 or below indicate good fit.⁵⁰ As is recommended,⁴⁴ we also examined the correlation residuals; correlation residuals above the absolute value of 0.10 indicate poor fit.⁴⁴

Due to the complexity of the proposed measurement model, we developed the model in three stages. In the first stage, we tested a few competing domain-specific models, which are listed in Appendix 2. For example, for the domain Attitudes and Perceptions, we compared a model that allowed negatively worded items to covary with a model that did not allow them to covary. We used model fit statistics to select the best fitting model. In the second stage, we removed items with R-square values less than 0.20 from our selected models. In the third stage, we combined separate domains of agency to create a global measurement model. We tested a few competing models to determine which model best fit the data. The framework for these competing models was identified a priori (i.e., number of domains and correlation between domains); however, due to the stages used to build this model, we could not specify a priori the exact number of items in each domain. Our tested models, which were composed of the best-fitting domainsspecific models and excluded items with factors loadings below 0.20, included comparisons of a one factor model to a model composed of five domains of agency, a comparison of a model with correlated domains to one without correlated domains, and a comparison of models that did or did not include the domain "Views About Intimate Partner Violence". We chose to test whether this domain should be included due to mixed prior evidence: although frequently identified as a domain of agency,^{22,24,29,34,35} a prior measurement study argued against its inclusion due to the low correlation with other domains of agency.²²

Results

Table 1 shows basic demographic characteristics of women. The mean age of women was about 31 years. The majority had never attended school (77%), were Hindu (96%), belonged to a Scheduled Tribe (93%), and were married or cohabitating (98%).

Table 2 shows the classification of items into domains and sub-domains, and the frequencies of each item. The proportion of women answering in a way that denoted more agency varied considerably by domain, which provides evidence for the multidimensional nature of agency. For instance, approximately 90% of women could travel to locations within the village alone, although more than half of women thought a husband was justified beating his wife in a number of scenarios.

Table 3 shows fit statistics for the selected domain-specific measurement models. Most of the *a priori* identified domains fit the data well. However, the initial model for the domain Decision Making in the Home and Control Over Income did not fit the data well (Appendix 2). Modification indices showed that allowing two items to covary (i.e., decisions about where you can work, decisions about whether you should work) improved model fit. Allowing these items to covary is conceptually justified because of the related nature of these two items. Additionally, we were not able to test one competing model for the domain Attitudes and Perceptions. Specifically, we planned to test if this domain was best measured with two sub-domains (Son Preference, Views on Gender Norms). However, this model would not converge even after performing a number of modifications to the model (i.e., fixing additional parameters, different estimation procedures) thereby indicating that the data did not fit the model well. All other models identified *a priori* were tested and fit the data well. Exclusion of items with R-squared values less 0.20 from these selected models generally improved model fit.

Table 4 shows fit statistics for competing global agency measurement models composed of multiple domains. The domain Views About Intimate Partner Violence had

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a very low R-squared value (0.043), which indicates that this domain contributed very little to the overall agency measure. Therefore, although inclusion of this domain resulted in slightly better fit, we decided that the most appropriate model excluded this domain. Our final identified model fit the data well (CFI = 0.974, TLI = 0.970, RMSEA = 0.031).

Figure 1 shows the structure of the final measurement model. Table 5 reports the standardized coefficient estimates from this model, where the variance of the latent variable Agency is fixed to 1. A comparison of domain-specific coefficient estimates shows that each domain contributes a moderate amount to Agency (coefficient estimate range: 0.539 to 0.740), and Freedom of Movement makes the largest contribution to overall Agency (0.740). The coefficient estimates for domains can be interpreted as the proportional change in global Agency score due to a one standard deviation unit change in domain-specific coefficient scores. For example, a 1 standard deviation unit increase in Freedom of Movement results in a 0.740 standard deviation unit increase in women's overall Agency.

Discussion

We performed a comprehensive assessment of measurement of women's agency. We reviewed the literature to identify relevant indicators, collected information about these indicators in a sample of over 3000 women, used theory to inform our proposed measurement model, and then tested our proposed measurement model with CFA. Our analysis confirmed that our theory-informed measurement model, composed of four domains (Household Decision Making, Freedom of Movement, Attitudes and Perceptions, Participation in the Community), fit the data well. Few studies have assessed measurement of women's agency, and to our knowledge our study is the only study to assess all common domains of agency identified in the literature.

Our measurement tool can be used to measure women's agency in rural Indian contexts. This tool can be especially useful for evaluating the effect of social and economic interventions and policies on the expansion of the rights of women. Many evaluation studies measure women's agency insufficiently: a recent review of economic empowerment intervention studies found that many studies did not assess women's agency directly, and among those that did, most studies did not measure agency beyond narrowly defined indicators related to household-decision making.¹⁵ Our tool, which includes broad measures of agency encompassing multiple domains, can help researchers measure agency comprehensively. In addition, we took care to exclude indicators that may be tapping into context as opposed to agency (e.g., views on intimate partner violence), and thus the indicators in our measurement tool may be applicable in a variety of settings.

We integrated agency indicators from multiple sources and collected primary data. This enabled us to test a broader collection of indicators than prior research studies. Our results advance measurement of women's agency in a few key areas, which are applicable to measurement efforts in South Asia and beyond. First, we found that a few common indicators used to measure agency, including attending groups and having control over income, were not good indicators in our study setting because many women lived in communities without community groups to attend and very few women earned an income. Instead, indicators such as group participation may be measuring the context in which women live. Participation in community groups is commonly used to measure the domain Participation in the Community, 30,39,51 and thus this domain might not be captured sufficiently in many studies. In addition, using these indicators to measure agency across settings is especially problematic, since different contexts will have varying levels of opportunities for paid employment and group membership. Some measurement tools use indicators such as employment and group membership to compare empowerment across settings,^{51,52} and the validity of these indicators in specific contexts should be assessed carefully.

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Second, we found that the domain Views on Intimate Partner Violence contributed very little to the overall agency measurement model. Our results align with measurement studies among women in India, Pakistan,²² and Egypt,²⁰ which found the domain Views on Intimate Partner Violence weakly correlated with other domains. This domain might be measuring closely related but distinct concepts, such as social norms about violence .²² Although this domain is frequently used to measure women's agency in a number of settings,^{24,29,52} our study adds to a growing body of measurement research that indicates it may not be a relevant domain.

Third, the domains of agency identified and assessed in our study can serve as a framework for agency measurement in other contexts. We assessed domains identified in many studies beyond South Asia,^{17,19,53} and conceptual and empirical work indicates that although specific indicators may vary, domains remain consistent. For instance, applied research guided by conceptual work measures agency across multiple settings by identifying common domains and allowing specific indicators to vary across settings,^{23,51,54} and a validation study in India and Pakistan found that domains remained consistent, although specific indicators used to measure agency were more or less relevant.²² Thus, the domains that we identified in our study may be generalizable to settings beyond South Asia, which could be confirmed with future research.

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Figure 1. Final women's agency measurement model (Rajasthan, India 2016)

Table 1

Socio-demographic characteristics of 3042 women (Rajasthan, India 2016)

Variables	n	Percentage	Mean (standard deviation)
Age			31.3 (7.2)
Never attended school	2340	77%	
Hindu religion	2889	96%	
Belongs to a Scheduled Tribe	2817	93%	
Married or cohabitating	2989	98%	
Primary toilet facility is open area	2827	93%	

			Ι		and control over income	Decision making in					Percent of wor
	Control over income						decisions	Home			men answerir
10. Who decides how your husband's earnings will be used?	 Decisions about making purchases for daily household needs? 	8. Decisions about making major household purchases?	7. Decisions about where you can work?	6. Decisions about whether you can work?	5. Decisions about visits to your family or friends?	4. Decisions about the education of your children, including where they go to school and until which grade?	3. Decisions about whether to use contraception?	2. Decisions about how many children to have and when?	 Decisions about health care for yourself? 	Who usually makes the following decisions:	ng affirmatively to women's agenc
2994	2995	2996	2994	2996	2994	2991	2967	2994	2996	ъ	cy items (Ra
2%	28%	1%	19%	23%	4%	4%	3%	2%	4%	Responde nt only	ijasthan, India 20
82%	45%	70%	56%	55%	75%	78%	87%	89%	61%	Jointly with other family members)16)
16%	27%	29%	25%	22%	21%	18%	10%	%6	35%	Respondent not involved	

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			and perceptions	Attitudes				Table 2, con
preference	Son			Views on gender norms				tinued
17. It is better for a family to have sons than daughters	16. It is better to send a son to school than a daughter	15. A wife should tolerate being beaten by her husband to keep family together	14. A wife has a right to express her opinion even if she disagrees with what her husband is saying	13. A married woman should be able to work outside the home if she wants to	12. Husband should help with chores if wife is working	11. Important decisions should only be made by men in the family	Do you agree or disagree with each statement:	
3037	3039	3026	3033	3031	3040	3038	n	
11%	4%	54%	93%	93%	95%	47%	Agree	
89%	%96	46%	7%	7%	5%	53%	Disagree	

		violence	Views on intimate partner			Table 2, continued
22. A husband is justified in beating his wife if she shows disrespect for in-laws	21. A husband is justified in beating his wife if she doesn't cook food properly	20. A husband is justified in beating his wife if she argues with him	19. A nusband is justified in beating his wife if she neglects the house or children	18. A husband is justified in beating his wife if she leaves the home without telling him	Do you agree or disagree with each statement:	
3038	3040	3035	3038	3038	r	
59%	58%	60%	63%	52%	Agree	
41%	42%	40%	37%	48%	Disagree	

26. To homes of friends in the village? 3041 90% 27. To a shrine/mosque/temple/churc h within the village? 3041 90% 27. To a shrine/mosque/temple/churc h within the village? 3041 90% Are you usually permitted to go to the following places on your own, only if someone accompanies you, or not at all? 3041 90% Outside 29. To the market to buy things? 3041 54% 29. To a health center or doctor within the village? 3041 54% 31. To homes of friends in the village? 3041 54% 32. To a shrine/mosque/temple/churc h within the village? 3041 54% 32. To a shrine/mosque/temple/churc h within the village? 3041 54%	Table 2, continu	ued Within the village	Are you usually permitted to go to the following places on your own, only if someone accompanies you, or not at all? 23. To the market to buy things? 24. To a health center or doctor within the village? 25. To the community center or other meeting place within the village?	<i>n</i> 3041 3041	Alone 91% 89%	Not alone 8% 11%	Not a
Within the the octor within the village? 3041 89% village 25. To the community center or other meeting place within the village? 3041 89% 26. To homes of friends in the village? 3041 88% 27. To a shrine/mosque/temple/churc go to the following places on your own, only if someone accompanies you, or not at all? 3041 90% 28. To the market to buy things? 29. To a health center or the 3041 54% 29. To a health center or the 30. To the community center or other meeting place within the village? 3041 54% 31. To homes of friends in the village? 3041 54% 49% 32. To a shrine/mosque/temple/churc h within the village? 3041 54%			23. To the market to buy things?	3041	91%	8%	
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go to the following places on your own, only if someone accompanies you, or not at all? 28. To the market to buy things? 29. To a health center or doctor within the village? 30. To the community center or other meeting place within the village? 31. To homes of friends in the village? 32. To a shrine/mosque/temple/churc h within the village? 3041 54%	Freedom of movement		27. To a shrine/mosque/temple/churc h within the village? Are you usually permitted to	3041	%06	10%	
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31. To homes of friends in the village? 3041 54% 32. To a shrine/mosque/temple/churc h within the village? 3041 53%		village	30. To the community center or other meeting place within the village?	3041	49%	49%	
32. To a shrine/mosque/temple/churc h within the village? 3041 53%			31. To homes of friends in the village?	3041	54%	45%	
			32. To a shrine/mosque/temple/churc h within the village?	3041	53%	47%	

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					Participation in the community						Table 2, continu
			issues	Outside home-					issues	Family-	ued
40. Who decides who you vote for?		39. Are you consulted by others (such as family members and other people in the village) for advice and information?		38. Do you feel comfortable attending rural meetings unaccompanied?	37. Protest the misbehaviour of authorities or elected officials?	36. Ensure proper payment of wages for public works or other similar programs?	35. Help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?	34. Protest a man divorcing or abandoning his wife?	33. Protest a man beating his wife?	Do you feel comfortable speaking up in public to:	
2834	σ	3039	п	3039	3038	3038	3039	3039	3039	a	
60%	Respondent	3%	Frequently	35%	22%	12%	21%	18%	17%	No, not at all comfortable	
23%	Respondent and someone else	41%	Sometimes	8%	11%	8%	10%	9%	9%	Yes, but with a great deal of difficulty	
17%	Someone else	13%	Rarely	11%	20%	15%	16%	16%	14%	Yes, but with a little difficulty	
		42%	Never	30%	35%	40%	35%	39%	41%	Yes, fairly comfortable	
				17%	13%	26%	17%	18%	19%	Yes, very comfortable	

Table 3

Model fit statistics for selected domain-specific measurement models (
Rajasthan,
India 2016)

	Model description			Model fit indice	S	
			Degrees			
Domain		Sample	of			
	Structure description	size	freedom	CFI	TLI	RMSEA (90% CI)
	2 domains: control over income					
Decision making in home	(items 8-10), decision making in	3006	22		7 20 0	
and control over income	home (items 1-7)* Allow work		ç	0.004		
	decisions to covary**					
	1 domain (items 11-17).* Allow					
Attitudes and perceptions	negatively worded items to	3040	8	0.966	0.910	0.030 (0.019, 0.042)
	covary*					
Views about intimate	1 domain (items 18-22)*	3041	л	700 N	0 005	0 071 /0 058 0 085)
partner violence			1			
Freedom of movement	Within the village (items 23-27)*	3041	U	0.997	0.994	0.069 (0.056, 0.083)
Participation in the	2 domains: family-related issues			1		
community	(items 33-34), non-family related issues (items 35-40)*	3039	19	0.948	0.923	0.032 (0.025, 0.040)

*identified a prior

**identified post hoc

***unable to estimate parameters because model is just identified





Table 5 Standardized (pefficients for fir	ıal CFA model (Rajasthan, India 2	2016)	
Dom	lain	Subdo	omain	Item	
Name	coefficient (SE)	Name	coefficient (SE)	Description	coefficient (SE)
				1. Decisions about health care for yourself?	0.427 (0.024)
				 Decisions about how many children to have and when? Decisions about whether to use contraception? 	0.733 (0.016) 0.655 (0.019)
Decision making in	0.550	Home decisions	0.968 (0.039)	4. Decisions about the education of your children, including where they go to school and until which grade?	0.558 (0.018)
and control	(0.033)			5. Decisions about visits to your family or friends?	0.651 (0.019)
over income				6. Decisions about whether you can work?	0.526 (0.021)
				7. Decisions about where you can work?	0.572 (0.019)
		Control over	0.868	8. Decisions about making major household purchases?	0.597 (0.023)
		income	(0.040)	10. Who decides how your husband's earnings will be used?	0.594 (0.030)
				12. Husband should help with chores if wife is working	0.844 (0.048)
Attitudes and	0.539	n/a	n/a	 A married woman should be able to work outside the home if she wants to 	0.872 (0.047)
perceptions				14. A wife has a right to express her opinion even if she disagrees with what her husband is saying	0.450 (0.049)
				23. To the market to buy things?	0.920 (0.008)
T Socion of	0 7 10			24. To a health center or doctor within the village?	0.976 (0.004)
movement	(0.037)	n/a	n/a	z3. To the continuutity certier of other theeting brace within the village?	0.933 (0.008)
				26. To homes of friends in the village?	0.927 (0.009)
				27. To a shrine/mosque/temple/church within the village?	0.912 (0.009)

Domain Subdomain Item	
coefficient coefficient coefficient	coefficient
Name (SE) Name (SE) Description (SE)	(SE)
Family- related 0.831 33. Protest a man beating his wife? 0.92	0.926 (0.009)
issues (0.017) 34. Protest a man divorcing or abandoning his wife? 0.95	0.959 (0.008)
Participation 0.641 0.65 0.75	0.754 (0.023)
community (0.029) family 0.923 36. Ensure proper payment of wages for public works or other 0.73 related (0.018) similar programs?	0.736 (0.020)
issues 37. Protest the misbehaviour of authorities or elected officials? 0.75	0.750 (0.019)
38. Do you feel comfortable attending rural meetings 0.74 unaccompanied?	0.747 (0.024)

**variance of latent variable agency fixed to 1.

Appendix 1 Item sources		
Items	Potential responses	Source
Who usually makes the following decisions:		
Decisions about health care for yourself?		NFHS-3, DHS-7
Decisions about whether you can work?		Adopted from DHS-5 (Women's Status Module)
Decisions about where you can work?		Developed by study's advisory committee
Decisions about the education of your children, including where they go	Respondent; husband;	Adopted from DHS-5 (Women's Status Module)
Decisions about visits to your family or friends?	iointly: other response	NFHS-3, DHS-7
Decisions about making major household purchases?		NFHS-3, DHS-7
Decisions about making purchases for daily household needs?		NFHS-3
Who decides how your husband's earnings will be used?		NFHS-3, DHS-7
How the money you earn will be used?		NFHS-3, DHS-7
Do you agree or disagree with each statement:		
Important decisions should only be made by men in the family		DHS-5 (Women's Status Module)
If the wife is working outside the home, then the husband should help		
her with household chores A married woman should be able to work outside the home if she wants		DHS-5 (Women's Status Module)
to	Agree; disagree; don't know	DHS-5 (Women's Status Module)
whether husband is saying		DHS-5 (Women's Status Module)
A wife should tolerate being beaten by her husband to keep family		
together		DHS-5 (Women's Status Module)
It is better to send a son to school than a daughter		DHS-5 (Women's Status Module)
It is better for a family to have sons than daughters		Author
A husband is justified in beating his wife if she:		
Leaves the home without telling him		Adopted from NFHS-3 & DHS-7
Neglects the house or children		NFHS-3
Argues with him	Agree; disagree; don't know	NFHS-3, DHS-7
Doesn't cook food properly		NFHS-3
Shows disrespect for in-laws		NFHS-3

Appendix 1 continued on the next page

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אוטעפו ווג אמנואנוכא וטו מוו כטוואוט						
	Model description			Model fit	indices	
Domain		Sample	Degrees of			
	Structure description	size	freedom	CFI	TL	RMSEA (90% CI)
	1 domain (items 1-10)*	2996	35	0.739	0.664	0.140 (0.135, 0.145)
	1 domain (items 1-10)*					
	Allow work decisions to	2996	34	0.946	0.929	0.064 (0.059, 0.070)
Decision making in home	covary**					
and control over income	2 domains: control over					
	income (items 8-10),					
	decision making in home	2996	33	0.954	0.937	0.060 (0.055, 0.066)
	(items 1-7)* Allow work					
	1 domain (items 11-17)*	3040	14	0.462	0.193	0.091 (0.083, 0.099)
Attitudes and perceptions	1 domain (items 11-17).*					
-	Allow negatively worded	3040	ω	0.966	0.910	0.030 (0.019, 0.042)
Views about intimate narther	, t					
violence	1 domain (items 18-22)*	3041	თ	0.997	0.995	0.071 (0.058, 0.085)
	Outside the village (items 28-32)*	3041	IJ	0.998	0.996	0.089 (0.076, 0.103)
	Within the village (items 23-27)*	3041	ហ	0.997	0.994	0.069 (0.056, 0.083)
	1 domain (items 33-40)*	3039	20	0.861	0.806	0.051 (0.044, 0.058)
Participation in the	2 domains: family-related					
community	issues (items 33-34), non- family related issues	3039	19	0.948	0.923	0.032 (0.025, 0.040)
	(items 35-40)*					

Appendix 2 Model fit statistics for all considered domain-specific measurement models

*identified a prior

**identified post hoc

References

- 1. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change.* 1999;30(3):435-464.
- 2. Malhotra A, Schuler SR. Women's empowerment as a variable in international development. In: Narayan D, ed. *Measuring empowerment: cross-disciplinary perspectives*. Washington, DC: The World Bank; 2005:71-88.
- 3. Gage AJ, Hutchinson PL. Power, control, and intimate partner sexual violence in Haiti. *Archives of Sexual Behavior.* 2006;35(1):11-24.
- 4. Koenig MA, Ahmed S, Hossain MB, Mozumder ABMKA. Women's status and domestic violence in rural Bangladesh: individual- and community-level effects. *Demography.* 2003;40(2):269-288.
- 5. Bloom SS, Wypij D, Das Gupta M. Dimensions of women's autonomy and the influence on maternal health care utilization in a north Indian city. *Demography.* 2001;38(1):67-78.
- 6. Corroon M, Speizer IS, Fotso JC, et al. The role of gender empowerment on reproductive health outcomes in urban Nigeria. *Maternal and Child Health Journal.* 2014;18(1):307-315.
- 7. Fapohunda BM, Orobaton NG. When women deliver with no one present in Nigeria: who, what, where and so what? *PLoS One.* 2013;8(7):e69569.
- 8. Hindin MJ. Women's power and anthropometric status in Zimbabwe. *Soc Sci Med.* 2000;51(10):1517-1528.
- 9. Mabsout R. Capability and health functioning in Ethiopian households. *Social Indicators Research.* 2011;101(3):359-389.
- 10. Yount KM, Dijkerman S, Zureick-Brown S, VanderEnde KE. Women's empowerment and generalized anxiety in Minya, Egypt. *Soc Sci Med.* 2014;106:185-193.
- 11. James-Hawkins L, Peters C, VanderEnde K, Bardin L, Yount KM. Women's agency and its relationship to current contraceptive use in lower-and middle-income countries: A systematic review of the literature. *Global Public Health.* 2016:1-16.
- 12. Alsop R, Heinsohn N. *Measuring empowerment in practice: structuring analysis and framing indicators (Policy research working paper No. 3510).* Washington, DC: The World Bank;2005.
- 13. Kishor S. *Introduction.* Calverton, MD: ORC Macro; 2005.
- 14. Mason KO. The status of women: conceptual and methodological issues in demographic studies. *Sociol Forum.* 1986;1(2):284-300.
- 15. Taylor G, Pereznieto P. *Review of evaluation approaches and methods used by interventions on women and girls' economic empowerment.* London, United Kingdom: Overseas Development Institute;2014.
- 16. Ibrahim S, Alkire S. Agency and empowerment: a proposal for internationally comparable indicators. *Oxford Development Studies.* 2007;35(4):379-403.

- 17. Pratley P. Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review of evidence from the developing world. *Soc Sci Med.* 2016;169:119-131.
- 18. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Maternal & Child Nutrition.* 2015;11(4):452-482.
- 19. Richardson RA. Measuring women's empowerment: a critical review of current practices and recommendations for researchers. *Soc Indic Res.* 2018;137(2):539-557.
- 20. Yount KM, VanderEnde KE, Dodell S, Cheong YF. Measurement of Women's Agency in Egypt: A National Validation Study. *Soc Indic Res.* 2016;128(3):1171-1192.
- 21. Mosedale S. Assessing women's empowerment: towards a conceptual framework. *J Int Dev.* 2005;17(2):243-257.
- 22. Agarwala R, Lynch SM. Refining the measurement of women's autonomy: an international application of a multi-dimensional construct. *Soc Forces*. 2006;84(4):2077-2098.
- 23. Mason KO, Smith HL. *Women's empowerment and social context: results from five Asian countries.* Washington, DC: Gender and Development Group, World Bank;2003.
- 24. Gupta K, Yesudian PP. Evidence of women's empowerment in India: a study of socio-spatial disparities. *GeoJournal.* 2006;65(4):365-380.
- 25. Mason KO, Smith HL. Husbands' versus wives' fertility goals and use of contraception: the influence of gender context in five Asian countries. *Demography.* 2000;37(3):299-311.
- 26. Morgan SP, Niraula BB. Gender inequality and fertility in two Nepali villages. *Pop Dev Rev.* 1995;21(3):541-561.
- 27. Ahmed AU, Quisumbing AR, Nasreen M, Hoddinott JF, Bryan E. *Comparing food and cash transfers to the ultra poor in Bangladesh.* Washington, DC: International Food Policy Research Institute;2009.
- 28. Kabeer N. Conflicts over credit: re-evaluating the empowerment potential of loans to women in rural Bangladesh. *World Dev.* 2001;29(1):63-84.
- 29. Rahman M, Hoque MA, Makinoda S. Intimate partner violence against women: is women empowerment a reducing factor? A study from a national Bangladeshi sample. *J Fam Violence*. 2011;26(5):411-420.
- 30. Kabeer N, Mahmud S, Tasneem S. *Does paid work provide a pathway to women's empowerment? Empirical findings from Bangladesh (Working paper No. 375).* Brighton, United Kingdom: Institute of Development Studies;2011.
- 31. Jejeebhoy SJ, Sathar ZA. Women's autonomy in India and Pakistan: the influence of religion and region. *Popul Dev Rev.* 2001;27(4):687-712.
- 32. Schuler SR, Islam F, Rottach E. Women's empowerment revisited: a case study from Bangladesh. *Development in Practice.* 2010;20(7):840-854.

- 33. Steele F, Goldstein H. A multilevel factor model for mixed binary and ordinal indicators of women's status. *Sociol Method Res.* 2006;35(1):137-153.
- 34. Sandberg J, Rafail P. Measurement models of women's autonomy using the 1998/1999 India DHS. *Journal of Population Research.* 2013;30(4):367-381.
- 35. Shroff MR, Griffiths PL, Suchindran C, Nagalla B, Vazir S, Bentley ME. Does maternal autonomy influence feeding practices and infant growth in rural India? *Soc Sci Med.* 2011;73(3):447-455.
- 36. Allendorf K. Women's agency and the quality of family relationships in India. *Popul Res Policy Rev.* 2012;31(2):187-206.
- 37. Schuler SR, Hashemi SM, Riley AP. The influence of women's changing roles and status in Bangladesh's fertility transition: evidence from a study of credit programs and contraceptive use. *World Dev.* 1997;25(4):563-575.
- 38. Papanek H. Purdah: separate worlds and symbolic shelter. *Comparative Studies in Society and History.* 1973;15(3):289-325.
- 39. Deininger K, Liu Y. Economic and social impacts of an innovative self-help group model in India. *World Dev.* 2013;43:149-163.
- 40. Nandi A, Maloney S, Agarwal P, Chandrashekar A, Harper S. The effect of an affordable daycare program on health and economic well-being in Rajasthan, India: protocol for a cluster-randomized impact evaluation study. *BMC Public Health.* 2016;16(1):490.
- 41. The Global Gender Gap Report. Geneva: World Economic Forum;2016.
- 42. Kishor S, Gupta K. Women's empowerment in India and its states: evidence from the NFHS. *Econ Polit Weekly.* 2004;39(7):694-712.
- 43. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. *The women's empowerment in agriculture index.* Oxford: Oxford Poverty and Human Development Initiative, University of Oxford;2013.
- 44. Kline RB. *Principles and Practice of Structural Equation Modeling.* 3rd ed. New York, NY: The Guilford Press; 2011.
- 45. Muthen LK, Muthen BO. *Mplus User's Guide. Seventh Edition.* Los Angeles, CA: Muthen & Muthen; 1998-2015.
- 46. Bentler PM. Comparative fit indexes in structural models. *Psychol Bull.* 1990;107(2):238-246.
- 47. Tucker L, Lewis C. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika.* 1973;38(1):1-10.
- 48. Steiger JH. Statistically based tests for the number of common factors. Psychometric Society; May 1980, 1980; Iowa City, IA.
- 49. McDonald RP, Marsh HW. Choosing a multivariate model: Noncentrality and goodness of fit. *Psychol Bull.* 1990;107(2).
- 50. Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling.* 1999;6(1):1-55.
- 51. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. The women's empowerment in agriculture index. *World Development.* 2013;52:71-91.

- 52. Ewerling F, Lynch JW, Victora CG, van Eerdewijk A, Tyszler M, Barros AJD. The SWPER index for women's empowerment in Africa: development and validation of an index based on survey data. *The Lancet Global Health* 2017;5(9):e916-e923.
- 53. James-Hawkins L, Peters C, VanderEnde K, Bardin L, Yount KM. Women's agency and its relationship to current contraceptive use in lower- and middle-income countries: A systematic review of the literature. *Glob Public Health.* 2018;13(7):843-858.
- 54. Kabeer N, with Ragui Assaad, Akosua Darkwah, Simeen Mahmud, Hania Sholkamy, Sakiba Tasneem and Dzodzi Tsikata. *Paid work, women's empowerment, and inclusive growth: transforming the structures of constraint.* New York: UN Women;2013.

5 | Gender-sensitive determinants of poor mental health among rural Indian women

5.1 Preface to Manuscripts 3 and 4

In the last chapter, I critically reviewed theoretical and empirical methods for measuring women's empowerment and developed a new measurement tool. This measurement tool will feature heavily in Chapter 6, which explores the effect of affordable daycare on women's mental distress.

In this chapter, I investigate two potential gender-sensitive determinants of poor mental health: intimate partner violence (IPV) and work demands. These determinants are closely tied to the process of women's empowerment that I described in the last chapter. Specifically, both factors might create unfavorable conditions for the process of empowerment. Experiencing IPV likely constrains women's freedom, and high work demands might lead to stressful circumstances that interfere with a women's ability to identify and enact important life decisions (i.e., agency).

Both IPV and work demands are likely determinants of poor mental health, yet certain aspects of these determinants have not been adequately measured in most research. Regarding IPV, partner controlling behaviour is an identified aspect of IPV, but it is overlooked by many investigators and is rarely investigated. Regarding work demands, most traditional work surveys do not capture unpaid work, such as caregiving and housework, and thus the full extent of women's work demands has been largely invisible.

5.2 Are work demands associated with mental distress? Evidence from women in rural India

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Richardson RA, Nandi A, Jaswal S, Harper S. Are work demands associated with mental distress? Evidence from women in rural India. *Social Psychiatry and Psychiatric Epidemiology*. December 2017, Volume 52, Issue 12, pp. 1501-1511.

Abstract

Background: High work demands might be a determinant of poor mental health among women in low- and middle-income countries, especially in rural settings where women experience greater amounts of labor-intensive unpaid work. Research originating from such settings is lacking.

Methods: We estimated the cross-sectional association between work demands and mental distress among 3177 women living in 160 predominantly tribal communities in southern Rajasthan, India. A structured questionnaire captured the number of minutes women spent on various activities in the last 24 hours, and we used this information to measure women's work demands, including the total work amount, nature of work (e.g., housework), and type of work (e.g., cooking). Mental distress was measured with the Hindi version of the twelve item General Health Questionnaire. We used negative binomial regression models to estimate the association between work demands (amount, nature, type) and mental distress.

Results: On average, women spent more than 9.5 hours a day on work activities. The most time intensive work activity was caring for children, the elderly, or disabled (149 minutes). In adjusted models, we found a U-shaped association between work amount and mental distress. High amounts of housework were associated with higher distress, whereas paid work and farmwork amount was not. Certain types of housework, including collecting water and cleaning, was associated with increased distress scores.

Conclusions: We found an association between aspects of work demands and mental distress. Research in other contexts where women perform high amounts of unpaid work, particularly within the home or farm, is warranted.

INTRODUCTION

Time is a valuable, finite resource for promoting health and well-being¹. Activities that promote well-being, such as building close relationships, exercising, personal care, relaxing, and interacting with neighbors and community members, require time investments¹. Lack of sufficient time to perform these activities after doing essential, required activities (such as eating, working, and household obligations) has been called 'time poverty'^{2,3}. Time poverty might adversely affect mental health by infringing upon the time available to engage in activities that promote mental well-being.

Research originating from both high^{4,5} and low and middle income countries (LMICs)⁶⁻⁹ consistently shows that women perform more hours of work compared to men. The strong patterning of work time by gender appears to be due, at least in part, to traditional gender roles that relegate domestic work to women^{7,10,11}. The social patterning of free time by gender has led some to describe time poverty as a social determinant of health¹.

In addition to the amount of time spent working, the characteristics of this work may have implications for mental health. In some LMIC settings, the majority of work performed by women includes unpaid tasks such as collecting fuel, fetching water, childcare, cooking, and cleaning¹². Unpaid housework may be less "valued" by both the person performing the work and others within the household. In addition, some tasks can be especially onerous and time-consuming in settings that lack basic infrastructure such as electricity, transportation, and running water¹³. Thus, work demands, including the amount (i.e., time poverty), nature (e.g., housework), and type (e.g., fetching water) of work could have implications for women's mental health.

Although work demands might affect mental health among women in LMICs, we are not aware of empirical research explicitly investigating work demands as a potential cause of poor mental health in a LMIC setting. In this study, we investigate the relation between work demands and women's mental health in one LMIC setting, predominantly tribal communities in rural Rajasthan, India. Specifically, we investigate whether work demands, including the total work amount, nature of the work (e.g., paid) and type of work (e.g., caregiving), are associated with women's mental distress.

METHODS

Data source

The data come from pre-intervention interviews from a cluster-randomized evaluation measuring the impact of a community-run daycare program on women's economic opportunity and empowerment in rural Rajasthan, India¹⁴. Village hamlets (i.e., a cluster of houses that share a community center and constitute a separate entity) located in five blocks in the Udaipur District were invited to participate in the study. Within each selected hamlet, we enumerated all households that had at least one eligible woman (specifically a mother or female guardian with a child between one and six years of age) and randomly selected one eligible woman in each household to participate in the study. Only women with children between one and six years of age were interviewed because the main goal of the study was to assess the impact of daycare, and only children within this age range were eligible for the daycare program.

We identified 3899 potentially eligible women, and 343 women were interviewed and determined to be ineligible. Among the 3557 potentially eligible women, 127 could not be contacted after 3 attempts, 95 migrated before completing the survey, 5 refused participation, and 152 were excluded due to other reasons (e.g., only one of two children were eligible for the daycare program). A total of 3177 women participated in the study, for an overall response rate of 89%.

Trained interviewers collected data using structured, computerized surveys conducted between December 2014 and June 2015. All women underwent an informed consent

process and were offered a small gift (a blanket) for participation in the study. Further information on the study design and procedures is available elsewhere¹⁴. This study was approved by the Institutional Review Board of McGill University's Faculty of Medicine and the Human Subjects Committee of the Institute for Financial Management in Chennai, India.

Variables

The main study variables are time use and mental distress. Time use was measured using a structured questionnaire¹⁵ that asked respondents whether they spent any time in the past 24 hours on specific work-related activities (e.g., laundry) and how much time they spent on each activity. Our study conceptualized work using the International Labour Organization's definition, which defines it as "any activity performed by persons of any sex and age to produce goods or to provide services for use by others or for own use."¹⁶ We asked women about a number of different types of work activities, including paid work (agricultural labor, non-agricultural labor, other paid work), household work (collecting water, cooking, cleaning, laundry, caring for others, gathering fuel), and farmwork (tending animals, working in own field). If women engaged in more than one activity (e.g., cooking while caring for a child), only the primary activity identified by women was reported in the survey. This survey was designed to measure work activities and did not capture all non-work activities such as eating and sleeping.

We tallied the amount of time spent on each activity. We created a total work amount variable by summing all types of work activities for each woman. In a few instances (n=14), summary measures exceeded 24 hours. Because the survey only collected the primary work activity, and total work amount should not exceed 24 hours, in these instances we truncated total work amount at 24 hours. We classified work by the nature of the work, and tallied the amount of time spent doing paid work, household work, and farmwork.

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Mental distress was measured with the Hindi version of the twelve item General Health Questionnaire (GHQ-12),¹⁷ translated by Gautam et al¹⁸. We assessed the face validity of the GHQ-12 among local experts, and we also pilot tested the GHQ-12 with local women. Based upon this work we concluded the GHQ-12 was culturally relevant and the meaning of the questions was retained in the Hindi translation. Responses for each question ranged from 1 to 4 on a Likert scale. For instance, for the question "Have you recently been able to concentrate on what you're doing?" potential responses include "better than usual, same as usual, less than usual, much less than usual". We dichotomized responses to classify women as experiencing some versus no distress for each question using a common GHQ-12 scoring method (i.e., the 0-0-1-1 scoring system). This scoring method is commonly used to measure mental health problems in India¹⁹⁻²², and a study comparing three different GHQ-12 scoring methods found that this scoring method had the best classification properties²³. Distress scores could range from 0 to 12, with higher scores denoting greater distress.

We measured characteristics that might confound the association between time use and mental distress, including socio-demographic characteristics, autonomy, and household composition. Socio-demographic variables included each woman's age, educational level, marital status, caste and religion, and household income and wealth. Household income was derived from 14 questions pertaining to income from wages, sales, rent, investments, pensions, government grants, and inheritance. We summarized household wealth with a principal component analysis (PCA) using 27 asset-based indicators that are commonly used to measure wealth in India (Appendix 1)²⁴.

Women's autonomy was measured with two summary measures. Freedom of movement captured women's ability to go to locations within the village (i.e., place of worship, friends' homes, market, health center, community center). We summed the number of places women could travel alone (potential score range: 0-5). Household decision-making was constructed from 8 questions pertaining to women's involvement in household decisions (i.e., decisions about: her own healthcare, whether she can

work, where she can work, education of her children, visits to family and friends, making major household purchases, making minor household purchases, and how husband's earnings are spent). We summed the number of decisions women were involved in (potential score range: 0-8).

We constructed household composition variables, including the number of adult women, presence of a mother-in-law, number of sons less than 7 years, number of sons older than 7 years, number of daughters less than 7 years, and number of daughters older than 7 years. The age and sex of a child might confound the association between time use and mental health. Older children (i.e., age 7 or older) might assist women with work activities, and the work activities they assist with may be different for boys and girls²⁵. In addition, the sex of the child may affect women's mental health ²⁶. Preference for male children is common in Indian society due to a patriarchal social structure that makes daughters a financial liability: sons are expected to financially support their parents, whereas due to the long-standing practice of dowry, the daughter's family is expected to give large sums of money or gifts to the groom's family. In addition, some women may be blamed for giving birth to a girl instead of a boy.²⁶ However, it should be noted that patriarchy and son preference is generally less pronounced in tribal communities than other Indian populations.

Statistical Analyses

We calculated summary statistics, including means and standard deviations for continuous variables and percentage of participants in each category for categorical variables. Almost all women were married and the same religion, and therefore we did not include these variables in our analyses. Because a large percentage of women reported belonging to a Scheduled Tribe, we collapsed caste into two categories so that it could be included in the analysis: 1) women who belong to a Scheduled Caste, Scheduled Tribe, Other Backward Caste, or did not know which group they belonged to, and 2) women who did not belong to a Scheduled Caste, Scheduled Tribe, or Other
Backward Caste. For all variables included in the analysis, we assessed the linearity of the relationship between independent variables (time use, confounding variables) and the dependent variable (GHQ-12 score) graphically.

We modeled the relation between time use and mental distress with negative binomial regression using fractional polynomials to model non-linear relationships²⁷. We identified the best fitting model by computing chi-square test statistics of the deviance difference between linear models and models with higher order polynomial terms. All models adjusted for potential confounders of the association between time use and mental distress, including household wealth and income, household composition (number of adult women, mother-in-law lives in household, number of daughters <7 years old, number of daughters ≥7 years old, number of sons <7 years old, number of sons \geq 7 years old), location (5 districts), and the woman's age, educational attainment, caste, and autonomy (freedom of movement, household decision-making). We modeled the relationships between these potential confounders and time use as (log) linear unless there was evidence of non-linear effects. For a few variables, we found evidence of non-linear relationships and used higher order terms, including square root (total work amount, housework, wealth), log (income), and inverse square root (collecting water, cleaning). All models clustered standard errors at the hamlet level to account for correlated observations within hamlets. Missing data was minimal (i.e., <4% for all variables), resulting in an analytic sample size of 3177 for unadjusted models and 3023 for adjusted models.

We estimated marginal predicted GHQ-12 scores at different levels of time use, and we displayed these predicted scores graphically. Predicted GHQ-12 scores were only calculated for the time range reported by participants. For example, study participants reported collecting firewood for a maximum of 8 hours, and therefore predicted GHQ-12 values were only estimated up to 8 hours. We also estimated predicted GHQ-12 scores at specific levels of time use. For summary work amounts (e.g., total work), we estimated predicted GHQ-12 scores at 1, 4, 8, and 12 hours of work. For specific types

of work (e.g., cleaning), we estimated predicted GHQ-12 scores at 1 and 3 hours of work. These work amounts reflected typical amounts of time women spent on summary and specific activities. We estimated predicted differences, and we reported the absolute difference in GHQ-12 score and the difference in standard deviation units of GHQ-12 score.

RESULTS

Table 1 shows that the majority of participants had no education (74%), belonged to a Scheduled Tribe (78%), and were of Hindu religion (72%). On average, women reported 2.1 out of 12 possible distress symptoms, and 73% reported at least one distress symptom. Women reported spending more than 9.5 hours a day on work activities, and the largest source of work was caring for children, the elderly, or disabled (149 minutes), cooking (99 minutes), and tending animals (65 minutes). A few women (7%) reported working more than 16 hours a day, and these women reported much higher amounts of caregiving than women working less than 16 hours (i.e., 296 vs 136 minutes). Few women (5%) performed paid or in-kind work, whereas most (99%) performed housework or farmwork (Table 2).

The association between overall work amount and mental distress was non-linear (Supplemental Figure 1, Table 3). In adjusted models, working up to approximately 5-6 hours in the last 24 hours was associated with fewer symptoms of mental distress, whereas working more than 5-6 hours was associated with more symptoms of mental distress. The predicted difference in the number of distress symptoms between working 4 versus 1 hour was -0.45 (-0.69, -0.20), whereas the predicted difference between working 12 versus 4 hours was 0.21 (0.04, 0.39). Moderate amounts of work were associated with the lowest levels of distress; women who performed between 2.5 and 11.5 hours of work each day, which included two-thirds of the study population, had a predicted GHQ-12 score below the average score. After approximately 11.5 hours, mental distress score increased more dramatically with increasing work amount.

The relationship between work and mental distress differed depending on the nature of work performed. Similar to total work amount, we found a non-linear relationship between housework and mental distress (Figure 1, Table 3), although predicted distress scores increased more dramatically with more hours of housework. In adjusted models, working up to approximately 3-4 hours in the last 24 hours was associated with fewer symptoms of mental distress, and working more than 3-4 hours was associated with more symptoms of mental distress. The predicted difference in the number of distress symptoms between doing 4 hours versus 1 hour of housework was -0.23 (95% CI: - 0.42, -0.03), whereas the predicted difference between doing 12 versus 4 hours was 0.63 (95% CI: 0.41, 0.85). Women who performed between 1 and 8.5 hours of work had a predicted GHQ-12 score below the average GHQ-12 score, and this included about two-thirds of the study population. Although paid work and farmwork were associated with slight decreases in mental distress score, these associations were weak in fully adjusted models.

Specific types of work activities were associated with modest differences in mental distress (Table 4, Supplemental Figure 2). The largest increases in predicted distress score between working 1 versus 3 hours were observed for cleaning (0.35, 95% CI: 0.15, 0.56), doing laundry (0.24, 95% CI: -0.04, 0.51), collecting water (0.22, 95% CI: 0.07, 0.37), and tending animals (0.22, 95% CI: 0.01, 0.41), and the largest decrease in distress score was observed for working in a woman's own field (-0.18, 95% CI: -0.28, -0.07)

DISCUSSION

Women have a high burden of common mental health conditions such as mood and anxiety disorders²⁸. A growing body of evidence indicates that social factors differentially experienced by women, such as IPV²⁹, low autonomy^{29,30}, and poverty³¹, might be contributors to women's high prevalence of mental health problems. Our study adds to the growing body of evidence by describing another potential cause of poor

mental health among women, namely work demands. To our knowledge, this is the first study to quantitatively investigate the relation between time spent on various work activities and mental health in a lower-income context.

Our results provide evidence that work demands might be a determinant of poor mental health. The relation between work amount and distress was relatively flat up until a certain work threshold, which lends support to the idea that time poverty is salient for mental health. We also found evidence that the nature of the work was important: housework was associated with mental distress whereas other types of work were not. Engaging in 12 vs 4 hours of housework was associated with a change in 0.63 distress symptoms, which corresponds roughly to a 25% increase relative to the mean number of distress symptoms. Housework may be expected of women, and women's contribution may be largely invisible and may not be valued as an important contribution to the household either by the women performing the work or her family members.

Context likely plays a critical role in explaining these associations. Maintaining social ties through visits to neighbors and natal family members could be an important source of support that buffers exposure to life stressors, and time poverty may infringe upon these relationships. Decomposing work into constituent activities showed that the amount of time spent cleaning and doing laundry were associated with the largest increases in distress scores. In this study context, these specific activities may be particularly demanding because they require a water source. Almost all households lacked running water and electricity, and the mountainous terrain and long distances to water sources may make these activities especially onerous. In addition, work performed within the home may be more detrimental to mental health because it may limit interactions with other women. In fact, the activity associated with the largest increase in distress was cleaning, which is done within the home and can be physically demanding. These results indicate that it is not only the amount of work, but also the nature of the work, which may affect mental health. The observed associations from this

study might be generalizable to rural India or other LMIC settings, yet are unlikely to be generalizable to high-income settings.

The reasons for the association between low work amount and high distress are less clear. Doing some work might be good for mental health because contributing to the daily functioning of the household might give women a sense of purpose, belonging, and importance. However, this observed association may also be due to reverse causality (i.e., high levels of mental distress may result in women not performing these work activities) or due to confounding due to physical health problems (i.e., women who perform only a small amount of work may have physical health problems that limit their ability to perform work, and these health problems may adversely affect their mental health). Our study cannot rule out these alterative reasons because it is cross-sectional and we did not collect information on physical health. However, this basic pattern of both low and high work amounts being associated with poorer mental health is also observed in high-income country settings³²⁻³⁵. One study of Australian women controlled for both physical health problems and accounted for reverse causation due to its longitudinal study design³⁵. The study found that this U-shaped association persisted ³⁵, which provides some indication that our observed association may not be due to unmeasured confounding or reverse causation. Further longitudinal work will help us clarify this association.

Our study was conducted in tribal communities (predominantly Bhil and Garasia tribes) in rural Rajasthan. Scheduled Tribes lag far behind other groups in India in regards to health and education,^{36 37} and they are generally considered the most socially disadvantaged group in India.³⁸ Tribal groups face many forms of discrimination and social exclusion³⁸, and certain work activities, especially those performed outside the home, may expose women to discrimination from the community at-large. Thus, the underlying cause of distress may be the experiences of discrimination from certain work activities, and not the work activity per se. Although our study cannot separate the effects of discrimination from those of work, we have controlled for caste or tribal

affiliation in our analyses, which may indirectly control for differences in experiences of discrimination. However, because less than 3% of women did not belong to a Scheduled Caste, Scheduled Tribe, or Other Backwards Caste, we could not formally investigate the effect of work on distress among women from less disadvantaged castes.

Further qualitative research can shed light on the mechanisms linking work with distress. Our study defined work using the International Labour Organization's (ILO) definition, which defines work broadly in order to capture work traditionally performed by women (e.g., unpaid, within the home) that has not been historically recognized as work. We used this definition because we felt it important to include all work done by women, even work that tends to be invisible (e.g., childcare). However, women in this context may not consider all activities meeting the ILO definition work, and women's perception regarding if the activity is "work" may impact mental health. Additionally, it may be the experiences associated with certain activities (e.g., shame) that impacts mental health, and not the activity per se. Additional qualitative work could identify activities that are perceived of as less valued, demeaning, or shameful to identify mechanisms linking work with mental health.

The GHQ-12 has undergone extensive psychometric evaluation. A recent systematic review of tools to screen common mental disorders (CMDs) in LMICs found that the GHQ-12 is one of the most common screening tools and demonstrates some of the strongest psychometric properties among the roughly 20 assessed instruments.³⁹ Within India, validation studies indicate the GHQ-12 performs well in a number of different populations and settings^{18,21,40-42}, and a comparison of 5 screening tools found that the GHQ-12 had among the strongest psychometric properties.²⁰ However, the GHQ-12 has some limitations. First, the GHQ-12 was developed to measure mental distress among Europeans. Although previously validated in India, the GHQ has not been validated in our specific study population. Thus, there is a possibility that women in this context may not find some of the distress symptoms from the GHQ-12 (e.g., difficulty

concentrating) actually signs of distress. Relatedly, the GHQ may not capture all distress symptoms applicable to this setting: physical complaints, such as weakness and fatigue, may be important indicators of poor mental health in an Indian context⁴³.

Second, the GHQ-12 has not been validated against clinical diagnoses in a comparable context, so the cut-point for classifying women as having a CMD is unknown. That caveat considered, within India, what constitutes a high amount of distress varies considerably; validation studies of the GHQ-12 from other parts of India have found that the cut-point for classifying someone as having a CMD range from 1/2 in a general practice in Bangalore¹⁹ to 7/8 in clinics in Goa²⁰. This variation in cut-points across samples supports the argument against classification schemes,⁴⁴⁻⁴⁷ and accordingly we have selected to measure distress symptoms continuously. Further validation research could determine the appropriate cut-point among tribal Indian women. Relatedly, because there is a scarcity of mental health research among women in tribal communities, there are no other studies using the GHQ-12 among tribal women that we can compare our scores to. Our study provides data about tribal women's distress levels, which could be compared to future research studies in a similar population.

There are several additional caveats to consider. First, although we used a comprehensive measure of time use, we only captured time use patterns in the last 24 hours. This "snapshot" of each woman's time likely varies from day to day, and thus measurement error may attenuate the relation between time use and mental distress. Second, the time use survey captured only the primary activity, and thus did not capture simultaneously engaging in multiple activities (e.g., caring for children while cooking). For some activities, such as childcare, women might be multi-tasking for the majority of the day, and the actual amount of time women are engaged in these activities may be much greater. Third, the time use survey did not capture leisure activities, such as time spent visiting relatives. This might be a protective factor against poor mental health, and would complement the measures of work amount used in this study.

Strengths of our study include a comprehensive measure of women's time use, which allowed us to investigate specific work activities. We also had comprehensive measures of household wealth, autonomy, and household structure, and therefore we may have adequately controlled for variables that confound the relation between time use and mental health. In addition, our study had an adequate sample size to model non-linear effects, and therefore we may have been able to detect more nuanced (non-linear) relationships than prior studies conducted in high-income countries.

In summary, our study found that work demands were associated with mental distress among women in tribal communities in rural India. These results highlight the importance that work may play in shaping women's mental health in LMIC settings where women experience a high amount of housework. Work demands might be a determinant of poor mental health among women in these contexts, and this topic deserves further research consideration.

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Figure 1. Predicted GHQ-12 score for summary work activities

Table 1

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Characteristics of 3177 rural Indian women

	% or mean (SD)	% missing
Socio-demographic		
Age (years)	29.9 (6.9)	<1%
Education		<1%
Never attended school	74%	
Attended primary school	15%	
Attended secondary school	10%	
Attended graduate school or higher	<1%	
Religion		<1%
Hindu	72%	
Muslim	<1%	
Christian	3%	
No religion	4%	
Other	6%	
Don't know	15%	
Caste		<1%
Scheduled Caste	2%	
Scheduled Tribe	78%	
Other Backward Caste	1%	
None of them	3%	
Don't know	17%	
Marital status		<1%
Married or cohabitating	99%	
Widowed	1%	
Annual household income (rupees)	56,960 (65,360)	3%
Family composition		
Number of adult women in household	1.4 (0.64)	<1%
Mother-in-law lives in home	26%	<1%
Number of daughters less than 7 years old	0.9 (0.8)	<1%
Number of daughters 7 years old or older	0.7 (1.0)	<1%
Number of sons less than 7 years old	0.9 (0.8)	<1%
Number of sons 7 years old or older	0.7 (1.0)	<1%
Women's autonomy		
Decision-making index	5.5 (2.3)	1%
Freedom of movement index	4.4 (1.3)	<1%

Table 1 continued on next page

Table 1, continued

	% or mean (SD)	% missing
Selected wealth indicators		
Home has electricity	53%	<1%
Number of household members per total rooms in home	4.6 (2.0)	<1%
Source of drinking water public or private tap	3%	<1%
Mental distress		
GHQ-12 score (range 0-12)	2.1 (2.5)	<1%

Table	2
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Time use in last 24 hours among 3177 rural Indian women

	Mean minutes (SD)	% engaged in activity in last 24 hours	% missing
Total work	581 (251)	99%	<1%
Total paid work	17 (82)	5%	<1%
Agricultural laborer	3 (34)	1%	<1%
Non-agricultural laborer	7 (54)	3%	<1%
Other	7 (49)	3%	<1%
Total unpaid work (housework + farmwork)	564 (245)	99%	<1%
Total housework	437 (206)	99%	<1%
Collecting water	53 (63)	93%	<1%
Cooking	99 (54)	96%	<1%
Cleaning	48 (42)	94%	<1%
Laundry	53 (51)	72%	<1%
Caring for children, elderly, or disabled	149 (142)	95%	<1%
Gathering fuel or firewood	35 (75)	24%	<1%
Total farmwork	128 (130)	86%	<1%
Tending animals	65 (72)	78%	<1%
Working in own fields	62 (97)	45%	<1%
Other activities			
Shopping	8 (38)	6%	<1%
Tending own business	3 (28)	3%	<1%
Political activities or attending village meetings	1 (13)	1%	<1%
Watching TV or listening to radio	3 (21)	4%	<1%

Predicted GHQ-12	score for summary wc	rk activities				
		Hours involved in ac	livity in last 24 hours		Estimated differe	nce (12 vs 4 hours)
					GHO-12 score	Difference in standard deviation
	-	4	8	12	difference	units of GHQ-12
Total work						
Unadjusted	2.66 (2.30, 3.03)	2.09 (1.90, 2.28)	2.02 (1.89, 2.16)	2.13 (2.00, 2.25)	0.04 (-0.13, 0.21)	0.02 (-0.05, 0.09)
Adjusted ^a	2.38 (2.05, 2.71)	1.94 (1.77, 2.10)	1.96 (1.85, 2.08)	2.15 (2.02, 2.27)	0.21 (0.04, 0.39)	0.09 (0.01, 0.16)
Paid work						
Unadjusted	2.13 (2.01, 2.25)	2.06 (1.89, 2.22)	1.97 (1.68, 2.26)	1.88 (1.46, 2.30)	-0.18 (-0.47, 0.11)	-0.07 (-0.19, 0.05)
Adjusted ^b	2.09 (1.99, 2.20)	2.01 (1.84, 2.19)	1.91 (1.60, 2.22)	1.81 (1.37, 2.26)	-0.20 (-0.50, 0.09)	-0.08 (-0.20, 0.04)
Housework						
Unadjusted	2.34 (2.06, 2.63)	1.97 (1.81, 2.13)	2.09 (1.96, 2.21)	2.37 (2.21, 2.53)	0.40 (0.20, 0.60)	0.16 (0.08, 0.24)
Adjusted ^b	2.08 (1.83, 2.34)	1.85 (1.72, 1.99)	2.08 (1.97, 2.19)	2.49 (2.31, 2.66)	0.63 (0.41, 0.85)	0.26 (0.17, 0.34)
Farmwork						
Unadjusted	2.20 (2.06, 2.34)	2.05 (1.90, 2.20)	1.87 (1.59, 2.15)	1.70 (1.30, 2.10)	-0.35 (-0.64, -0.05)	-0.14 (-0.26, -0.02)
Adjusted ^b	2.14 (2.03, 2.26)	2.06 (1.91, 2.20)	1.95 (1.65, 2.24)	1.84 (1.40, 2.28)	-0.22 (-0.54, 0.11)	-0.09 (-0.22, 0.05)
^a Adjusted for house	shold wealth and incor	ne, household compos	ition (number of adult	women in household	d, respondent's mother-	-in-law lives in
household, number	r of daughters over 7 y	ears old in household,	number of daughters	under 7 years old in	household, number of	sons over 7 years old in
household, number	of sons under 7 years	s old in household), loc	ation (5 districts), anc	l woman's age, educ:	ational attainment, cast	te, and autonomy
(freedom of mover	nent, household decisio	on-making)				
^b Adjusted for house	shold wealth and incor	ne, household compos	ition (number of adult	women in household	d, respondent's mother-	-in-law lives in
household, number	r of daughters over 7 y	ears old in household,	number of daughters	under 7 years old in	household, number of	sons over 7 years old in
household, number	of sons under 7 years	s old in household), loc	ation (5 districts), anc	l woman's age, educ:	ational attainment, cast	te, and autonomy
(freedom of mover	nent, household decision	on-making), plus time ϵ	engaged in other work	< activities		

Table 3

	Hours involved in	activity in last 24 hours	Differe	nce (3 vs 1 hour)
	-	ω	GHQ-12 score difference	Difference in standard deviation units of GHQ-12
Working in own fields				
Unadjusted	2.14 (2.01, 2.27)	1.92 (1.76, 2.08)	-0.22 (-0.33, -0.11)	-0.09 (-0.13, -0.05)
Adjusted	2.11 (2.01, 2.21)	1.93 (1.79, 2.08)	-0.18 (-0.28, -0.07)	-0.07 (-0.11, -0.03)
Tending animals				
Unadjusted	2.14 (2.01, 2.26)	2.28 (2.05, 2.51)	0.14 (-0.05, 0.34)	0.06 (-0.02, 0.14)
Adjusted	2.10 (2.00, 2.21)	2.31 (2.08, 2.54)	0.22 (0.01, 0.41)	0.08 (0.00, 0.17)
Collecting water				
Unadjusted	2.16 (2.02, 2.29)	2.50 (2.27, 2.74)	0.35 (0.20, 0.50)	0.14 (0.08, 0.20)
Adjusted	2.12 (2.00, 2.23)	2.34 (2.12, 2.56)	0.22 (0.07, 0.37)	0.09 (0.03, 0.15)
Cooking				
Unadjusted	2.20 (2.04, 2.35)	2.04 (1.88, 2.20)	-0.16 (-0.36, 0.04)	-0.06 (-0.14, 0.02)
Adjusted	2.12 (1.99, 2.25)	2.10 (1.91, 2.29)	-0.02 (-0.26, 0.21)	-0.01 (-0.11, 0.09)
Cleaning				
Unadjusted	2.18 (2.04, 2.31)	2.52 (2.25, 2.80)	0.35 (0.15, 0.54)	0.14 (0.06, 0.22)
Adjusted	2.18 (2.05, 2.31)	2.54 (2.24, 2.83)	0.35 (0.15, 0.56)	0.14 (0.06, 0.23)
Laundry				
Unadjusted	2.15 (2.02, 2.27)	2.25 (1.97, 2.52)	0.10 (-0.14, 0.34)	0.04 (-0.06, 0.14)
Adjusted	2.13 (2.02, 2.23)	2.37 (2.05, 2.69)	0.24 (-0.04, 0.51)	0.10 (-0.02, 0.21)
Gathering fuel or firewood				
Unadjusted	2.18 (2.06, 2.31)	2.40 (2.19, 2.62)	0.22 (0.07, 0.37)	0.09 (0.03, 0.15)
Adjusted	2.14 (2.03, 2.24)	2.25 (2.05, 2.45)	0.11 (-0.05, 0.28)	0.05 (-0.02, 0.11)
Caring for children, elderly, or disabled				
Unadjusted	2.10 (1.96, 2.24)	2.16 (2.03, 2.28)	0.06 (-0.01, 0.13)	0.02 (0.00, 0.05)
Adjusted	2.01 (1.89, 2.13)	2.15 (2.04, 2.25)	0.14 (0.06, 0.21)	0.06 (0.03, 0.09)
^a All models adjusted for household weal	th and income, household	composition (number of adult w	omen in household, responden	t's mother-in-law lives in household,
number of daughters over 7 years old in	household, number of dat	ughters under 7 years old in hou	isehold, number of sons over 7	years old in household, number of
sone under 7 veare old in household) lo	nation (5 districts) and wo	man'e ana admatianal attainm.	ant casta and autonomy (froor	form of moviormont household

decision-making), plus time engaged in other unpaid work activities sons under / years old in household), location (5 districts), and woman's age, educational attainment, caste, and autonomy (freedom of movement, household r of

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Table 4: Predicted GHQ-12 score for specific work activities

Supplemental Figure 1

Predicted GHQ-12 score for total work amount



Supplemental Figure 2

Predicted GHQ-12 scores for specific activities



Appendix 1

Construction of household wealth index

We summarized household wealth with a PCA using 27 indicators that are commonly used to measure wealth in India.²¹¹ These indicators included housing characteristics (i.e., type of toilet facility, material of exterior wall, type of roofing, number of household members per total rooms in home, home electrification, source of drinking water), the number of durables owned (i.e., number of cell phones, sewing machines, watches/clocks, electric stoves, wood stoves, fans, televisions, VCRs/CD players, radios, bikes, motorcycles, wells, grain storage cans, pressure cookers, chairs/stools, beds, tables, silver jewelry, gold jewelry, and wedding ornaments), property ownership (i.e., home ownership, amount of agricultural land owned), and whether the household had a savings account. We used a one component PCA that explained 27% of the variance.

References

- 1. Strazdins L, Griffin AL, Broom DH, et al. Time scarcity: another health inequality? *Environ Plan.* 2011;43(3):545-559.
- 2. Vickery C. The time-poor: a new look at poverty. *J Hum Resour.* 1977;12(1):27-48.
- 3. Harvey AS, Mukhopadhyay AK. When twenty-four hours is not enough: time poverty of working parents. *Soc Indic Res.* 2007;82(1):57-77.
- 4. Warren T, Pascall G, Fox E. Gender equality in time: low-paid mothers' paid and unpaid work in the UK. *Fem Econ.* 2010;16(3):193-219.
- 5. Mattingly MJ, Blanchi SM. Gender differences in the quantity and quality of free time: the US experience. *Soc Forces.* 2003;81(3):999-1030.
- 6. Bardasi E, Wodon Q. Measuring time poverty and analyzing its determinants: concepts and application to Guinea. In: Wodon B, ed. *Gender, time use, and poverty in Sub-Saharan Africa*. Washington, DC: The World Bank; 2006:75-95.
- 7. Kes A, Swaminathan H. *Gender, time use, and poverty in sub-Saharan Africa.* Washington, DC: World Bank Publications;2006.
- 8. Floro MS, Pichetpongsa A. Gender, work intensity, and well-being of Thai homebased workers. *Fem Econ.* 2010;16(3):5-44.
- 9. Gammage S. Time pressed and time poor: unpaid household work in Guatemala. *Fem Econ.* 2010;16(3):79-112.
- 10. Lachance-Grzela M, Bouchard G. Why do women do the lion's share of housework? A decade of research. *Sex Roles.* 2010;63(11-12):767-780.
- 11. Ramu GN. *Women work and marriage in urban India: a study of dual-and singleearner couples.* Newbury Park, CA: Sage Publications; 1989.
- 12. United Nations. *The world's women 2015: trends and statistics.* New York, NY: United Nations, Department of Economic and Social Affairs, Statistics Division;2015.
- 13. Razavi S. *The political and social economy of care in a development context: conceptual issues, research questions and policy options.* Geneva, Switzerland: United Nations Research Institute for Social Development;2007.
- 14. Nandi A, Maloney S, Agarwal P, Chandrashekar A, Harper S. The effect of an affordable daycare program on health and economic well-being in Rajasthan, India: protocol for a cluster-randomized impact evaluation study. *BMC Public Health.* 2016;16(1):490.
- 15. Beaman L, Duflo E, Pande R, Topalova P. Female leadership raises aspirations and educational attainment for girls: a policy experiment in India. *Science*. 2012;335(6068):582-586.
- 16. 19th International Conference of Labour Statisticians. Resolution concerning statistics of work, employment, and labour underutilization. Geneva, Switzerland: International Labour Organization; 2013.
- 17. Goldberg DP. The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness. London, UK: Oxford University Press; 1972.

- 18. Gautam S, Nijhawan M, Kamal P. Standardisation of Hindi version of Goldberg's general health questionnaire. *Indian J Psychiatry.* 1987;29(1):63.
- 19. Shamasundar C, Murthy SK, Prakash OM, Prabhakar N, Krishna DK. Psychiatric morbidity in a general practice in an Indian city. *Br Med J.* 1986;292(6537):1713-1715.
- 20. Patel V, Araya R, Chowdhary N, et al. Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med.* 2008;38(02):221-228.
- 21. Patel V, Pereira J, Mann A. Somatic and psychological models of common mental disorder in primary care in India. *Psychol Med.* 1998;28(1):135-143.
- 22. Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol.* 2010;39(6):1510-1521.
- 23. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med.* 1997;27(1):191-197.
- 24. International Institute for Population Sciences(IIPS) and Macro International. *National Family Health Survey (NFHS-3), 2005-2006: India: Volume 1.* Mumbai, India: IIPS;2007.
- 25. Motiram S, Osberg L. Gender inequalities in tasks and instruction opportunities within Indian families. *Fem Econ.* 2010;16(3):141-167.
- 26. Patel V, Rodrigues M Fau DeSouza N, DeSouza N. Gender, poverty, and postnatal depression: a study of mothers in Goa, India. *Am J Psychiatry*. 2002;159(1):43-47.
- 27. Royston P, Altman DG. Regression using fractional polynomials of continuous covariates: parsimonious parametric modelling. *Appl Stat.* 1994;43(3):429-467.
- 28. Seedat S, Scott KM, Angermeyer MC, et al. Cross-national associations between gender and mental disorders in the World Health Organization World Mental Health Surveys. *Arch Gen Psychiatry.* 2009;66(7):785-795.
- 29. Patel V, Kirkwood BR, Pednekar S, et al. Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry.* 2006;63(4):404-413.
- 30. Yount KM, Dijkerman S, Zureick-Brown S, VanderEnde KE. Women's empowerment and generalized anxiety in Minya, Egypt. *Soc Sci Med.* 2014;106:185-193.
- 31. Patel V, Kirkwood BR, Pednekar S, Weiss H, Mabey D. Risk factors for common mental disorders in women. Population-based longitudinal study. *Br J Psychiatry.* 2006;189(6):547-555.
- 32. Dooley D. Unemployment, Underemployment, and Mental Health: Conceptualizing Employment Status as a Continuum. *Am J Community Psychol.* 2003;32(1):9-20.
- 33. Kleiner S, Pavalko EK. Clocking in: the organization of work time and health in the United States. *Soc Forces.* 2010;88(3):1463-1486.

- 34. Milner A, Smith P, LaMontagne AD. Working hours and mental health in Australia: evidence from an Australian population-based cohort, 2001-2012. *Occup Environ Med.* 2015;72(8):573-579.
- 35. Dinh H, Strazdins L, Welsh J. Hour-glass ceilings: Work-hour thresholds, gendered health inequities. *Soc Sci Med.* 2017;176:42-51.
- 36. Maharatna A. How Can 'Beautiful' Be 'Backward'? Tribes of India in a Long-term Demographic Perspective. *Economic and Political Weekly.* 2011;XLVI(4):42-52.
- 37. Subramanian SV, Smith GD, Subramanyam M. Indigenous health and socioeconomic status in India. *PLOS Med.* 2006;3(10):e421.
- 38. Thorat S, and M. Mahamallik, *Human poverty and socially disadvantaged groups in India.* New Delhi, India: UNDP-HDRC 2007.
- 39. Ali GC, Ryan G, De Silva MJ. Validated screening tools for common mental disorders in low and middle income countries: a systematic review. *PLoS One.* 2016;11(6):e0156939.
- 40. Endsley P, Weobong B, Nadkarni A. The psychometric properties of GHQ for detecting common mental disorder among community dwelling men in Goa, India. *Asian J Psychiatr.* 2017;28:106-110.
- 41. Kashyap GC, Singh SK. Reliability and validity of general health questionnaire (GHQ-12) for male tannery workers: a study carried out in Kanpur, India. *BMC psychiatry.* 2017;17(1):102.
- 42. Bandyopadhyay G, Sinha S, Sen B, Sen G. Validity of General Health Questionnaire (GHQ-36/GHQ-12) in the psychiatric O.P.D. of a general hospital-a pilot study. *Int J Soc Psychiatry*. 1988;34(2):130-134.
- 43. Pereira B, Andrew G, Pednekar S, Pai R, Pelto P, Patel V. The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord.* 2007;102(1-3):209-218.
- 44. Krishnan KR. Towards a scientific taxonomy of depression. *Dialogues Clin Neurosci.* 2008;10(3):301-308.
- 45. Nandi A, Beard JR, Galea S. Epidemiologic heterogeneity of common mood and anxiety disorders over the lifecourse in the general population: a systematic review. *BMC psychiatry.* 2009;9:31.
- 46. Parker G. Classifying depression: should paradigms lost be regained? *Am J Psychiatry.* 2000;157(8):1195-1203.
- 47. Parker G. Through a glass darkly: the disutility of the DSM nosology of depressive disorders. *Can J Psychiatry.* 2006;51(14):879-886.

5.3 The effect of intimate partner violence on women's mental distress: a prospective cohort study of 3010 rural Indian women

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ABSTRACT

Background: Intimate partner violence (IPV) is a serious public health concern. Although IPV encompasses different types of abuse (physical, sexual, psychological) and controlling behaviour, controlling behaviour is a rarely investigated aspect of IPV. Controlling behaviour might have important implications for women's mental health.

Methods: Our data come from 3010 partnered women living in rural tribal communities in Rajasthan, India. Women completed baseline interviews, and approximately 1.5 years later these same women were re-interviewed. We measured IPV with questions adopted from the Demographic and Health Survey's Domestic Violence Module, which asked 6 questions about physical abuse, 4 questions about psychological abuse, and 5 questions about partner controlling behaviour. Mental distress was measured with the GHQ-12 (score range: 0-12). Using a fixed effects approach that models changes in the exposure and outcome within the same individual, we modeled the relation between IPV and mental distress with negative binomial regression models.

Results: In models that controlled for time-varying confounding (e.g., household wealth, number of sons in the household, number of daughters in the household, other types of abuse), experiencing psychological abuse increased mental distress by 0.65 symptoms (95% CI: 0.39, 0.91), experiencing controlling behaviour increased mental distress by 0.31 symptoms (95% CI: 0.21, 0.41), and experiencing physical abuse led to a slight decrease in distress symptoms (adjusted mean difference = -0.18, 95% CI: -0.43, 0.06).

Conclusions: Psychological abuse and controlling behaviour may be important drivers of the relation between IPV and women's mental health.

INTRODUCTION

Intimate partner violence (IPV) is a serious public health concern. Worldwide, approximately 30% of women over the age of 15 experience physical or sexual abuse during their lifetime.¹ IPV can have severe consequences for women's health, including higher risk of gynecological problems,² depression,³ HIV infection,⁴ homicide,⁵ and attempted suicide.^{6,7}

IPV is "any behavior within an intimate relationship that causes physical, psychological or sexual harm to those in the relationship" and encompasses various types of abuse (physical, sexual, psychological) and controlling behavior (e.g., restricting access to friends and family, monitoring movements) by an intimate partner.⁸ These various forms of abuse can negatively affect mental health. IPV might erode women's self-esteem⁹ and self-efficacy,¹⁰ and fear of future abuse may result in hypervigilance and overly cautious behaviour to avoid angering or offending the abusive partner. The reduction in self-esteem^{11,12} and self-efficacy,²¹⁴ coupled with a stressful living environment, may also contribute to poor mental health. Physical, sexual, and psychological abuse – the most commonly investigated aspects of IPV – are consistently associated with worse mental health among various populations.^{13,14}

Controlling behaviour might be an important, yet overlooked dimension of IPV. Controlling behaviour is rarely investigated. For instance, a systematic review of studies investigating the health effects of IPV among Indian women found that only 4% of studies investigated controlling behaviour.¹⁵ Controlling behaviour might limit women's agency (i.e., ability to make decisions and then act upon them)¹⁶ and reduce ties with neighbors, friends, and family members, which could be an important source of support that buffers the effect of various life stressors. Reduced agency and social ties might be pathways linking controlling partner behaviour with IPV.

Our study addresses this gap in the literature using longitudinal data collected as part of a randomized controlled trial conducted in rural tribal communities in Rajasthan, India.

Using data from this trial, we estimated the longitudinal association between women's exposure to physical and psychological abuse, as well as controlling behaviour, and changes to mental distress.

METHODS

Study population

Our data come from a cluster-randomized controlled trial assessing the impact of access to an affordable daycare program on women and children's health and wellbeing. The trial was conducted in 160 village hamlets (i.e., clusters of houses that constitute separate communities around a village) in rural Rajasthan, India. We conducted a household census in the 160 hamlets to identify eligible households, namely those with a mother (either biological or guardian) of at least one child between one and six years old. One eligible woman from each eligible household was randomly selected to participate in the study, and women who agreed to participate underwent an informed consent process. Trained interviewers conducted structured interviews in women's homes. A total of 3177 women completed interviews between January and May 2015 (participation rate = 89%). Approximately 1.5 years later, between June and October 2016, 3042 women were re-interviewed (participation rate = 96%). We restricted our sample to women who were partnered or married at baseline, which resulted in a final analytic sample size of 3010.

The study received ethics approval from the Institutional Review Board of McGill University's Faculty of Medicine and the Human Subjects Committee of the Institute for Financial Management in Chennai, India. The trial protocol is publicly available.¹⁷

Measures

The primary exposure of interest was IPV. Questions pertaining to IPV came from the DHS Domestic Violence Module,¹⁸ which were adopted from the Conflict Tactics Scale (CTS).¹⁹ The CTS has been found to be a reliable and valid way to measure IPV.²⁰ A review of early validation work found that the CTS was consistently reliable in different studies (n=6), and that the dimensions of abuse put forth by the CTS were generally consistent across studies (n=6).²⁰ The DHS Domestic Violence Module included 6 questions about women's experiences of physical abuse (e.g., slapped by partner) and 4 questions about psychological abuse (e.g., partner threatened to hurt you) in the past year. There were 5 questions about women's experience of a partner's controlling behaviour (e.g., partner limits contact with your family), which were not restricted to the past year. Response categories included "not at all", "sometimes", and "often". For each of these three types of abuse, we classified women as experiencing abuse if she answered "sometimes" or "often" to any question in that category. Although the DHS module includes guestions about sexual abuse, these guestions were not included in our survey because a local advisory committee suggested they were not culturally appropriate.

The primary outcome was reported symptoms of mental distress. Mental distress was measured with the twelve item General Health Questionnaire (GHQ-12),²¹ translated into Hindi by Gautam et al.²² The GHQ-12 is commonly used to detect mental health problems in India.²³⁻²⁵ The GHQ-12 includes 12 items about how women have been feeling recently. For example, women were asked, "have you recently been losing confidence in yourself?". Potential responses were "not at all", "no more than usual", "rather more than usual", and "much more than usual". We used a scoring system commonly employed in India²³⁻²⁶ (i.e., the 0-0-1-1 scoring system) to dichotomize each symptom as occurring more than usual or not. Thus, distress scores could range from 0 to 12, with higher scores denoting greater reported distress.

Interviewers collected information on IPV, mental health, socio-demographic characteristics, and wealth indicators during baseline and follow-up interviews. Socio-demographic variables included age, religion, caste, education, and number of sons and daughters living in the household. Wealth variables included 23 asset-based indicators commonly used to measure wealth in India.²⁷ Indicators included housing characteristics (i.e., type of toilet facility, material of exterior wall, type of roofing, home electrification, source of drinking water), the number of durables owned (i.e., number of cell phones, watches/clocks, electric stoves, wood stoves, fans, televisions, bikes, motorcycles, wells, grain storage cans, pressure cookers, chairs/stools, beds, silver jewelry, gold jewelry, and wedding ornaments), home ownership, and whether the household had a savings account. We summarized wealth with a polychoric principal component analysis (PCA),²⁸ which is a common way to measure wealth in LMICs.²⁹ We used a one component PCA that explained 27% of the variance in baseline surveys, and 26% of the variance in follow-up interviews.

Because this randomized trial was not specifically designed to investigate the impact of IPV, some important characteristics of women were not measured. For instance, a recent systematic review identified childhood sexual abuse, childhood trauma, and early life experiences as important confounders in the relation between IPV exposure and mental health.³ Our goal was to estimate the effect of reporting one of three types of IPV (i.e., controlling behaviour, psychological abuse, physical abuse) in the past year on the number of mental distress symptoms. We adopted a fixed effects approach, which models changes in the exposure and outcome within the same individual, and thus individuals act as their own controls. Using this design any measured or unmeasured fixed characteristics of individuals (e.g., caste), including past exposures (e.g., childhood sexual abuse), are accounted for.³⁰ A fixed effects approach can provide a less biased estimate than standard regression adjustment in the presence of unmeasured, time-fixed confounders. However, because a fixed effects approach models changes within individuals over time, this approach does not control for time-varying characteristics of individuals (e.g., wealth) or reverse causation.³⁰

Analysis

We modeled the relation between IPV and mental distress with negative binomial regression models, commonly used for overdispersed count variables.³¹ Our models controlled for measured time-varying confounders, including household wealth, number of sons in the household, and number of daughters in the household. We also controlled for randomized treatment assignment (i.e., access to affordable daycare versus control conditions), because access to daycare might confound the relation between IPV and mental health. Using trial data as if it originated from an observational study by controlling for treatment assignment is an approach that has been used in prior studies.^{32,33}

We also estimated the effect of being exposed to multiple forms of abuse by including product terms in the regression equation (e.g., physical abuse X controlling behaviour). Due to potential clustering of responses (i.e., women living in the same village hamlets may have correlated responses; repeated measures within the same individuals), we estimated standard errors using a bootstrap procedure.³⁴ We did not account for losses to follow-up or missing data in our analyses because loss to follow-up was minimal (i.e., 4%) and missing data was rare (i.e., <4% for any variable). We also estimated these same effects by modeling counts of abuse items as our main exposure (e.g., controlling behaviours: range 0 to 4).

Our main effect estimate is the predicted mean difference in the number of mental distress symptoms due to exposure to different forms of abuse. We also estimated the effect of being jointly or triply exposed to multiple types of abuse concurrently (e.g., experiencing both physical and psychological abuse concurrently), and we estimated whether the effect of experiencing multiple types of abuse concurrently was more than the estimated effect of experiencing these forms of abuse separately (i.e., if there were departures from additivity). We did this by estimating the joint effect (e.g., joint effect of experiencing these concurrently) and subtracting the

estimated independent effects of experiencing each type of abuse (e.g., independent effect of physical abuse + independent effect of psychological abuse).

Sensitivity analysis

Exposure to the trial intervention, randomized access to a community-based daycare program, may result in some unmeasured changes and residual time-varying confounding. Therefore, in a sensitivity analysis we restricted our sample to women living in village hamlets that were not randomized to the intervention (the control arm).

RESULTS

The majority of women included in this study had no education (76%), were Hindu (85%), and were members of a Scheduled Tribe (94%). Table 1 shows baseline sociodemographic characteristics of women by reported exposure to abuse. There were no major difference between women's reported abuse and most demographic characteristics. However, women who reported no abuse had slightly higher wealth scores and married at a slightly older age compared to women who reported experiencing abuse. Women who reported no abuse reported less distress symptoms (1.6), compared to women reporting controlling behaviour (2.4), physical abuse (2.6), or psychological abuse (2.9).

Abuse was common (Table 2). The majority of women reported controlling behaviour (60%), and many women reported psychological abuse (34%) or physical abuse (37%). Experiencing multiple forms of abuse concurrently was common, and the most common pattern was experiencing all three types of abuse concurrently (20%). There was a gradient between the number of abuse items women answered affirmatively to and mental distress score, with women answering affirmatively to more items having a higher mental distress score (Figure 1). This pattern was consistent for psychological abuse, controlling behaviour, and physical abuse.

Over the study period, 37% of women reported a change in physical abuse, 43% reported a change in controlling behaviour, and 41% reported a change in psychological abuse. In both unadjusted and adjusted models, changes in experiencing abuse corresponded to a change in mental distress (Table 3). In models that adjusted for time-varying confounders (i.e., household wealth, number of boys in the household, number of girls in the household, treatment assignment, other types of abuse), experiencing psychological abuse increased mental distress by 0.65 symptoms (95% CI: 0.39, 0.91), and experiencing controlling behaviour increased mental distress by 0.31 symptoms (95% CI: 0.21, 0.41). A change in exposure to physical abuse led to a small decrease in distress symptoms (adjusted mean difference = -0.18, 95% CI: -0.43, 0.06). We also estimated the association between changes in the number of abuse items and changes in mental distress (Appendix 1). This analysis generally showed a similar relationship to those reported in Table 3. However, in adjusted models, physical abuse had virtually no effect on mental distress (adjusted mean difference in counts = 0.02, 95% CI: -0.05, 0.09).

The number of distress symptoms reported by women jointly exposed to psychological abuse and controlling behaviour concurrently was smaller than what would be expected if the exposures acted additively (excess difference due to joint exposure = -0.47, 95% CI: -0.79, -0.16). The effect of experiencing both controlling behaviour and physical abuse concurrently was associated with a larger than would be expected effect estimate if the independent effects were both additive (excess difference due to concurrent exposure = 0.23, 95% CI: -0.03, 0.49), indicating that experiencing both types of abuse concurrently is more detrimental to mental distress than experiencing each separately. Exposure to psychological abuse and physical abuse concurrently, and all three types of abuse concurrently, showed no major departures from additivity.

A sensitivity analysis restricted to women living in the control arm of the study (Appendix 2) found virtually the same effect estimates as those reported in the main analysis

(Table 3) for emotional abuse and controlling behaviour. However, the restricted sample found a null effect estimate for physical abuse (adjusted mean difference = 0.00, 95% CI: -0.36, 0.36), whereas the unrestricted main analysis showed some indication that physical abuse corresponded to a slight decrease in distress score (adjusted mean difference = -0.18, 95% CI: -0.43, 0.06), although confidence intervals between these two estimates overlapped.

DISCUSSION

Violence against Indian women is exceedingly common. Nationally representative surveys of ever-married Indian women aged 15-49 estimate that 31% have experienced physical, sexual or psychological abuse by an intimate partner in their lifetime, and 48% have experienced at least one controlling behavior by their husband.³⁵ Our study found that among women living in rural tribal communities, more than one third experienced psychological abuse or physical abuse in the past year, and the majority of women reported controlling partner behaviour. Our study found that many women experienced multiple types of abuse concurrently, which mirrors research in other contexts that show specific types of abuse rarely occur in isolation.³⁶⁻³⁸

Our study found that psychological abuse and controlling behaviour were more damaging to women's mental health than physical abuse, and we found some limited evidence that controlling behaviour modified the effect of other forms of abuse. Although psychological abuse and controlling behaviour are commonly experienced by women, they have rarely been investigated in relation to women's mental health.¹⁵ We are aware of one other longitudinal study among Indian women that investigated psychological abuse, and this study also found that psychological abuse had a stronger effect than physical abuse.³⁹ To our knowledge, this is the only longitudinal study to investigate the effect of controlling behaviour on women's mental health in an Indian context.

Controlling behaviour by a woman's partner is common in India,²⁷ and some women in this context may not consider it abuse. There is also some debate in the literature regarding if controlling behaviour should be considered a part of, or separate from, IPV.^{36,40} We classified controlling behaviour as part of IPV, which is supported by a recent study in Pune, India, which found wide agreement that controlling behaviour (e.g., limiting contacts with natal family, limiting mobility outside of the home) was a salient dimension of IPV.⁴¹

Our study addresses many knowledge gaps. First, the majority of IPV research is conducted in high-income settings,^{3,13} and our study adds information about the effect of IPV in a LMIC setting. Second, our study investigated psychological abuse and controlling behaviour, which are neglected aspects of IPV.^{3,15} Third, most research is cross-sectional,^{14,42} and our study provides longitudinal evidence for the link between IPV and mental health. Longitudinal evidence is crucial for understanding the relationship between different forms of IPV and women's mental health because of the potential for reverse causation (e.g., women with mental health problems may be more likely to be victims of abuse⁴³) and reporting bias (e.g., women who are depressed may retrospectively reinterpret acts as abuse). Fourth, we were able to account for early life experiences through a fixed effects study design, and the majority of longitudinal studies have not controlled for these factors.³ Taken together, our paper strengthens the evidence for a link between IPV and mental health.

Our study has limitations. First, our study only investigated abuse by an intimate partner. In an Indian context, it is not uncommon for in-laws living in the household to be involved in abuse.⁴⁴ Our study was not designed to capture abuse from other family members, which could be a direction for future research. Second, we used questions from the DHS, which may miss some examples of abuse specific to India. For instance, one study found that additional examples of psychological abuse include the spreading of false rumours and harassment about dowry payments.⁴¹ Third, there is some indication that the relation between IPV and mental health is bi-directional;³² our

measures include past-year abuse and current mental health, and thus we could not investigate if poor mental health led to subsequent abuse. Fourth, we did not investigate the effect of sexual abuse, and investigating the effect of sexual abuse – in relation to other forms of IPV – could be one direction of future research.

In summary, our study contributes to a better understanding of the causes of poor mental health among Indian women. We found a longitudinal association between psychological abuse and controlling partner behaviour and IPV. IPV is highly prevalent among Indian women, and identifying strategies to reduce IPV may have important implications for women's mental health.



*values are mean (standard **some women experience	GHQ-12 score (0-12)	18 or older	15-18	15 or younger	Age at marriage	Wealth index score	household	Number of girls in	household	Number of boys in	None of them	Caste	Other Backwards	Scheduled Caste	Scheduled Tribe	Caste	No	Yes	Hindu religion	No	Yes	Ever attended school	Age (years)	1			Baseline socio-demographi
d deviation) or % d multiple forms of a	2.6 (2.7)	47%	46%	7%		-0.3 (1.3)	1.7 (1.3)		1.7 (1.2)		2%	1%		2%	96%		15%	85%		76%	24%		30.2 (6.8)	(n = 1162)	abuse	Any physical	ic characteristics of (
buse and are therefor	2.9 (2.7)	47%	46%	7%		-0.1 (1.3)	1.8 (1.3)		1.7 (1.2)		2%	<1%		2%	%96		14%	86%		75%	25%		30.1 (6.9)	(n = 1045)	abuse	Any emotional	3010 Indian women by
e represented in multipl	2.4 (2.5)	48%	45%	7%		0.0 (1.4)	1.6 (1.2)		1.6 (1.2)		3%	1%		2%	95%		16%	84%		74%	26%		29.7 (6.7)	(n = 1840)	behaviour	Any controlling	reported abuse
le abuse categories	1.6 (2.1)	50%	45%	6%		0.1 (1.4)	1.7 (1.3)		1.6 (1.2)		4%	1%		3%	92%		15%	85%		75%	25%		30.2 (6.6)	(n = 935)	No abuse		

 Table 1

 Raceline conin-demonranhic characteristics of 3010 Inc

Indian
Percent
60%
18%
20%
25%
40%
42%
34%
16%
2%
22%
28%
37%
4%
10%
12%
19%
21%
31%

Table 3					
Association betv	veen changes in II	PV experienc	e and changes in menta	al distress	
Controllin			Crude mean		Excess difference
ŋ	Psychologica	Physica	difference	Adjusted mean	due to joint
behaviour	l abuse	l abuse	(95% CI)	difference (95% CI)*	exposure
No	No	No	0 (Ref)	0 (Ref)	n/a
Yes	No	No	0.30 (0.18, 0.42)	0.31 (0.21, 0.41)	n/a
No	Yes	No	0.67 (0.38, 0.96)	0.65 (0.39, 0.91)	n/a
			-0.18 (-0.42,		
No	No	Yes	0.05)	-0.18 (-0.43, 0.06)	n/a
					-0.47 (-0.79, -
Yes	Yes	No	0.51 (0.37, 0.65)	0.49 (0.35, 0.63)	0.16)
No	Yes	Yes	0.45 (0.13, 0.77)	0.47 (0.14, 0.80)	0.01 (-0.45, 0.46)
Yes	No	Yes	0.36 (0.18, 0.55)	0.36 (0.21, 0.50)	0.23 (-0.03, 0.49)
Yes	Yes	Yes	0.87 (0.76, 0.97)	0.85 (0.74, 0.97)	0.08 (-0.37, 0.52)
*adjusted for ho	usehold wealth, nu	umber of boys	s in the household, num	ber of girls in the household	d, treatment
assignment, and	the following inte	raction terms	: controlling behaviour >	X psychological abuse, phy	sical abuse X
controlling beha	viour, physical abu	use X psycho	logical abuse, physical a	abuse X psychological abu:	se X controlling
behaviour					
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Assc
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of abuse
items a
nd menta
l distress

Association between changes in counts of abuse items	שווע וווכווומו עושנוכשש	
	Crude mean	Adjusted mean difference
	difference (95% CI)	(95% CI)*
Controlling behaviour	0.19 (0.15, 0.23)	0.20 (0.16, 0.24)
Psychological abuse	0.33 (0.23, 0.44)	0.33 (0.24, 0.41)
Physical abuse	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)
Controlling behaviour + psychological abuse	0.42 (0.33, 0.51)	0.42 (0.34, 0.49)
Controlling behaviour + physical abuse	0.20 (0.13, 0.27)	0.20 (0.13, 0.27)
Psychological abuse + physical abuse	0.31 (0.21, 0.42)	0.32 (0.23, 0.40)
Controlling behaviour + psychological abuse +		
physical abuse	0.41 (0.32, 0.50)	0.41 (0.33, 0.49)
*adjusted for household wealth, number of boys in the	household, number of girl	is in the household,
treatment assignment, and the following interaction ter	ms: controlling behaviour	X psychological abuse,
physical abuse X controlling behaviour, physical abuse	X psychological abuse, p	ohysical abuse X
psychological abuse X controlling behaviour		

Association between ch 1259)	anges in IPV experienc	ce and changes in r	nental distress among wom	en in control arm (n=
			Crude mean	Adjusted mean
Controlling	Psychological	Physical	difference	difference
behaviour	abuse	abuse	(95% CI)	(95% CI)*
No	No	No	0 (Ref)	0 (Ref)
Yes	No	No	0.35 (0.23, 0.47)	0.38 (0.25, 0.50)
No	Yes	No	0.76 (0.46, 1.05)	0.73 (0.46, 1.00)
No	No	Yes	0.01 (-0.32, 0.34)	0.00 (-0.36, 0.36)
Yes	Yes	No	0.43 (0.23, 0.62)	0.44 (0.24, 0.64)
No	Yes	Yes	0.59 (0.17, 1.00)	0.60 (0.12, 1.08)
Yes	No	Yes	0.27 (0.08, 0.48)	0.29 (0.06, 0.52)
Yes	Yes	Yes	0.81 (0.63, 0.99)	0.81 (0.66, 0.96)
*adjusted for household assignment, and the foll controlling behaviour, pl	l wealth, number of boy lowing interaction terms hysical abuse X psychc	s in the household, s: controlling behav ological abuse, phy	, number of girls in the hous iour X psychological abuse, sical abuse X psychological	ehold, treatment physical abuse X abuse X controlling
behaviour				

References

- 1. Devries KM, Mak JYT, García-Moreno C, et al. The Global Prevalence of Intimate Partner Violence Against Women. *Science*. 2013;340(6140):1527-1528.
- 2. Campbell J, Jones A, Dienemann J, et al. Intimate partner violence and physical health consequences. *Archives of Internal Medicine*. 2002;162(10):1157-1163.
- 3. Devries KM, Mak JY, Bacchus LJ, et al. Intimate Partner Violence and Incident Depressive Symptoms and Suicide Attempts: A Systematic Review of Longitudinal Studies. *PLoS Med.* 2013;10(5):e1001439.
- 4. Jewkes RK, Dunkle K, Nduna M, Shai N. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: a cohort study. *The Lancet.* 2010;376(9734):41-48.
- 5. Petrosky E, Blair JM, Betz CJ, Fowler KA, Jack SPD, Lyons BH. Racial and Ethnic Differences in Homicides of Adult Women and the Role of Intimate Partner Violence - United States, 2003-2014. *MMWR Morbidity and mortality weekly report.* 2017;66(28):741-746.
- 6. Maselko J, Patel V. Why women attempt suicide: the role of mental illness and social disadvantage in a community cohort study in India. *J Epidemiol Community Health.* 2007;62(9):817-822.
- 7. Devries K, Watts C, Yoshihama M, et al. Violence against women is strongly associated with suicide attempts: evidence from the WHO multi-country study on women's health and domestic violence against women. *Soc Sci Med.* 2011;73(1):79-86.
- 8. Heise L, Garcia Moreno C. Violence by intimate partners. In: Krug EG et al, ed. *World report on violence and health*. Geneva: World Health Organization; 2002.
- 9. Bradley R, Schwartz AC, Kaslow NJ. Posttraumatic stress disorder symptoms among low-income, African American women with a history of intimate partner violence and suicidal behaviors: self-esteem, social support, and religious coping. *Journal of traumatic stress.* 2005;18(6):685-696.
- 10. Thompson MP, Kaslow NJ, Short LM, Wyckoff S. The mediating roles of perceived social support and resources in the self-efficacy-suicide attempts relation among African American abused women. *J Consult Clin Psychol.* 2002;70(4):942-949.
- 11. Maciejewski PK, Prigerson HG, Mazure CM. Self-efficacy as a mediator between stressful life events and depressive symptoms. Differences based on history of prior depression. *Br J Psychiatry.* 2000;176:373-378.
- 12. Sowislo JF, Orth U. Does low self-esteem predict depression and anxiety? A meta-analysis of longitudinal studies. *Psychol Bull.* 2013;139(1):213-240.
- 13. Howard LM, Oram S, Galley H, Trevillion K, Feder G. Domestic violence and perinatal mental disorders: a systematic review and meta-analysis. *PLoS Med.* 2013;10(5):e1001452.

- 14. Lagdon S, Armour C, Stringer M. Adult experience of mental health outcomes as a result of intimate partner violence victimisation: a systematic review. *Eur J Psychotraumatol.* 2014;5.
- 15. Kalokhe A, Del Rio C, Dunkle K, et al. Domestic violence against women in India: A systematic review of a decade of quantitative studies. *Glob Public Health.* 2017;12(4):498-513.
- 16. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change.* 1999;30(3):435-464.
- 17. Nandi A, Maloney S, Agarwal P, Chandrashekar A, Harper S. The effect of an affordable daycare program on health and economic well-being in Rajasthan, India: protocol for a cluster-randomized impact evaluation study. *BMC Public Health.* 2016;16(1):490.
- 18. United States Agency for International Development. Domestic Violence Module: Demographic and Health Surveys Methodology. 2014; <u>http://dhsprogram.com/pubs/pdf/DHSQMP/DHS6_Module_Domestic_Violence_6Aug20_14_DHSQMP.pdf</u>.
- 19. Straus M. Measuring intrafamily conflict and violence: the conflict tactics (CT) scales. In: Straus MA, Gelles RJ, eds. *Physical violence in American families: Risk factors and adaptations to violence in 8,145 families*. New Brunswick, NJ: Transaction; 1990:29-45.
- 20. Straus MA. The conflict tactics scales and its critics: An evaluation and new data on validity and reliability. In: Straus MA, Gelles RJ, eds. *Physical violence in American families: Risk factors and adaptations to violence in 8,145 families.* New Brunswick, NJ: Transaction; 1990:49-73.
- 21. Goldberg DP. The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness. London, UK: Oxford University Press; 1972.
- 22. Gautam S, Nijhawan M, Kamal P. Standardisation of hindi version of Goldberg's General Health Questionnaire. *Indian journal of psychiatry.* 1987;29(1):63.
- 23. Patel V, Pereira J, Mann A. Somatic and psychological models of common mental disorder in primary care in India. *Psychol Med.* 1998;28(1):135-143.
- 24. Patel V, Araya R, Chowdhary N, et al. Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med.* 2008;38(02):221-228.
- 25. Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol.* 2010;39(6):1510-1521.
- 26. Shamasundar C, Murthy SK, Prakash OM, Prabhakar N, Krishna DK. Psychiatric morbidity in a general practice in an Indian city. *Br Med J.* 1986;292(6537):1713-1715.
- 27. International Institute for Population Sciences(IIPS) and Macro International. *National Family Health Survey (NFHS-3), 2005-2006: India: Volume 1.* Mumbai, India: IIPS;2007.

- 28. Kolenikov S, Angeles G. *The use of discrete data in principal component analysis: theory, simulations, and applications to socio-economic indices.* CPC/MEASURE: Working paper No. WP-04-85;2004.
- 29. Filmer D, Pritchett L. The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries. *Population and Development Review.* 1999;25(1):85-120.
- 30. Allison PD. Fixed effects regression methods for longitudinal data using SAS. 2005.
- 31. Hilbe JM. *Negative Binomial Regression.* New York, NY: Cambridge University Press; 2011.
- 32. Tsai AC, Tomlinson M, Comulada WS, Rotheram-Borus MJ. Intimate Partner Violence and Depression Symptom Severity among South African Women during Pregnancy and Postpartum: Population-Based Prospective Cohort Study. *PLoS Med.* 2016;13(1):e1001943.
- 33. Maika A. Effects of inequality, family investment and early childhood interventions on children cognitive and socio-emotional wellbeing in Indonesia. Australia: School of Public Health, University of Adelaide; 2016.
- 34. Mooney CZ, Duval RD. *Bootstrapping: A Nonparametric Approach to Statistical Inference.* Vol No. 95: Sage; 1993.
- 35. International Institute for Population Sciences (IIPS) and ICF. *National Family and Health Survey (NFHS-4).* Mumbia, India: IIPS;2015/2016.
- 36. Ludermir AB, Lewis G, Valongueiro SA, de Araújo TVB, Araya R. Violence against women by their intimate partner during pregnancy and postnatal depression: a prospective cohort study. *The Lancet.* 2010;376(9744):903-910.
- 37. Coker AL, Davis KE, Arias I, et al. Physical and mental health effects of intimate partner violence for men and women. *Am J Prev Med.* 2002;23(4):260-268.
- 38. Tsai AC, Weiser SD, Dilworth SE, Shumway M, Riley ED. Violent Victimization, Mental Health, and Service Utilization Outcomes in a Cohort of Homeless and Unstably Housed Women Living With or at Risk of Becoming Infected With HIV. *Am J Epidemiol.* 2015;181(10):817-826.
- 39. Stephenson R, Winter A, Hindin M. Frequency of intimate partner violence and rural women's mental health in four Indian states. *Violence Against Women.* 2013;19(9):1133-1150.
- 40. Garcia-Moreno C, Jansen HAFM, Ellsberg M, Heise L, Watts CH. Prevalence of intimate partner violence: findings from the WHO multi-country study on women's health and domestic violence. *The Lancet.* 2006(368):1260-1269.
- 41. Kalokhe AS, Potdar RR, Stephenson R, et al. How well does the World Health Organization definition of domestic violence work for India? *PLoS One.* 2015;10(3):e0120909.
- 42. Beydoun HA, Beydoun MA, Kaufman JS, Lo B, Zonderman AB. Intimate partner violence against adult women and its association with major depressive disorder, depressive symptoms and postpartum depression: a systematic review and meta-analysis. *Soc Sci Med.* 2012;75(6):959-975.

- 43. McPherson MD, Delva J, Cranford JA. A longitudinal investigation of intimate partner violence among mothers with mental illness. *Psychiatr Serv.* 2007;58(5):675-680.
- 44. Kaur R, Garg S. Domestic violence against women: a qualitative study in a rural community. *Asia Pacific Journal of Public Health.* 2009;22(2):242-251.

6 | Addressing structural determinants to improve women's mental health

6.1 Preface to Manuscript 5

In the final manuscript of my thesis, I expand my research from measuring and describing gender-sensitive determinants of mental health to investigating potential interventions to address these determinants to improve women's mental health. This final manuscript draws heavily upon my work in the preceding two chapters: I use the tool I developed to measure women's agency, and I use my work on women's work burden and IPV to inform framing of my research question, measurement, and interpretation of results.

Despite the great burden of CMDs experienced by women, only a minority of women with mental health problems in LMICs will ever receive treatment.¹ Many experts call for addressing political, social, and economic factors (i.e., structural determinants) as a strategy to improve population mental health.²⁻⁵ Such an approach moves beyond interventions targeting individuals to one that targets social conditions.⁶ Research into policies or interventions to address structural determinants is an "orphan" area of research,⁴ and this chapter offers evidence for the effect of one structural factor on mental health, an affordable daycare program.

6.2 The effect of affordable daycare on women's mental health: evidence from a cluster randomized trial in rural India (Manuscript 5)

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Abstract

Background: Structural factors that give rise to economic, educational, and social disadvantage play a key role in the development of mental health problems. Access to affordable daycare is one structural factor that might improve population mental health.

Methods: We conducted a cluster-randomized controlled trial in rural Rajasthan, India. Communities lacking adequate daycare facilities were identified (n=160) and randomly selected for development of a community-run daycare program (n=80) or control conditions (n=80). Women eligible for the daycare program living in these communities completed structured interviews before the intervention (participation rate = 89%) and approximately one year after rollout of the intervention (participation rate = 96%), resulting in a final analytic sample of 3041. Mental distress was measured with the twelve item General Health Questionnaire (GHQ-12) (score range: 0-12). We modeled the relation between access to daycare and the number of mental distress symptoms with negative binomial regression using an intention-to-treat approach, which groups women according to if they lived in communities randomized to affordable daycare or not. We also evaluated the effect of access to daycare on potential intermediate variables, specifically women's work burden, agency, and intimate partner violence (IPV).

Results: Treatment assignment resulted in a reduction of 0.21 (95% CI: -0.43, 0.02) distress symptoms. We found evidence that daycare may have led to shifts in women's work burden and reduced IPV, but we found virtually no change in women's agency.

Conclusion: Access to affordable daycare might be one policy lever to improve population mental health.

Introduction

Mental and behavioural disorders are leading causes of disability among women of childbearing age.⁷ Structural factors that give rise to economic, educational, and social disadvantage play a key role in the development of mental health problems,³ and identifying interventions to confront these factors could greatly improve population mental health.³ However, intervention studies that target structural factors, such as poverty alleviation programs,⁸ rarely investigate mental health outcomes.

Access to affordable daycare might be one structural factor that could improve population mental health through several mechanisms. First, in many contexts, traditional gender roles relegate housework and caregiving to women, and high amounts of unpaid work might contribute to daily life stressors. An excess burden of unpaid work is associated with more mental distress,⁹ and daycare may improve mental health by reducing unpaid work demands. Second, daycare might shift women's household responsibilities (such as expanding opportunities for women to engage in income-generating activities), which could shift household dynamics and expand women's status within the home. These changes might increase a woman's ability to make choices and act upon those choices (i.e., agency^{10,11}) or reduce her exposure to IPV. Although there are feasible reasons why daycare might improve women's mental health, extant quasi-experimental evidence is inconsistent; these studies find that daycare increased mother's mental health problems^{12,13} or had no effect on mental health.¹⁴ We are not aware of any randomized trials on this topic.

India is one context where access to affordable, high-quality daycare is limited. Current government programs include the Integrated Child Development Scheme (ICDS), which provides pre-school education to children ages 3 to 6 through local facilities (anganwadis) and nurseries that provide care for young children

(crèches). However, crèches are poorly regulated and are rarely functional, and the few operational crèches are characterized by poorly trained staff and substandard facilities.¹⁵ Anganwadis only reach about one in four children, and are marked by insufficient hours of operation, poorly trained workers, chronic staff absenteeism, and substandard facilities.¹⁵

Using data from two waves of a cluster-randomized trial, the aim of this study is to evaluate the effect of providing access to an affordable daycare program on women's mental health in a lower income setting, rural Rajasthan, India. We also evaluated if the provision of daycare resulted in changes to women's work demands, IPV, and agency, which are potential mechanisms linking daycare with mental health.

METHODS

Study design

This cluster-randomized controlled trial assessed the impact of providing affordable daycare on women and children's health and well-being. We recruited mothers or guardians with young children, specifically between the ages of one and six, living in rural communities from five blocks (geographical areas) in the Udaipur District of Rajasthan, India. A total of 160 village hamlets (i.e., clusters of houses that constitute separate communities) were included in the study. The study received ethics approval from the Institutional Review Board of McGill University's Faculty of Medicine and the Human Subjects Committee of the Institute for Financial Management in Chennai, India. The trial protocol is publicly available.¹⁶

Participants

Potential village hamlets were identified by the non-governmental organization Seva Mandir, which operates community development programs, including daycare centers called *balwadis*, in rural communities in the Udaipur District. A total of 160 hamlets where Seva Mandir had not previously established a daycare were selected between December 2014 and January 2015. These hamlets met the following criteria, established *a priori*: 1) there was no readily accessible government-operated daycare; 2) at least 25 children between the ages of one and six lived in the hamlet; 3) hamlets had an existing structure suitable for daycare; 4) a woman qualified to operate the daycare lived in the study hamlet or nearby; and 5) the village council indicated adequate demand for daycare. To reduce potential spillover effects between treatment and control villages that might occur if women in control villages enrolled their children in balwadis in treatment villages, we selected control hamlets that were at least 1.5 kilometers from treatment hamlets. Hamlets tended to be geographically isolated.

We conducted a household census in the 160 village hamlets to enumerate the population and identify eligible households, namely those with a mother (either biological or guardian) of at least one child between one and six years old. Trained interviewers randomly selected one eligible woman from each eligible household. Selected women were invited to participate in the study and underwent an informed consent process. Women who could read and write signed a written consent form, and women who could not read or write gave oral consent. Interviewers gave all women a copy of their consent form, which included contact details for the regional research manager. After consenting, women completed baseline interviews (described in the Procedures section) and were offered a small gift for participation.

Randomisation and masking

Treatment was assigned using a stratified randomization procedure. Since there was substantial heterogeneity across blocks, we stratified by block (n=5) and randomly selected hamlets to receive the affordable daycare program (n=80) or serve as control hamlets (n=80). Assignment to treatment or control hamlet was conducted at McGill University by one of the investigators (SH) using a random number generator in Stata. The treatment assignment was communicated to Seva Mandir, who implemented the daycare programs.

Village hamlets were assigned to treatment or control groups after completion of baseline interviews to minimize bias in recruitment of participants and to avoid biased baseline participant responses due to treatment assignment. Due to the nature of the intervention, it was not possible to mask treatment assignment to study participants or interviewers after implementation of the intervention. The research assistant who cleaned the data and the author conducting the analysis (RR) were not blinded to treatment group assignment.

Procedures

The intervention was an offer of full-time, community-run, affordable daycare (balwadi). Each balwadi provided childcare, nutritious meals, preschool education, and linkage to health services (e.g., immunizations) to children between one and six years of age. Balwadis were operated by local women, called *sanchalikas*, who were hired and trained by Seva Mandir. Any child between the ages of one and six living in these communities could use the balwadi, regardless of participation in the study. Families using the daycare facility were charged a small yearly fee per child (i.e., 150 rupees or about \$2.30 USD). These fees were deposited into a collective fund, which was used to purchase items for the children attending the balwadi (e.g., shoes, sweaters).

Daycare services in treatment hamlets were promoted to encourage high utilization. After treatment assignment, community meetings in the treatment hamlets informed residents that a daycare program would be set up in their community and explained how to access the daycare. Once the daycare was set up, the sanchalika visited households of eligible children to encourage families to enrol their children in the program.

Two field workers visited each of the 80 balwadis each month to verify that the balwadis were operational and operating in the correct location, that children were receiving food, and that care was being provided by the sanchalika. Seva Mandir monitored the number of days the daycare centers were open with a camera monitoring system that requires sanchalikas to take three self-timed pictures each day (i.e., at approximately 10am, 12:30pm, and 4pm). This system has been shown to improve teacher attendance.¹⁷ These photographs were used to confirm the number of days the balwadis were open for at least 6 hours, which is considered a full day of operation. Sanchalikas were encouraged to operate the daycare centers at least 5 days a week for 6 hours each day, and they received a monthly salary that was based upon the number of full days the balwadi was open.

Eligible women living in the 160 study hamlets completed structured interviews administered by trained interviewers in their homes. Baseline interviews were conducted between January and June 2015. Village hamlets were assigned to treatment or control groups after baseline interviews were completed. Follow-up interviews were conducted between June and October 2016, approximately one year after implementation of the daycare centers.

We collected household composition and socio-demographic information. At follow-up, women's utilization of the *balwadi* in the past year was measured by

asking if they made any use of the balwadi, as well as the number of days each week and hours each day each child typically attended.

We measured household wealth with 23 asset-based indicators that are commonly used to measure wealth in low- and middle-income countries (LMICs).^{18,19} These indicators included housing characteristics (i.e., type of toilet facility, material of exterior wall, type of roofing, home electrification, source of drinking water), the number of durables owned (i.e., number of cell phones, watches/clocks, electric stoves, wood stoves, fans, televisions, bikes, motorcycles, wells, grain storage cans, pressure cookers, chairs/stools, beds, silver jewelry, gold jewelry, wedding ornaments), home ownership, and whether the household had a savings account. We created a summary wealth score using a polychoric principal component analysis (PCA), which is a type of PCA that can appropriately model ordinal variables.²⁰ We used the Stata user-written command -polychoricpca-, which uses the factor loadings from a polychoric PCA to estimate a wealth score for each individual. We used a one component PCA that explained 26% of the variance.

Mental distress was measured using the GHQ-12,²¹ translated into Hindi by Gautam et al.²² The GHQ-12 is commonly used to detect mental health problems in India.²³⁻²⁵ For each item, women were asked which of four responses corresponded most closely to how they had been feeling recently. For example, one item asks, "Have you recently felt capable of making decisions about things?", and potential responses ranged from "much less than usual" to "more so than usual". We dichotomized responses to indicate none versus some distress for each item using a scoring system commonly employed in India²³⁻²⁵ (i.e., 0-0-1-1 scoring system). Using this system, distress scores could range from 0 to 12, with higher scores denoting more distress.

Work demands were measured with a time use survey²⁶ that asked respondents how much time they spent on paid work (e.g., agricultural labour) and unpaid work activities (e.g., laundry) in the past 24 hours. The survey only captured the primary work activity; multitasking, when women performed two or more work activities at once (such as cleaning while caring for children), was not accounted for. We created variables for paid work, farm work (caring for animals, working in own field), housework (collecting water, cooking, cleaning, laundry, gathering fuel or firewood), and caring for children, the elderly or the disabled. We also created a summary measure of total work amount by summing together all of these work activities.

Women's agency was measured with 23 questions. These questions, and the frequency of responses, are shown in Appendix 1. We conducted a review of the literature on measuring women's agency to identify relevant indicators in an Indian context, and we then used confirmatory factor analysis (CFA) to develop a measurement model using these indicators. Development of this measurement tool is described elsewhere.²⁷ Because some items were dichotomous or ordinal, we used robust weighted least squares CFA, which is a type of CFA that can appropriately model this type of data.²⁸ We accounted for correlated observations within hamlets by estimating standard errors clustered at the hamlet level. Our measurement model was composed of 4 agency domains: Household Decision-Making (9 questions; e.g., who makes decisions about health care for yourself?), Freedom of Movement (5 questions; e.g., are you allowed to go to the market to buy things in your village alone?), Participation in the Community (6 questions; e.g., do you feel comfortable speaking out against a man beating his wife?), and Attitudes and Perceptions (3 questions; e.g., a husband should help with chores if a wife is working). Model fit indices show that our measurement model fit the data well (Bentler Comparative Fit Index = 0.974, Tucker Lewis Index = 0.970, Root Mean Square Error of Approximation = 0.031). Using this model, for each woman we calculated summary scores for each of these four domains of agency,

as well as an overall agency score. Scores are expressed in standard deviation units, and higher scores denote greater agency. Appendix 2 shows summary statistics for these calculated scores. All measurement models were estimated in Mplus 7.4.²⁹

IPV was measured with questions from the Demographic and Health Survey's Domestic Violence Module,³⁰ which includes 6 questions about women's experiences of physical abuse (e.g., slapped by partner) in the past year, 4 questions about psychological abuse (e.g., partner threatened to hurt you) in the past year, and 5 questions about partner's controlling behaviour (e.g., partner limits contact with your family) that was not restricted to the past year. Response categories include "not at all", "sometimes", and "often". We classified women as experiencing abuse in each of these three categories if she answered "sometimes" or "often" to any item.

Outcomes

The primary outcome was number of mental distress symptoms, and the secondary outcomes were women's work demands, agency, and IPV. For all outcomes, we calculated the mean difference between treatment and control groups approximately 12 months after the intervention.

Statistical analyses

The initial sample size determination for this trial was calculated for the outcome women's labour force participation. The number of clusters (village hamlets) was fixed at 160 due to the finite number of village hamlets lacking daycare in the study area. This power calculation indicated that 20 individuals per 160 clusters (n=3200) would provide adequate power to detect a meaningful difference in labour force participation. Due to the fixed sample size, we calculated the

minimal detectable effect using a formula that accounts for correlated observations within clusters.³¹ Calculations assumed an intra-cluster correlation of 0.05 (which is a typical value in social science surveys),³¹ 160 clusters, 20 women per cluster, a loss to follow-up of 10% over a year and a half period, a 1:1 allocation ratio, an alpha level of 0.05, and 80% power. With these parameters, the smallest difference that can be detected at the specified alpha level is a difference of 0.14 mental distress symptoms (range: 0-12).

The primary analytic approach was intention-to-treat (ITT). ITT compares outcomes across village hamlets according to their randomized treatment assignment, regardless of how compliant hamlets were with their treatment. Additionally, the ITT analysis includes all women living in these village hamlets who completed baseline and follow-up interviews, regardless of if they used, or did not use, daycare. Thus, the ITT estimates the average effect of the offer of access to a community-based daycare program on women's mental health.

We used negative binomial regression to compare the mean difference in number of mental distress symptoms, measured at follow-up, among women living in village hamlets randomized to the affordable daycare program compared to women living in control villages. We used negative binomial models because the outcome (number of mental distress symptoms) is a count variable, and count variables are most appropriately modeled with Poisson or negative binomial regression.³² We chose negative binomial regression models over Poisson models because we found evidence of overdispersion, which can result in underestimated standard errors in Poisson regression models.³² We calculated the mean difference in the number of distress symptoms in models that adjusted for the stratification variable (block), as well as in models that adjusted for baseline covariates that may be predictors of mental distress (i.e., baseline mental distress score, age, household wealth, marital status) to increase statistical precision.³³

We estimated the mean difference of our secondary outcomes with linear regression for work demands and agency, and with logistic regression for IPV. The partially adjusted models included an indicator for stratification variable (block), and the fully adjusted models included baseline covariates that may be predictors of the outcomes. For models estimating work demands, baseline covariates included work amount, age, wealth, and number of daughters in the household; for models estimating IPV, baseline covariates included IPV exposure and educational attainment; and for models estimating women's agency, baseline covariates included age, educational attainment, wealth, marital status, and age at marriage.

All models estimated robust standard errors to account for potential clustering of responses among women within the same hamlet. Analyses were conducted using Stata 14. A data monitoring committee did not oversee the study, which is standard practice in evaluations of social interventions with no clear risk of participant harm. The trial is registered at the IRSCTN trial registry, number IRSCTN45369145, and the American Economic Association's registry, number AEARCTR-0000774.

Role of the funding source

The funder of the study had no role in the study design, data collection, data analysis, data interpretation, or writing of the report. RR, AN, and SH had full access to all the data in the study. RR had final responsibility for the decision to submit for publication.

RESULTS

Figure 1 shows participant selection and response rates. We identified 3899 potentially eligible women living in 160 village hamlets, and 343 women were interviewed and determined to be ineligible. Among the remaining 3557 potentially eligible women, 3177 women participated (response rate = 89%), and 3042 of enrolled women were re-interviewed approximately 1.5 years later (participation rate = 96%). Among the 4% of women who were lost to follow-up, we compared baseline differences in socio-demographic characteristics (age, marital status, age at first marriage, annual household income, wealth, education), number of hours worked, exposure to IPV, and mental distress score. We found some minor differences between the two groups; namely, women lost to follow-up were slightly younger (mean difference = 1.7 years, 95% CI: 0.50, 2.9) and were less likely to be married (mean difference = 2.2%, 95% CI: 0.0%, 4.3%).

On average, women enrolled in the study were approximately 30 years old and had an average household income of 56,452 INR (approximately \$880 USD). The majority of women were from Scheduled Tribes (93%), had never attended school (74%), were currently married or cohabitating (98%), and reported 2.1 out of a possible 12 distress symptoms. The majority of women reported some form of IPV (70%), most commonly controlling behaviour (60%), although many women reported psychological abuse (34%) or physical abuse (37%). Table 1 shows that the baseline characteristics of women was well-balanced by treatment assignment. Table 2 shows that daycare centers were open for an average of 16 days each month in the treatment communities. Approximately 41% of women in the treatment group utilized daycare, while 5% of women in the control group did. Overall, women in the treatment group utilized daycare 0.2 days each week.

Access to the affordable daycare program resulted in modest reductions in mental distress among women living in these communities (Table 3). In unadjusted models, treatment assignment resulted in a reduction of 0.22 (95% CI: -0.51, 0.07) distress symptoms. We observed virtually the same relationship in partially adjusted (-0.18, 95% CI: -0.40, 0.05) and fully adjusted models (-0.21, 95% CI: -0.43, 0.02), although adjustment increased statistical precision. This reduction corresponded to an 11% reduction (95% CI: -23.1%, 1.1%) in mental distress symptoms relative to the mean in fully adjusted models.

We found modest reductions in our hypothesized intermediate variables, IPV and work demands, but virtually no change in agency (Table 3). In fully adjusted models, we found a 3 percentage point decrease (95% CI: -7, 1) in exposure to IPV among women living in treatment communities, which was driven primarily by a decrease in partner controlling behaviour (decrease = 5 percentage points, 95% CI: -10, 0) and psychological abuse (decrease = 4 percentage points, 95% CI: -8, 1). We found very modest reductions in women's total work amount (adjusted mean difference = -0.12 hours, 95% CI: -0.53, 0.30), which was primarily due to reductions in caring for children, the elderly, and the disabled (adjusted mean difference = -0.16 hours, 95% CI: -0.36, 0.04). We also found a very slight increase in the amount of time women spent performing farm work (adjusted mean difference = 0.08 hours, 95% CI: -0.15, 0.32). However, we did not find any meaningful changes in either women's overall agency (adjusted mean difference = 0.02, 95% CI: -0.05, 0.10), nor its constituent parts Household Decision-Making (adjusted mean difference = 0.02, 95% CI: -0.02, 0.06), Freedom of Movement (adjusted mean difference = 0.02, 95% CI: -0.05, 0.09), Participation in the Community (adjusted mean difference = 0.01, 95% CI: -0.08, 0.10), or Attitudes and Perceptions (adjusted mean difference = 0.02, 95% CI: -0.01, 0.04).

DISCUSSION

There is a dearth of research on structural factors affecting mental health, and our study evaluated the effect of one potential structural factor, access to affordable daycare. We found that access to daycare led to modest reductions in women's mental distress. Affordable daycare may be one structural factor that can improve population mental health.

To our knowledge, this is the first randomized trial to evaluate the effect of access to affordable daycare on women's mental health. Quasi-experimental studies have found mixed results,¹²⁻¹⁴ and thus our study adds important information on this topic. These differences in results may be due to two reasons. First, although quasi-experimental study designs can provide strong evidence, they are nevertheless still susceptible to confounding by unmeasured factors, which may lead to biased study results. Our experimental study randomized participants to treatment assignment – which, in expectation, balances measured and unmeasured confounders between treatment groups – and thus can provide stronger evidence and reduced risk of confounding.

Second, these quasi-experimental studies were conducted in very different settings than our study (i.e., Quebec, Mexico, Ecuador), and access to affordable daycare might affect mechanisms linking daycare with mental health differently in different contexts. For example, employment is one hypothesized variable linking daycare with mental health (either positively by increasing women's agency, or negatively by increasing women's work burden). In Quebec, access to subsidized daycare increased women's labour force participation, while in our study access to daycare led to virtually no change in paid work amount. In our study context, there are limited economic opportunities, which may cap daycare's effect on paid employment. However, in Quebec daycare has the potential to lead to sizeable increases in women's labour force participation due to far more economic

opportunities. The heterogeneous effects of daycare on employment may help explain why the Quebec study found that access to daycare increased mothers' depressive symptoms (potentially through an increase in overall work burden), while our study found that access to daycare led to a reduction in mental distress (potentially by decreasing work demands). Thus, the mixed results in the literature may reflect true heterogeneous effects.

We found that access to affordable daycare corresponded to an 11% (95% CI: -23.1%, 1.1%,) decrease relative to the mean number of distress symptoms, or a reduction of 0.08 (95% CI: -0.18, 0.01) standard deviation units. These effect estimates are of similar magnitude to other social interventions in LMICs that investigate mental health outcomes. For instance, a randomized controlled trial of a multifaceted livelihood intervention among the very poor conducted in 6 countries (including India) found a 0.10 standard deviation improvement in mental health score.³⁴

We found some indication that daycare reduced IPV and shifted women's work demand patterns, although we did not find much evidence that daycare changed women's agency. IPV is consistently associated with poor mental health,³⁵ and prior work originating from India indicates that psychological abuse and controlling behaviour can be particularly detrimental.³⁶ Thus, the reductions we observed in psychological abuse (4 percentage point reduction, 95% CI: -8, 1) and controlling behaviour (5 percentage point reduction, 95% CI: -10, 0) likely contributed to the decrease in mental distress observed in our study. In addition, we found very modest reductions in overall work burden (-7 minutes, 95% CI: -32, 18), which was primarily due to reductions in the amount of time women reported caring for children, the elderly, or disabled (-10 minutes, 95% CI: -22, -2). These shifts in work demand patterns might feasibly lead to reductions in mental distress; prior work in this study population indicates that high amounts of housework and care work are associated with greater mental distress.⁹ Taken

together, our study provides some indication that many mechanisms working together might lead to reductions in mental distress, as opposed to one singular mechanism.

We did not find compelling evidence that daycare increased women's agency, although it should be noted that all agency effect estimates were positive, indicating that women randomized to daycare had very slightly higher agency scores in all agency domains. Increasing women's agency is a transformational process that may take many years to come to fruition. Thus, the relatively short follow-up time in our study (approximately 1 year post intervention) might not have been a long enough period to affect substantial change.

The daycare model evaluated in our study was developed by our partner organization, Seva Mandir, and thus is not directly comparable to the anganwadis and crèches sponsored by the Indian government. However, our results do demonstrate that consistent access to affordable daycare might lead to reductions in mental distress among Indian mothers, which could inform current policy debates. Recent legislative efforts are scaling up access to daycare; in 2017, the Indian government enacted the Maternity Benefit Act, which requires all employers with more than 50 employees to provide daycare to children between the ages of 6 months and 6 years. Scale-up of these services may have unintended, positive consequences for mothers' mental health throughout India.

Our study has a number of strengths, including detailed measures of women's work burden and agency, a relatively large sample size, random allocation to daycare, high participation rates, and low loss to follow-up. However, our study has limitations. First, our time use survey did not capture other aspects of time use that may be relevant, such as working at a more leisurely pace or performing one task at a time, both of which are associated with better well-being among women.³⁷ Our study was not able to detect these work patterns, and thus the

modest changes in work patterns observed in this study might belie greater shifts in women's work demands. Second, our study found modest effect estimates, with some degree of uncertainty. Therefore, although our study indicates daycare might be beneficial to women's mental health in this context, these results should be interpreted cautiously. Replication studies conducted in similar settings, such as other areas in rural India, could confirm our study results. Third, we measured mental distress with the GHQ-12. Although the GHQ-12 has strong psychometric properties among Indian adults,²⁴ it was initially developed for a European population. Thus, it may miss some symptoms of poor mental health among Indian women, such as weakness or tiredness.³⁸ Fourth, our study was conducted in rural communities in India, and results may not be generalizable to other contexts.

In conclusion, our study found that access to affordable daycare led to modest reductions in women's mental distress. These results offer evidence that expanded access to daycare might lead to improvements in population mental health. Future research in other contexts, as well as replication studies in India, would confirm results.

Figure 1. Participant flow chart



Table	1
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Selected baseline characteristics of 3177 rural Indian women

		Intervention
	Control group	group
	(n = 1543)	(n = 1634)
Socio-demographic		
Age (years)	30.0 (6.8)	30.0 (6.8)
Caste		
Schedule caste	22 (2%)	55 (4%)
Schedule tribe	1177 (92%)	1286 (94%)
Don't know/none of them*	74 (6%)	29 (2%)
Married or cohabitating	1531 (99%)	1610 (99%)
Age of first marriage (years)	17.5 (2.7)	17.4 (3.0)
Annual household income in rupees	57214 (66485)	55732 (64067)
Wealth score	0.1 (1.4)	-0.1 (1.4)
Never attended school	1130 (73%)	1226 (75%)
Number of children in household	3.2 (1.6)	3.3 (1.6)
Hours worked in past 24 hours	9.7 (4.3)	9.7 (4.1)
Selected agency questions		
Who makes decisions about health care for yourself		
Respondent only	211 (14%)	207 (13%)
Respondent involved in decision	715 (47%)	687 (43%)
Respondent not involved in decision	590 (39%)	691 (44%)
Husband should help with chores if wife is working		
Agree	1420 (93%)	1443 (89%)
Disagree	111 (7%)	180 (11%)
Can you go to a market in your village		
Alone	1366 (89%)	1452 (89%)
Not alone	158 (10%)	153 (9%)
Not at all	17 (1%)	26 (2%)
Decisions about whether you can work?		
Respondent only	228 (15%)	267 (17%)
Respondent involved in decision	747 (49%)	743 (47%)
Respondent not involved in decision	542 (36%)	584 (37%)
Reported any IPV	1060 (70%)	1094 (69%)
Mental distress		
GHQ-12 score (mean; range 0-12)	2.2 (2.5)	2.1 (2.4)

Data are n, n (%), or mean (SD). *includes 46 women from an Other Backward Caste

 Table 2

 Treatment utilization & compliance

	Control group (n= 1486)	Intervention group (n= 1555)
Balwadi use		
No	1408 (94.8%)	917 (59.0%)
Yes	78 (5.2%)	638 (41.0%)
Number of days typically used balwadi	0.2	2.2
Number of hours typically used balwadi each day they used balwadi	0.3	2.5
Average number of days balwadi open each month	0 days	16 days

Intention-to-treat (ITT) estimates for the effect of offering af	fordable daycare			
	Control group	Intervention group	Mean difference	Mean difference in standard deviation units
Mental distress				
Partially adjusted ^a	1.95 (1.81, 2.09)	1.77 (1.60, 1.95)	-0.18 (-0.40, 0.05)	-0.07 (-0.16, 0.02)
Fully adjusted ^b	1.98 (1.83, 2.13)	1.77 (1.60, 1.95)	-0.21 (-0.43, 0.02)	-0.08 (-0.18, 0.01)
Total work amount (hours)				
Partially adjusted ^a	10.23 (9.96, 10.51)	10.12 (9.82, 10.42)	-0.11 (-0.52, 0.29)	-0.03 (-0.12, 0.07)
Fully adjusted ^e	10.24 (9.96, 10.52)	10.11 (9.82, 10.43)	-0.12 (-0.53, 0.30)	-0.03 (-0.12, 0.07)
Housework (hours)				
Partially adjusted ^a	4.79 (4.64, 4.94)	4.78 (4.62, 4.93)	-0.01 (-0.23, 0.20)	0.01 (-0.09, 0.08)
Fully adjusted ^c	4.79 (4.65, 4.93)	4.78 (4.62, 4.93)	-0.01 (-0.22, 0.20)	0.01 (-0.09, 0.08)
Caring for children, elderly, disabled (hours)				
Partially adjusted ^a	2.10 (1.96, 2.25)	1.95 (1.82, 2.08)	-0.16 (-0.35, 0.04)	-0.08 (-0.18, 0.02)
Fully adjusted ^c	2.11 (1.96, 2.26)	1.94 (1.82, 2.07)	-0.16 (-0.37, 0.03)	-0.08 (-0.18, 0.02)
Farm work (hours)				
Partially adjusted ^a	3.00 (2.85, 3.15)	3.08 (2.91, 3.26)	0.08 (-0.15, 0.31)	0.04 (-0.07, 0.14)
Fully adjusted ^c	3.00 (2.85, 3.15)	3.10 (2.91, 3.27)	0.09 (-0.14, 0.33)	0.04 (-0.06, 0.14)
Paid work (hours)				
Partially adjusted ^a	0.35 (0.24, 0.46)	0.33 (0.24, 0.42)	-0.02 (-0.16, 0.12)	-0.01 (-0.11, 0.08)
Fully adjusted ^c	0.35 (0.24, 0.46)	0.33 (0.24, 0.42)	-0.02 (-0.17, 0.12)	-0.02 (-0.11, <u>0.08)</u>

Table 3 continued on next page

			Mean difference in standard deviation
Control group	Intervention group	Mean difference	units
-0.13 (-0.17, -0.08)	-0.10 (-0.16, -0.05)	0.02 (-0.05, 0.10)	0.03 (-0.07, 0.13)
-0.13 (-0.18, 0.08)	-0.10 (-0.16, -0.05)	0.02 (-0.05, 0.10)	0.04 (-0.06, 0.14)
-0.03 (-0.05, -0.01)	-0.01 (-0.04, 0.02)	0.03 (0.01, 0.05)	0.01 (-0.02, 0.04)
-0.03 (-0.05, -0.01)	-0.01 (-0.04, 0.02)	0.02 (-0.02, 0.06)	0.05 (-0.04, 0.13)
-0.17 (-0.21, -0.12)	-0.15 (-0.20, -0.10)	0.02 (-0.05, 0.09)	0.03 (-0.08, 0.13)
-0.17 (-0.22, -0.12)	-0.15 (-0.20, -0.10)	0.02 (-0.05, 0.09)	0.03 (-0.07, 0.14)
-0.02 (-0.08, 0.04)	-0.02 (-0.09, 0.04)	0.00 (-0.10, 0.09)	0.00 (-0.10, 0.09)
-0.03 (-0.09, 0.04)	-0.02 (-0.08, 0.05)	0.01 (-0.08, 0.10)	0.01 (-0.09, 0.10)
-0.07 (-0.09, -0.05)	-0.06 (-0.07, -0.04)	0.01 (-0.01, 0.04)	0.05 (-0.04, 0.15)
-0.07 (-0.09, -0.05)	-0.05 (-0.07, -0.04)	0.02 (-0.01, 0.04)	0.07 (-0.03, 0.16)
0.78 (0.75, 0.80)	0.75 (0.71, 0.78)	-0.03 (-0.08, 0.02)	-0.07 (-0.18, 0.04)
0.78 (0.75, 0.80)	0.75 (0.71, 0.78)	-0.03 (-0.07, 0.01)	-0.07 (-0.17, 0.03)
0.27 (0.24, 0.30)	0.26 (0.23, 0.29)	-0.01 (-0.05, 0.03)	-0.03 (-0.12, 0.06)
0.27 (0.24, 0.30)	0.26 (0.23, 0.28)	-0.01 (-0.05, 0.03)	-0.03 (-0.12, 0.06)
0.32 (0.29, 0.35)	0.28 (0.25, 0.31)	-0.04 (-0.08, 0.01)	-0.08 (-0.18, 0.01)
0.32 (0.29, 0.35)	0.28 (0.25, 0.31)	-0.04 (-0.08, 0.01)	-0.08 (-0.18, 0.01)
0.72 (0.69, 0.75)	0.67 (0.64, 0.71)	-0.05 (-0.10, 0.00)	-0.10 (-0.21, 0.00)
0.72 (0.69, 0.75)	0.67 (0.64, 0.71)	-0.05 (-0.10, 0.00)	-0.11 (-0.21, 0.00)
d wealth, marital status, and l	block		
, number of girls in household	I, and block		
r, mantal status, age at marria t, and block	age, and block		
	Control group -0.13 (-0.17, -0.08) -0.13 (-0.18, 0.08) -0.03 (-0.05, -0.01) -0.03 (-0.05, -0.01) -0.17 (-0.21, -0.12) -0.17 (-0.22, -0.12) -0.02 (-0.08, 0.04) -0.02 (-0.09, -0.05) -0.07 (-0.09, -0.05) -0.07 (-0.09, -0.05) 0.78 (0.75, 0.80) 0.27 (0.24, 0.30) 0.27 (0.24, 0.30) 0.27 (0.24, 0.30) 0.32 (0.29, 0.35) 0.72 (0.69, 0.75) 0.72 (0.69, 0.75) 0.72 (0.69, 0.75) 0.72 (0.69, 0.75) 0.72 (0.69, 0.75) 0.72 (0.69, 0.75) 1 wealth, marital status, and I number of girls in household, number of girls in household t, marital status, age at marrital t, and block	Control group Intervention group -0.13 (-0.17, -0.08) -0.10 (-0.16, -0.05) -0.13 (-0.18, 0.08) -0.10 (-0.16, -0.05) -0.03 (-0.05, -0.01) -0.01 (-0.04, 0.02) -0.03 (-0.05, -0.01) -0.01 (-0.04, 0.02) -0.17 (-0.21, -0.12) -0.15 (-0.20, -0.10) -0.17 (-0.22, -0.12) -0.15 (-0.20, -0.10) -0.02 (-0.08, 0.04) -0.02 (-0.09, 0.04) -0.03 (-0.09, -0.05) -0.06 (-0.07, -0.04) -0.07 (-0.09, -0.05) -0.06 (-0.07, -0.04) -0.78 (0.75, 0.80) 0.75 (0.71, 0.78) 0.78 (0.75, 0.80) 0.26 (0.23, 0.29) 0.27 (0.24, 0.30) 0.26 (0.23, 0.29) 0.27 (0.24, 0.30) 0.28 (0.25, 0.31) 0.32 (0.29, 0.35) 0.28 (0.25, 0.31) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75) 0.67 (0.64, 0.71) 0.72 (0.69, 0.75)<	Control group Intervention group Mean difference -0.13 (-0.17, -0.08) -0.10 (-0.16, -0.05) 0.02 (-0.05, 0.10) -0.33 (-0.05, -0.01) -0.01 (-0.04, 0.02) 0.03 (0.01, 0.05) -0.03 (-0.05, -0.01) -0.01 (-0.04, 0.02) 0.02 (-0.05, 0.10) -0.17 (-0.21, -0.12) -0.15 (-0.20, -0.10) 0.02 (-0.05, 0.09) -0.17 (-0.22, -0.12) -0.15 (-0.20, -0.10) 0.02 (-0.05, 0.09) -0.02 (-0.08, 0.04) -0.02 (-0.09, 0.04) 0.00 (-0.10, 0.09) -0.03 (-0.09, -0.05) -0.02 (-0.06, 0.05) 0.01 (-0.04, 0.02) -0.02 (-0.08, 0.04) -0.02 (-0.08, 0.05) 0.01 (-0.06, 0.10) -0.02 (-0.09, 0.04) -0.02 (-0.06, 0.05) 0.01 (-0.06, 0.10) -0.07 (-0.09, -0.05) -0.06 (-0.07, -0.04) 0.01 (-0.06, 0.01) -0.07 (-0.09, -0.05) -0.05 (-0.07, -0.04) 0.02 (-0.07, 0.04) -0.07 (-0.09, -0.05) -0.05 (-0.07, -0.04) 0.02 (-0.07, 0.04) -0.07 (-0.09, -0.05) -0.05 (-0.07, 0.01) 0.02 (-0.07, 0.01) -0.78 (0.75, 0.80) 0.75 (0.71, 0.78) -0.03 (-0.07, 0.01) 0.27 (0.24, 0.30) 0.26 (0.23, 0.28) -0.01 (-0.05, 0

Table 3, continued

Appendix 1 Percent answering affirmative	v to women's age	nev items at follow-un					
		Who usually makes the following		Respondent	Jointly with other family	Respondent	
		decisions:	п	only	members	not involved	
		Decisions about health care for					
		yourself?	2996	4%	61%	35%	
	-	Decisions about how many children to					
		have and when?	2994	2%	89%	9%	
	decisions	Decisions about whether to use					
)		contraception?	2967	3%	87%	10%	
Decision making in the		Decisions about the education of your					
income		children, including where they go to	2001	10/	700/	400/	
		Decisions about visits to your family or					
		friends?	2994	4%	75%	21%	
		Decisions about whether you can work?	2996	23%	55%	22%	
		Decisions about where you can work?	2994	19%	56%	25%	
	Control over	Decisions about making major household purchases?	2996	1%	70%	29%	
	income	Who decides how your husband's earnings will be used?	2994	2%	82%	16%	
		Do you agree or disagree with each					
		statement:	п	Agree	Disagree		
		Husband should help with chores if wife					
Attitudes and herce	ntione	is working	3040	95%	5%		
רווומעפט מות ספרסס		A married woman should be able to	0001	000	70/		
					ì		
		A wife has a right to express her opinion even if she disagrees with what					
		her husband is saying	3033	93%	7%		

Appendix 1 continued on next page

			in the community									Freedom of m	I				Appendix 1, con
	issues	Outside			เงอนตอ	related	Family-					ovement					itinued
Do you feel comfortable attending rural meetings unaccompanied?	Protest the misbehaviour of authorities or elected officials?	Ensure proper payment of wages for public works or other similar programs?	Help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?	Protest a man divorcing or abandoning his wife?	Protest a man beating his wife?	public to:	Do you feel comfortable speaking up in		within the village?	To homes of friends in the village?	To the community center or other meeting place within the village?	village?	To the market to buy things?	all?	someone accompanies you, or not at	Are you usually permitted to go to the following places on your own, only if	
3039	3038	3038	3039	3039	3039	п			3041	3041	3041	3041	3041	п			
35%	22%	12%	21%	18%	17%	comfortable	No, not at all		%06	90%	88%	89%	91%	Alone			
8%	11%	8%	10%	%6	9%	difficulty	with a great deal of	Yes, but	10%	9%	12%	11%	8%	Not alone			
11%	20%	15%	16%	16%	14%	difficulty	with a little		0%	1%	1%	0%	1%	Not at all			
30%	35%	40%	35%	39%	41%	comfortable	Yes, fairly										
17%	13%	26%	17%	18%	19%	comfortable	Yes, very										

Appendix 2 Summary statistics for derived women's agency scores at follow-up

	Mean	Standard deviation	Minimum	Maximum
Overall agency score	-0.12	0.73	-2.83	1.66
Household Decision-Making	-0.02	0.46	-1.57	1.85
Freedom of Movement	-0.16	0.65	-3.05	1.13
Participation in the Community	-0.02	0.94	-2.14	1.58
Attitudes and Perceptions	-0.06	0.27	-1.09	0.41

References

- 1. Demyttenaere K, Bruffaerts R, Posada-Villa J, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *Jama.* 2004;291(21):2581-2590.
- 2. Burns JK. Poverty, inequality and a political economy of mental health. *Epidemiol Psychiatr Sci.* 2015;24(2):107-113.
- 3. Patel V. Addressing social injustice: a key public mental health strategy. *World Psychiatry.* 2015;14(1):43-44.
- 4. World Health Organization and Calouste Gulbenkian Foundation. *Social determinants of mental health.* Geneva, Switzerland: World Health Organization;2014.
- 5. Lund C. Poverty and mental health: towards a research agenda for low and middle-income countries. Commentary on Tampubolon and Hanandita (2014). *Soc Sci Med.* 2014;111:134-136.
- 6. UNICEF Office of Research. *The Structural Determinants of Child Well-being.* Florence, Italy 2012.
- 7. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet.* 2017;390(10100):1211-1259.
- 8. Lund C, De Silva M, Plagerson S, et al. Poverty and mental disorders: breaking the cycle in low-income and middle-income countries. *Lancet.* 2011;378(9801):1502-1514.
- 9. Richardson R, Nandi A, Jaswal S, Harper S. Are work demands associated with mental distress? Evidence from women in rural India. *Soc Psychiatry Psychiatric Epidemiol.* 2017;52(12):1501-1511.
- 10. Malhotra A, Schuler SR. Women's empowerment as a variable in international development. In: Narayan D, ed. *Measuring empowerment: cross-disciplinary perspectives*. Washington, DC: The World Bank; 2005:71-88.
- 11. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change.* 1999;30(3):435-464.
- 12. Rosero J, Oosterbeek H. *Trade-offs between different early childhood interventions: Evidence from Ecuador.* Tinbergen Institute Discussion Paper;2011.
- 13. Baker M, Gruber J, Milligan K. Universal childcare, maternal labor supply, and family well-being. *Journal of Political Economy.* 2008;116(4):709-745.
- 14. Ángeles G, Gadsden P, Galiani S, et al. *Evaluación de impacto del programa estancias infantiles para apoyar a madres trabajadoras. Informe final de la evaluación de impacto.* México: Instituto Nacional de Salud Pública;2011.
- 15. Palriwala R, Neetha N. *The care diamond: state social policy and the market.* Geneva, Switzerland: United Nations Research Institute for Social Development;2009.

- 16. Nandi A, Maloney S, Agarwal P, Chandrashekar A, Harper S. The effect of an affordable daycare program on health and economic well-being in Rajasthan, India: protocol for a cluster-randomized impact evaluation study. *BMC Public Health.* 2016;16(1):490.
- 17. Duflo E, Hanna R, Ryan SP. Incentives work: getting teachers to come to school. *American Economic Review.* 2012;102(4):1241-1278.
- Filmer D, Pritchett L. The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries. *Population and Development Review*. 1999;25(1):85-120.
- 19. Filmer D, Pritchett LH. Estimating wealth effects without expenditure Data—Or tears: An application to educational enrollments in states of India. *Demography.* 2001;38(1):115-132.
- 20. Kolenikov S, Angeles G. *The use of discrete data in principal component analysis: theory, simulations, and applications to socio-economic indices.* CPC/MEASURE: Working paper No. WP-04-85;2004.
- 21. Goldberg DP. The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness. London, UK: Oxford University Press; 1972.
- 22. Gautam S, Nijhawan M, Kamal P. Standardisation of hindi version of Goldberg's General Health Questionnaire. *Indian journal of psychiatry.* 1987;29(1):63.
- 23. Patel V, Pereira J, Mann A. Somatic and psychological models of common mental disorder in primary care in India. *Psychol Med.* 1998;28(1):135-143.
- 24. Patel V, Araya R, Chowdhary N, et al. Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med.* 2008;38(02):221-228.
- 25. Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol.* 2010;39(6):1510-1521.
- 26. Beaman L, Duflo E, Pande R, Topalova P. Female leadership raises aspirations and educational attainment for girls: a policy experiment in India. *Science*. 2012;335(6068):582-586.
- 27. Richardson R, Schmitz N, Harper S, Nandi A. Development of a tool to measure women's agency in India *Manuscript submitted for publication.* 2018.
- 28. Kline RB. *Principles and Practice of Structural Equation Modeling.* 3rd ed. New York, NY: The Guilford Press; 2011.
- 29. Muthen LK, Muthen BO. *Mplus User's Guide. Seventh Edition.* Los Angeles, CA: Muthen & Muthen; 1998-2015.
- 30. United States Agency for International Development. Domestic Violence Module: Demographic and Health Surveys Methodology. 2014; <u>http://dhsprogram.com/pubs/pdf/DHSQMP/DHS6_Module_Domestic_Violence_6Aug20</u> <u>14_DHSQMP.pdf</u>.
- 31. Bloom HS. *Learning more from social experiments: Evolving analytic approaches.* New York, NY: Russell Sage Foundation; 2005.

- 32. Hilbe JM. *Negative Binomial Regression*. New York, NY: Cambridge University Press; 2011.
- 33. Glennerster R, Takavarasha K. *Running randomized evaluations: A practical guide.* Princeton, New Jersey & Woodstock, United Kingdom: Princeton University Press; 2013.
- 34. Banerjee A, Duflo E, Goldberg N, et al. A multifaceted program causes lasting progress for the very poor: Evidence from six countries. *Science*. 2015;348(6236):1260799.
- 35. Lagdon S, Armour C, Stringer M. Adult experience of mental health outcomes as a result of intimate partner violence victimisation: a systematic review. *European Journal of Psychotraumatology.* 2014;5:10.3402/ejpt.v3405.24794.
- 36. Richardson R, Nandi A, Harper S. The effect of intimate partner violence on women's mental distress: a prospective cohort study of 3010 rural Indian women. 2018.
- 37. Floro MS, Pichetpongsa A. Gender, work intensity, and well-being of Thai homebased workers. *Fem Econ.* 2010;16(3):5-44.
- 38. Pereira B, Andrew G, Pednekar S, Pai R, Pelto P, Patel V. The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord.* 2007;102(1-3):209-218.
7 | Conclusions

7.1 Summary of findings

The overarching goal of my thesis was to investigate gender-sensitive determinants of poor mental health among Indian women. My work highlights the need for accurate measurement and shows that gender-sensitive factors are important determinants of mental health in an Indian context. My work also demonstrates that gender-sensitive determinants are not immutable; interventions can shift women's exposure to detrimental gender-sensitive determinants (e.g., IPV), which can lead to improvements in mental health.

Chapter 4 addressed the thorny issue of how to measure empowerment. My manuscript "Measuring women's empowerment: a critical review of current practices and recommendations for researchers" provided a comprehensive review of measurement practices, summarized current conceptualizations of empowerment, and identified some shortcomings in current measurement approaches. From this review emerged a set of best practices; broadly, to use theory to inform study measures, to use analytic methods that minimize implicit judgments, and to collect comprehensive information. My second manuscript, "Development of a tool to measure women's agency in India", used some of these best practices to develop a measurement tool to measure the core component of women's empowerment, women's agency. This measurement tool encompassed 23 indicators that measured 4 domains of agency (i.e., Household Decision-Making, Freedom of Movement, Participation in the Community, and Attitudes and Perceptions).

Chapter 5 investigated the effect of two gender-sensitive determinants on mental health. My manuscript, "Are work demands associated with mental distress? Evidence from women in rural India", found that experiencing high amounts of housework was associated with more distress (predicted mean difference between 12 versus 4 hours of work = 0.63 distress symptoms, 95% CI: 0.41, 0.85), whereas paid work and farm work

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amount were not. Certain types of housework, including collecting water and cleaning, were associated with higher distress scores. My manuscript, "The effect of intimate partner violence on women's mental distress: a prospective cohort study of 3010 rural Indian women", found that experiencing psychological abuse increased mental distress by 0.65 symptoms (95% CI: 0.39, 0.91) and experiencing controlling behaviour increased mental distress by 0.31 symptoms (95% CI: 0.21, 0.41), whereas I found little evidence that experiencing physical abuse increased mental distress.

Chapter 6 evaluated the effect of a structural intervention on women's mental health. My manuscript, "The effect of affordable daycare on women's mental health: evidence from a cluster randomized trial in rural India", found that randomization to affordable daycare resulted in a 0.21 (95% CI: -0.43, 0.02) reduction in mental distress symptoms. Daycare also resulted in some changes to IPV and work demand patterns, which are potential intermediate factors linking daycare with mental distress. Access to affordable daycare resulted in a 3 percentage point decrease (95% CI: -7, 1) in women's exposure to IPV, which was driven primarily by a decrease in partner controlling behaviour (decrease = 5 percentage points, 95% CI: -10, 0) and psychological abuse (decrease = 4 percentage points, 95% CI: -8, 1). Daycare also resulted in minor shifts to women's total work amount (adjusted mean difference = -0.12 hours, 95% CI: -0.53, 0.30), which was primarily due to reductions in caring for children, the elderly, and the disabled (adjusted mean difference = -0.16 hours, 95% CI: -0.36, 0.04).

7.2 Implications for research and public health

The results of this research are relevant to researchers, public health practitioners, and development professionals studying gender in LMICs, as well as those interested in gender-sensitive determinants of poor mental health. This thesis shows that comprehensive measurement of gender-sensitive factors can help uncover determinants of poor mental health among women living in tribal communities in rural India. The research in this thesis also signals that comprehensive and accurate

measurement of gender-sensitive determinants may reveal new relationships in other contexts as well.

This thesis makes contributions to improving measurement of women's empowerment, which is an identified research gap.^{4,7,106} The recommendations for measuring empowerment provided in this thesis could help researchers and public health professionals develop better measurement tools, which would strengthen research into the causes and consequences of women's empowerment, as well as evaluations of interventions that may increase empowerment. My measurement work could also contribute to monitoring SDG-5, which is to achieve gender equity and empower all women and girls.¹⁰⁷ For research conducted in rural India, my tool to measure women's agency could be used by other researchers studying empowerment in this context.

An important finding in my thesis is the need for accurate, comprehensive measurement when studying gender-sensitive determinants. Most extant research uses broad measures (e.g., IPV versus no IPV, total work time), and my research demonstrates that these broad measures may obscure salient constituent parts that contribute to poor mental health. My research found that some rarely investigated aspects (e.g., unpaid housework burden, controlling partner behaviour) had some of the largest effects on mental health. Measuring these neglected constituent parts may not only be relevant for investigating mental health, but also for investigating the health and well-being of women more broadly.

Many leading experts have called for addressing the political, social, and economic factors (i.e., structural factors) that impact mental health.⁷⁵⁻⁷⁸ However, few interventions have been implemented with the explicit intention of addressing social determinants of health,¹⁹ and where evidence does exist (such as with poverty alleviation programs), mental health outcomes are rarely investigated.⁸⁰ This thesis provides evidence of the effect of one structural factor on women's mental health, an affordable daycare program. These results may inform policy debates about affordable daycare. In India,

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recent legislative efforts (e.g., the Maternity Benefit Act of 2017) aim to scale up access to daycare, and our results show that these policies may have unintended, positive consequences for mothers' mental health throughout India. Addressing structural determinants of poor mental health can complement efforts to scaling up and improve mental health treatment.

7.3 Future research directions

The results of the manuscripts presented in Chapters 4-6 provide opportunities for future research. In Chapter 4, I presented a tool to measure women's agency in one specific context, rural Rajasthan, India. Additional measurement research would complement my work. Specifically, replication studies could confirm whether this measurement tool is consistent across rural India, as well as assess if this measurement tool is applicable to similar LMIC settings. Future research could also assess the reliability of these survey indicators.

Due to concerns about the appropriateness of asking sex-related questions, we did not include questions about women's perceptions about women's sexual rights (e.g., a woman has the right to refuse sex with her husband if she is sick) in our measurement tool, nor did we assess the effect of sexual abuse on IPV. These are worthy aspects, and future qualitative research could identify culturally appropriate ways of asking these questions so that they can be integrated into future quantitative research.

Women's empowerment and mental health were core components of this thesis, and these two factors likely influence each other in complex, bi-directional ways. Thus, future research could investigate the longitudinal and potentially bi-directional relation between women's mental health and empowerment. My thesis did not investigate this relation because longitudinal information about women's agency was unavailable.

I found affordable daycare had a modest effect on mental health. One limitation of this research was the short time frame (women were interviewed approximately 1 year after

the intervention), which may not have been a long enough time to lead to measureable changes, especially in regards to related factors such as women's agency. Thus, a natural extension of this work would be to extend the amount of time daycare is available and to follow up women for a longer time period. This research could confirm that daycare results in reductions in mental distress in our study population and would also clarify mechanisms through which it may do so.

The results of this thesis also point to a few broader areas of future research. First, there are likely many more unidentified gender-sensitive determinants, and improved measurement may help uncover them. Second, this thesis demonstrates that structural interventions can have detectable effects on mental health, and future research could investigate the effects of other structural factors on mental health.

7.4 Conclusion

This thesis advanced knowledge on the measurement of gender-sensitive determinants, estimated the relation between gender-sensitive determinants and women's mental health, and evaluated the effect of one potential intervention on improving women's mental health. Results demonstrate the importance that gender-sensitive factors may have in the development of mental health problems. Further research on additional interventions that expand the rights of women – or mitigate the effects of these gender-sensitive determinants – are urgently needed to improve the mental health of women in resource-poor settings.

8 | Appendices

Appendix A: General Health Questionnaire survey questions

H. General Health Questionnaire सामान्य स्वास्थ्य प्रश्नावली			
	INTERVIEWER READOUT: We want to know how your health has been in general over the last few weeks.		
	सर्वेक्षणकर्ता पढ़ें: हम जानना चाहते हैं कि पिछले कुछ सप्ताह के दौरान आपका स्वास्थ्य कैसा रहा है।		
H.1	Have you recently been able to concentrate on what you're doing? क्या आप हाल ही में अपने किये कार्यों पर ध्यान केन्द्रित कर पा रहे हैं।	BETTER THAN USUAL सामान्य से बेहतर1	
		SAME AS USUAL सामान्य के समान2	
		LESS THAN USUAL सामान्य से कम	
		MUCH LESS THAN USUAL सामान्य से बह्त कम4	
H.2	Have you recently lost much sleep over worry?	NOT AT ALL बिलकुल नहीं1	
	क्या आपको हाल ही में चिन्ता के कारण नींद का नुकसान	NO MORE THAN USUAL सामान्य से जयादा नहीं2	
	हुआ है।	RATHER MORE THAN USUAL सामान्य से कुछ	
		ु ज्यादा	
		MUCH MORE THAN USUAL) सामान्य से बहत	
		ु ज्यादा4	
H.3	Have you recently felt that you are playing a	MORE SO THAN USUAL सामान्य से ज्यादा1	
	useful part in things?	SAME AS USUAL सामान्य के समान2	
	क्या आपको हाल के दिनों में ऐसा लगता है कि आप घटित होने वाली घटनाओं में महत्वपूर्ण भाग रहे हैं।	। LESS SO THAN USUAL सामान्य से कम	
		MUCH LESS THAN USUAL सामान्य से बहत कम4	
H.4	Have you recently felt capable of making decisions about things? क्या हाल के दिनों में आपको ऐसा लगा है कि आप निर्णय लेने में सक्षम हैं।	MORE SO THAN USUAL सामान्य से ज्यादा1	
		SAME AS USUAL सामान्य के समान	
		LESS SO THAN USUAL सामान्य से कम	
		MUCH LESS THAN USUAL सामान्य से बहत कम4	
H.5	Have you recently felt constantly under strain? क्या हाल के दिनों में आपको ऐसा लगा है कि आप लगातार तनाव में हैं।	NOT AT ALL बिलकल नहीं1	
		NO MOBE THAN USUAL सामान्य से जयादा नहीं	
		BATHER MORE THAN USUAL सामान्य से कछ	
		ज्यादा 3	
		अग्रितात्वा के तहन	
H.6	Have you recently felt you couldn't overcome your difficulties? क्या हाल के दिनों में आपको लगा है कि आप अपनी समस्याओं से पार नहीं पा रहे है।	0पादा	
		MOOL MORE I HAN OODAL सामान्य स बहुत ज्यादा4	

H.7 H.8	Have you recently been able to enjoy your normal day to day activities क्या आप हाल के दिनों में अपनी सामान्य दैनिक गतिविधियों का आनन्द उठा पा रहे हैं। Have you recently been able to face up to your problems? क्या आप हाल के दिनों में अपनी समस्याओं का सामना कर पाने में सक्षम रहे हैं।	MORE SO THAN USUAL सामान्य से ज्यादा1 SAME AS USUAL सामान्य के समान2 LESS SO THAN USUAL सामान्य से कम3 MUCH LESS THAN USUAL सामान्य से बहुत कम4 MORE SO THAN USUAL सामान्य से ज्यादा1 SAME AS USUAL सामान्य के समान3 MUCH LESS THAN USUAL सामान्य से ज्यादा1 SAME SO THAN USUAL सामान्य के समान
H.9	Have you recently been feeling unhappy or depressed? क्या आपने हाल के दिनों में अप्रसन्नता या उदासी महसूस की है।	MUCH LESS THAN USUAL सामान्य से बहुत कम4 NOT AT ALL बिलकुल नहीं1 NO MORE THAN USUAL सामान्य से जयादा नहीं2 RATHER MORE THAN USUAL सामान्य से कुछ ज्यादा
H.10	Have you recently been losing confidence in yourself? क्या आप हाल के दिनों में अपने आत्मविश्वास को खो रहे हैं।	NOT AT ALL बिलकुल नहीं1 NO MORE THAN USUAL सामान्य से जयादा नहीं2 RATHER MORE THAN USUAL सामान्य से कुछ ज्यादा
H.11	Have you recently been thinking of yourself as a worthless person? कया आप हाल के दिनों में अपने आप को एक निरर्थक व्यक्ति समझने लगे हैं।	NOT AT ALL बिलकुल नहीं1 NO MORE THAN USUAL सामान्य से जयादा नहीं2 RATHER MORE THAN USUAL सामान्य से कुछ ज्यादा
H.12	Have you recently been feeling reasonably happy, all things considered? क्या आप हाल के दिनों में, सभी चीजों को घ्यान में रखते हुए, स्वयं को समुचित रूप से प्रसन्न महसूस कर रहे हैं।	MORE SO THAN USUAL सामान्य से ज्यादा1 SAME AS USUAL सामान्य के समान2 LESS SO THAN USUAL सामान्य से कम3 MUCH LESS THAN USUAL सामान्य से बहुत कम4

Appendix B: Intimate partner violence survey questions

K.10	INTERVIEWER READOUT: I am going to ask you about some situations which happen to some women. Please tell me if these apply to your relationship with your husband. सर्वेक्षणकर्ता पढ़ें: अब मैं आपसे कुछ ऐसी स्थितियों के बारे में पूछना चाहता/चाहती हूं जो कि कुछ महिलाओं के साथ होती हैं। कृपया मुझे बताइये अगर ऐसा आपके साथ भी होता है।	
K.10.1	He (is/was) jealous or angry if you(talk/talked) to other men. अगर आप किसी और पुरूष से बात करती है/थी तो आपके पति को जलन होती है/थी।	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं999
K.10.2	He (does/did) not permit you to meet your female friends. उन्होंने आपको आपकी महिला मित्रों से मिलने की अनुमति नहीं दी	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं999
K.10.3	He (tries/tried) to limit your contact with your family. उन्होंने आपके परिवार के साथ आपके संपर्क पर पाबंदी लगाने की कोशिश की	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं
K.10.4	He (insists/insisted) on knowing where you (are/were). उन्होंने यह जानने का प्रयास करते हैं/थे कि आप कहां हैं/थे।	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं
K.10.5	He (does/did) not trust you with any money. उन्हें पैसों के लेकर आप पर विश्वास नहीं है/था	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं

K.11	INTERVIEWER READOUT: Now if you will permit me, I need to ask some more questions about your relationship with your husband. In the last 12 months how often did your husband ever: सर्वेक्षणकर्ता पढ़ें: अगर आप अनु मति दें, तो मैं आपके पति के साथ आपके संबंधों के बारे में कुछ और प्रश्न पूछना चाहूंगी। क्या पिछले 12 महीनों में आपके पति ने कभी भी:	
K.11.1	Say or do something to humiliate you in front of others? दूसरों के सामने आपको नीचा दिखाने के लिये कुछ कहा या किया	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं
K.11.2	Threaten to hurt or harm you or someone close to you? आपको या आपके किसी पास वाले को चोट पहुंचाने या नुकसान पहुंचाने की धमकी दी	OFTEN बहुत बार
K.11.3	Insult you or make you feel bad about yourself? आपकी बेइज्जती की या आपको स्वयं के बारे में बुरा महसूस करवाया।	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं

K.12	INTERVIEWER READOUT: During the last 12 months how often did your husband do any of the following things to you: सर्वेक्षणकर्ता पढ़ें: पिछले 12 महीनों के दौरान क्या आपके पति ने आपके साथ निम्नलिखित में से कभी कुछ भी किया:	
K.12.1	Slap you. चांटा मारा	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं
K.12.2	Twist your arm or pull your hair. आपकी बांह मोड़ी या बाल खींचे	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं
K.12.3	Push you, shake you, or throw something at you. आपको धक्का दिया, हिलाया या आप पर कुछ फेंका	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं
K.12.4	Punch you with his fist or with something that could hurt you. आपको मुक्का मारा या किसी ऐसी चीज से मारा जिससे आपको चोट लग सके	OFTEN बहुत बार
K.12.5	Kick you, drag you, or beat you up. आपको लात मारी, घसीटा, या मारा₋पीटा	OFTEN बहुत बार1 SOMETIMES कभी कभी2 NOT AT ALL बिलकुल नहीं3 DON'T KNOW पता नहीं
K.12.6	Try to choke you or burn you on purpose. आपका गला दबाने की या जानबूझ कर जलाने की कोशिश की	OFTEN बहुत बार
K.12.7	Threaten or attack you with a knife, gun, or any other weapon. आप पर चाकू, बन्दूक या अन्य किसी हथियार से हमला किया या धमकी दी	OFTEN बहुत बार

9 | References

- 1. Canadian Institutes of Health Research. Definition of sex and gender. 2015; http://www.cihr-irsc.gc.ca/e/47830.html. Accessed February 14, 2018.
- 2. World Health Organization. Gender Fact Sheet. 2015; http://www.who.int/mediacentre/factsheets/fs403/en/. Accessed April 12, 2018.
- 3. World Health Organization. Gender and women's mental health. 2017; http://www.who.int/mental_health/prevention/genderwomen/en/. Accessed October 27, 2017.
- 4. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Maternal & Child Nutrition*. 2015;11(4):452-482.
- 5. Pratley P. Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review of evidence from the developing world. *Soc Sci Med.* 2016;169:119-131.
- 6. Alsop R, Heinsohn N. *Measuring empowerment in practice: structuring analysis and framing indicators (Policy research working paper No. 3510).* Washington, DC: The World Bank;2005.
- 7. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Change.* 1999;30(3):435-464.
- 8. Agarwala R, Lynch SM. Refining the measurement of women's autonomy: an international application of a multi-dimensional construct. *Soc Forces.* 2006;84(4):2077-2098.
- 9. Sandberg J, Rafail P. Measurement models of women's autonomy using the 1998/1999 India DHS. *Journal of Population Research.* 2013;30(4):367-381.
- 10. *The Global Gender Gap Report.* Geneva: World Economic Forum;2016.
- 11. Kishor S, Gupta K. Women's empowerment in India and its states: evidence from the NFHS. *Econ Polit Weekly.* 2004;39(7):694-712.
- 12. Goldberg D, Huxley P. *Common mental disorders: a biosocial model.* London: Tavistock/Routledge; 1992.
- 13. World Health Organization. *Depression and other common mental disorders: global health estimates.* Geneva, Switzerland2017.
- 14. Steel Z, Marnane C, Iranpour C, et al. The global prevalence of common mental disorders: a systematic review and meta-analysis 1980-2013. *Int J Epidemiol.* 2014;43(2):476-493.
- 15. Seedat S, Scott KM, Angermeyer MC, et al. Cross-national associations between gender and mental disorders in the World Health Organization World Mental Health Surveys. *Arch Gen Psychiatry.* 2009;66(7):785-795.
- 16. Gururaj G, Varghese M, Benegal V, et al., and NMHS collaborators group. *National Mental Health Survey of India, 2015-16: Prevalence, patterns and outcomes.* Bengaluru, India: National Institute of Mental Health and Neuro Sciences;2016.
- 17. Kumar S, Jeyaseelan L, Suresh S, Ahuja RC. Domestic violence and its mental health correlates in Indian women. *The British Journal of Psychiatry*. 2005;187(1):62-67.

- 18. Shidhaye R, Patel V. Association of socio-economic, gender and health factors with common mental disorders in women: a population-based study of 5703 married rural women in India. *Int J Epidemiol.* 2010;39(6):1510-1521.
- 19. Solar O, Irwin A. *A conceptual framework for action on the social determinants of health.* Geneva, Switzerland: World Health Organization;2010.
- 20. Marmot MG, Smith GD, Stansfeld S, et al. Health inequalities among British civil servants: the Whitehall II study. *Lancet.* 1991;337(8754):1387-1393.
- 21. Thoits PA. Sociological approaches to mental illness. In: Teresa L. Scheid & Tony N. Brown, ed. *A handbook for the study of mental health, Second edition*. New York, NY: Cambridge University Press; 2010:121-138.
- 22. Blazer DG, Kessler RC, McGonagle KA, Swartz MS. The prevalence and distribution of major depression in a national community sample: the National Comorbidity Survey. *Am J Psychiatry.* 1994;151(7):979-986.
- 23. Everson SA, Maty SC, Lynch JW, Kaplan GA. Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and diabetes. *Journal of psychosomatic research*. 2002;53(4):891-895.
- 24. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA*. 2003;289(23):3095-3105.
- 25. Miller DK, Malmstrom TK, Joshi S, Andresen EM, Morley JE, Wolinsky FD. Clinically relevant levels of depressive symptoms in community-dwelling middle-aged African Americans. *Journal of the American Geriatrics Society.* 2004;52(5):741-748.
- 26. Kessler RC, Mickelson KD, Williams DR. The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. *Journal of Health and Social Behavior.* 1999:208-230.
- 27. Thoits PA. Multiple identities: Examining gender and marital status differences in distress. *American Sociological Review.* 1986:259-272.
- 28. Phillips SP. Defining and measuring gender: a social determinant of health whose time has come. *Int J Equity Health.* 2005;13(4).
- 29. Rastogi M, Therly P. Dowry and its link to violence against women in India: feminist psychological perspectives. *Trauma, violence & abuse.* 2006;7(1):66-77.
- 30. Arnold F, Choe MK, Roy TK. Son Preference, the Family-Building Process and Child Mortality in India. *Population Studies.* 1998;53(3):301-315.
- 31. Dyson T, Moore M. On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review.* 1983;9(1):35-60.
- 32. Ministry of Finance. *Gender and Son Meta-Preference: Is Development Itself an Antidote?* : Government of India;2018.
- 33. Heise L, Garcia Moreno C. Violence by intimate partners. In: Krug EG et al, ed. *World report on violence and health*. Geneva: World Health Organization; 2002.
- 34. Devries KM, Mak JYT, García-Moreno C, et al. The Global Prevalence of Intimate Partner Violence Against Women. *Science.* 2013;340(6140):1527-1528.
- 35. Devries KM, Mak JY, Bacchus LJ, et al. Intimate Partner Violence and Incident Depressive Symptoms and Suicide Attempts: A Systematic Review of Longitudinal Studies. *PLoS Med.* 2013;10(5):e1001439.
- 36. International Institute for Population Sciences (IIPS) and ICF. *National Family and Health Survey (NFHS-4)*. Mumbia, India: IIPS;2015/2016.

- 37. Stephenson R, Winter A, Hindin M. Frequency of intimate partner violence and rural women's mental health in four Indian states. *Violence Against Women.* 2013;19(9):1133-1150.
- 38. Patel V, Kirkwood BR, Pednekar S, et al. Gender disadvantage and reproductive health risk factors for common mental disorders in women: a community survey in India. *Arch Gen Psychiatry.* 2006;63(4):404-413.
- 39. Finkelhor D, Hotaling G, Lewis IA, Smith C. Sexual abuse in a national survey of adult men and women: prevalence, characteristics, and risk factors. *Child Abuse & Neglect.* 1990;14(1):19-28.
- 40. Stoltenborgh M, van Ijzendoorn MH, Euser EM, Bakermans-Kranenburg MJ. A global perspective on child sexual abuse: meta-analysis of prevalence around the world. *Child Maltreat.* 2011;16(2):79-101.
- 41. Chen LP, Murad MH, Paras ML, et al. Sexual abuse and lifetime diagnosis of psychiatric disorders: systematic review and meta-analysis. *Mayo Clinic proceedings.* 2010;85(7):618-629.
- 42. Breiding MJ, Smith SG, Basile KC, Walters ML, Chen J, Merrick MT. Prevalence and characteristics of sexual violence, stalking, and intimate partner violence victimization—national intimate partner and sexual violence survey, United States, 2011. *MMWR Surveill Summ.* 2014;63(8):1-18.
- 43. Raj A, McDougal L. Sexual violence and rape in India. *Lancet.* 2014;383(9920):865.
- 44. Dahlberg LL, Mercy JA. *World report on violence and health.* Geneva, Switzerland: World Health Organization;2002.
- 45. *ILO Global Estimate of Forced Labour: Results and Methodology.* Geneva, Switzerland: International Labour Office;2012.
- 46. The Walk Free Foundation. *The Global Slavery Index* 2016.
- 47. Oram S, Abas M, Bick D, et al. Human Trafficking and Health: A Survey of Male and Female Survivors in England. *Am J Public Health.* 2016;106(6):1073-1078.
- 48. Fisher J, Herrman H, Cabral de Mello M, Chandra PS. Women's Mental Health. In: Patel V, Minas H, Cohen A, Prince M, eds. *Global Mental Health: Principles and Practice*. Oxford, UK: Oxford University Press; 2014.
- 49. Warren T, Pascall G, Fox E. Gender equality in time: low-paid mothers' paid and unpaid work in the UK. *Fem Econ.* 2010;16(3):193-219.
- 50. Mattingly MJ, Blanchi SM. Gender differences in the quantity and quality of free time: the US experience. *Soc Forces.* 2003;81(3):999-1030.
- 51. Bardasi E, Wodon Q. Measuring time poverty and analyzing its determinants: concepts and application to Guinea. In: Wodon B, ed. *Gender, time use, and poverty in Sub-Saharan Africa*. Washington, DC: The World Bank; 2006:75-95.
- 52. Kes A, Swaminathan H. *Gender, time use, and poverty in sub-Saharan Africa.* Washington, DC: World Bank Publications;2006.
- 53. Floro MS, Pichetpongsa A. Gender, work intensity, and well-being of Thai homebased workers. *Fem Econ.* 2010;16(3):5-44.
- 54. Gammage S. Time pressed and time poor: unpaid household work in Guatemala. *Fem Econ.* 2010;16(3):79-112.
- 55. International Labour Organization. *Women at Work: Trends 2016.* Geneva, Switzerland2016.

- 56. Dinh H, Strazdins L, Welsh J. Hour-glass ceilings: Work-hour thresholds, gendered health inequities. *Soc Sci Med.* 2017;176:42-51.
- 57. Kleiner S, Pavalko EK. Clocking in: the organization of work time and health in the United States. *Soc Forces.* 2010;88(3):1463-1486.
- 58. Schulz R, Sherwood PR. Physical and mental health effects of family caregiving. *The American journal of nursing.* 2008;108(9 Suppl):23-27.
- 59. Cannuscio CC, Jones C, Kawachi I, Colditz GA, Berkman L, Rimm E. Reverberations of family illness: a longitudinal assessment of informal caregiving and mental health status in the Nurses' Health Study. *Am J Public Health.* 2002;92(8):1305-1311.
- 60. Maselko J. Social Epidemiology and Global Mental Health: Expanding the Evidence from High-Income to Low- and Middle-Income Countries. *Curr Epidemiol Rep.* 2017;4(2):166-173.
- 61. Patel V, Ramasundarahettige C, Vijayakumar L, et al. Suicide mortality in India: a nationally representative survey. *Lancet.* 2012;379(9834):2343-2351.
- 62. United Nations. *The world's women 2015: trends and statistics.* New York, NY: United Nations, Department of Economic and Social Affairs, Statistics Division;2015.
- 63. Lund C, Breen A, Flisher AJ, et al. Poverty and common mental disorders in low and middle income countries: A systematic review. *Soc Sci Med.* 2010;71(3):517-528.
- 64. Yount KM, Dijkerman S, Zureick-Brown S, VanderEnde KE. Women's empowerment and generalized anxiety in Minya, Egypt. *Soc Sci Med.* 2014;106:185-193.
- 65. Hadley C, Brewis A, Pike I. Does less autonomy erode women's health? Yes. No. Maybe. *American Journal of Human Biology.* 2010;22(1):103-110.
- 66. Richardson RA. Measuring women's empowerment: a critical review of current practices and recommendations for researchers. *Soc Indic Res.* 2018;137(2):539-557.
- 67. Patel V, Rodrigues M Fau DeSouza N, DeSouza N. Gender, poverty, and postnatal depression: a study of mothers in Goa, India. *Am J Psychiatry*. 2002;159(1):43-47.
- 68. Rahman A, Iqbal Z, Harrington R. Life events, social support and depression in childbirth: perspectives from a rural community in the developing world. *Psychol Med.* 2003;33(7):1161-1167.
- 69. Unisa S. Childlessness in Andhra Pradesh, India: Treatment seeking and consequences. *Reproductive Health Matters.* 1999;7(13):54-64.
- 70. Dyer SJ, Abrahams N, Mokoena NE, Lombard CJ, van der Spuy ZM. Psychological distress among women suffering from couple infertility in South Africa: a quantitative assessment. *Hum Reprod.* 2005;20(7):1938-1943.
- 71. Omoaregba JO, James BO, Lawani AO, Morakinyo O, Olotu OS. Psychosocial characteristics of female infertility in a tertiary health institution in Nigeria. *Ann Afr Med.* 2011;10(1):19-24.
- 72. Klemetti R, Raitanen J, Sihvo S, Saarni S, Koponen P. Infertility, mental disorders and well-being--a nationwide survey. *Acta Obstet Gynecol Scand.* 2010;89(5):677-682.
- 73. Demyttenaere K, Bruffaerts R, Posada-Villa J, et al. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *Jama.* 2004;291(21):2581-2590.
- 74. World Health Organization. *Mental Health Atlas.* Geneva, Switzerland2011.
- 75. Burns JK. Poverty, inequality and a political economy of mental health. *Epidemiol Psychiatr Sci.* 2015;24(2):107-113.

- 76. Patel V. Addressing social injustice: a key public mental health strategy. *World Psychiatry.* 2015;14(1):43-44.
- 77. World Health Organization and Calouste Gulbenkian Foundation. *Social determinants of mental health.* Geneva, Switzerland: World Health Organization;2014.
- 78. Lund C. Poverty and mental health: towards a research agenda for low and middleincome countries. Commentary on Tampubolon and Hanandita (2014). *Soc Sci Med.* 2014;111:134-136.
- 79. UNICEF Office of Research. *The Structural Determinants of Child Well-being.* Florence, Italy 2012.
- 80. Lund C, De Silva M, Plagerson S, et al. Poverty and mental disorders: breaking the cycle in low-income and middle-income countries. *Lancet.* 2011;378(9801):1502-1514.
- 81. Thorat S, and M. Mahamallik, *Human poverty and socially disadvantaged groups in India.* New Delhi, India: UNDP-HDRC 2007.
- 82. Maharatna A. How Can 'Beautiful' Be 'Backward'? Tribes of India in a Long-term Demographic Perspective. *Economic and Political Weekly.* 2011;XLVI(4):42-52.
- 83. Subramanian SV, Smith GD, Subramanyam M. Indigenous health and socioeconomic status in India. *PLOS Med.* 2006;3(10):e421.
- 84. Basu AM. Is Discrimination in Food Really Necessary for Explaining Sex Differentials in Childhood Mortality? *Population Studies.* 1989;43(2):193-210.
- 85. Ali GC, Ryan G, De Silva MJ. Validated screening tools for common mental disorders in low and middle income countries: a systematic review. *PLoS One.* 2016;11(6):e0156939.
- 86. Patel V, Araya R, Chowdhary N, et al. Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med.* 2008;38(02):221-228.
- 87. Goldberg DP. *The detection of psychiatric illness by questionnaire: a technique for the identification and assessment of non-psychotic psychiatric illness.* London, UK: Oxford University Press; 1972.
- 88. Goldberg DP, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med.* 1997;27(1):191-197.
- 89. Shamasundar C, Murthy SK, Prakash OM, Prabhakar N, Krishna DK. Psychiatric morbidity in a general practice in an Indian city. *Br Med J.* 1986;292(6537):1713-1715.
- 90. Patel V, Pereira J, Mann A. Somatic and psychological models of common mental disorder in primary care in India. *Psychol Med.* 1998;28(1):135-143.
- 91. Patel V. Talking sensibly about depression. *PLoS Med.* 2017;14(4):e1002257.
- 92. Krishnan KR. Towards a scientific taxonomy of depression. *Dialogues Clin Neurosci.* 2008;10(3):301-308.
- 93. Nandi A, Beard JR, Galea S. Epidemiologic heterogeneity of common mood and anxiety disorders over the lifecourse in the general population: a systematic review. *BMC psychiatry.* 2009;9:31.
- 94. Parker G. Classifying depression: should paradigms lost be regained? *Am J Psychiatry.* 2000;157(8):1195-1203.

- 95. Parker G. Through a glass darkly: the disutility of the DSM nosology of depressive disorders. *Can J Psychiatry.* 2006;51(14):879-886.
- 96. Endsley P, Weobong B, Nadkarni A. The psychometric properties of GHQ for detecting common mental disorder among community dwelling men in Goa, India. *Asian J Psychiatr.* 2017;28:106-110.
- 97. Kashyap GC, Singh SK. Reliability and validity of general health questionnaire (GHQ-12) for male tannery workers: a study carried out in Kanpur, India. *BMC psychiatry*. 2017;17(1):102.
- 98. Gautam S, Nijhawan M, Kamal P. Standardisation of Hindi version of Goldberg's general health questionnaire. *Indian J Psychiatry.* 1987;29(1):63.
- 99. Bandyopadhyay G, Sinha S, Sen B, Sen G. Validity of General Health Questionnaire (GHQ-36/GHQ-12) in the psychiatric O.P.D. of a general hospital--a pilot study. *Int J Soc Psychiatry.* 1988;34(2):130-134.
- 100. Kline RB. *Principles and Practice of Structural Equation Modeling.* 3rd ed. New York, NY: The Guilford Press; 2011.
- 101. Hu Lt, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling.* 1999;6(1):1-55.
- 102. Bentler PM. Comparative fit indexes in structural models. *Psychol Bull.* 1990;107(2):238-246.
- 103. Kirmayer LJ. Cultural variations in the clinical presentation of depression and anxiety: implications for diagnosis and treatment. *J Clin Psychiatry.* 2001;62 Suppl 13:22-28; discussion 29-30.
- 104. Kirmayer LJ, Sartorius N. Cultural models and somatic syndromes. *Psychosomatic medicine.* 2007;69(9):832-840.
- 105. Pereira B, Andrew G, Pednekar S, Pai R, Pelto P, Patel V. The explanatory models of depression in low income countries: listening to women in India. *J Affect Disord.* 2007;102(1-3):209-218.
- 106. Ibrahim S, Alkire S. Agency and empowerment: a proposal for internationally comparable indicators. *Oxford Development Studies.* 2007;35(4):379-403.
- 107. United Nations General Assembly. *Transforming our world: the 2030 agenda for sustainable development.* New York, NY: United Nations;2015.