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Understanding The Mechanisms Linking Gendered Intrahousehold Bargaining Power And Child Nutrition In Rural Nepal

Shibani Kulkarni
University of South Carolina

UNDERSTANDING THE MECHANISMS LINKING GENDERED INTRA-HOUSEHOLD BARGAINING POWER AND CHILD NUTRITION IN RURAL NEPAL

by

Shibani Kulkarni

Bachelor of Science
University of Pune, 2004

Master of Science
University of Pune, 2006

Master of Public Health
Emory University, 2010

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Accepted by:

Edward A. Frongillo, Major Professor

Christine E. Blake, Committee Member

Kenda Cunningham, Committee Member

Spencer Moore, Committee Member

Cheryl L. Addy, Vice Provost and Dean of the Graduate School

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ABSTRACT

Child undernutrition is a serious issue in Nepal as 36% of children below five years of age are chronically undernourished. Reducing child undernutrition is an important priority to prevent adverse effects through the life course that perpetuate the cycle of undernutrition and poverty.

Women's intra-household bargaining power is an important determinant of child nutrition. Intra-household bargaining power is an individual's relative social and economic position within the household to access and control resources, and influence decision-making. In our research, we use women's intra-household bargaining power as a resource for care, which enables women to be exposed to nutrition information, gain knowledge, access economic and social opportunities to improve food security, and positively influence child nutrition. While there is evidence on the positive association between women's bargaining power and child nutrition, research gaps exist in understanding the mechanisms through which this relationship is linked and the role of men's intra-household bargaining power in children nutrition.

We conducted a cross-sectional analysis of the baseline data from 2012 of the multisectoral program, *Suaahara,* in rural Nepal. We measured intra-household bargaining power based on four domains: 1) ownership and control of assets, 2) social participation, 3) workload, and 4) household decision-making control. In the first manuscript, we examined the relationship between women's bargaining power and infant and young child feeding (IYCF) practices in children aged 0-23 months, and tested if

exposure to IYCF messages mediated this relationship. Exposure to IYCF information mediated the relationship between social participation and early initiation of breastfeeding and dietary diversity. Household decision-making control had a direct, positive relationship with exclusive breastfeeding.

In the second manuscript, we examined the relationship between bargaining power of women and men with child height-for-age z-score (HAZ) in children aged 0-59 months, and tested if household food insecurity mediated this relationship. Women's ownership and control of assets was positively associated with higher HAZ and food insecurity partially mediated this relationship. Men's social participation was directly associated with higher HAZ and indirectly associated through food insecurity.

We found that different domains of women's and men's bargaining power relate to child feeding and child nutritional status. Our study attempts to address the research gaps by providing empirical evidence on men's role in child nutrition and examining potential mechanisms that may be targeted for nutrition programming and policy. Strategies engaging men and women may prove effective for nutrition-specific and nutrition-sensitive interventions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

HAZ..... Height-for-age z-score

IYCF.....Infant and young child feeding

LAZ .....Length-for-age z-score

WAZ..... Weight-for-age z-score

WHO .....World Health Organization

WHZ..... Weight-for-height z-score

CHAPTER 1

INTRODUCTION

Despite a significant decline in the past two decades, the burden of child undernutrition in Nepal is still high with 36% of the children below 5 years of age being categorized as stunted.[1,2] The first thousand days of a child's life starting *in-utero* through the first two years is a critical period for immediate and long-term growth and development.[3] Efforts to reduce child undernutrition are important because the adverse effects of stunting span across the life course in early childhood development, schooling outcomes, adult health and nutrition, birth outcomes, productivity, and income and wages.[4–6]

Interventions to reduce child undernutrition increasingly employ nutrition-specific and nutrition-sensitive strategies to address the underlying sociocultural and economic issues that affect health behaviors, access to health and nutrition resources, and food security, which ultimately affect child nutritional status.[7] One important area for nutrition-sensitive interventions is the improvement of women's status within the household and the community.[8,9]

Women's household status, as explained by intra-household bargaining power, and henceforth interchangeably used as bargaining power, is the relative social and economic position of a woman within a household for accessing and controlling resources, and her decision-making control. In our research, women's bargaining power refers to a mother's bargaining power. Women can leverage their bargaining power to

access socioeconomic and health opportunities and influence decisions for self and family. Our research is guided by the Care for Nutrition conceptual framework by Engle et al. (1999)[10] where we use bargaining power as a resource for care. For the mother of a young child, having high bargaining power can enable access to health information and knowledge, social capital, and economic means, which can promote and improve individual health behaviors, caring practices, and affect household-level determinants such as household food security to positively influence child nutritional status.[10,11]

In South Asia, women's bargaining power is gendered due to the social context and cultural norms where men and women within a household are likely to have differential say in decision-making and control of resources.[12] There is evidence of a significant, positive relationship between women's bargaining power and child nutritional status, but more research is needed to understand 1) the relationship between women's bargaining power and child feeding practices, 2) the relationship between men's bargaining power and child nutritional status, and 3) the mechanisms through which women's and men's bargaining power relates to child feeding practices and nutritional status.

It is important to understand the relationship between child feeding practices and bargaining power because improving infant and young child feeding (IYCF) practices is critical to improving child nutritional status. A primary focus on improving behaviors that support good child nutrition involve increasing knowledge and awareness to result in behavior change for improved IYCF practices.[13] Following appropriate IYCF practices requires social, economic, knowledge, and human resources, which are more likely to be accessed and used if women have high bargaining power. Research on IYCF

determinants thus far mainly shows that sociodemographic factors such as mother's education, urban or rural setting, geographic location, and access to health services are associated with IYCF practices.[14–16]

Understanding men's bargaining power in relation to child undernutrition is critical as men's role is shown to be associated with other health-related factors such as access to knowledge resources and health-seeking behavior,[17–19] which can affect child nutritional status. Research exploring men's role in child nutrition has primarily focused on paternal education or income. There is limited evidence on the relationship between men's household bargaining power and child nutritional status.[20,21]

Our research is focused on understanding the relationship of gendered intra-household bargaining and child nutrition by examining the mechanism linking this relationship. Understanding the mechanisms increases the scientific plausibility of the observed relationship between women's bargaining power and child nutrition. Understanding intra-household bargaining for women and men in the household and the extent of their ability to make economic, social, and health decisions for improved child nutrition is important to design targeted and effective interventions to improve child nutritional status.

We used baseline data collected in 2012 from the first phase of *Suaahara,* a multisectoral nutrition intervention project in Nepal. We created measures and indicators of access to and control of resources and household decision-making of women and men. We produced two manuscripts resulting from this research. In the first manuscript, we analyzed the relationship between women's bargaining power and four World Health Organization (WHO)-recommended IYCF practices: 1) early initiation of breastfeeding,

2) exclusive breastfeeding, 3) minimum meal frequency, and 4) dietary diversity in children 0-23 months. We also examined if exposure to IYCF information mediated the relationship between women's bargaining power and IYCF practices.

In the second manuscript, we analyzed the relationship between women's and men's bargaining power, and child nutritional status. We examined women's and men's decision-making control to describe the gender dynamics within the household. We also studied the association of women's and men's bargaining power with child nutritional status and tested household food insecurity as a mediator of this relationship.

1.1 Goals and Outcomes of Dissertation Research

The overall objective of this research is to understand the role of gendered intra-household bargaining on IYCF practices and child nutritional status, and identify specific paths connecting intra-household bargaining power and child nutrition. By studying men's and women's bargaining power, this research contributes to the emerging literature on men's role in child nutrition, which is still considerably understudied. This research will also contribute to the broader field of determinants of child nutrition and women's empowerment by 1) assessing how men's and women's bargaining power relates to child nutrition by identifying specific domains of bargaining that are significant and 2) understanding distinct mechanisms through which bargaining power relates to IYCF practices and child nutritional status.

1.2 Specific Aims

1. To understand the relationship between women's intra-household bargaining power and IYCF practices in children aged 0-23 months

1.1. To examine the relationship between women's intra-household bargaining power with four WHO-recommended IYCF practices (early initiation, exclusive breastfeeding, minimum meal frequency, and diet diversity).

1.2. To examine if exposure to IYCF information mediates the relationship between women's bargaining power and IYCF practices

2. To understand the relationship between women's and men's intra-household bargaining power with child nutritional status in children aged 0-59 months

2.1. To describe men's and women's household decision-making control.

2.2. To examine the relationship between intra-household bargaining power of women and men with child nutritional status

2.3. To test if household food insecurity mediates the relationship between women's and men's bargaining power and child nutritional status

1.3 Prior Studies on Women's Bargaining Power

The baseline data from *Suaahara* has been used to assess the relationship of women's empowerment in agriculture with maternal and child nutritional status in two studies. Women's empowerment in agriculture index was used for the following domains: 1) autonomy in agricultural production; 2) access and control of resources including household assets, agricultural assets, and credit decision-making; 3) control over use of income; 4) leadership as indicated by active group membership and public speaking; and 5) workload and leisure time. In one of the studies, the aggregate measure of women's empowerment in agriculture was associated greater maternal body mass index and maternal dietary diversity.[22] Active group participation was associated with greater maternal dietary diversity, while control over income and reduced workload was

associated with higher maternal BMI. Women's control over income was associated with higher height-for-age z-score (HAZ) and dietary diversity in children 0-59 months.

The second study examined the relationship between women's empowerment in agriculture and nutritional status in children 0-23 months.[23] Overall empowerment in agriculture and three of its domains, namely autonomy in production, control over income, and leisure time were positively associated with length-for-age z-score (LAZ).

The current research expands on the prior *Suaahara*-based studies to understand the household dynamics and its relationship with child nutrition by 1) understanding the relationship between multiple domains of intra-household bargaining power and multiple IYCF practices, 2) examining individual level (exposure of IYCF information) and household level (food insecurity) mechanisms to understand how bargaining power operates to affect IYCF and child nutritional status, respectively, and 3) understanding the role of men's bargaining power and the relationship with child nutrition, which thus far has not been studied.

In the following chapters, I first review the relevant literature around child nutrition and bargaining power. Second, I describe the methods followed in conducting this research. Third, I present two manuscripts that address the two specific aims of this research. Lastly, I summarize the findings of this research and discuss the contribution to literature and implications for future research, programs, and policies.

CHAPTER 2

BACKGROUND AND SIGNIFICANCE

Presented in this chapter is the background literature on child nutrition and intra-household bargaining power. I provide an overview of child nutrition and feeding practices in Nepal. I then summarize the literature on the role of women in child nutrition to highlight the importance of understanding maternal determinants of child nutrition. Intra-household bargaining power is defined and related literature is summarized, specifically focusing on the different domains of bargaining power and how each domain relates to child feeding practices and/or nutritional status. Lastly, as our research also focuses on men's role in child nutrition, relevant literature is described on this topic.

2.1 Child Nutrition in Nepal

2.1.1 Overview of Child Nutritional Status in Nepal

Child undernutrition is a serious issue in Nepal despite the significant gains in reduction of undernutrition made in recent years.[2,24] According to the most recent Demographic and Health Survey, 2016 report, 36% of children below five years were stunted (chronic undernutrition), 10% were wasted (acute undernutrition), and 27% were underweight.[1] The 2015 Millennium Development Goal for Nepal for a reduction in child stunting to 30% was not met.[25] Child undernutrition, especially in the first two years of life contributes to larger maternal and child health issues such as child mortality, maternal mortality due to the intergenerational cycle of undernutrition, and affects socioeconomic

issues such as education and income generation.[4,26,27] Child undernutrition is a result of multiple socioeconomic and cultural factors.[10,11] Understanding and addressing the determinants of child undernutrition is an important priority for programs and policy.

2.1.2 Infant and Young Child Feeding Practices in Nepal

Child nutritional status is greatly determined by feeding practices in the early childhood period.[13,28] Infant and young child feeding encompasses several breastfeeding and complementary feeding (breast milk plus semi-solid and solid foods) practices. Some of the key WHO-recommended practices in the first 24 months of life include early initiation of breastfeeding, i.e., putting a child to breast within an hour of birth; exclusive breastfeeding for six months; age-appropriate introduction of complementary feeding; consuming meals a minimum number of times in a day, known as the minimum meal frequency; and having a diverse diet to meet the macronutrient and micronutrient requirements, known as the dietary diversity.[29] According to the 2016 Nepal Demographic and Health Survey, the prevalence of exclusive breastfeeding for the first six months of life was 66% and early initiation was 55%. The prevalence of minimum diet diversity among children aged 6-23 months was only 35%.[1]

Following appropriate IYCF practices helps not only in providing adequate nutrition, but only promotes general child health and development, and reduces the incidence of common childhood illness. For example, exclusive breastfeeding is associated with reduced incidence of common childhood illnesses such as diarrhea and acute respiratory tract infections, which contribute to child undernutrition.[30,31] Similarly, exclusive breastfeeding is associated with early gross motor and cognitive development.[32,33]

Worldwide statistics on growth faltering suggest that LAZ, which measures long-term nutritional status sharply declines from 3 months to 24 months.[34] Appropriate introduction of complementary feeding through adequate quantity and quality of semi-solid and solid foods in addition to breast milk is required for the growing infant beyond six months to meet the increasing and diverse nutrient requirement. Dietary diversity, a measure of complementary feeding quality, has consistently shown a significant relationship with child nutritional status, especially with HAZ and prevalence of stunting.[35] Interventions targeting improved complementary feeding have also shown to be effective not only in improving IYCF practices but also child growth.[36,37]

2.1.3 Window of Opportunity for Improved Child Nutrition

The coincidence of the sensitive phase of rapid growth and development in children and period of child feeding practices in the first two years of life highlights the importance of addressing child undernutrition in the first 1000 days of life. Public health practitioners and researchers have called for increased promotion of IYCF practices as an important strategy to combat child undernutrition in developing countries.[13,38–40] Current public health strategies have moved toward more integrated approaches to reduce undernutrition, and therefore understanding the sociocultural determinants of feeding practices and child nutrition is important for informing effective programs and policies.[41]

2.2 Role of Women in Child Nutrition

Determinants of child nutrition are varied, complex, and often interact with one another. The UNICEF conceptual framework (1990) for child undernutrition explains the basic, intermediate, and proximal factors leading to child undernutrition.[42] These factors affect an individual's health and nutrition within the social, economic, and political

context, which provide the necessary resources for women to facilitate for better nutrition and care practices that support optimal child nutrition, growth, and development. Engle and colleagues (1999) presented a modified UNICEF conceptual framework known as the Care for Nutrition conceptual framework to elaborate the concept of care for child health and nutrition. They defined care practices as "the practices of caregivers that affect nutrient intake, health, and the cognitive and psychosocial development of the child"(pp. 1310).[10] They further elaborated on the resources needed for caregivers to optimally care for children such as education, health and nutrition status, knowledge and beliefs, autonomy and control of resources within the household, workload, social support from family members and community. These caregiver characteristics are influenced by broader economic, social, and political contexts. Women's position in a household and her ability to leverage that position can increase her access to and control of resources that could positively impact child nutrition outcomes.

Gender is an important social determinant that intersects with the broader economic and social context, and with several proximal factors affecting undernutrition such as food security, access to health care and information, and human capital.[12,43,44] Improved role of women in the household and community is shown to be associated with better maternal and child nutritional status.[43,45,46] Below, I discuss how women's role is tied to the basic and proximal determinants of child nutrition and then specifically discuss intra-household bargaining as a determinant of child nutrition.

2.2.1 Socioeconomic Context and Role of Women

Poverty is one of the fundamental causes of child undernutrition. Economic growth is associated with improved child nutritional status. For example, one multi-

country analysis showed that GDP growth of 5.5% annually, predicted a 1% reduction in prevalence of stunting per year, translating into a large cumulative effect over years.[47] Women's education and employment is shown to contribute to national growth in developing countries. For example, a regional analysis of across Africa, Asia, and Latin America showed that gender inequality in education directly affects economic growth and also has an indirect effect through reduced human capital.[48] Another study in India found that female education in terms of enrollment rates in school and average rate of education significantly contributed to economic growth.[49]

Household economy and assets are also strongly associated with better child nutritional outcomes.[2] Gender norms within the broader social context define women's role related to access and use of household economic resources.[50] Research suggests that greater women's economic control has a positive effect on household economy, income generation, and maternal and child nutrition.[22,23,51,52]

Social context in a setting can create opportunities or constraints that affect child nutrition. Maternal education, as a resource for care, is an indicator of social development on broader scale and is shown to be associated with child nutrition. A multi-country study involving 85 countries found that higher national female literacy levels were significantly associated with reduction in childhood stunting.[53] Maternal education also matters at the household level, and is one of the most basic and commonly included variables in child nutrition and public health studies. It is shown to have a strong, positive effect on child nutrition.[47,54,55] One important mechanism through which maternal education affects child nutrition is better health knowledge and improved health care utilization. For example, a study in Bolivia to elucidate the pathways between maternal education and childhood

stunting found health-care utilization for essential care such as prenatal care, institutional delivery, receiving tetanus injection before birth, and using modern contraception significantly explained the effect of maternal education on child nutrition.[56] Similarly, one study in Lesotho found that the nutrition knowledge mediated the relationship between maternal education and child wasting, with a greater effect among wealthier households.[57] Maternal education is shown to improve women's status, affect greater decision-making for self and children, and provide equitable health care for children.[58]

Social construction of gender norms affects women's status at home and outside the household. Patriarchal societies in South Asia have been shown to influence women's access to economic and social resources, and decision-making control. For example, one review on women's status in Asian countries noted several institutional forces including laws restricting female ownership of assets, prohibition from working outside, perception of male dominance, and inability of women to carry forward family name affected women's status in the society and the household.[59] Similarly, a study in India and Pakistan found household decision-making control, mobility, experience and protection from domestic violence, and control over economic resources was a result of gender stratification within the society that provided differential and unequal access to and control of resources for men and women.[60] It was also noted that equal status for men and women, controlling for other socioeconomic indicators had a significant, positive effect on child nutritional status.

2.2.3 Maternal Characteristics as Human-Capital for Child Nutrition

In general, maternal characteristics link the proximal and distal factors that affect child nutrition. The cyclic nature of maternal and child nutrition is strongly showcased in

several studies that examined the relationship between maternal health and child nutrition. For example, maternal height is consistently shown to be an important predictor of child nutritional status.[4,61,62] A six-country study found the prevalence of child stunting at two years was significantly more in shorter mothers and those children were more likely to be shorter in adulthood.[63] Maternal anemia is a common health issue in developing countries and associated with anemia in children. For example, one study in Mexico estimated that maternal anemia was associated with a three-fold increased risk of low hemoglobin levels in infants.[64] In Indonesia, normal birth weight infants with anemic mothers had 80% higher odds of being anemic, and low birth weight infants had more than three times the odds of being anemic at 3-5 months of age than mothers who were non-anemic.[65] Anemia in children is detrimental to physical and cognitive development in their critical growth period, which can in turn hinder optimal growth and development during the critical first two years of life and beyond.[3,66]

2.3 Overview of Intra-household Bargaining Power

Sociocultural norms in patriarchal societies such as in South Asia govern the role of men and women within a household. Low women's status in such settings creates inequality in access to and control of resources, and their decision-making power.[12] A way to understand the differential position between men and women in a household is through intra-household bargaining power. Intra-household bargaining is primarily an economic concept that describes a household as a collective where members may have preferences on household consumption or production, which can create conflicts.[67–69] Resolution of any conflict depends on the members of a household that have the power to negotiate or influence an outcome. Economists describe this (bargaining) power as the

"threat point",[67,69] which is an "individual's social and economic position if the household were to breakdown" (pp 325).[17] Intra-household bargaining refers to the relative social and economic position of individuals within a household for accessing and controlling resources and decision-making power.

Intra-household bargaining can be a result of gendered social norms and institutional factors such as laws and policies, which may provide differential access to resources due to gender.[68,70] In most settings in South Asia, gendered roles tilt intra-household bargaining power in favor of men. This inequality creates and reinforces the differential position between men and women within a household and may affect child nutrition outcomes.

While the concept of intra-household bargaining is economic in nature, its has sociocultural underpinnings that have commonality with the basic determinants of child undernutrition.[10] In the current research, we examine the relationship between intra-household bargaining power as indicated by access to and control of resources and decision-making power and child nutrition outcomes, to highlight the role of household gender dynamics in child nutrition.

There are two main dimensions of intra-household bargaining: 1) access to and control of resources, and 2) decision-making control.[12] Access to and control of resources and decision-making control usually have a reciprocal relationship where higher access to and control of resources can lead to more decision-making control and vice versa.[67,71]

1. Access to and control of resources

Intra-household bargaining power is an unobservable construct. Economists use proxy measures of access to and control of financial resources and education to study an

individual's position in a household. In addition, time and social resources are also important to study when examining the relationship between intra-household bargaining and child nutrition as these factors can affect access to health resources, knowledge, and caregiving behaviors, which can influence child nutrition.

Access to and control of mainly economic resources can increase an individual's ability of bargaining in household matters and therefore, education, income, employment and ownership of assets are commonly used as proxy measures.[71–73] Education can lead to more self-awareness, independent thinking, and informed decision-making, which is shown to be associated with greater decision-making power and improved maternal and child health nutrition outcomes.[74,75] Women's employment and control over income puts them in a better position to negotiate household decisions.[67] Working outside the home can increase an individual's social capacity for interactions, increase social capital, which can also influence household bargaining.[67] Ownership of assets refers mainly to the access to financial resources, which not only provides a fall back option when needed to support the household but also improves decision-making power related to the asset as well as other household decisions. Studies have demonstrated a positive relationship between women's ownership of assets and maternal and child health outcomes.[71–73]

Time is a resource that is gendered, with unequal allocation for women and men. Women tend to have higher workload than men as a result of being involved in household chores, in caretaking for young children and elders, and contributing to household income or food production through employment, wages, or subsistence farming.[76] There is leisure time inequality between men and women, which can increase

time constraints, adversely affect maternal well-being, and negatively impact child-care practices.[77–79]

Like economic resources and time, social resources such as social capital can affect an individual's decision-making and influence child nutrition outcomes. Social resources such as access to groups like microcredit groups, mothers' group, agriculture groups can provide social capital which can lead to informational support, increase social awareness and social capital, and influence bargaining within the household.[69,80]

2. *Decision-making control*

Decision-making control is a part of bargaining power, where an individual can exert their influence to make household decisions.[71,81] Greater decision-making control for women related to family issues, reproductive health, domestic violence, and mobility is associated with improved child nutrition outcomes.[82,83] Indeed, the relationship between decision-making and access to resources such as education, income, employment is bi-directional because both factors are governed by social norms and while women with greater assets or resources would have more power to make decisions, better decision-making control could also lead to gaining access to education, having more say in income and employment activities, and owning more assets.

Overall, evidence shows that higher access to and control of resources, and better decision-making control are associated with improved child nutritional status, but little is known about the relationship between intra-household bargaining power and infant feeding practices beyond the effect of women's education or income. Intra-household bargaining power may affect important health and human resources required for improved caregiving (appropriate IYCF) practices and child nutrition outcomes.

The traditional roles of men and women produce differential intra-household bargaining, but less is known about how men's role in intra-household bargaining is associated with child nutrition outcomes. Understanding these relationships will provide evidence for effective program interventions and policies to promote not only child nutrition but also women's empowerment and maternal well-being.

2.3.1 Intra-household Bargaining and Women's Empowerment

Empowerment is a *process* of increasing an individual's ability to make *choices* that facilitate the individual to take necessary actions that lead to the desired outcome.[84] This process is specific to those who have thus far been deprived of the opportunity to make choices to bring about a change within their social, economic, and political context.[85] Women's empowerment can be explained as a process by which women redefine their roles within the household and community in a way that expands their abilities as decision-makers and agents of action for self and family where they previously faced restrictions.[86] Women's empowerment could be used as a measure of bargaining power over time.[76] Similar measures about access to resources and decision-making that constitute intra-household bargaining have been used to examine the effect of empowerment on several maternal and child health outcomes.[82,83,87]

2.4 Intra-household Bargaining Power Domains and Child Nutrition

The discussion thus far underscores the importance of understanding the role of women in child nutrition, examining specific paths, and devising interventions that consider women's role in the household and the community. In our research we focus on four specific intra-household bargaining power domains: 1) ownership and control of assets, 2) social participation, 3) workload, and 4) household decision-making control.

Described below is a review of evidence detailing the relationship between four specific domains of bargaining power used in our research.

2.4.1 Ownership and Control of Assets and Child Nutrition

Women with economic assets are more likely to have higher bargaining power, which can have a positive influence on child nutritional status. For example, based on a nationally representative sample, Allendorf (2007) found that women's land ownership was positively associated with decision-making related to household economy, women's mobility, and own health. Women's land ownership also significantly reduced the odds of prevalence of stunting and underweight in children under five years of age.[70]

Women's control over assets is also associated with other aspects of child well-being, which may be related to child nutrition. Study on men's and women's economic assets and education found that woman's assets and husband's education were positively associated with expenditure on children's education, while only husband's assets was related to food expenditure in Bangladesh.[88] Overall financial autonomy or equal say in household economic decision-making significantly affects child nutritional status, but the several indicators for it have shown to have differential effect. In a study on the effect of women's financial autonomy and stunting in children under 36 months, in Andhra Pradesh, India, found that children of women who had the ability to set aside money for use as they choose had 23% lower odds of stunting than those who did not. The study however found no effect of decision-making related to purchase of large household items on stunting.[89]

Another study in India of mother-child dyads in children 3-5 months found that mother's financial autonomy increased odds of exclusive breastfeeding by 26% after

adjusting for confounding, but found no significant association with LAZ, weight-for-age z score (WAZ), or weight-for-height z score (WHZ).[90] Women's empowerment in agriculture, and specifically, women's control over income was positively associated with child HAZ in Nepal.[22] Overall, having more control of assets may result in women leveraging their bargaining power to access information and economic resources that can enable women to care more effectively for their children by improving feeding practices, improving diet quantity and quality, and ultimately improving child nutrition.

2.4.2 Social Participation and Child Nutrition

Women's social capital can have a positive effect of child health and nutrition.[91] Social participation increases access to social capital. Social capital is defined "as resources embedded in social structures which are accessed and/or mobilized in purpose actions" (pp35).[92] Social capital can improve access to food and health resources, knowledge networks, improve economic and living conditions, improve psychological and emotional well-being, which together can help in self-efficacy for child care, increased food security, reduction in child illnesses, and improvement in child health, which ultimately leads to improved child nutritional status.[80] Literature on the effects of social capital on child nutrition has broadly focused on two types of social capital: 1) structural social capital, which encompasses group membership and extent of participation, citizenship, and social network characteristics and 2) cognitive social capital, which is how an individual *feels* about trust, reciprocity, sharing, and support.[80,93]

A number of studies related to social capital have analyzed data from the Young Lives (YL) study in Andhra Pradesh, India, Vietnam, Peru, and Ethiopia. The YL study used a number of measures of structural and cognitive capital. One study focusing on

children aged 6-18 months found that high cognitive social capital was associated with improved LAZ and WAZ among children, but did not find community group membership to be associated with child nutritional status. Additionally, it found that involvement in citizenship activities was negatively associated with HAZ in India, but was positively associated in Vietnam.[80] Another analysis of the same dataset found no association between any of the above-mentioned social capital measures with prevalence of stunting in children under one year of age in India.[94] Another YL study examined the size of the network and network characteristics in the same sample in India and found that larger network size and a network with higher literacy level were significantly associated with higher LAZ.[95] The study also found that mother's network comprising of non-family members was negatively associated with LAZ. Recent studies in Nepal examining women's empowerment in agriculture have analyzed the social domain based on active participation in group membership and found that group membership was related to maternal nutrition, but did not find any relationship with child nutrition in children under two years or children under five years.[22,23]

Studies promoting social capital through group membership have also shown improvements in child feeding behaviors. In developing countries, interventions have incorporated social components such as mother-to-mother support groups, group prenatal services, i.e., increased structural social capital with an aim to increase knowledge and awareness of different practices and have noted some success for exclusive breastfeeding.[96,97] For example, a group-based intervention with expectant mothers in Uttar Pradesh, India showed that recommended feeding practices immediately after birth including feeding colostrum, early initiation of breastfeeding, and exclusive breastfeeding

for the first week improved among those in the intervention group.[98] An intervention combining health programming with self-help groups in India showed that women in the intervention group had significantly higher odds of feeding colostrum than the control group.[99] Research is still need to test specific mechanisms through which group membership may influence behavior change and improve IYCF practices.

2.4.3 Workload and Child Nutrition

Time as a resource for child nutrition is relatively understudied.[82,100] Discussion about time allocation and workload is often studied as *gendered time* indicating the differential availability and use of time for engaging in different activities between men and women. Gendered time in low- and middle-income countries can be a result of several sociocultural factors including the traditional role of men and women in the society, related norms that perpetuate this distinction, household composition in terms of number and gender, environmental factors and agricultural seasons, farming patterns, availability and access to basic utilities, and health and social services.[101] Women spend significantly more time than men in child care, with recent estimates for South Asian countries like India and Pakistan suggesting women spend ten times as much time on unpaid child care as men.[78]

Related to gendered time is the concept of time poverty which is defined as "the lack of enough time for rest and leisure after accounting for the time that has to be spent working, whether in the labor market, doing domestic work, or performing other activities such as fetching water and wood" (pp.45).[102] Women in developing countries, especially in rural areas bear the burden of being involved in productive activities for income as well as household chores leading to higher workload and limited time for rest

and leisure even during sensitive phases such as pregnancy.[103,104] Increased domestic workload can also hinder employment for women. For example, the Demographic and Health Survey (2011) from Nepal revealed more workload at home as a reason for not working outside. Those with the least education have the most workload at home.[105] Time constraints and high workload can also lead to inadequate care for young children, who are often looked after by an older child or sibling in the family.[78] Time constraints and inadequate child care can lead to insufficient time for appropriate IYCF practices.[103] While research on time allocation and child feeding in South Asia is limited, one qualitative study in Nepal to identify behavior change strategies for better IYCF practices found that mother's paucity of time and labor work activities hindered exclusively breastfeeding.[79] Two studies in Nepal examining women's empowerment in agriculture also found that reduced workload as measured by total number of hours worked in a day was associated with maternal higher BMI and availability of leisure time for mothers was associated with higher LAZ in children under two years.[22,23] Studies have also examined women's work status, employment, and income as indicators for women's workload. For example, in a study in India, mother's current and previous employment was negatively associated with WAZ.[106] Another study from a nationally representative data in India, however, found that children of working women had higher WAZ than non-working women. Variation in research findings related to time allocation or workload and child nutrition highlight complexity of this issue. On the one hand, working women can contribute to household income, which can positively affect nutrition status, while on the other hand, overburden and time constraints, especially with gender-specific roles, can

also likely result in inadequate care for the child and the mother, which can negatively impact feeding practices and child nutritional status.

While there is some evidence of time and workload affecting child nutritional status, there is limited evidence examining the linking factors between workload and IYCF practices. Workload is likely to affect not only exclusive breastfeeding but also complementary feeding through time insufficiency for preparation of nutritionally diverse food or practicing responsive feeding, which is shown to be associated with better child nutritional status and early childhood development.[107,108]

2.4.4 Decision-making Control

Household decision-making on aspects related to health for self and child, family planning, and domestic violence are commonly studied indicators for empowerment or autonomy, and in general, have shown to have a positive relationship with child nutritional status.[82,83] While there is some variation in the results in different settings, greater decision-making control is shown to be associated with better child nutrition.

An analysis from a nationally representative sample in Nepal found that HAZ was significantly higher in children where mothers had a final say in sole or joint decision-making about seeking health care for self.[109] The study also found that difficulty in going alone to get medical care for self was associated with lower WHZ but found no association with HAZ. There was no association between getting permission to access care and HAZ, stunting, or WHZ. Overall, the study showed greater decision-making has a positive association with several child nutrition measures.

In a study in India, Shroff et al. (2009) showed that with regards to mobility, not needing permission to go to the market was associated with significantly lower odds of

child stunting, but stunting was not associated with decision-making related to going and staying with parents or siblings and permission to visit friends and relatives.[89] In another study in India, Shroff et al. (2011) found that autonomy in child-care decisions was associated with increased LAZ but did not have any effect on WAZ and WLZ.[90] A study in Afghanistan showed that lack of maternal autonomy, as measured by needing permission to see a doctor for child health care and having the requirement to be accompanied by someone to see a doctor, was significantly associated with higher odds of stunting.[110] Decision-making related to family planning was positively associated with WAZ in children 0-5 years in Pakistan.[21] An analysis of factors influencing child nutrition in Southern India found that women's position in the household and involvement in major household decisions was positively associated with WAZ; other empowerment variables such as mobility and control for food supply did not show any relationship with WAZ.[106]

The evidence above suggests that disempowerment in this domain limits access to economic and health-care resources. Utilization of health services is shown to be related to IYCF practices,[111,112] therefore, it is important to examine if bargaining power has an impact on IYCF practices.

2.4.5 Food Security and Role of Women

Household food security is a proximal factor that affects child nutrition through food availability and diet diversity, and is shown to be associated with maternal factors such as education and her role within the household. [113,114] Diet quality is an important predictor of child nutritional status.[35] Food security affects the quantity and quality of diet.[115,116] Maternal education has a positive relationship with household food security

and is shown to be independent of socioeconomic status or income. Women with higher education status make better decisions about equitable food allocation for children and better diet quality, which ensures consumption of essential micronutrients as well as macronutrients for optimal child growth and development.[114,117] Women's bargaining power can, therefore, affect household food security through women's role in food production, procurement, allocation, and preparation.

2.5 Men's Intra-household Bargaining Power and Child Nutrition

While there is research on women's access to and control of resources and decision-making control affecting child nutritional status, there is less information about men's bargaining power and its effect on child nutrition. Most studies have examined men's role in terms of father's education as determinant or confounder for child nutritional status or health. Fathers with higher educational attainment are more likely to have economic resources that can help with uptake of health services, provision of food and other household necessities to improved child nutritional status. For example, analyses from large-scale nutrition surveillance data from Indonesia and Bangladesh revealed that father's education significantly reduced the odds of stunting in children under five years and that paternal education was also associated with other nutritionally important practices such as vitamin A supplementation and use of iodized salt.[20] Another study based on a household survey in Pakistan tried to elucidate pathways linking parental education and child health outcomes. It found that father's education was positively associated with child immunization through father's health knowledge.[21] One study in rural Madhya Pradesh, India found that illiterate fathers had the highest odds of children being underweight, stunted, or wasted as compared to those with higher levels of

education. There was also a gradient-effect, where the odds of undernutrition were highest in the lowest levels of education.[118]

Importance of father's involvement in child nutrition and feeding practices is also evident through intervention studies and qualitative inquiry. Much of the research related to father's involvement and influence on breastfeeding practices is from developed countries, which points to the emotional and informational support that women received from the child's father.[119] For example, a 2-month intervention with expectant fathers on the management of breastfeeding found that those in the intervention group were significantly more likely to have babies that were exclusively breastfed for six months than in the control group and the mothers were less likely to encounter problems such as perceived milk insufficiency.[120] A qualitative study in the U.S. found that low-income mothers had positive attitudes and knowledge towards breastfeeding when they received encouragement from the baby's father to breastfeed.[121]

While information is available on father's education and support, less evidence is available on gendered bargaining power as a potential determinant of child health and nutrition. No evidence is available on how gender dynamics and intra-household bargaining affects child nutritional status and feeding practices. As discussed earlier, social and cultural norms affect women's position, expected roles, and women's bargaining power in the household. These norms also influence decision-making and household bargaining between a man and a woman. Women are more likely to be involved in household care activities, while men are involved in income generation, work outside home, and are responsible for expenditure on household items. A qualitative study in Ghana highlighted that women's lack of economic support or autonomy affected

health-seeking behavior for children with malaria.[122] The results from this study also suggested that husbands had a final say about where the child should be taken to a clinic and often controlled the payment for the same. Less involvement of father or refusal to pay resulted in delayed care for the child. The study also found that in case of disagreement between husband and wife about the place and expense to seek care, usually, the father had the last say, which also led to delayed health-seeking behavior.[122] Another study in Ghana about intra-household decision-making about seeking care for yellow fever in children showed that in resource-poor settings fathers prioritized between spending for use of health services or investing in income generating aspects such as the purchase of agricultural productions.[17] The sole decision regarding payment of health care rested on the father due to traditional roles of earning wages that is associated with men.

In general, spousal decision-making is shown to affect health-seeking behavior in other aspects such as family planning and reproductive health. Research aimed at understanding this has usually assessed men and women's responses about who takes decisions, either solely or jointly. Considerable disagreement between spouses is noted on who takes household decisions. For example, in Bangladesh, couples' reports on household decision-making suggested that when couples provided consistent information about their individual autonomy of decision-making about a particular aspect, it resulted in higher odds in seeking antenatal care, while discordant answers resulted in lower odds of care seeking during pregnancy.[123] This likely indicates an imbalance in intra-household bargaining or poor spousal communication and related decision-making.

Male autonomy may or may not result in male involvement in health-seeking activities. For example, in Nepal, a study on pregnant women seeking antenatal care showed that sole women's decision-making in a number of household decisions resulted in low male involvement in antenatal care, while joint decision-making by men and women resulted in more male involvement.[18] Another study in Nepal also found that agreement between spouses on who makes certain household decision was strongly associated with health care use related to ANC, institutional delivery, receiving tetanus toxoid for the pregnant woman, and child immunization as compared to spousal disagreement or women indicating sole decision-making power.[19]

Overall evidence suggests that spousal communication, decision-making, and bargaining is related to health, but virtually no research exists on mechanisms of how decision-making control relates to child nutrition. With gendered roles in households, South Asian context of patriarchy, and documented low status of women, it is important to understand how men and women's role and decision-making within the household affects child nutrition for effective nutrition-sensitive interventions.

2.6 Conceptual Model

Our research is guided by Care for Nutrition conceptual framework by Engle et al. (1999) that describes paths and linkages between basic, underlying, and immediate determinants of child nutrition, and specifically incorporates the concept of care and related caring practices which ultimately create an environment that can enable proper child growth and nutrition.[10] One of the resources needed to care for child nutrition explained in the framework is women's autonomy, which relates to access economic and social resources, workload and household decision-making control. In our research, we

use women's bargaining power as a resource for care with specific domains that capture: 1) ownership and control of assets, 2) social participation, 3) workload based on time allocation on productive activities, and 4) household decision-making control.

We conceptualize bargaining power to influence individual-level and household-level processes that ultimately influence feeding practices and child nutritional status, respectively. Intra-household bargaining as a resource for care can affect processes at an individual level for IYCF practices through the mother as the primary caretaker who provides food to the child through breastfeeding and complementary feeding. A mother's bargaining power can, therefore, enable her to access different channels of communication and health resources to gain exposure to specific IYCF information thereby ultimately affecting IYCF practices.

We also conceptualize that bargaining power can influence child nutrition at a household level by the way of household food security. Food security is dependent on different individuals in the household including the mother of the child and other male figures involved in income generation and/or agricultural productivity to contribute to household food provision, and food quality and quantity, which can ultimately affect child nutritional status.

In our research, we examine two distinct paths through which bargaining may relate to infants and young children and preschool-aged children differently. We focus on the exposure to IYCF information as a mechanism that may relate to IYCF practices because they are critical in the first two years of life for optimal nutrition and there is a need for appropriate knowledge about IYCF practices to follow them effectively.[8,124] In the second mechanism we examine child HAZ in children below five years. Lower HAZ

may reflect the cumulative disadvantage more in children under five years than children under two years. The path through food insecurity may also more distinctly relate to children older than two years due to their independence in feeding themselves and predominant reliance on family foods as opposed to baby-specific foods such as breast milk or other supplemental semi-solid foods. We examine men's role in HAZ in this second path as men are more involved in household food procurement and therefore may more likely influence HAZ than IYCF practices. We acknowledge that the two paths studied in this research can likely converge at two possible points: 1) household food insecurity may influence child dietary diversity,[115,125] but those relationships and effects may be more prominent in the older children, and 2) IYCF practices can relate to child nutritional status, but cannot be assessed in our research due to cross-sectional nature of our data.

In the first manuscript, we examine how women's intra-household bargaining power relates to exposure to IYCF information, and how that, in turn, relates to IYCF practices. In the second manuscript, we examine the path from intra-household bargaining power to food insecurity leading to child nutritional status.

2.7 Specific Aims

1. To understand the relationship between women's intra-household bargaining power and IYCF practices in children 0-23 months

    1.1 To examine the relationship between women's intra-household bargaining power with four WHO-recommended IYCF practices (early initiation, exclusive breastfeeding, minimum meal frequency, and diet diversity).

Hypothesis: Women's bargaining power will be positively associated with improved IYCF practices.

1.2 To examine if access to IYCF information mediates the relationship between women's bargaining power and IYCF practices

Hypothesis: Higher bargaining power will be associated with greater exposure to IYCF information, which in turn will be associated with improved IYCF practices.

2. To understand the relationship of women's and men's bargaining power with child nutritional status in children aged 0-59 months

2.1 To describe household decision-making control agreement between women and men

2.2 To examine the relationship between intra-household bargaining power of women and men with child nutritional status

Hypothesis: Higher women's bargaining power will be positively associated with child nutritional status as compared to men's bargaining power.

2.3 To test if household food insecurity mediates the relationship between women's and men's bargaining power and child nutritional status

Hypothesis: Household food insecurity will mediate the relationship between women's and men's bargaining power and child nutritional status such that higher bargaining power for both will reduce household food insecurity which will be then be associated with better child nutritional status.

2.8 Significance

Women's intra-household bargaining is an important issue that can affect care through IYCF practices. This research contributes to the literature on social determinants of IYCF practices that has thus far mainly studied factors such as parental education, socioeconomic status, and access to health care. Our research, therefore, provides a nuanced understanding of how context-specific women's intra-household bargaining in Nepal affects IYCF practices and offers an opportunity to understand if and how different bargaining domains may relate to the different feeding practices. This can provide valuable information to devise effective strategies to promote IYCF practices and reduce child undernutrition.

Understanding men's role in child nutrition has been increasingly recognized as an important factor, but there is limited evidence on how men's bargaining power may influence child nutrition. Due to the traditionally dominant role of men in South Asia, men not only affect household economy and resources, but also the status of the women in the household, both of which can influence child nutrition. Research related to men's role is limited to educational attainment or income, while no research has been done on the men's intra-household bargaining as compared women. Our research provides an understanding of gender dynamics related to household decision-making and economic resources and the relatively understudied social resources, and time allocation for men and women within households.

The aim of this research was also to understand specific mechanisms through which the association between bargaining power and child nutrition is likely to occur. One of the linking mechanisms tested in this research is exposure to IYCF practices.

Information about appropriate IYCF practices is critical in bringing about behavior change communication and provision of IYCF information is an important strategy of behavior change interventions. Bargaining power can improve knowledge by accessing and utilizing resources such as mass media communications, health care providers, and community health workers that can provide IYCF information.

The other mechanism we test that links bargaining power and child nutritional status is food insecurity. Food security as a linking mechanism between intra-household bargaining and child nutritional status is not studied even if individual relationships between bargaining power, child nutrition, and food insecurity are examined. Understanding this linking mechanism provides us with an understanding of the specific bargaining domains that are significant to this relationship. Studying the food insecurity mechanism contributes to the overall scientific plausibility of the relationship between bargaining power and child nutrition, and suggests specific aspects of bargaining power that could be targeted through intervention strategies. Overall, this research is important because interdisciplinary interventions will benefit from the information to target multiple outcomes such as food security, IYCF practices, and child nutritional status. This is also the first study to examine the relationship between men's intra-household bargaining and child nutritional status, which will help to understand household gender dynamics and the relationship with child nutrition, which has not been previously studied.

Our research expands on bargaining power to include multiple domains of bargaining. Empowerment studies have mainly been limited to women's household decision-making control and/ or education.

Overall, the results from this study provide a greater understanding of the gendered perspective of different bargaining domains that affect child nutrition. Findings from this research can have potential implications for future research and nutrition program interventions.

CHAPTER 3

RESEARCH METHODS AND DESIGN

3.1 Overview

This study used the baseline data collected in 2012 from the *Suaahara* project, a multi-sectoral, community-focused project aimed at improving health and nutrition of women and young children in Nepal. The overall goal of this research was to understand the relationship of gendered intra-household bargaining power with IYCF practices and child nutritional status, and identify specific pathways connecting bargaining power and child nutrition.

3.2 Study Setting

Nepal is a landlocked country between India and China, with high burden of poverty and history of political tension. The hills, mountains, and *terai* (plains) are Nepal's three agro-ecological zones. Child undernutrition is a major issue in Nepal, with 36% of children under five years being chronically undernourished, despite its significant overall reduction in the past 20 years.[2,126] Health and nutrition in women and children differ by geographical region and social institutions such as caste and religion. Rural populations disproportionately bear a high burden of maternal and child undernutrition.[126]

The data for the current research were from the baseline survey for *Suaahara* project, a multi-sectoral intervention program aimed at improving the health and nutrition status of women and children in Nepal by targeting health behavior, increasing access to quality health and nutrition resources, and improving coordination between government

and non-governmental stakeholders for nutrition promoting strategies. This project approach aligned with the Government of Nepal's Multi-sectoral Nutrition Plan 2013-2017.[127] *Suaahara* was implemented in rural areas of 16 districts across Nepal (Figure 3.1).

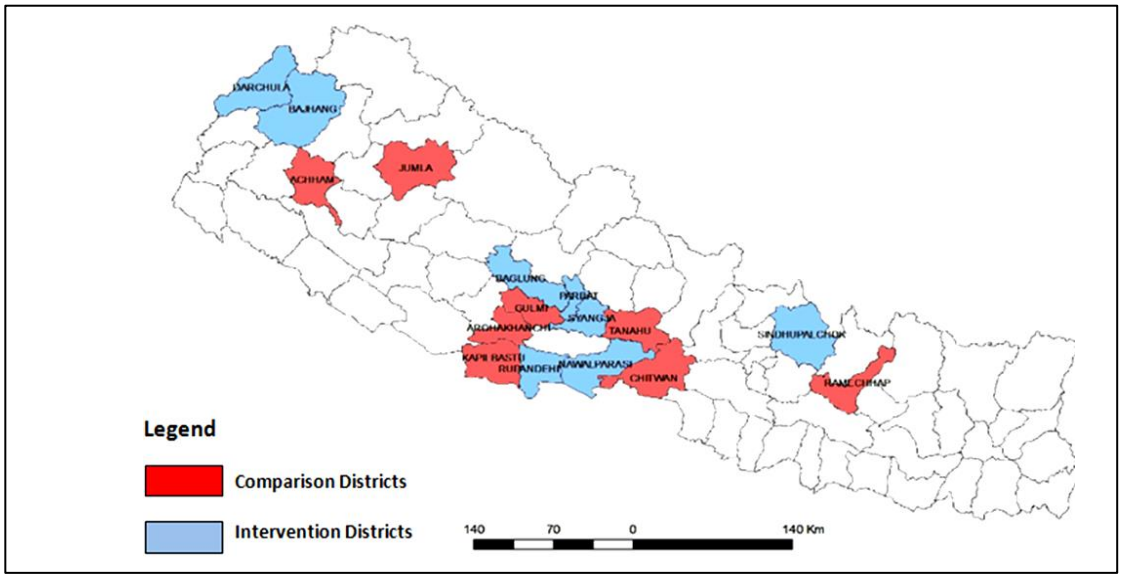

Figure 3.1: *Suaahara* program districts

Source: Cunningham et al., 2013

3.3 Sample

The sample for *Suaahara* was acquired through multistage cluster sampling. For the first stage, 16 districts were selected across Nepal with intervention and control arms having eight districts each. Districts were matched for sociodemographic and agro-ecological characteristics. Eighty Village Development Committees (VDCs) were selected using probability proportional to size for the second stage with five VDCs per district. For the third stage, three rural wards were selected from each VDC using probability proportional to size to get a total of 240 wards. For the last stage, within each ward, 17 households with children under five years were randomly selected to obtain a

total sample of 4,080 households. Within each household, one child less than five years of age was randomly selected as the index child for the survey and if available, one child having the same biological mother was selected as the non-index child. The mother of the index child completed the household survey. A separate questionnaire was administered to the male household head, preferably the father of the index child when available, or other male member of the household who made major household decisions.[127]

Table 3.1 Sample size based on specific aims and specific outcomes

Specific Aims	**Age Group (months)**	**Sample Size**	**Applicable Nutrition Indicator**
1	0-5	384	Exclusive breastfeeding
1	6-23	1402	Minimum diet diversity, minimum meal frequency WAZ
1	0-23	1787	Early initiation
2	0-59	2166[a]	HAZ
2	0-59	1052[b]	HAZ

Note: Actual sample slightly lower for different models based on data available on the four bargaining domains

[a] Sample based on data available for women's and men's bargaining domains; includes all male respondents i.e. father of the index child (spouse of the mother) or another male decision-maker in the household

[b] Sample based only on if male respondent is the father of the index child (spouse of the mother).

The sample for the current research differs according to the specific aims and is presented in Table 3.1. For aim 1, where the outcome is IYCF practices, the sample consisted of index children aged 0-23 months. Age range of the sample differed for specific IYCF practices as follows: 1) 0-5 months for exclusive breastfeeding, 2) 0-23 months for early initiation, and 3) 6-23 months for minimum meal frequency and dietary diversity. For aim 2, the sample consisted of index children aged 0-59 months. For aims that have men's intra-household bargaining as a variable, sample size was based on bargaining power information available for men and women.

3.4. Data Collection

Data for the *Suaahara* baseline survey were collected in 2012. Trained enumerators collected information on the household surveys. One interview was conducted with the mother of the index child and another interview was conducted either with the father of the index child or another male household decision-maker. Information from the mother was collected on child health and child care, infant and young child feeding practices, household food security, maternal diet diversity, women's empowerment, information access, maternal health, IYCF knowledge, attitude, and perceptions, water sanitation and hygiene, child and maternal anthropometry, and hemoglobin measurement. Anthropometric measurements were age-appropriate where children aged 0-23 months were measured using supine length, while for children aged 24-59 months, standing height was measured in duplicates by trained enumerators using standardized length boards (ShorrBoard produced by Weight and Measure LLC).[127] Interviews with male household decision-makers provided information on household composition, household economics, social assistance, male empowerment, and agricultural and land practices.

3.5 Data Management

The International Food Policy Research Institute (IFPRI) collected the data. For the purpose of this research, I signed a formal data-sharing agreement with IFPRI to use the data for this research only. A committee member formerly affiliated with IFPRI shared the dataset using a password-protected, cloud-based application with the committee chair and me. The dataset is also stored on the student's password-protected laptop hard drive for the data analysis for this research.

3.6 Measures

The two main outcomes of the study related to child nutrition were IYCF practices for children 0-23 months and child nutritional status for children 0-59 months.

3.6.1 Outcome Variables

1. Infant and Young Child Feeding Practices (Manuscript 1)*:* Indicators for each of the practices were based on the WHO guidelines.[29] We chose the following four IYCF practices as they encompass main practices that affect nutrient intake in the first 24 months of life. Early initiation focuses on an important feeding practice right after birth, exclusive breastfeeding is the recommended practice for the first six months for optimal nutrition, and minimum meal frequency and dietary diversity captures the quantity and quality of complementary foods, respectively, required from 6-23 months.

a. Early Initiation: Whether a child aged 0-23 months was put to breast within an hour after birth.
b. Exclusive breastfeeding for six months: Whether a child aged 0-5 months only had breast milk in the previous 24 hours of the survey.
c. Minimum meal frequency (MMF): Whether a child 6-23 months received the required number of semi-solid and solid meals in the previous day. For breastfed children aged 6-8 months, the minimum number of meals is two, and three meals for breastfed children aged 9-23 months. Overall, the minimum number of meals for non-breastfed children aged 6-23 months is three.
d. Dietary diversity*:* This measures the number of food groups consumed by a child aged 6-23 month in the previous 24 hours. The specific food groups are: 1) grains, roots, and tubers; 2) legumes and nuts; 3) dairy products; 4) flesh foods (meat,

fish, poultry, and organ meats); 5) eggs; 6) vitamin A rich fruits and vegetables; and 7) other fruits and vegetables.

2. Child Nutritional Status (Manuscript 2)*:* Standard deviation scores for length/height-for-age (L/HAZ) based on the WHO growth standards were used.[128] LAZ is applicable to children under 24 months and HAZ is applicable to children 24-59 months.

3.6.2 Key Explanatory Variables

1. Intra-household bargaining power (Manuscripts 1 and 2): This measurement for women and men was based on access to and control of resources and decision-making control. Women's and men's bargaining power was measured in four ways: 1) ownership and control of assets, 2) social participation, 3) workload, and 4) household decision-making control. The variables for the specific domains were constructed as follows:

We used ten household assets to form an additive scale to measure ownership and control of assets. Ownership and control of assets is commonly used as a proxy for measuring the economic domain of bargaining power.[100,129] To measure control of assets, we used questions about decisions regarding renting and selling of assets used previously in studies on women's empowerment in agriculture.[22,23] The ten assets used were: 1) house and other structures, 2) large consumer durables (e.g., fridge, TV, sofa), 3) small consumer durables (e.g., radio, cookware), 4) mobile phone, 5) transportation (motorized or non-motorized), 6) agricultural land, 7) non-agricultural land, 8) non-mechanized farm equipment, 9) large livestock, and 10) small livestock. If the household had a particular asset, we first assessed if the respondent solely or jointly owned that specific asset. If a respondent solely or jointly owned an asset, we also considered if s/he was involved in sole or joint decision-making about selling or renting of that asset. For each asset, a value

of 1 was assigned if the respondent solely or jointly owned that asset and was also involved in sole or joint decision-making about selling or renting of that asset. Since our study focus was on intra-household bargaining, which relates to the *relative* socioeconomic position, we measured sole or joint ownership of assets as opposed to only sole ownership, which would indicate total autonomy. Values for all assets were summed to obtain a total score ranging from 0-10.

Social participation for women and men was based on active group membership in different community-based groups, where the participant regularly attended meetings, engaged in discussions and/or volunteered. Participation in groups such as agricultural groups, water user's, land/forest users', credit or microfinance, mutual help or insurance group, trade or business association, civic groups, religious groups, mother's group or other women's groups was measured. A value of 1 was assigned for each group that a respondent participated. The total number of groups in which the respondent participated was calculated. This measure is previously used examining women's empowerment in agriculture.[22,23] Since a majority of those with group membership participated in one group we created a binary variable to indicate whether or not the respondent participated in any community group.

Workload domain measured the total time spent by the respondent on work activities in a 24-hour period. Information was collected on all productive activities (work/ employment, agriculture activities, domestic work, and care for children/ adults/elders) and personal activities (sleeping and resting, personal care, time spent of leisure activities, and social and/or religious activities). To determine the workload, total time spent on domestic work, care for children and elders, wage work or employment,

and subsistence activities such as farming and livestock, and schoolwork was calculated, based on the respondent's previous 24-hour recall. This measure is previously used in examining women's empowerment in agriculture index.[22,23]

Household decision-making control was based on respondent's sole or joint household decision-making on household economy, health of the family and self, and domestic violence and mobility.[2,82,130] Since our research focus was on intra-household bargaining, which relates to the *relative* socioeconomic position, we measured sole or joint decision-making as opposed to sole decision-making power. Sole decision-making implies complete autonomy.[100] Decisions in households are usually made with several family members, and within the Nepali context, joint decision-making or support is more prevalent and favorable.[131] Measuring sole or joint decision-making as opposed to sole-decision-making captures that women's status is related to other individuals within a household, which influences her bargaining power.[131] Understanding if others are involved in decision-making helps identify potential for program engagement with the household members that may not only influence women's bargaining power but also child nutrition. The eight decisions used to create this measure were: 1) major household expenditures such as on refrigerator or TV, 2) minor household expenditures such as food for daily consumption or other household necessities, 3) use of family planning products, 4) respondent's health and nutrition, 5) children's healthcare, 6) child feeding, 7) how to keep from domestic violence, and 8) mobility to go to a relative or friend's house. Men's decision-making did not include items on domestic violence and mobility, therefore only six items were considered for men's decision-making. For each joint decision, we also assessed the extent of decision-making control. The response scale for the extent to which

the respondent feels s/he can contribute to the joint decision was measured as 1= *not at all*, 2= *small extent*, 3= *some extent*, 4= *to a large extent*. For each type of decision, a person was adequate if s/he was the sole decision-maker, or for joint decision-making, if the respondent felt s/he can be involved at least to *some extent* of decision-making. We then calculated the proportion of a respondent's involvement in sole or joint decision-making. All decisions made in the household were computed for the denominator and a total of sole or joint decisions made served as the numerator.[130] Manuscript 1 only included women's bargaining domain variables, while manuscript 2 included men's and women's bargaining domains variables.

2. Exposure to IYCF Information (Manuscript 1): This variable was measured as an additive scale from 0-8 based on if a mother had heard of eight IYCF practice-related messages. IYCF messages used were: 1) early initiation, 2) colostrum feeding, 3) exclusive breastfeeding for first six months, 4) not giving any water or liquids other than breast milk for the first six months, 5) starting complementary feeding (semi-solid/ mashed foods) at 6 months, 6) feeding eggs, fish, and meat to children older than 6 months, 7) hand washing before feeding, and 8) how to feed a child during illness. Since the aim of this variable was to capture a mother's access to IYCF information, an overall score (range: 0-8) of all messages was considered rather than using one or two specific messages related to each practice as a predictor for each outcome.

3. Household Food Insecurity (Manuscript 2): Household food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS).[132] The mean HFIAS score in our sample was skewed towards the lower end of the score range. Using linear transformation for the scale score would be inappropriate for mediation analysis to

compute the product of coefficients and determine the related direct and indirect effects. We, therefore, used the HFIAS prevalence categories as a continuous variable with a score ranging from 1 (food secure) to 4 (severely food insecure). To ensure our interpretation and inference of the results would not differ, we first analyzed the relationship between food insecurity prevalence as a categorical variable and the outcome child HAZ (Reference category= score 1;**β**= -0.120, p=0.040 for score 2; **β** = -0.0783, p=0.279 for score 3; **β** =-0.280, p=0.058 for score 4). We then tested the relationship between food insecurity prevalence as a continuous category and HAZ (**β**= -0.0507, p=0.022). Both methods showed an overall negative relationship between food insecurity and child nutrition. We also separately assessed food insecurity as an outcome using it as a continuous variable and as a categorical variable using the ordered logit model with women's and men's bargaining domains as the explanatory variables. The interpretation of the relationship between bargaining domains and food insecurity did not differ using continuous versus categorical variable. Hence, we used the HFIAS prevalence as a continuous variable.

4. Covariates (Manuscripts 1 and 2)

We considered certain maternal, child, and socioeconomic characteristics as potential confounders based on prior evidence suggesting an association with child HAZ, exposure to IYCF information, food insecurity, and/or bargaining power. For example, higher maternal education has been shown to be associated with higher HAZ, better food security, and bargaining power [133,134]. Household wealth can affect food and health resources, which could influence child HAZ. Agro-ecological areas were used to control for geographic differences in feeding practices. The covariates used in all multivariable

analyses were child age, child gender, maternal age (years), maternal height (centimeters), maternal education (years of formal schooling), number of children under 5 years in the household, household wealth (sum of number of small durable assets, large assets, and agricultural assets), whether the respondent was in the *Suaahara* intervention or control group, and agro-ecological zone of the household (Hills, *Terai,* Mountains).

To account for clustering, we analyzed the variability of outcomes at the district level and the village development committee (VDC) level separately. We found more variability at the VDC level than the district level. Based estimates, the VDC level variability also accounted for the district level variability. We also assessed regression results using wards (240 clusters) as a random effect. The results from this analysis did not differ as compared to VDC being treated as random effects. Hence clustering was VDC level (80 clusters) was used as random effects for all multivariate models and mediation analysis.

3.7 Analysis Plan: Manuscript 1

Analyses were conducted in Stata SE version 14. Descriptive statistics were obtained through proportions or means and standard deviation. Bivariate relationships were assessed for each of the main explanatory variables of bargaining power, exposure to IYCF messages, and covariates with the four IYCF practices, separately. Simple logistic regression was used for bivariate analysis of early initiation, exclusive breastfeeding, and minimum meal frequency. Simple linear regression was used for dietary diversity.

For multivariable analyses, generalized structural equation modeling (GSEM) using the *gsem* command, which allows for binary outcome variables, was used to estimate the path from each bargaining power domain variable to the exposure to IYCF

information measure, consequently leading to each of the four IYCF practices. We used the product-of-coefficients method for the path analysis to test for mediation.[135] Using GSEM, we employed this product-of-coefficients method where two regression models were analyzed for each IYCF outcome- one model where each IYCF practice was regressed on the mediator (exposure to IYCF information), main explanatory variables of bargaining power, and covariates, and another model where the mediator (exposure to IYCF information) was regressed on the main explanatory bargaining variables and covariates. The indirect effect was obtained as a product of each bargaining domain coefficient on the mediator and the mediator coefficient on the outcomes. The coefficient between each of the bargaining domains and IYCF practices was the direct effect.

We met the following three assumptions for the recursive path analysis.[135] First, we found no exposure-mediator interaction by testing for interaction between each of the bargaining domains and exposure to IYCF information. Second, we included potential covariates in all regression analyses to account for confounding between bargaining power and exposure to IYCF information, bargaining power and IYCF practices, and exposure to IYCF information and IYCF practices based on previous evidence.[63,134,136] Third, we used path analysis with cross-sectional data and justified no reverse causality based on theory related to women's empowerment that suggests women with greater access to resources and decision-making control are more likely to leverage their position for better health and nutrition outcomes[58,85,86,137] and previous research that highlights this relationship.[82,83,87]

Sociodemographic covariates (i.e., child age, child gender, maternal age, height, and education, number of children five years in a household, household wealth, if the

respondent was in *Suaahara* intervention or control group, and agro-ecological area) were used in all models. Child sickness in the past 15 days due to diarrhea or fever was included as a covariate for exclusive breastfeeding, minimum meal frequency, and dietary diversity, as sickness may influence child food intake. In the mediation analysis, for the legs of the paths that were significant, the indirect effect was calculated as the product of the individual coefficients of each leg leading to the mediator and then to the outcome using the *nlcom* procedure to obtain appropriate test statistics, standard errors, and significance levels. All continuous variables were standardized.

3.8 Analysis plan: Manuscript 2

All analyses were conducted in Stata SE version 14. Descriptive statistics were obtained through proportions, or means and standard deviation, as relevant to the variables. Bivariate relationship with child HAZ using simple linear regression was assessed for each of the main explanatory variables of bargaining power, food insecurity, and control variables. To describe the household decision-making control between spouses, we calculated percent agreement and kappa to understand whether there was agreement on who was involved in specific household decisions. We assessed agreement on five household decisions: 1) major household expenditure, 2) minor household expenditure, 3) family planning decisions, 4) decisions regarding child's health, and 5) decision regarding child feeding. Agreement was assessed using seven categories: 1) mother of child solely takes the decision, 2) father of child solely takes the decision, 3) spouses jointly take the decision, 4) spouses and another person involved in decision-making, 5) mother and another person decides, 6) father and another person decides, and 7) only others decide. The sample size for each decision differed because it was based on

whether or not both men and women had data on a particular decision and if a particular decision was made in a household. The response categories for persons involved in decision-making would only allow comparing joint decision between spouses. For example, if a mother responded that spouse makes a particular decision, she would be referring to the father of the index child. If a male member who is not the spouse of the mother responded to a question that spouse makes a particular decision; he would not be referring to the mother of the index child. Hence, the percent agreement was only assessed between spouses.

We used multilevel modeling to assess the relationship between HAZ and women's bargaining power, men's bargaining power, women's and men's bargaining power together, and the interaction between women's and men's bargaining power to test if the relationship between women's bargaining power and HAZ is dependent on men's bargaining power.

We used generalized structural equation modeling with household food insecurity as the mediator. Using GSEM, we employed this product-of-coefficients method where two regression models were analyzed- one model where child HAZ was regressed on the mediator (household food insecurity), main explanatory variables of bargaining power for women and/or men, and covariates, and another model where the mediator (household food insecurity) was regressed on the main explanatory bargaining variables and covariates. The indirect effect was obtained as a product of each bargaining domain coefficient on the mediator and the mediator coefficient on the outcome. The coefficient between each of the bargaining domains and child HAZ was the direct effect.

We met the following three assumptions for the recursive path analysis.[135] First, we found no exposure-mediator interaction by testing for interaction between each of the women's bargaining domains and household food insecurity, and except for men's workload, there were no significant interactions between men's bargaining domains and food insecurity. Based on the interaction estimates, the effect of food insecurity on men's average workload was close to zero (-0.049); hence, men's workload was included in the mediation analysis. Second, we included potential covariates in all regression analyses to account for confounding between bargaining power and household food insecurity, bargaining power and child HAZ, and food security and child HAZ based on previous evidence.[63,134,136] Third, we used path analysis with cross-sectional data and justified no reverse causality based on theory related to women's empowerment that suggests women with greater access to resources and decision-making control are more likely to leverage their position for better health and nutrition outcomes[58,85,86,137] and previous research that highlights this relationship.[82,83,87]

In the mediation analysis, for the legs of the paths that were significant, the indirect effect was calculated as the product of the individual coefficients of each leg leading to the mediator and then to the outcome using the *nlcom* procedure to obtain appropriate test statistics, standard errors, and significance levels. The indirect effect was compared to the total effect, i.e., the sum of indirect effect and direct effect to assess the relative contribution of the indirect path. Results are presented as standardized coefficients for all continuous variables. To understand if there would be any difference in findings between men's sample that only included spouses of the mother as compared to the entire male respondent sample, we also analyzed models with the sample that only

included bargaining information on the father of the index child, n=1052. The results for this analysis did not differ from the main analysis and are therefore not presented further, but specific relevant findings were noted in the discussion section of the manuscript.

3.9 Ethical Approval

Ethical approval for the primary data collection was obtained from the Nepal Health Research Council and for secondary data analysis was obtained from the Institutional Review Board of University of South Carolina.

CHAPTER 4

RESULTS

This chapter consists of two manuscripts that relate to the two specific aims of this dissertation research. Section 4.1 contains the first manuscript titled *"Exposure to nutrition information as a linking mechanism between women's intra-household bargaining power and infant and young child feeding practices in rural Nepal."* Section 4.2 contains the second manuscript titled *"Examining the relationship between gendered intra-household bargaining power, household food insecurity, and child nutritional status in rural Nepal."*

4.1 MANUSCRIPT 1

Exposure to nutrition information as a linking mechanism between women's intra-household bargaining power and infant and young child feeding practices in rural Nepal[1]

[1] Kulkarni, S., Frongillo E.A., Cunningham K., Moore S., Blake C.E., To be submitted

ABSTRACT

Objectives: Women's intra-household bargaining power is an important determinant of child nutritional status, but there is limited evidence on how bargaining power relates to infant and young child feeding (IYCF) practices. The objectives of this study were to 1) understand which domains of bargaining power are associated with different IYCF practices, and 2) examine if women's bargaining power is related to exposure to IYCF information, and if exposure to IYCF information is in turn associated with improved IYCF practices.

Methods: We conducted a cross-sectional analysis of the baseline data from 2012 of the multi-sectoral program, *Suaahara,* in rural Nepal, focusing on households with a mother and child 0-23 months of age (n=1787). Women's intra-household bargaining power consisted of four domains: 1) ownership and control of household assets, 2) social participation, 3) workload, and 4) household decision-making control. We used generalized structural equation modeling to examine if exposure to IYCF information mediated the relationship between the four bargaining domains and early initiation, exclusive breastfeeding, minimum meal frequency, and dietary diversity, separately.

Results: Social participation was positively associated with exposure to IYCF information, which in turn was related to early initiation and dietary diversity. Household decision-making control was directly associated with exclusive breastfeeding. No domains were associated with minimum meal frequency.

Conclusion: Social participation and household decision-making control are potentially important domains to consider for improving IYCF practices. Exposure to IYCF information is an important mechanism linking bargaining power and IYCF practices.

INTRODUCTION

Promotion of appropriate infant and young child feeding (IYCF) practices is important for the reduction of child undernutrition.[1–3] Despite a significant decline in the past two decades, the burden of child undernutrition in Nepal is still high and is coupled with poor IYCF practices.[4–7] According to the 2016 Nepal Demographic and Health Survey, the prevalence of exclusive breastfeeding for the first six months of life was 66% and early initiation was 55%. The prevalence of minimum diet diversity among children aged 6-23 months was only 35%.[4] Improving IYCF practices is an important priority for nutrition programs and policies to ensure proper health and nutrition in the first 1000 days of life to prevent short- and long-term adverse human and economic consequences.[8–12]

Women's household status is an important determinant of child nutritional status [13,14]. Women's status, as reflected in the intra-household bargaining power, refers to the relative social and economic position of a woman within a household for accessing and controlling resources, and her decision-making control.[15–17] In our research, we conceptualize women's intra-household bargaining power, henceforth referred to as bargaining power, as consisting of four domains: 1) ownership and control of household assets, 2) social participation, 3) workload- time spent working in a day, and 4) household decision-making control.[18] In our research, we refer to the mothers of the children when discussing women's bargaining power. We use women's bargaining power as a resource for care, drawing from the Care for Nutrition conceptual framework by Engle et al. (1999).[19] Women's bargaining power is important for child feeding because following appropriate IYCF practices requires economic, social, and human capital

resources. Women's bargaining power as a resource for care can enable women to access and be exposed to information, make informed decisions, and follow recommended IYCF practices.[19]

One mechanism through which bargaining power is likely to be associated with feeding practices is by increasing their exposure to IYCF information. Bargaining power may provide women with economic and social resources, as well as the time to gain relevant nutrition information, thereby improving access to IYCF information.

Ownership and control of assets may increase health care utilization by having material resources to access health care or health information. For example, ownership and control of assets can increase the availability of transportation to access health resources.[20] Assets owned by women may provide greater access to potential communication channels such as TV, radios, telephones to access social and health information that provide IYCF messaging.[21,22]

Social participation through group membership forms a resource for social capital.[23] Social participation can facilitate information and knowledge exchange, which can improve access to health resources and knowledge networks related to child nutrition, thus improving IYCF practices.[24] Membership in groups explicitly targeting nutrition-sensitive information has shown considerable success in improving IYCF practices in South Asia.[25] Evidence from Bangladesh also suggests that group membership positively relates to improved household dietary diversity,[26] which in turn could relate to child dietary diversity. Women's bargaining power in the social participation domain may, therefore, provide opportunities for interaction and health education to increase women's exposure to nutrition messages and consequently relate to better IYCF practices.

Heavy workload and related time constraints may negatively affect maternal health care utilization such as uptake of ANC services or facility-based delivery, thereby limiting access to IYCF information.[27,28] Time constraints can lead to inadequate care for young children and potentially influence whether a mother follows recommended IYCF practices.[29–31] Household decision-making is shown to be positively related to health care utilization including seeking antenatal and postnatal care services,[14] and can improve access and exposure to information, thus influencing IYCF practices.

Improving exposure to IYCF information through different avenues such as mass media, improved health care utilization, targeted counseling, and peer support are common strategies used in behavior change interventions for improving IYCF practices.[3,31,32] Studying exposure to IYCF information directly, rather than using a proxy measure such as availability of information or program participation, is critical as it is a known factor relating to IYCF practices; information is necessary to increase knowledge about feeding practices.[33,34]

Prior studies on women's bargaining power have mainly focused on child nutritional status.[35,14] Evidence on how bargaining power relates to IYCF practices is limited.[36–38] Studies have either focused on specific aspects of bargaining such as household decision-making or proxies such as level of education. There is also limited understanding of how domains such as social participation or workload affect different IYCF practices. Research is specifically needed to understand if and how individual domains of women's bargaining power influence IYCF practices differently and to identify mechanisms through which this association is linked.[35] Explaining the linkage between the different domains of bargaining power and IYCF practices contributes to

strengthening the scientific plausibility of this associative relationship. Understanding the mechanisms through which this relationship may be linked also provides input for evidence-based nutrition interventions.

The objectives of this study were to 1) understand which domains of bargaining power are associated with different IYCF practices, and 2) examine if women's bargaining power is related to exposure to IYCF information, and if exposure to IYCF information is in turn associated with improved IYCF practices.

METHODS

Study design and sampling

We conducted a cross-sectional secondary data analysis of the *Suaahara* program's baseline survey from 2012. *Suaahara,* a multisectoral intervention, aims to improve the health and nutrition status of women and children in Nepal by increasing access to quality health and nutrition services, improving health and nutrition behaviors, and improving coordination between government and non-governmental stakeholders for nutrition promoting strategies. The program, initially implemented from 2011-2016, is now in its second-phase (2016-2021) with interventions in 40 of Nepal's 75 districts. Ethical approval for the data collection was obtained from the Nepal Health Research Council and for this secondary data analysis was obtained from the Institutional Review Board of University of South Carolina.

The sample for the *Suaahara* survey was acquired through multistage cluster sampling. For the first stage, 16 districts (8 intervention and 8 matched comparison) were purposefully selected. A total of 80 Village Development Committees (VDCs) were selected using probability proportional to size for the second stage with 5 VDCs per

district. For the third stage, three rural wards were selected from each VDC using probability proportional to size to get a total of 240 wards. For the last stage, within each ward, 17 households with children under five years were randomly selected to obtain a total sample of 4,080 households. Within each household, one child less than five years of age was randomly selected as the index child for the survey and, if available, one child having the same biological mother as the index child was selected as the non-index child. The mother of the index child completed the household survey. Since the outcome variables for this analysis were IYCF practices, the sample only included data on children aged 0-23 months (n=1787).

Data collection for the *Suaahara* baseline survey was conducted in 2012 by trained enumerators. Information from the mother was collected on child health and child care, IYCF practices, household food security, maternal diet diversity, women's empowerment, information access, maternal health, IYCF knowledge, attitude, and perceptions, water sanitation and hygiene, child and maternal anthropometry, and hemoglobin.

Outcome variables

Four World Health Organization (WHO)-recommended IYCF practices were the outcome variables that capture the main practices to follow from birth to 24 months: 1) early initiation, 2) exclusive breastfeeding, 3) minimum meal frequency, and 4) dietary diversity. We chose the following four IYCF practices as they encompass main practices that affect nutrient intake in the first 24 months of life. Early initiation focuses on an important feeding practice right after birth, exclusive breastfeeding is the recommended practice for the first six months for optimal nutrition, and minimum meal frequency and

dietary diversity captures the quantity and quality of complementary foods, respectively, required from 6-23 months. Early initiation was coded as a binary variable indicating if a child aged 0-23 months was put to the breast within an hour after birth. Exclusive breastfeeding was a binary variable indicating if a child aged 0-5 months only had breast milk in the previous 24 hours of the survey. Minimum meal frequency was a binary variable based on whether a child aged 6-23 months received the required number of semi-solid or solid meals or milk feeds in the previous day. For breastfed children aged 6-8 months, the minimum number of meals is two, and for breastfed children aged 9-23 months, the minimum number of meals is three. The minimum number of meals for non-breastfed children aged 6-23 months is four. Dietary diversity was a continuous variable that measured the consumption of foods among children aged 6-23 months in the 24 hours prior to the survey, with foods grouped into 7 groups: 1) grains, roots, and tubers; 2) legumes and nuts; 3) dairy products; 4) flesh foods (meat, fish, poultry, and organ meats); 5) eggs; 6) vitamin-A-rich fruits and vegetables; and 7) other fruits and vegetables.

Explanatory Variables

Women's bargaining power was measured through 4 domains: 1) ownership and control of household assets, 2) social participation, 3) workload, and 4) household decision-making control. The variables for the specific domains were constructed as described below.

We used ten household assets to form an additive scale to measure ownership and control of assets. The ten assets used were: 1) house and other structures, 2) large consumer durables (e.g., fridge, TV, sofa), 3) small consumer durables (e.g., radio,

cookware), 4) mobile phone, 5) transportation (motorized or non-motorized), 6) agricultural land, 7) non-agricultural land, 8) non-mechanized farm equipment, 9) large livestock, and 10) small livestock. Based on if the household owned a particular asset, we first assessed if the respondent solely or jointly owned a specific asset. If a respondent solely or jointly owned an asset, we also considered if s/he was involved in sole or joint decision-making about selling or renting of that asset. For each asset, a value of 1 was assigned if the respondent solely or jointly owned that asset and was also involved in sole or joint decision-making about selling or renting of that asset.[38,39] Since our study focus is on intra-household bargaining, which relates to the *relative* socioeconomic position, we measured sole or joint ownership of assets as opposed to only sole ownership, which would indicate total autonomy. Values for all assets were summed to obtain a total score ranging from 0-10.

Social participation was based on active group membership, where the respondent regularly attended meetings, participation in discussions, and/or volunteered, in different community-based groups.[38,39] Participation in groups such as agricultural groups, water user's, land/forest users', credit or microfinance, mutual help or insurance group, trade or business association, civic groups, religious groups, mother's group or other women's groups was measured. A value of 1 was assigned for each group that a respondent participated. The total number of groups in which the respondent participated was calculated. As a majority of those with group membership participated in one group, we created a binary variable to indicate whether or not the respondent participated in any community group.

Workload domain measured the total time spent by women on work activities in a 24-hour period.[38,39] Information was collected on all productive and personal activities such as sleeping and resting, personal care, work/ employment, domestic work, care for children/ adults/elders, time spent of leisure activities, and social and/or religious activities. To determine the workload, total time spent on domestic work, care for children and elders, wage work or employment, and subsistence activities such as farming and livestock, and school work was calculated based on the respondent's previous 24-hour recall.

Household decision-making was measured as the proportion of household decisions in which the respondent had sole or joint decision-making control.[40] The eight decisions used to create this measure were: 1) major household expenditures such as refrigerator or TV, 2) minor household expenditures such as food for daily consumption or other household necessities, 3) use of family planning products, 4) respondent's health and nutrition, 5) children's healthcare, 6) child feeding, 7) how to keep from domestic violence, and 8) mobility to go to a relative or friend's house. For each joint decision, we also assessed the extent of decision-making control. The response scale for the extent to which the respondent feels she can contribute to the joint decision was measured as 1= *not at all*, 2= *small extent*, 3= *some extent*, 4= *to a large extent*. For each type of decision, a person was adequate if she was the sole decision-maker, or for joint decision-making, if the respondent felt she can be involved at least to *some extent* of decision-making. To calculate the proportion of women involved in sole or joint decision-making, all decisions made in the household were computed for the denominator and a total of sole or joint decisions made served as the numerator.

Exposure to IYCF information was measured as an additive scale from 0-8 based on if a mother had heard of eight IYCF practice-related messages. IYCF messages used were: 1) early initiation, 2) colostrum feeding, 3) exclusive breastfeeding for first six months, 4) not giving any water or liquids other than breast milk for the first six months, 5) starting complementary feeding (semi-solid/ mashed foods) at 6 months, 6) feeding eggs, fish, and meat to children older than 6 months, 7) hand washing before feeding, and 8) how to feed a child during illness. Since the aim of this variable was to capture a mother's exposure to IYCF information, an overall score (range: 0-8) of all messages was considered rather than using one or two specific messages related to each practice as a mediator for each outcome.

We considered certain maternal, child, and socioeconomic characteristics and geographical factors as potential confounders based on prior evidence suggesting an association with child feeding practices, exposure to IYCF information, and/or bargaining power. For example, higher maternal education has been shown to be associated with improved breastfeeding practices, access to information, and bargaining power.[41–43] Child age is associated with age-specific feeding practices through the first 24 months. Household wealth can affect food and health resources, which could influence feeding practices and access to information. Agro-ecological areas were used to control for geographic differences in access to food and feeding practices. The covariates used in all multivariable analyses were child age, child gender, maternal age (years), maternal height (centimeters), maternal education (years of formal schooling), number of children under 5 years in the household, household wealth (sum of number of small durable assets, large assets, and agricultural assets), if the respondent was in *Suaahara* intervention or control

group, and agro-ecological zone of the household (Hills, *Terai,* Mountains). Child sickness in the past 15 days due to diarrhea or fever was included as a covariate for exclusive breastfeeding, minimum meal frequency, and dietary diversity, as sickness may influence child food intake. Clustering of observations within the village development committees (80 clusters) was accounted for using the *vce* option to get the appropriate standard errors.

Statistical Analysis

Analyses were conducted in Stata SE version 14. Descriptive statistics were obtained through proportions or means and standard deviation. Bivariate relationships were assessed for each of the main explanatory variables of bargaining power, exposure to IYCF messages, and covariates with the four IYCF practices, separately. Simple logistic regression was used for bivariate analysis of early initiation, exclusive breastfeeding, and minimum meal frequency. Simple linear regression was used for dietary diversity. Irrespective of the significance value of the findings in bivariate analysis, all bargaining domain variables were included in multivariable analyses.

Generalized structural equation modeling (GSEM) allows for path analysis using categorical variables. We used the product-of-coefficients method for the path analysis to test for mediation (Figure 4.1).[44] Using GSEM, we employed this product-of-coefficients method where two regression models were analyzed for each IYCF outcome- one model where each IYCF practice was regressed on the mediator (exposure to IYCF information), main explanatory variables of bargaining power, and covariates, and another model where the mediator (exposure to IYCF information) was regressed on the main explanatory bargaining variables and covariates. The indirect effect was obtained as

a product of each bargaining domain coefficient on the mediator and the mediator coefficient on the outcomes. The coefficient between each of the bargaining domains and IYCF practices was the direct effect.

We met the following three assumptions for the recursive path analysis.[44] First, we found no exposure-mediator interaction by testing for interaction between each of the bargaining domains and exposure to IYCF information. Second, we included potential covariates in all regression analyses to account for confounding between bargaining power and exposure to IYCF information, bargaining power and IYCF practices, and exposure to IYCF information and IYCF practices based on previous evidence.[45–47] Third, we used path analysis with cross-sectional data and justified no reverse causality based on theory related to women's empowerment that suggests women with greater access to resources and decision-making control are more likely to leverage their position for better health and nutrition outcomes[48–51] and previous research that highlights this relationship.[35,14,52]

A total of four models were analyzed, one for each IYCF outcome. The mediator in each model was exposure to IYCF information. In mediation analysis, for the legs of the paths that were significant, the indirect effect was calculated as the product of the individual coefficients of each leg leading to the mediator and then to the outcome using the *nlcom* procedure to obtain appropriate test statistics, standard errors, and significance levels. All continuous variables were standardized.

RESULTS

The prevalence of appropriate IYCF practices was generally low in the sample. Early initiation of breastfeeding was reported in 39% of the sample and 49.3% were

exclusively breastfed, while minimum meal frequency was 72.2% and on average children consumed foods from three of the seven food groups and nearly 45.6% met the minimum dietary diversity cut-off of consuming foods from 4 of the 7 food groups (Table 4.1). Women were solely or jointly involved in three-quarters (75.6%) of household decisions. The mean asset ownership and control score was 2.8. Sixteen percent of the mothers actively participated in one or more community groups, and on average worked for 10.9 hours in a day. Mothers had heard about five of the eight IYCF messages.

None of the bargaining domains were significantly associated in bivariate analyses with early initiation or dietary diversity (Table 4.2). Workload was positively associated with minimum meal frequency. Household decision-making was positively associated with exclusively breastfeeding at P-value less than 0.1. Access to IYCF information was associated with higher odds of early initiation by about 12% and with higher diet diversity by 0.1 food groups, but was not associated with the other two child feeding variables.

In the mediation analysis, exposure to IYCF information was positively associated with early initiation and dietary diversity. Social participation was positively associated with exposure to IYCF message for all four domains (Table 4.3). Social participation did not have a direct significant relationship with any of the IYCF outcomes. Social participation had a significant indirect effect on early initiation at P-value less than 0.05 and dietary diversity at P-value less than 0.1.

Ownership and control of assets did not have a significant direct or indirect relationship with any of the IYCF outcomes. Women's workload was borderline significant with exposure to IYCF message for early initiation ($p=0.044$), but did not

have a direct relationship with any of the other IYCF outcomes. Household decision-making had a significant positive and direct relationship with early initiation and exclusive breastfeeding, but did not have a significant direct or indirect relationship with other domains.

DISCUSSION

Our study suggests that social participation is likely to be important for improved IYCF practices and that exposure to IYCF information may be an important linking mechanism between bargaining power and IYCF practices. Social participation was associated with higher exposure to IYCF information that was subsequently associated with early initiation and dietary diversity. Household decision-making had a direct positive relationship with exclusive breastfeeding and early initiation. None of the other domains were significantly related to early initiation and diet diversity, and no significant direct or indirect relationships were observed with minimum meal frequency.

Social participation was positively associated with exposure to information, which in turn was associated with early initiation and diet diversity. The association between social participation and exposure to IYCF knowledge is consistent with findings from other studies. Group membership in specific nutrition education or mother-to-mother support groups has shown to have a positive association with maternal information and knowledge.[53,54] For example, participation in a group-based maternal education program in eastern India improved dietary diversity in children under two years.[55] Group-based approach is increasingly considered as an important strategy to improve maternal and child nutrition outcomes through multiple social, economic, and agricultural paths.[25,56] Evidence also suggests that group membership through targeted nutrition programming

and relevant messages are most effective in bringing about positive results.[25] Our findings on mediation through exposure to IYCF practices lend empirical evidence to a possible path of social participation that increases awareness of appropriate IYCF practices, which is then translated to following the recommended IYCF practices. The findings from our path analysis may also suggest that increase in social participation may increase access to multiple health information resources through improved uptake of services and higher frequency of social interaction to be exposed to the IYCF messages.[57] The positive relationship between social participation and exposure to IYCF practices may also highlight higher mobility in women to access information, which is important for bargaining power.

Group membership is a part of structural social capital,[58] which also includes network size and characteristics, such as literacy level, or cognitive social capital. While not available in our dataset, these social capital factors may also play an important role in child nutrition outcomes.[59] For example, cognitive social capital, which captures dimensions of trust, social harmony, and cohesion, is consistently shown to be associated with child nutrition.[60] Our results on the positive relationship between exposure to IYCF messages and early initiation and dietary diversity also suggest possible increase in knowledge that may affect following recommended practices. Gaining knowledge and improving awareness are cognitive processes that need further investigation to understand how they may relate to bargaining power and IYCF practices.

Household decision-making was significantly associated with exclusive breastfeeding and early initiation. This finding is consistent with several studies showing that increased household decision-making is related to improved IYCF practices. For

example, with regards to exclusive breastfeeding, financial autonomy was positively associated with breastfeeding in infants 3-5 months in rural India.[37] Mother's autonomy in child feeding is shown to be positively associated with exclusive breastfeeding in Vietnam.[61] Our results may likely be driven by the fact that a majority of the mothers made the household decision-making child health and child feeding, which is especially critical for exclusive breastfeeding. Household decision-making was significantly related to exposure to IYCF messages, which suggests that other decisions such as on mobility or expenditure may also be important to be exposed to relevant information. Exposure to IYCF messages did not mediate the relationship between household decision-making and exclusive breastfeeding, which may be related to relatively smaller sample size insufficient to capture the effect of the relationship.

The lack of a significant relationship between household decision-making with other IYCF practices suggest that other practices may require support from other members of the family or community and/or may be dependent on other household aspects such as food security or access to health care in addition to having decision-making control. Prior literature on household decision-making and IYCF practices has been limited with mixed results for complementary feeding practices. For example, household decision-making was only significantly related to minimum meal frequency and minimal acceptable diet in two countries out of 10 countries in a multi-country study from sub-Saharan Africa.[62] Mothers with low involvement in household decision-making had lower dietary diversity in a review of factors affecting feeding practices in South Asia, however the effect size was small.[63] Women in South Asia have overall low household decision-making control.[64] Material resource constraints for food acquisition

and preparation may hinder mother's provision of adequate quantity and quality of food and have a differential effect on IYCF practices than decision-making. Some of the effect on feeding practices may also be influenced by other female figures in the household such as mothers-in-law, therefore, understanding the relative bargaining power of the mother in comparison to the mother-in-law may provide information on other household members who can affect child feeding.

Ownership and control of assets was not positively associated with increased exposure to IYCF information or any of the IYCF practices. This is contrary to expectation because women with more assets may more likely have higher exposure to IYCF information, as they may be better able to access resources that provide health information having access to transportation to seek care and information, possessing media such as TV, radio, and phone, which can help with improved access to information.[20–22,65–67] Regression analyses to examine the relationship between ownership and control of individual assets and IYCF information (results not shown) suggested owning a phone was positively associated with exposure to IYCF information. While more research is needed to provide empirical evidence on mobile health technology, IYCF messages, and related practices, studies exploring the relationship between different forms of media suggest that, given the rapid increase in mobile usage in developing countries, this avenue should be exploited for access to information.[22,68] Our finding on the relationship of individual assets with IYCF information suggests that more research is needed to understand and evaluate the trade-offs between using a whole scale measure versus more specific items that focus on distinct aspects on gaining nutrition knowledge and improving practices.

Ownership and control of assets did not have a direct association with any of the IYCF outcomes. While women's economic independence may relate to child nutrition, with regards to IYCF practices, the results have been mixed. For example, in India, maternal wealth as determined by her employment and household wealth had no significant positive association with IYCF practices.[69] In resource-poor settings, mothers may prioritize finances to cover costs that affect the whole household or may to choose quantity of food to satiate hunger over dietary diversity, which may be more cost prohibitive, thus access to and control of economic resources may not have a large effect on IYCF practices.

Workload was not significantly associated with IYCF practices. This finding is contrary to our expectation. Care for children could be compromised when mothers have a higher workload and more time is allocated to other activities or if children are left unattended.[70] Working mothers may not get enough opportunity to exclusively breastfeed their child.[30,31,71] Time allocation may be contextual and may affect IYCF practices differently. For example, data from women's empowerment in agriculture in five countries suggest that women involved in agricultural activities have greater diet diversity and that this was related to production diversity.[29] Therefore, women spending more time working for wages or in subsistence agriculture may be able to provide diverse foods, irrespective of access to information. We also did not find any significant indirect effect through exposure to IYCF information for workload except for a small effect with early initiation. Research related to health-seeking behavior or healthcare utilization in India, Vietnam, and Ethiopia show that heavy workload and time constraints limit a woman's ability to seek care.[27,71,72] Future research can help our understanding of

specific aspects of women's time allocation for care practices that may relate most to IYCF practices.

We did not find a significant relationship between all domains and child nutrition, which highlights that specific bargaining domains may be key in improving practices. For example, higher household decision-making was directly associated with exclusive breastfeeding and to a small extent with early initiation. Given a mother's role as a primary caregiver, mothers would be expected to be more involved in child feeding-related decision-making. Lack of a significant finding between the economic domain and either breastfeeding and early initiation suggests that while women may be better able to access health resources if they have more economic control, this control and access to economic resources likely has less effect on breastfeeding feeding behaviors. Conversely, women's social participation is more likely to be associated with information to IYCF information and dietary diversity, which suggests that domains other than decision-making control are more important to affect complementary feeding behaviors that involve interactions or process other than only the mother and the child. No significant direct relationship between other domains may suggest the need for measures that capture specific aspects of IYCF practices. For example, information on economic control of food resources or food expenditure may more precisely capture the relationship between economic control of resources and dietary diversity. Similarly, measures for assessing time spent in feeding or food-related practices for the child may be helpful in understanding the overall workload in relation to child feeding practices.

To our knowledge, this is the first study to have simultaneously examined several domains of household bargaining and several IYCF practices in South Asia. This study

provides a comprehensive view of the social, economic, and cultural aspects of household bargaining power and IYCF practices. Additionally, we focused on testing a possible mechanism linking bargaining power and IYCF outcomes. Understanding potential mechanisms is essential for elucidating the nature of relationships between bargaining power and IYCF practices. Our study shows that certain bargaining domains are related to accessing IYCF information, thereby highlighting the need for behavior change interventions to address gender-related barriers in gaining access to IYCF information.

The cross-sectional data do not allow us to make any causal inferences. Owing to the specific age-range for exclusive breastfeeding, our sample size for this outcome was small. The data for the different bargaining domains and IYCF practices are self-reported; therefore the possibility of socially biased responses cannot be ruled out, especially for responses related to household decision-making. For social participation, availability of measures about network characteristics may have provided a more nuanced view of its relationship with IYCF information access and IYCF practices.

Future research could focus on specific aspects of the individual domains of bargaining. For example, cognitive aspects of social capital such as trust, perceived support, and/or reciprocity could be combined with the structural aspects of participation and size of the network to understand the relative contribution of each aspect to influence IYCF practices. Mechanisms linking bargaining power to knowledge or intention of IYCF practices could be assessed to provide evidence of relationship between bargaining and cognitive processes such as knowledge and intention, which are shown to be associated with practices.[73] Since exposure to IYCF information could potentially promote nutrition knowledge and possible practices through more social participation,

greater investments could be made to improve women's participation. Combining nutrition messaging with social participation can help maximize women's use of social resources and time to build social capital, offer opportunities to economically contribute to the household, and improve nutrition knowledge and related-self efficacy. Interventions could also focus on involving mothers and grandmothers, who are known to influence feeding habits and are involved in child feeding to participate together in group-based programs to target multiple members of the household who can support a mother in following appropriate IYCF practices. Overall, our study highlights that addressing poor feeding practices will require strengthening women's bargaining power and exposure to IYCF information.

REFERENCES

1. Menon P, Bamezai A, Subandoro A, Ayoya MA, Aguayo V. Age-appropriate infant and young child feeding practices are associated with child nutrition in India: insights from nationally representative data. *Matern Child Nutr*. 2015;11(1):73-87. doi:10.1111/mcn.12036.

2. Jones AD, Ickes SB, Smith LE, et al. World Health Organization infant and young child feeding indicators and their associations with child anthropometry: a synthesis of recent findings. *Matern Child Nutr*. August 2013:1-17. doi:10.1111/mcn.12070.

3. Bhutta ZAZ, Ahmed T, Black RER, et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 2008;371(9610):417-440. doi:10.1016/S0140-6736(07)61693-6.

4. Ministry of Health Nepal, New ERA Nepal, ICF International. *Nepal Demographic and Health Survey 2016*.; 2017. https://dhsprogram.com/publications/publication-FR336-DHS-Final-Reports.cfm. Accessed November 27, 2017.

5. Nepal Ministry of Health and Population, New Era, ICF International. *Nepal Demographic and Health Survey 2011*.; 2012.

6. Headey DD, Hoddinott J. Understanding the rapid reduction of undernutrition in Nepal, 2001-2011. *PLoS One*. 2015;10(12). doi:10.1371/journal.pone.0145738.

7. Cunningham K, Headey D, Singh A, Karmacharya C, Pandey Rana P. Maternal and Child Nutrition in Nepal: Examining drivers of progress from the mid-1990s to 2010s. *Glob Food Sec*. 2017;13:30-37. doi:10.1016/j.gfs.2017.02.001.

8. Black RE, Alderman H, Bhutta ZA, et al. Maternal and child nutrition: building momentum for impact. *Lancet*. 2013;382(9890):372-375. doi:10.1016/S0140-6736(13)60988-5.

9. Bryce J, Coitinho D, Darnton-Hill I, Pelletier D, Pinstrup-Andersen P. Maternal and child undernutrition: effective action at national level. *Lancet*. 2008;371(9611):510-526. doi:10.1016/S0140-6736(07)61694-8.

10. Bhutta ZA, Das JK, Rizvi A, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *Lancet*. 2013;382(9890):452-477. doi:10.1016/S0140-6736(13)60996-4.

11. Hoddinott J, Maluccio JA, Behrman JR, Flores R, Martorell R. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *Lancet*. 2008;371(9610):411-416. doi:10.1016/S0140-6736(08)60205-6.

12. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340-357. doi:10.1016/S0140-6736(07)61692-4.

13. Taukobong HFG, Kincaid MM, Levy JK, et al. Does addressing gender inequalities and empowering women and girls improve health and development programme outcomes? *Health Policy Plan*. 2016;31(10):1492-1514. doi:10.1093/heapol/czw074.

14. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Matern Child Nutr*. February 2014. doi:10.1111/mcn.12113.

15. Doss C. Intrahousehold Bargaining and Resource Allocation in Developing Countries. *World Bank Res Obs*. 2013;28(1):52-78. doi:10.1093/wbro/lkt001.

16. Haddad L, Hoddinott J, Alderman H. *Intrahousehold Resource Allocation: An Overview*.; 1994.

17. Agarwal B. "Bargaining" and Gender Relations: Within and Beyond the Household. *Fem Econ*. 1997;3(1):1-51. doi:10.1080/135457097338799.

18. Richards E, Theobald S, George A, et al. Going beyond the surface: Gendered intra-household bargaining as a social determinant of child health and nutrition in low and middle income countries. *Soc Sci Med*. 2013;95:24-33. doi:10.1016/j.socscimed.2012.06.015.

19. Engle PL, Menon P, Haddad L. Care and nutrition: concepts and measurement. *World Dev*. 1999;27(8):1309-1337.

20. Teijlingen van E, Simkhada B, van Teijlingen E, Porter M, Simkhada P. Major problems and key issues in Maternal Health in Nepal. *Kathmandu Univ Med J*. 2006;4(14):258-263.

21. Demilew YM. Factors associated with mothers' knowledge on infant and young child feeding recommendation in slum areas of Bahir Dar City, Ethiopia: cross sectional study. *BMC Res Notes*. 2017;10(1):191. doi:10.1186/s13104-017-2510-3.

22. Wu Q, Scherpbier RW, van Velthoven MH, et al. Poor infant and young child feeding practices and sources of caregivers' feeding knowledge in rural Hebei Province, China: findings from a cross-sectional survey. *BMJ Open*. 2014;4(e005108):e005108. doi:10.1136/bmjopen-2014-005108.

23. Lin N. Building a Network Theory of Social Capital. *Connections*. 1999;22(1):28-51. http://www.insna.org/PDF/Connections/v22/1999_I-1-4.pdf. Accessed November 27, 2017.

24. Harpham T, De Silva M, Jones N, Garlick C. *Maternal Social Capital and Child Wellbeing in Comparative Perspective*. London; 2006.

25. Kumar N, Scott S, Menon P, et al. Pathways from women's group-based programs to nutrition change in South Asia: A conceptual framework and literature review. *Glob Food Sec*. 2017. doi:10.1016/j.gfs.2017.11.002.

26. Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU. Women's Empowerment in Agriculture: What Role for Food Security in Bangladesh? *World Dev*. 2014;61:11-52. doi:10.1016/j.worlddev.2014.03.025.

27. Duong D, Binns CW, Lee A. Utilization of delivery services at the primary health care level in rural Vietnam. *Soc Sci Med*. 2004;59(12):2585-2595. doi:10.1016/J.SOCSCIMED.2004.04.007.

28. Berhane Y, Gossaye Y, Emmelin M, Hogberg U. Women's health in a rural setting in societal transition in Ethiopia. *Soc Sci Med*. 2001;53(11):1525-1539. doi:10.1016/S0277-9536(00)00441-X.

29. Komatsu H, Malapit HJL, Theis S. How Does Women's Time in Reproductive Work and Agriculture Affect Maternal and Child Nutrition? Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal. *SSRN Electron J*. December 2015. doi:10.2139/ssrn.2741272.

30. Jones A, Agudo Y, Galway L, Bentley J, Pinstrup-Andersen P. Heavy agricultural workloads and low crop diversity are strong barriers to improving child feeding practices in the Bolivian Andes. *Soc Sci Med*. 2012;75(9):1673-1684. doi:10.1016/J.SOCSCIMED.2012.06.025.

31. Locks LM, Pandey PR, Osei AK, et al. Using formative research to design a context-specific behaviour change strategy to improve infant and young child feeding practices and nutrition in Nepal. *Matern Child Nutr*. 2015;11(4):882-896. doi:10.1111/mcn.12032.

32. Avula R, Menon P, Saha KK, et al. A program impact pathway analysis identifies critical steps in the implementation and utilization of a behavior change communication intervention promoting infant and child feeding practices in Bangladesh. *J Nutr*. 2013;143(12):2029-2037. doi:10.3945/jn.113.179085.

33. Hackett KM, Mukta US, Jalal CSB, Sellen DW. A qualitative study exploring perceived barriers to infant feeding and caregiving among adolescent girls and young women in rural Bangladesh. *BMC Public Health*. 2015;15(1):771. doi:10.1186/s12889-015-2115-5.

34. Sanghvi T, Jimerson A, Hajeebhoy N, Zewale M, Nguyen GH. Tailoring Communication Strategies to Improve Infant and Young Child Feeding Practices in Different Country Settings. *Food Nutr Bull*. 2013;34(3_suppl2):S169-S180. doi:10.1177/15648265130343S204.

35. Cunningham K, Ruel M, Ferguson E, Uauy R. Women's empowerment and child nutritional status in South Asia: a synthesis of the literature. *Matern Child Nutr*. 2014;11:1-19. doi:10.1111/mcn.12125.

36. Brennan L, McDonald J, Shlomowitz R. Infant feeding practices and chronic child malnutrition in the Indian states of Karnataka and Uttar Pradesh. *Econ Hum Biol*. 2004;2(1):139-158. doi:10.1016/j.ehb.2003.09.003.

37. 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. doi:10.1016/j.socscimed.2011.05.040.

38. Malapit HJL, Kadiyala S, Quisumbing AR, Cunningham K, Tyagi P. Women's Empowerment Mitigates the Negative Effects of Low Production Diversity on Maternal and Child Nutrition in Nepal. *J Dev Stud*. 2015;51(8):1097-1123. doi:10.1080/00220388.2015.1018904.

39. Cunningham K, Ploubidis GB, Menon P, et al. Women's empowerment in agriculture and child nutritional status in rural Nepal. *Public Health Nutr*. 2015;18(17):3134-3145. doi:10.1017/S1368980015000683.

40. Bhagowalia P, Menon P, Quisumbing A. *What Dimensions of Women's Empowerment Matter Most for Child Nutrition? Evidence Using Nationally Representative Data from Bangladesh*.; 2012. http://agris.fao.org/agris-search/search.do?recordID=QB2015107363. Accessed July 14, 2016.

41. Adhikari M, Khanal V, Karkee R, et al. Factors associated with early initiation of breastfeeding among Nepalese mothers: further analysis of Nepal Demographic and Health Survey, 2011. *Int Breastfeed J*. 2014;9(1):21. doi:10.1186/s13006-014-0021-6.

42. Quisumbing AR, De La Brière B. *Women's Assets and Intra-Household Allocation in Rural Bangladesh: Testing Measures of Bargaining Power*.

43. Sharma SK, Sawangdee Y, Sirirassamee B. Access To Health: Women's Status And Utilization of Maternal Health Services In Nepal. *J Biosoc Sci*. 2007;39(5):671. doi:10.1017/S0021932007001952.

44. Vanderweele TJ. *Explanation in Causal Inference: Methods for Mediation and Interaction*. New York, NY, USA: Oxford University Press; 2015.

45. Addo OY, Stein AD, Fall CH, et al. Maternal Height and Child Growth Patterns. *J Pediatr*. 2013;163(2):549-554.e1. doi:10.1016/j.jpeds.2013.02.002.

46. Miller LC, Joshi N, Lohani M, et al. Women's education level amplifies the effects of a livelihoods-based intervention on household wealth, child diet, and child growth in rural Nepal. *Int J Equity Health*. 2017;16. doi:10.1186/s12939-017-0681-0.

47. Vir SC. Improving women's nutrition imperative for rapid reduction of childhood stunting in South Asia: coupling of nutrition specific interventions with nutrition sensitive measures essential. *Matern Child Nutr*. 2016;12(S1):72-90. doi:10.1111/mcn.12255.

48. Kabeer N. Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gend Dev*. 2005;13(1):13-24.

49. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Chang*. 1999;30(May):435-464.

50. Mosedale S. Assessing women's empowerment: towards a conceptual framework. *J Int Dev*. 2005;17(2):243-257. doi:10.1002/jid.1212.

51. Malhotra A, Mather M. Do Schooling and Work Empower Women in Developing Countries? Gender and Domestic Decisions in Sri Lanka. *Sociol Forum*. 1997;12(4):599-630. doi:10.1023/A:1022126824127.

52. Van den Bold M, Quisumbing AR, Gillespie S. *Women's Empowerment and Nutrition: An Evidence Review*. Washington D.C.; 2013.

53. Singh A, Klemm RD, Mundy G, Pandey Rana P, Pun B, Cunningham K. Improving maternal, infant and young child nutrition in Nepal via peer mobilization. *Public Health Nutr*. November 2017:1-11. doi:10.1017/S1368980017002993.

54. Lutter CK, Iannotti L, Creed-Kanashiro H, et al. Key principles to improve programmes and interventions in complementary feeding. *Matern Child Nutr*. 2013;9(S2):101-115. doi:10.1111/mcn.12087.

55. Nair N, Tripathy P, Pradha H, et al. Effect of participatory women's groups and counselling through home visits on children's linear growth in rural eastern India (CARING trial): a cluster-randomised controlled trial. *Lancet Glob Heal*. 2017;5:e1004-e1016. doi:10.1016/S2214-109X(17)30339-X.

56. Brody CM, De Hoop T, Vojtkova M, Warnock R, Dunbar M. Economic Self-Help Group Programs for Improving Women' s Empowerment: A Systematic Review. *Campbell Syst Rev*. 2015;11(9).

57. Kanani S, Singh R, Baqar S, Mahajan U, Belwal LM. *Using Participatory Learning and Action to Empower Women's Groups to Improve Feeding Practices in Madhya Pradesh*.; 2015. http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/.

58. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health Place*. 2007;13(2):341-355. doi:10.1016/j.healthplace.2006.02.005.

59. Moestue H, Huttly S, Sarella L, Galab S. "The bigger the better" – mothers' social networks and child nutrition in Andhra Pradesh. *Public Health Nutr*. 2007;10(11):1274-1282. doi:10.1017/S1368980007702896.

60. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health Place*. 2007;13(2):341-355. doi:10.1016/j.healthplace.2006.02.005.

61. Duong D V, Lee AH, Binns CW. Determinants of breast-feeding within the first 6 months post-partum in rural Vietnam. *J Paediatr Child Health*. 2005;41(7):338-343. doi:10.1111/j.1440-1754.2005.00627.x.

62. Na M, Jennings L, Talegawkar SA, Ahmed S. Association between women's empowerment and infant and child feeding practices in sub-Saharan Africa: an analysis of Demographic and Health Surveys. *Public Health Nutr*. 2015;18(17):3155-3165. doi:10.1017/S1368980015002621.

63. Senarath U, Agho KE, Akram D-S, et al. Comparisons of complementary feeding indicators and associated factors in children aged 6-23 months across five South Asian countries. *Matern Child Nutr*. 2012;8(s1):89-106. doi:10.1111/j.1740-8709.2011.00370.x.

64. Acharya DR, Bell JS, Simkhada P, van Teijlingen ER, Regmi PR. Women's autonomy in household decision-making: a demographic study in Nepal. *Reprod Health*. 2010;7(1):15. doi:10.1186/1742-4755-7-15.

65. Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic Status, Education and Empowerment: Implications for Maternal Health Service Utilization in Developing Countries. Shea BJ, ed. *PLoS One*. 2010;5(6):e11190. doi:10.1371/journal.pone.0011190.

66. Abate KH, Belachew T. Women's autonomy and men's involvement in child care and feeding as predictors of infant and young child anthropometric indices in coffee farming households of Jimma Zone, South West of Ethiopia. Renzaho AMN, ed. *PLoS One*. 2017;12(3):1-16. doi:10.1371/journal.pone.0172885.

67. Currie D, Wiesenberg S. Promoting women's health-seeking behavior: research and the empowerment of women. *Health Care Women Int*. 2003;24(10):880-899. doi:10.1080/07399330390244257.

68. Vitta BS, Benjamin M, Pries AM, Champeny M, Zehner E, Huffman SL. Infant and young child feeding practices among children under 2 years of age and maternal exposure to infant and young child feeding messages and promotions in Dar es Salaam, Tanzania. *Matern Child Nutr*. 2016;12(S2):77-90. doi:10.1111/mcn.12292.

69. Malhotra N. Inadequate feeding of infant and young children in India: lack of nutritional information or food affordability? *Public Health Nutr*. 2013;16(10):1723-1731. doi:10.1017/S1368980012004065.

70. Samman E, Presler-Marshall E, Jones N, et al. *Women's Work Mothers, Children and the Global Childcare Crisis*. London; 2016. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10333.pdf. Accessed July 28, 2016.

71. Kabir A, Maitrot MRL. Factors influencing feeding practices of extreme poor infants and young children in families of working mothers in Dhaka slums: A qualitative study. Wieringa F, ed. *PLoS One*. 2017;12(2):e0172119. doi:10.1371/journal.pone.0172119.

72. Garg S, Agarwal P, Singh M. Maternal health-care utilization among women in an urban slum in Delhi. *Indian J Community Med*. 2007;32(3):203. doi:10.4103/0970-0218.36829.

73. Nguyen PH, Kim SS, Nguyen TT, et al. Exposure to mass media and interpersonal counseling has additive effects on exclusive breastfeeding and its psychosocial determinants among Vietnamese mothers. *Matern Child Nutr*. 2016;12(4):713-725. doi:10.1111/mcn.12330.

Table 4.1: Descriptive statistics of child, maternal, and household characteristics for children under 24 months and their mothers in *Suaahara* study in Nepal

Variable	N	Mean (SD) or %	Range
Child Characteristics			
Child age (months)	1787	12.3 (6.74)	0-23.9
Child gender (female)	1787	49.3	-
Infant and Young Child Feeding (IYCF) practices			
Early initiation (age: 0-23 mo)	1787	39.0	-
Exclusive breastfeeding (age: 0-6 mo)	385	49.3	-
Minimum meal frequency (age: 6-23 mo)	1402	72.2	-
Minimum dietary diversity (age: 6-23 mo)	1402	45.58	-
Dietary diversity score (age: 6-23 mo)	1402	3.33 (1.20)	0-7
Maternal Characteristics			
Intra-household bargaining domains			
Ownership and control of assets	1787	2.78 (2.25)	0-9
Social participation (%)	1679	15.72	-
Social participation score	1679	0.21(0.55)	0-5
Time allocated to work/ 24 hours	1787	10.98 (2.98)	0.58-18.9
Proportion of Household decision-making	1787	75.6 (21.4)	0-100
Exposure to IYCF information	1787	4.82(2.07)	0-8
Maternal age (years)	1787	24.9 (5.59)	15-52
Maternal height (cm)	1786	151.6 (5.50)	133.2-179.5
Maternal years of schooling	1786	5.16 (4.48)	0-15
Household Characteristics			
Children under 5 years	1787	1.42 (0.62)	1-5
Household wealth (assets)	1787	5.81 (3.65)	0-26
Agro-ecological area	1787		
Mountain		25.1	
Hills		50.6	
Terai		24.3	

Table 4.2: Bivariate associations of child, maternal, and household characteristics with IYCF practices in children 0-24 months in *Suaahara* study in Nepal

Variable	**Early initiation** N=1677 OR (P-value)	**Exclusive breastfeeding** N=362 OR (P-value)	**Minimum meal frequency** N=1315 OR (P-value)	**Dietary Diversity** N=1315 Coefficient (P-value)
Child Characteristics				
Child age (months)	0.996 (P=0.593)	0.491 (P<0.001)	1.044 (P<0.001)	0.0720 (P<0.001)
Child gender (female)	0.920 (0.402)	1.359 (P=0.146)	1.277 (0.049)	0.0836 (P=0.208)
Maternal Characteristics				
Ownership and control of assets	0.984 (P=0.457)	1.0308 (P=0.523)	1.004 (P=0.870)	-0.00563 (P=0.702)
Social Participation	0.885 (P=0.376)	1.307 (P=0.378)	0.976 (P=0.886)	0.147 (P=0.102)
Workload	0.989 (P=0.525)	0.949 (P=0.108)	**1.046 (P=0.033)**	0.00991 (P=0.389)
Household decision-making	1.175 (P=0.490)	**2.468 (P=0.076)**	0.951 (P=0.863)	-0.0536 (P=0.730)
Exposure to IYCF information	**1.116 (P<0.001)**	1.020 (P=0.720)	1.005 (P=0.874)	**0.0968 (p<0.001)**
Maternal age (years)	0.973 (0.004)	0.999 (0.960)	0.990 (P=0.383)	-0.0133 (P=0.030)
Maternal height (cm)	1.011 (0.234)	1.046 (P=0.022)	0.996 (P=0.758)	0.0109 (P=0.069)
Maternal years of schooling	1.028 (0.013)	0.965 (P=0.121)	1.020 (P=0.148)	0.0622 (P<0.001)
Household				
Children under 5 years	0.935 (0.412)	1.171 (P=0.296)	0.904 (0.334)	-0.265 (P<0.001)
Household wealth (assets)	1.019 (0.179)	0.920 (P=0.005)	0.979 (0.220)	0.0595 (P<0.001)
Agro-ecological area				
Mountain	Ref	Ref	Ref	Ref
Hills	1.194 (P=0.146)	0.979 (P=0.936)	0.560 (P<0.001)	0.0622 (P=0.435)
Terai	1.127 (P=0.408)	0.426 (P=0.004)	0.478 (P<0.001)	-0.166 (P=0.087)

Table 4.3: Individual path coefficients for relationship between the bargaining domains, exposure to IYCF information, and IYCF outcomes

	Early initiation	**Exclusive breastfeeding**	**Minimum Meal frequency**	**Dietary Diversity**
	N=1677	**N=362**	**N=1315**	**N=1315**
	Model 1	**Model 2**	**Model 3**	**Model 4**
Leg 1 [a]				
Ownership & control of assets	0.00754 (P=0.845)	-0.0506 (P=0.449)	0.0290 (P=0.467)	0.0290 (P=0.467)
Social participation	0.266 (P<0.001)	0.390 (P<0.001)	0.214 (P=0.013)	0.214 (P=0.013)
Workload	0.0526 (P=0.044)	0.0476 (P=0.331)	0.0492 (P=0.096)	0.0492 (P=0.096)
Household decision-making	0.0131 (P=0.710)	0.0783 (P=0.064)	-0.0150 (P=0.699)	-0.0150 (P=0.699)
Leg 2 [b]				
Exposure to IYCF Information	0.241 (P=0.001)	0.185 (P=0.202)	-0.00754 (P=0.925)	0.0596 (P=0.014)
Direct Effect [c]				
Ownership & Control of assets	-0.0912 (P=0.300)	-0.172 (P=0.346)	0.0278 (P=0.753)	-0.0205 (P=0.404)
Social Participation	-0.210 (P=0.209)	0.218 (P=0.572)	-0.197 (P=0.239)	-0.0514 (P=0.466)
Workload	-0.0287 (P=0.611)	0.0205 (P=0.898)	0.0893 (P=0.159)	0.0167 (P=0.478)
Household decision-making	0.132 (P=0.042)	0.350 (P=0.036)	-0.0105 (P=0.898)	0.0337 (P=0.203)
Indirect Effect [d]				
Social Participation	0.0642 (P=0.010)	-	-	0.0128 (P=0.071)
Workload	0.0127 (P=0.080)			

[a] Leg 1 denotes the relationship between bargaining domains and exposure to IYCF information, the first leg of the indirect path.

[b] Leg 2 denotes the relationship between exposure to IYCF information and IYCF outcomes, the second leg of the indirect path.

[c] Direct effect denotes the direct path from bargaining domains and IYCF outcomes.

[d] Total indirect effect calculated for significant paths for leg1 and leg2 and is the product of coefficients of leg 1 and leg 2

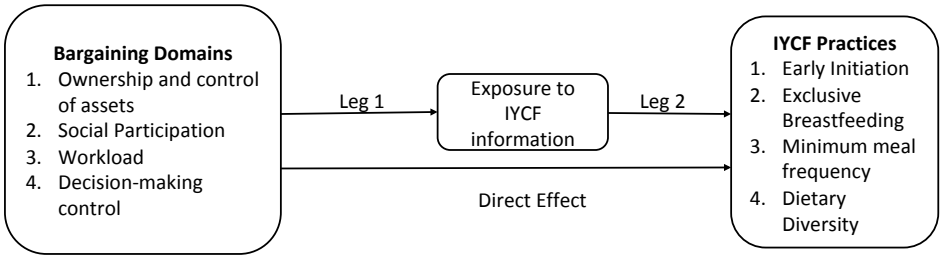

Figure 4.1: Path diagram for generalized structural equation modeling

4.2 MANUSCRIPT 2

Examining the relationship between gendered intra-household bargaining power, household food insecurity, and child nutritional status in rural Nepal[2]

[2] Kulkarni S., Frongillo E.A., Cunningham K., Moore S., Blake C.E. To be submitted

ABSTRACT

Objectives: Women's intra-household bargaining power is an important determinant of child nutritional status, but more research is needed to understand how men's bargaining power individually and together with women's bargaining power is related to child nutrition and the mechanisms through which this linkage occurs. The objectives of this study were to 1) understand how intra-household bargaining of women and men is related to child height-for-age z-score (HAZ), and 2) if household food insecurity mediates the relationship between women's and men's intra-household bargaining and HAZ because food insecurity is an important predictor of child nutritional status, and is also shown to be associated with women's bargaining power.

Methods: We conducted a cross-sectional analysis of the baseline data from 2012 for an impact evaluation of the *Suaahara* program in rural Nepal in 2,166 households with children aged 0-59 months, their mothers, and their fathers or other male respondents involved in making major household economic decisions. Intra-household bargaining power for women and men consisted of four domains: 1) ownership and control of assets, 2) social participation, 3) workload, and 4) household decision-making control. We used multilevel modeling to assess the relationship between HAZ and women's bargaining power, men's bargaining power, women's and men's bargaining power together, and the interaction between women's and men's bargaining power. Generalized structural equation modeling was used to test household food insecurity as a mediator.

Results: In the multilevel analysis, women's workload was negatively associated with HAZ in the women's bargaining model and in the combined model of women's and men's bargaining, while men's social participation was positively associated with HAZ in the men's bargaining model and the combined model. No significant interactions were

found between men's and women's bargaining domains suggesting that the relationship between women's bargaining and child HAZ was not moderated by men's bargaining power. Food insecurity was a partial mediator such that women's ownership and control of assets and men's social participation were negatively associated with food insecurity, which in turn was negatively associated with child HAZ.

Conclusions: Women's workload and ownership and control of assets, and men's social participation, may be important domains to improve child HAZ. Program strategies could include comprehensively promoting women's bargaining power, while also promoting men's engagement in nutrition programming.

INTRODUCTION

Over the past two decades, Nepal has experienced a significant reduction in the prevalence of child undernutrition.[1,2] This encouraging downward trend, however, still shows a substantial burden of child undernutrition with 36% of children below five years being classified as stunted.[1] Efforts to reduce child undernutrition are critical because adverse effects of stunting span across the life course in early childhood development, schooling outcomes, adult health and nutrition, birth outcomes, productivity, and income and wages.[3–5] Strategies for reducing undernutrition increasingly employ nutrition-specific and nutrition-sensitive interventions that address the socioeconomic and cultural factors that influence child nutrition including women's household status.[6,7]

Women's status is an important determinant of child nutritional status.[8,9] Women's household status is reflected in intra-household bargaining power, which refers to the relative social and economic position of a woman within a household.[10–12] Bargaining power encompasses two aspects: access to and control of resources, and

decision-making control.[11] An individual's access to economic resources such as assets and social resources such as social capital can increase their influence within the household and improve knowledge and awareness. Higher decision-making control may indicate greater bargaining to influence health, economic, and social decisions that can affect self or others.[11] In resources poor-settings, time allocation is critical for women as they are involved in domestic and productive work, thereby creating gendered workload, which can influence access to and control of other social, economic, and health resources and may negatively impact bargaining power within the household.[13,14]

Improved child nutritional status is generally associated with mothers who have more social and economic resources at their disposal and better decision-making control in the household.[15,9] While there is evidence on the relationship between women's bargaining power and child nutrition, two related issues that need greater attention in research, programs, and policies are: 1) understanding the role of men's bargaining power in child nutrition, and 2) identifying the mechanisms linking intra-household bargaining power and child nutrition.

In South Asia, deeply-rooted patriarchal systems greatly determine the household power structure and women's low bargaining power within a household.[16,17] Studying men's role in intra-household bargaining would provide a comprehensive picture of household dynamics and its possible influence on child nutrition. To date, literature on men's role in child nutrition has mainly focused on father's education as a determinant or confounder of child nutritional status or health, and is shown to be associated with significantly lower odds of stunting, better paternal health knowledge, and improved health practices such as vitamin A supplementation, use of iodized salt, and child

immunization.[18,19] Greater agreement on who makes household decisions between spouses has been shown to be associated with better family planning, and maternal and child health care utilization such as seeking antenatal care.[20,21] The above evidence suggests that men's bargaining power is related to several predictors of child nutrition and that men may play an important role in child's health and related behaviors through their influence on decisions. Hence, it is essential to understand how men's bargaining power relates to child nutritional status. As research and interventions move toward addressing more distal factors of child nutrition, examining men's role in child nutrition is critical in gaining a nuanced understanding on how specific domains of bargaining for women and men may differentially influence child nutrition

Food insecurity is an important household determinant that is associated with women's bargaining power and child nutrition.[22] Women's bargaining power is critical in ensuring food security as women play a significant role in food production, procurement, and preparation [6,23]. Studies on women's empowerment in agriculture in Bangladesh and Nepal demonstrate its positive association with greater maternal and child dietary diversity.[24,25] Women's bargaining power can also promote more equitable allocation of economic resources to acquire food within the household for the mother and child, thereby resulting in better food security.[26–28] Consequently, food security can improve dietary quantity and quality, and may have a positive effect on child nutritional status. For example, a study in India showed that household food insecurity was associated with lower child dietary diversity, and that child dietary diversity was a significant predictor of stunting.[29] Elucidating paths between gendered bargaining power and child nutrition through food insecurity helps to address the current research gap on understanding

mechanisms through which women's status operates and relates to child nutrition.[15,30] Understanding the linking mechanisms can also suggest key factors that could be addressed through targeted nutrition interventions.[31–34]

Prior studies in Nepal on women's empowerment in agriculture have shown that specific domains related to workload and leisure, and gender parity in empowerment are associated child nutritional status. In this paper, we attempt to further the research on household bargaining power by 1) specifically understanding the relationship of different domains of men's bargaining power with child nutritional status including examining household decision-making control not done in prior studies, and 2) understanding mechanisms that link women's and men's bargaining power with child nutritional status.

The aim of our study was to understand the relationship between gendered intra-household bargaining and child nutritional status in rural Nepal. The specific objectives of this study were to 1) examine how women's and men's bargaining power is related to child HAZ, and 2) assess if household food insecurity mediates the relationship between women's and men's bargaining power and child HAZ.

METHODS

Study design and sampling

We conducted a secondary data analysis of the *Suaahara* program's cross-sectional baseline dataset, collected by trained enumerators in 2012. *Suaahara,* a multi-sectoral intervention, aims to improve the health and nutrition status of women and children in Nepal by increasing access to quality health and nutrition services, improving health and nutrition behaviors, and improving coordination between government and non-governmental stakeholders for nutrition promoting strategies. The program, initially

implemented from 2011-2016, is now in its second-phase (2016-2021) with interventions in 42 of Nepal's 77 districts. Ethical approval for data collection was obtained from the Nepal Health Research Council and for this secondary data analysis was obtained from the Institutional Review Board of University of South Carolina.

The sample for the *Suaahara* survey was acquired through multistage cluster sampling. For the first stage, 16 districts (8 intervention and 8 matched comparison) were purposefully selected. A total of 80 Village Development Committees (VDCs) were selected using probability proportional to size for the second stage with 5 VDCs per district. For the third stage, three rural wards were selected from each VDC using probability proportional to size to get a total of 240 wards. For the last stage, within each ward, 17 households with children under five years were randomly selected to obtain a total sample of 4,080 households. Within each household, one child less than five years of age was randomly selected as the index child for the survey and, if available, one child having the same biological mother as the index child was selected as the non-index child.

Interviews were conducted with the mother of the index child and with the father of the index child or when unavailable, another male household decision-maker or a female, if no males resided in the household. In this study, our sample consisted of households who had complete information on women's and men's bargaining domains (n=2,166) for children aged 0-59 months. Out of this sample, 1052 households had the father of the index child as the male respondent. Information was collected on child health and care, infant and young child feeding knowledge and practices, household food security, maternal diet diversity, women's empowerment, men's empowerment, information access, maternal health, water sanitation and hygiene, and child and maternal

anthropometry and hemoglobin. Anthropometric measurements were age-appropriate with children aged 0-23 months measured using supine length, while for children aged 24-59 months standing height was measured in duplicates by trained enumerators using standardized length boards (ShorrBoard produced by Weight and Measure LLC).[35]

Outcome Variables

Child height-for-age standard deviation z-scores (HAZ) based on the World Health Organization (WHO) growth standards were used.[36]

Explanatory Variables

Women's bargaining power was measured in four ways: 1) ownership and control of household assets, 2) social participation, 3) workload, and 4) household decision-making control. The variables for the specific domains were constructed as follows:

We used ten household assets to form an additive scale to measure ownership and control of assets. The ten assets used were: 1) house and other structures, 2) large consumer durables (e.g., fridge, TV, sofa), 3) small consumer durables (e.g., radio, cookware), 4) mobile phone, 5) transportation (motorized or non-motorized), 6) agricultural land, 7) non-agricultural land, 8) non-mechanized farm equipment, 9) large livestock, and 10) small livestock. If the household had a particular asset, we first assessed if the respondent solely or jointly owned that specific asset. If a respondent solely or jointly owned an asset, we also considered if s/he was involved in sole or joint decision-making about selling or renting of that asset.[25,37] For each asset, a value of 1 was assigned if the respondent solely or jointly owned that asset and was also involved in sole or joint decision-making about selling or renting of that asset. Since our study focus is on intra-household bargaining, which relates to the *relative* socioeconomic position, we

measured sole or joint ownership of assets as opposed to only sole ownership, which would indicate total autonomy. Values for all assets were summed to obtain a total score ranging from 0-10.

Social participation for women and men was based on active group membership in different community-based groups, where the participant regularly attended meetings, engaged in discussions and/or volunteered.[25,37] Participation in groups such as agricultural groups, water user's, land/forest users', credit or microfinance, mutual help or insurance group, trade or business association, civic groups, religious groups, mother's group or other women's groups was measured. A value of 1 was assigned for each group that a respondent participated. The total number of groups in which the respondent participated was calculated. As a majority of those with group membership participated in one group, we created a binary variable to indicate whether or not the respondent participated in any community group.

Workload domain measured the total time spent by the respondent on work activities in a 24-hour period.[25,37] Information was collected on all productive activities (work/ employment, agriculture activities, domestic work, and care for children/ adults/elders) and personal activities (sleeping and resting, personal care, time spent of leisure activities, and social and/or religious activities). To determine the workload measure, total time spent on domestic work, care for children and elders, wage work or employment, and subsistence activities such as farming and livestock, and schoolwork was calculated, based on the respondent's previous 24-hour recall.

Household decision-making control was measured based on respondent's sole or joint household decision-making on household economy, health of the family and self,

and domestic violence and mobility.[38] Since our focus was on intra-household bargaining, which relates to the *relative* socioeconomic position, we measured sole or joint decision-making as opposed to sole decision-making power, which would indicate total autonomy. The eight decisions used to create this measure were: 1) major household expenditures such as on refrigerator or TV, 2) minor household expenditures such as food for daily consumption or other household necessities, 3) use of family planning products, 4) respondent's health and nutrition, 5) children's healthcare, 6) child feeding, 7) how to keep from domestic violence, and 8) mobility to go to a relative or friend's house. Men's decision-making did not include items on domestic violence and mobility, therefore only six items were considered for men's decision-making. For each joint decision, we also assessed the extent of decision-making control. The response scale for the extent to which the respondent feels s/he can contribute to the joint decision was measured as 1= *not at all*, 2= *small extent*, 3= *some extent*, 4= *to a large extent*. For each type of decision, a person was adequate if s/he was the sole decision-maker, or for joint decision-making, if the respondent felt s/he can be involved at least to *some extent* of decision-making. We then calculated the proportion of a respondent's involvement in sole or joint decision-making. All decisions made in the household were computed for the denominator and a total of sole or joint decisions made served as the numerator.

Household food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS).[39] The mean HFIAS score in our sample was skewed towards the lower end of the score range. Using linear transformation for the scale score would be inappropriate for mediation analysis to compute the product of coefficients and determine the related direct and indirect effects. We, therefore, used the HFIAS prevalence

categories as a continuous variable with a score ranging from 1 (food secure) to 4 (severely food insecure). To ensure our interpretation and inference of the results would not differ, we first analyzed the relationship between food insecurity prevalence as a categorical variable and the outcome child HAZ (Reference category 1;β= -0.120, p=0.040 for score 2; β = -0.0783, p=0.279 for score 3; β =-0.280, p=0.058 for score 4). We then tested the relationship between food insecurity prevalence as a continuous category and HAZ (β= -0.0507, p=0.022). Both methods showed an overall negative relationship between food insecurity and child nutrition. We also separately assessed food insecurity as a continuous outcome variable and as a categorical variable using the ordered logit model with women's and men's bargaining domains as the explanatory variables. The interpretation of the relationship between bargaining domains and food insecurity did not differ using continuous versus categorical variable. Hence, we used the HFIAS prevalence as a continuous variable.

We considered certain maternal, child, and socioeconomic characteristics as potential confounders based on prior evidence suggesting an association with child HAZ, food insecurity, and/or bargaining power. For example, higher maternal education has been shown to be associated with higher HAZ, better food security, and bargaining power.[40,41] Household wealth can affect food and health resources, which could influence child HAZ. Agro-ecological areas were used to control for geographic differences in feeding practices and other cultural practices. The covariates used in all multivariable analyses were child age (months), child gender, maternal age (years), maternal height (centimeters), maternal education (years of formal schooling), number of children under 5 years living in the household, household wealth (sum of number of small durable

assets, large assets, and agricultural assets), if the respondent was in *Suaahara* control or intervention group, and agro-ecological zone of the household (t*erai,* hills, mountains). In all analyses, we accounted for village development committee level clustering (80 clusters) as random effects.

Statistical Analysis

All analyses were conducted in Stata SE version 14. Descriptive statistics were obtained through proportions, or means and standard deviation, as relevant to the variables. Bivariate relationship with child HAZ using simple linear regression was assessed for each of the main explanatory variables of bargaining power, food insecurity, and control variables. To describe the household decision-making control between spouses, we calculated percent agreement and kappa to understand whether there was agreement on who made specific household decisions. We assessed agreement on five household decisions: 1) major household expenditure, 2) minor household expenditure, 3) family planning decisions, 4) decisions regarding child's health, and 5) decision regarding child feeding. Agreement was assessed using seven categories: 1) mother of child solely takes the decision, 2) father of child solely takes the decision, 3) spouses jointly take the decision, 4) spouses and another person involved in decision-making, 5) mother and another person decides, 6) father and another person decides, and 7) only others decide. The sample size for each decision differed as it was based on whether or not both men and women had data on a particular decision and if a particular decision was made in a household. The response categories for persons involved in decision-making would only allow comparing joint decision between spouses. For example, if a mother responded that spouse makes a particular decision, she would be referring to the

father of the index child. If a male member who is not the spouse of the mother responded to a question that spouse makes a particular decision; he would not be referring to the mother of the index child. Hence, the percent agreement was only assessed between spouses.

We used multilevel modeling to assess the relationship between HAZ and women's bargaining power, men's bargaining power, women's and men's bargaining power together, and the interaction between women's and men's bargaining power to test if the relationship between women's bargaining power and HAZ is dependent on men's bargaining power. We used generalized structural equation (GSEM) modeling with household food insecurity as the mediator (Figure 4.2). Using GSEM, we employed this product-of-coefficients method where two regression models were analyzed- one model where child HAZ was regressed on the mediator (household food insecurity), main explanatory variables of bargaining power for women and/or men, and covariates, and another model where the mediator (household food insecurity) was regressed on the main explanatory bargaining variables and covariates. The indirect effect was obtained as a product of each bargaining domain coefficient on the mediator and the mediator coefficient on the outcome. The coefficient between each of the bargaining domains and child HAZ was the direct effect.

We met the following three assumptions for the recursive path analysis. First, we found no exposure-mediator interaction by testing for interaction between each of the women's bargaining domains and household food insecurity, and except for men's workload, there were no significant interactions between men's bargaining domains and food insecurity. Based on the interaction estimates, the effect of food insecurity on men's

average workload was close to zero (-0.049); hence, men's workload was included in the mediation analysis. Second, we included potential covariates in all regression analyses to account for confounding between bargaining power and household food insecurity, bargaining power and child HAZ, and food insecurity and child HAZ based on previous evidence.[42,41,43] Third, we used path analysis with cross-sectional data and justified no reverse causality based on theory related to women's empowerment that suggests women with greater access to resources and decision-making control are more likely to leverage their position for better health and nutrition outcomes[17,44–46] and previous research that highlights this relationship.[15,9,8]

In the mediation analysis, for the legs of the paths that were significant, the indirect effect was calculated as the product of the individual coefficients of each leg leading to the mediator and then to the outcome using the *nlcom* procedure to obtain appropriate test statistics, standard errors, and significance levels. The indirect effect was compared to the total effect, i.e., the sum of indirect effect and direct effect to assess the relative contribution of the indirect path. All continuous variables were standardized. To understand if there would be any difference in findings between men's sample that only included the spouse of the mother as compared to the entire male respondent sample, we also analyzed models with the sample that only included bargaining information on the father of the index child, n=1052. The results for this analysis did not differ from the main analysis and are therefore not presented further, but specific relevant findings are noted in the discussion section.

RESULTS

The mean child HAZ score was -1.71 (Table 4.4). Women's mean asset ownership and control score was 2.56, while for men it was 5.32. About 17% of women and men actively participated in at least one community group. Women solely or jointly participated in 74% of the eight household decisions while men solely or jointly participated in about 70% of the six household decisions. Women's mean time allocation for work was 11.1 hour in a day, while men worked 8.20 hours in a day.

Bivariate analysis showed that women's asset ownership and control slightly above significance level (0.056) and was positively associated with HAZ, while household decision-making control and workload were significantly associated with lower HAZ (Table 4.5). Bivariate relationship between women's social participation and child HAZ was not significant. Men's ownership and control of assets was not associated with HAZ. Men's social participation was associated with significantly higher HAZ, while household decision-making had a significant negative association with HAZ. Men's workload and child HAZ did not have a significant association.

Agreement between spouses on who makes household decisions was generally low as indicated by low percent agreement and related kappa (Table 4.6). Percent agreement between spouses was lowest for decisions regarding child health and highest for major household expenditure. Only 33.87% of the couples agreed on their sole or joint role in child health decision-making while 51.06% agreed on their decision-making control about major household expenditures.

We used four models for the multi-level regression analysis to explain the association of men's and women's bargaining power and child HAZ (Table 4.7). In

model 1, which tested for relationships between the four domains of women's bargaining power and HAZ, one standard deviation (SD) higher workload was significantly associated with 0.05 SD lower HAZ. Women's ownership and control of assets was not significantly associated with HAZ, while household decision-making was negatively related to HAZ with P-value slightly above significance level (P=0.058). In model 2, which tested for relationships between the same domains of men's bargaining power and HAZ, higher workload and ownership and control of assets were not significantly associated with HAZ. However, men's social participation was associated with 0.155 SD higher HAZ and household decision-making was associated with 0.039 lower HAZ (P=0.066). In model 3, the relationship between men and women's bargaining power together and child HAZ was tested. Women's ownership and control of assets was positively associated with child HAZ, while workload was negatively related to child HAZ. Men's social participation was positively associated with child HAZ. Women's and men's household decision-making control was negatively associated child HAZ, but at P-value less than 0.1. There were no significant interactions between any of the men's and women's bargaining domains (model 4) indicating that the relationship between maternal bargaining power and child HAZ was not moderated by men's bargaining power.

Results from mediation analysis are presented in Table 4.8. Model 5 represents testing food insecurity as a mediator between women's bargaining domains and HAZ. Women's ownership and control assets had a significant, positive, direct effect on child HAZ. Ownership and control of assets was also associated with lower food insecurity (leg 1, model 5), and in turn, food insecurity was negatively associated with child HAZ

(leg 2, model 5). This indirect path contributed to 5.92% of the total effect (Table 4.9). Women's workload had a direct, negative relationship, but food insecurity did not mediate the relationship between workload and HAZ. Household decision-making had a borderline significant (P=0.071) direct negative relationship with child HAZ. Food insecurity mediated the relationship between household decision-making and child HAZ such that household decision-making was positively associated with food insecurity, which in turn was negatively associated with child HAZ, and contributed to 7.76% of the total effect (Table 4.9). Women's social participation did not have a direct or indirect relationship with child HAZ.

Model 6 presents the path analysis between men's bargaining power and child HAZ. Men's social participation was associated lower food insecurity (leg 1, model 6), which was subsequently negatively related to HAZ (leg 2, model 6); this indirect path accounted for 4.15% of the total effect. Other domains did not have a direct or indirect significant relationship with HAZ or food insecurity.

Model 7 shows the results for testing food insecurity as a mediator with women's and men's bargaining domains together. Women's asset ownership and control was significantly associated with lower food insecurity, which in turn associated with lower child HAZ. This relationship mediated 3.88% of the total effect. Ownership of assets and control also had a significant direct relationship with child HAZ. Women's decision-making control was positively associated with food insecurity, which in turn was negatively associated with HAZ, accounting for 7.71% of the total effect. Men's social participation also had a significant and positive direct relationship with child HAZ.

In model 7, men's social participation was negatively associated with food insecurity, which, in turn, was negatively related to child HAZ, accounting for 3.71% of the total effect.

DISCUSSION

We examined the men's and women's bargaining domains with child nutritional status and found that distinct domains of men's and women's bargaining relate to child nutritional status and mediate the relationship through food insecurity. Women's ownership and control of asset had a positive relationship and workload had a negative relationship with child HAZ. Food insecurity mediated the relationship between women's ownership and control of assets. Men's social participation was related to higher HAZ score and food insecurity mediated this relationship.

The positive relationship between women's ownership and asset control suggests the importance of women's economic control, which is consistent with the research examining bargaining power and child nutrition.[26,47,48] Women's bargaining power through her assets is related to food allocation among adults.[40] Higher access to food may therefore also translate to better food allocation in terms of acquisition, dietary quantity, and quality for the child. Women's ownership and control of assets may indicate better resource allocation within the household and is also shown to be related to greater expenditure on child well-being such as health and schooling [10,28,46], thereby likely affecting the long-term nutritional status of children. Men's ownership and control of assets was not related to child nutrition directly or through food insecurity. In the South Asian context, men are more likely to own and control household assets than women. A non-significant finding may suggest the use of asset ownership and control for other

varied purposes in the household, which may not directly relate to child nutrition. The difference in findings between women's economic control as compared to men's economic control further highlights that women's individual access to resources is critical regardless of the husband's economic control and household wealth as it underscores that women as compared to men may likely allocate more of their resources to child health and nutrition.

For the mediation analysis, in models with men's bargaining power for only the spouse sample, i.e., index child's father (results not shown), men's asset ownership had a significant negative association with food insecurity, but food insecurity, though negatively related, was not significantly associated with HAZ. The difference in the results between the all-male sample and male 'spouse only' sample suggests that the father of index children may be a more productive household member for income generation or agricultural production affecting food insecurity as compared to other male members of the household, especially older men, who may not be as actively involved in income generation. The insignificant findings between food insecurity and HAZ in 'spouse only' analysis suggest the effect was likely not captured due to the reduction in overall sample size of the model from 2,164 for all male models versus 1,052 for 'spouse only' models.

Women's workload was associated with lower HAZ in our sample. Prior studies on women's workload have often focused on outside employment and have shown that it is negatively related to HAZ.[49] Women's satisfaction with their available leisure time is shown to be positively associated with length-for-age z-scores in Nepal.[25] Women's workload influences the time she has available to spend with her child and the quality of

child care she can provide, which may be reflected in poor feeding, hygiene practices, and care practices which could, in turn, affect child nutritional status.[13,50] Negative association between workload and HAZ also emphasizes the burden of time poverty where women in resource-poor settings disproportionately bear the weight of domestic work and being involved in productive markets to make ends meet. To understand how the relationship between women's workload and child HAZ may differ based on early childhood and preschool years, we also analyzed the relationship in children 0-23 months and 24-59 months separately (results not shown). Workload was not significantly related to children aged 0-23 months, but was negatively associated in children aged 24-59 months. Women may face excess workload burden during sensitive phases such as pregnancy and lactation [51,52], causing distress [53], which could adversely affect child growth *in-utero* and during early childhood, leading to poor long-term nutritional status and may be more prominently reflected in children 3-5 years with lower HAZ due to cumulative disadvantage. Men's workload was not significantly related to HAZ, which suggests that women's workload may contribute more to HAZ than men's workload possibly due to the traditional role of women in caring for children, thus also highlighting the gendered structure of women's time allocation.[50] Further examination is needed to understand specific aspects of time allocation and workload to identify where the biggest tradeoffs are between work and child care to gain a greater understanding of the workload domain.

Men's social participation, i.e. active group membership, was a significant predictor of child HAZ and was also related to household food insecurity. While there is limited information on understanding the mechanism of how the characteristics of social

networks may relate to health in men, networks may facilitate greater access to new knowledge and skills, which could improve health and nutrition outcomes. For example, a study in India found that men's social capital, as measured by the size of the network, was positively related to women attending antenatal care services.[54] Involvement in social groups may also present more opportunities to participate in income generating activities such as cash-based incentives or through improved agricultural practices, which can reduce household financial burden, improve food security, and increase child HAZ.[55,56] The positive association between men's social participation and child HAZ was also seen in the 'spouse only' model. Men's bargaining power in child nutrition is understudied, and our findings suggest that more research is needed to examine and evaluate structural and cognitive social capital and social support to elucidate how men's social domains of bargaining affect child nutritional status.

Women's social participation was not associated directly or indirectly with HAZ. Women's group participation has been shown to be related to child nutrition outcomes through multiple mechanisms such as increasing income and improving agricultural practices to promote increased food production diversity, thereby contributing to improved food security.[57] Prior studies also suggest that linkages from women's social participation to child nutrition may be more complex and possibly dependent on different facets of social capital and social support than just social participation.[58,59] Networks characteristics such as the size of the network or education of the network members may be more important for predicting child nutrition than participation alone.[59] Characteristics of women-based organizations such as collective maturity of the participants and their ability over-time to make decisions as a collective entity is related to reduction in the

prevalence of stunting[60], which suggests that rigorous longitudinal evaluation would serve well to expound the relationship between women's social participation and child HAZ, by accounting for the consistency and duration of social participation, generation of social capital, and concurrently understanding the process of empowerment.

The positive relationship between household decision-making for women with food insecurity and direct negative relationship with child HAZ were unexpected findings. With a few exceptions, empowerment literature generally suggests that women's decision-making is positively associated with child nutritional status.[9,15,61,62] Our unexpected results may perhaps be related to the significant disagreement about decision-making between spouses in our sample. This disagreement may be a result of socially desirable responses to highlight higher personal bargaining power than the spouse. We analyzed if disagreement on individual household decisions between spouses on who makes the decisions was associated with overall decision-making control (results not shown). We found that disagreement in decisions related to expenditure was associated with higher decision-making control in women, while disagreement in child health and feeding decisions was associated with higher decision-making control in men. This suggests that women and men may overestimate their role in decision-making in different aspects, which may not reflect their true decision-making control. The unexpected findings between food insecurity and household decision-making may be related to the differential estimation of decision-making control in women and men. Disagreement can also result from differential personal cognition and interpretation of questions between men and women.[63] We could not assess how responses may differ between spouses and other influential men in the household due to the way responses

categories were set-up. Understanding how other influential household males may respond to questions related to household decision-making in comparison to the mother of the child would provide further insights into the dynamics of gendered intra-household bargaining. It is also likely that household decision-making may be more immediately associated with relative proximal factors such as health-seeking behavior, rather than HAZ, a measure of chronic undernutrition. Future research is needed to understand any contextual factors, which may influence women's decision-making control and its effects on child HAZ.

In our sample, the relationship between women's bargaining power and child nutrition was not moderated by men's bargaining power. These findings suggest that despite the patriarchal context in South Asia, women's bargaining power domains may operate independently from men's bargaining power for child HAZ. Lack of a moderating effect by men's bargaining power also highlights the importance of women's bargaining power in child health and nutrition in terms of individual resource allocation and decision-making as being crucial regardless of poverty or the gendered social context.

Our study is one of the first that has compared women's and men's bargaining domains and assessed its relationship to child nutritional status. Our study adds to the current evidence on men's role on child nutrition that has focused either on interventions involving only men or only examined couples' decision-making in other health topics such as family planning and health-seeking behavior.[64,65] Analysis on women's empowerment in agriculture analysis conducted on the *Suaahara* study sample showed overall gender disparities in empowerment in agriculture negatively relate to child

HAZ.[25,37] Our study adds to this existing research by providing further in-depth understanding of the specific bargaining domains including household decision-making for women and men that are likely to be important for child nutrition. We also examined food security as a mechanism of how bargaining relates to HAZ. Understanding the role of food insecurity and how that relates to women's status and child nutrition is crucial to inform nutrition-sensitive strategies focusing on gender, nutrition, and agriculture.

The cross-sectional nature of our analysis does not allow us to make causal inferences. High disagreement between spouses on who makes household decisions may suggest that social desirability or differences in cognition between women and men about decision-making related questions may have affected their responses. We did not have information on domestic violence experiences of women, which is shown to be a predictor of food insecurity and child nutrition, and is an important domain of household bargaining.[66,67] Future studies should consider including this domain along with other domains to assess women's bargaining and its relationship with child nutrition.

Our study has several future research and program implications. Our analysis shows that men's role in the household is important and future studies should evaluate how men's bargaining power influences child nutrition in varied contexts to enhance our understanding of household dynamics and child nutrition, to develop a strong evidence base, and to inform programs and interventions. Studies should also focus on understanding other social domains such as social capital or social support, and its effect on child nutrition. Intervention strategies incorporating men's social participation can be designed to actively engage men in improving their knowledge, thereby improving their capacity to provide support to their wives during pregnancy, childbirth, and lactation to

positively contribute to improving child nutrition efforts. Considering that men's social participation was significant for food insecurity, poverty alleviation and health programs could be designed to include men and women to increase men's engagement with health and nutrition issues. Investments should be made in programs that can combine social participation and greater access to economic resources to effectively target different domains of women's bargaining power simultaneously. Microcredit programs have found success in this regard, but future programs could be more tailored toward a particular context and could involve other members of the household. Programs can be tailored to make women and men important stakeholders in improving not only child nutrition, but also in promoting a holistic, enabling environment for better child care and nutrition.

Nutrition-sensitive approaches focusing on improving women's social and economic empowerment may prove beneficial in improving household food security and child health. More context-specific strategies could be applied to improve asset ownership and improve women's participation in income generating activities. Since women's status is determined by the sociocultural context, efforts should also be made to address underlying issues such as low rates of education and poor adolescent health to empower women before marriage and childbearing. Gendered intra-household bargaining plays an important role in determining child nutrition, therefore, interventions should focus on engaging men and women of the household with context-specific, innovative strategies to reduce child undernutrition.

REFERENCES

1. Ministry of Health Nepal, New ERA Nepal, ICF International. *Nepal Demographic and Health Survey 2016*.; 2017. https://dhsprogram.com/publications/publication-FR336-DHS-Final-Reports.cfm. Accessed November 27, 2017.

2. Cunningham K, Headey D, Singh A, Karmacharya C, Pandey Rana P. Maternal and Child Nutrition in Nepal: Examining drivers of progress from the mid-1990s to 2010s. *Glob Food Sec*. 2017;13:30-37. doi:10.1016/j.gfs.2017.02.001.

3. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B. Developmental potential in the first 5 years for children in developing countries. *Lancet*. 2007;369(9555):60-70. doi:10.1016/S0140-6736(07)60032-4.

4. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*. 2008;371(9608):243-260. doi:10.1016/S0140-6736(07)61690-0.

5. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340-357. doi:10.1016/S0140-6736(07)61692-4.

6. Ruel MT, Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *Lancet*. 2013;382(9891):536-551. doi:10.1016/S0140-6736(13)60843-0.

7. Dewey KG. Reducing stunting by improving maternal, infant and young child nutrition in regions such as South Asia: evidence, challenges and opportunities. doi:10.1111/mcn.12282.

8. Van den Bold M, Quisumbing AR, Gillespie S. *Women's Empowerment and Nutrition: An Evidence Review*. Washington D.C.; 2013.

9. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Matern Child Nutr*. February 2014. doi:10.1111/mcn.12113.

10. Haddad L, Hoddinott J, Alderman H. *Intrahousehold Resource Allocation: An Overview*.; 1994.

11. Richards E, Theobald S, George A, et al. Going beyond the surface: Gendered intra-household bargaining as a social determinant of child health and nutrition in low and middle income countries. *Soc Sci Med*. 2013;95:24-33. doi:10.1016/j.socscimed.2012.06.015.

12. Agarwal B. "Bargaining" and Gender Relations: Within and Beyond the Household. *Fem Econ*. 1997;3(1):1-51. doi:10.1080/135457097338799.

13. Samman E, Presler-Marshall E, Jones N, et al. *Women's Work Mothers, Children and the Global Childcare Crisis*. London; 2016. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10333.pdf. Accessed July 28, 2016.

14. Blackden CM, Wodon Q. *Gender, Time Use, and Poverty in Sub-Saharan Africa*. (Wodon Q, Blackden CM, eds.). World Bank Publications; 2006. doi:10.1596/978-0-8213-6561-8.

15. Cunningham K, Ruel M, Ferguson E, Uauy R. Women's empowerment and child nutritional status in South Asia: a synthesis of the literature. *Matern Child Nutr*. 2014;11:1-19. doi:10.1111/mcn.12125.

16. Malhotra A, Schuler SR, Boender C. *Measuring Women's Empowerment as a Variable in International Development*.; 2002.

17. Kabeer N. Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gend Dev*. 2005;13(1):13-24.

18. Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *Lancet*. 2008;371(9609):322-328. doi:10.1016/S0140-6736(08)60169-5.

19. Meshram II, Kodavanti MR, Chitty GR, et al. Influence of feeding practices and associated factors on the nutritional status of infants in rural areas of Madhya Pradesh state, India. *Asia Pac J Public Health*. 2015;27(2):NP1345-61. doi:10.1177/1010539513486174.

20. Allendorf K. Couples' Reports of Women's Autonomy and Health-care Use in Nepal. *Stud Fam Plann*. 2007;38(1):35-46. doi:10.1111/j.1728-4465.2007.00114.x.

21. Story WT. Social capital and the utilization of maternal and child health services in India: A multilevel analysis. *Health Place*. 2014;28:73-84. doi:10.1016/j.healthplace.2014.03.011.

22. Engle PL, Menon P, Haddad L. Care and nutrition: concepts and measurement. *World Dev*. 1999;27(8):1309-1337.

23. Scanlan SJ. Women, Food Security, and Development in Less-Industrialized Societies: Contributions and Challenges for the New Century. *World Dev*. 2004;32(11):1807-1829. doi:10.1016/j.worlddev.2004.05.009.

24. Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU. Women's Empowerment in Agriculture: What Role for Food Security in Bangladesh? *World Dev*. 2014;61:11-52. doi:10.1016/j.worlddev.2014.03.025.

25. Malapit HJL, Kadiyala S, Quisumbing AR, Cunningham K, Tyagi P. Women's Empowerment Mitigates the Negative Effects of Low Production Diversity on Maternal and Child Nutrition in Nepal. *J Dev Stud*. 2015;51(8):1097-1123. doi:10.1080/00220388.2015.1018904.

26. Quisumbing AR, Maluccio JA. Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa*. *Oxf Bull Econ Stat*. 2003;65(3):283-327. doi:10.1111/1468-0084.t01-1-00052.

27. Quisumbing AR, Brown LR, Feldstein HS, Haddad L, Peña C. *Women: The Key to Food Security*. Washington, D.C.; 1995.

28. Hoddinott J, Haddad L. Does female income share influence household expenditures? Evidence from Côte d'Ivoire. *Oxf Bull Econ Stat*. 1995;57(1):77-96. doi:10.1111/j.1468-0084.1995.tb00028.x.

29. Chandrasekhar S, Aguayo VM, Krishna V, Nair R. Household food insecurity and children's dietary diversity and nutrition in India. Evidence from the comprehensive nutrition survey in Maharashtra. *Matern Child Nutr*. 2017;13:e12447. doi:10.1111/mcn.12447.

30. Taukobong HFG, Kincaid MM, Levy JK, et al. Does addressing gender inequalities and empowering women and girls improve health and development programme outcomes? *Health Policy Plan*. 2016;31(10):1492-1514. doi:10.1093/heapol/czw074.

31. Webb-Girard A, Cherobon A, Mbugua S, Kamau-Mbuthia E, Amin A, Sellen DW. Food insecurity is associated with attitudes towards exclusive breastfeeding among women in urban Kenya. *Matern Child Nutr*. 2012;8(2):199-214. doi:10.1111/j.1740-8709.2010.00272.x.

32. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household food security indicators. *Int J Food Safety, Nutr Public Heal*. 2009.

33. Nyyssölä M. *Women's Status and Children's Food Security in Nepal*.; 2007.

34. Iram U, Butt MS. Determinants of household food security. *http://dx.doi.org/101108/03068290410546011*. 2013.

35. Cunningham K, Kadiyala S, Chakrabarti S, et al. *Suaahara Baseline Survey Report*. Washington DC; 2013. http://pdf.usaid.gov/pdf_docs/PA00KC2C.pdf. Accessed July 13, 2016.

36. Onis M. WHO Child Growth Standards based on length/height, weight and age. *Acta Paediatr*. 2007;95(S450):76-85. doi:10.1111/j.1651-2227.2006.tb02378.x.

37. Cunningham K, Ploubidis GB, Menon P, et al. Women's empowerment in agriculture and child nutritional status in rural Nepal. *Public Health Nutr*. 2015;18(17):3134-3145. doi:10.1017/S1368980015000683.

38. Bhagowalia P, Menon P, Quisumbing A. *What Dimensions of Women's Empowerment Matter Most for Child Nutrition? Evidence Using Nationally Representative Data from Bangladesh*.; 2012. http://agris.fao.org/agris-search/search.do?recordID=QB2015107363. Accessed July 14, 2016.

39. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3*.; 2007. www.fantaproject.org. Accessed July 12, 2016.

40. Harris-Fry H, Shrestha N, Costello A, Saville NM. Determinants of intra-household food allocation between adults in South Asia – a systematic review. *Int J Equity Health*. 2017;16. doi:10.1186/s12939-017-0603-1.

41. Miller LC, Joshi N, Lohani M, et al. Women's education level amplifies the effects of a livelihoods-based intervention on household wealth, child diet, and child growth in rural Nepal. *Int J Equity Health*. 2017;16. doi:10.1186/s12939-017-0681-0.

42. Addo OY, Stein AD, Fall CH, et al. Maternal Height and Child Growth Patterns. *J Pediatr*. 2013;163(2):549-554.e1. doi:10.1016/j.jpeds.2013.02.002.

43. Vir SC. Improving women's nutrition imperative for rapid reduction of childhood stunting in South Asia: coupling of nutrition specific interventions with nutrition sensitive measures essential. *Matern Child Nutr*. 2016;12(S1):72-90. doi:10.1111/mcn.12255.

44. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Chang*. 1999;30(May):435-464.

45. Mosedale S. Assessing women's empowerment: towards a conceptual framework. *J Int Dev*. 2005;17(2):243-257. doi:10.1002/jid.1212.

46. Malhotra A, Mather M. Do Schooling and Work Empower Women in Developing Countries? Gender and Domestic Decisions in Sri Lanka. *Sociol Forum*. 1997;12(4):599-630. doi:10.1023/A:1022126824127.

47. Allendorf K. Do Women's Land Rights Promote Empowerment and Child Health in Nepal? *World Dev*. 2007;35(11).

48. Seebens H. Intra-household bargaining, gender roles in agriculture and how to promote welfare enhancing changes. 2010. www.fao.org/economic/esa. Accessed September 8, 2016.

49. Sethuraman K, Lansdown R, Sullivan K. Women's empowerment and domestic violence: the role of sociocultural determinants in maternal and child undernutrition in tribal and rural communities in South India. *Food Nutr Bull*. 2006;27(2):128-143.

50. Blackden M, Wodon Q, Blackden CM. *Gender, Time Use, and Poverty: Introduction*.; 2006. https://mpra.ub.uni-muenchen.de/11080/. Accessed August 1, 2016.

51. Jones A, Agudo Y, Galway L, Bentley J, Pinstrup-Andersen P. Heavy agricultural workloads and low crop diversity are strong barriers to improving child feeding practices in the Bolivian Andes. *Soc Sci Med*. 2012;75(9):1673-1684. doi:10.1016/J.SOCSCIMED.2012.06.025.

52. Garg S, Agarwal P, Singh M. Maternal health-care utilization among women in an urban slum in Delhi. *Indian J Community Med*. 2007;32(3):203. doi:10.4103/0970-0218.36829.

53. Avotri JY, Walters V. "You just look at our work and see if you have any freedom on earth'': Ghanaian women's accounts of their work and their health. *Soc Sci Med*. 1999;48(9):1123-1133. doi:10.1016/S0277-9536(98)00422-5.

54. Singh A, Ram F. Men's Involvement during Pregnancy and Childbirth: Evidence from Rural Ahmadnagar, India Population Review Men's Involvement during Pregnancy and Childbirth: Evidence from Rural Ahmadnagar, India. *Popul Rev*. 2009;48(1):83-102. doi:10.1353/prv.0.0016.

55. Rajbhandari BP. Bio-intensive Farming System : Validation of Its Approaches in Increasing Food Production , Improving Food Security and Livelihoods. *Nepal J Agric Sci*. 2011;9:112-124.

56. Sthapit BR, Joshi KD, Witcombe JR. Farmer Participatory Crop Improvement. III. Participatory Plant Breeding, a Case Study for Rice in Nepal. *Exp Agric*. 1996;32(4):479. doi:10.1017/S001447970000154X.

57. Kumar N, Scott S, Menon P, et al. Pathways from women's group-based programs to nutrition change in South Asia: A conceptual framework and literature review. *Glob Food Sec*. 2017. doi:10.1016/j.gfs.2017.11.002.

58. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health Place*. 2007;13(2):341-355. doi:10.1016/j.healthplace.2006.02.005.

59. Moestue H, Huttly S, Sarella L, Galab S. "The bigger the better" – mothers' social networks and child nutrition in Andhra Pradesh. *Public Health Nutr*. 2007;10(11):1274-1282. doi:10.1017/S1368980007702896.

60. Eklund P, Imai K, Felloni F. Women's organisations, maternal knowledge, and social capital to reduce prevalence of stunted children: evidence from rural Nepal. *J Dev Stud*. 2007;43(3):456-489. doi:10.1080/00220380701204406.

61. Dancer D, Rammohan A. Maternal autonomy and child nutrition. *Indian Growth Dev Rev*. 2009;2(1):18-38. doi:10.1108/17538250910953444.

62. 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. doi:10.1016/j.socscimed.2011.05.040.

63. Coates JC, Webb P, Houser RF, Rogers BL, Wilde P. “He said, she said”: who should speak for households about experiences of food insecurity in Bangladesh? *Food Secur*. 2010;2(1):81-95. doi:10.1007/s12571-010-0052-9.

64. 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. doi:10.1016/j.socscimed.2012.09.017.

65. Becker S, Fonseca-Becker F, Schenck-Yglesias C. Husbands’ and wives’ reports of women’s decision-making power in Western Guatemala and their effects on preventive health behaviors. *Soc Sci Med*. 2006;62(9):2313-2326. doi:10.1016/j.socscimed.2005.10.006.

66. Ackerson LK, Subramanian S V. Domestic violence and chronic malnutrition among women and children in India. *Am J Epidemiol*. 2008;167(10):1188-1196. doi:10.1093/aje/kwn049.

67. Sobkoviak RM, Yount KM, Halim N. Domestic violence and child nutrition in Liberia. *Soc Sci Med*. 2012;74(2):103-111. doi:10.1016/j.socscimed.2011.10.024.

Table 4.4: Descriptive statistics of child, family, and household characteristics for children aged 0-59 months in *Suaahara* study in Nepal, (n=2,166)[1]

Variable	Mean (SD) or %	Range
Child Characteristics		
Child age (months)	27.1 (16.61)	0-59.99
Child gender (female)	46.72	-
Child HAZ	-1.71 (1.25)	-5, - 4
Women's Intra-household Bargaining Domains		
Ownership and control of assets	2.56 (2.14)	0-9
Social participation (active group membership score)	0.23 (0.61)	0-7
Social participation (active group membership yes/no)	16.62	-
Time allocated to work/ 24 hours	11.1 (3.03)	-
Proportion of household decision-making	73.9 (20.8)	0-100
Men's Intra-household Bargaining Domains		
Ownership and control of assets	5.32 (2.31)	0-10
Social participation (active group membership score)	0.247 (0.64)	0-5
Social participation (active group membership yes/no)	16.81	-
Time allocated to work/ 24 hours	8.20 (3.95)	-
Proportion of household decision-making	69.5 (24.86)	0-100
Maternal age (years)	26.72 (6.24)	15-52
Maternal height (cm)	151.7 (5.64)	133-186.1
Maternal years of schooling	4.61 (4.49)	0-15
Household Characteristics		
Household food insecurity		
Food secure	74.56	-
Mildly food insecure	15.24	-
Moderately food insecure	8.40	-
Severely food insecure	1.80	-
Children under 5 years	1.38 (0.62)	1-5
Household wealth (assets)	6.18 (3.75)	0-23
Agro-ecological area		
Mountain	27.29	-
Hills	44.37	-
Terai	28.35	-

[1] Sample size is based on bargaining power data available on all domains for women and men

Table 4.5: Bivariate associations of child, family, and household characteristics with child HAZ in children 0-59 months in *Suaahara* study in Nepal, (n=2,166)

Variable	Child HAZ	p-value
Child Characteristics		
Child age (years)	-0.0218	<0.001
Child gender (female)	0.0885	0.100
Women's Intra-household Bargaining		
Ownership and control of assets	0.0240	0.056
Social participation (active group membership yes/no)	0.00614	0.932
Time allocated to work/ 24 hours	-0.0422	<0.001
Proportion of Household decision-making	-0.390	0.003
Men's Intra-household Bargaining Domains		
Ownership and control of assets	-0.0122	0.290
Social participation (active group membership yes/no)	0.324	<0.001
Time allocated to work/ 24 hours	0.00838	0.217
Proportion of Household decision-making	-0.343	0.001
Maternal Characteristics		
Maternal age (years)	-0.0229	<0.001
Maternal height (cm)	0.0571	<0.001
Maternal years of schooling	0.0693	<0.001
Household Characteristics		
Household Food Insecurity		
Food Secure	Reference	
Mildly food insecure	-0.372	<0.001
Moderately food insecure	-0.512	<0.001
Severely Food insecure	-0.716	<0.001
Children under 5 years	-0.161	<0.001
Household wealth (assets)	0.0670	<0.001
Agro-ecological area		
Mountain		
Hills	0.485	<0.001
Terai	0.478	<0.001

Table 4.6: Agreement on household decision-making between spouses

Decision	Percent Agreement	Kappa	n
Major household expenditure	51.06	0.2180	472
Minor household expenditure	42.00	0.2008	1188
Family planning decisions	50.38	0.0856	788
Decisions regarding child health	33.87	0.0756	1190
Decisions regarding child feeding	45.97	0.0593	1190

Note: All Kappa statistic values significant at $P<0.001$

Table 4.7: Multilevel regression analysis explaining the relationship of men's and women's bargaining domain with child HAZ (n=2,164)

Bargaining Domains	**Women's Bargaining**	**Men's Bargaining**	**Men's and Women's Bargaining Together**	**Interaction with men's bargaining**
	Model 1	Model 2	Model 3	Model 4
Women's Domains				
Ownership & Control of assets	0.0388 (P=0.128)	-	0.0514 (P=0.047)	0.0227 (P=0.296)
Social Participation	0.00660 (P=0.903)	-	-0.00601 (P=0.912)	-0.0233 (P=0.848)
Workload	-0.0508 (P=0.013)	-	-0.0522 (P=0.011)	-0.0109 (P=0.553)
Household Decision-Making	-0.0457 (P=0.058)	-	-0.0425 (P=0.077)	0.000898 (P=0.964)
Men's Domains				
Ownership & Control of assets	-	-0.0255 (P=0.233)	-0.0308 (P=0.154)	-
Social Participation	-	0.155 (0.003)	0.156 (P=0.003)	-
Workload	-	-0.000178 (0.993)	0.00483 (P=0.805)	-
Household Decision-Making	-	-0.0391 (P=0.066)	-0.0412 (P=0.053)	-

Table 4.8: Path coefficients for mediation analysis linking bargaining domains, food insecurity, and child HAZ (n=2,164)

Bargaining Domains	**Women's Bargaining** Model 5			**Men's Bargaining** Model 6			**Women's and men's bargaining together** Model 7		
Women's Domains	Leg 1	Leg 2	Direct	Leg 1	Leg 2	Direct	Leg 1	Leg 2	Direct
Ownership & Control of assets	-0.0628 (P=0.021)	-0.0519 (P=0.015)	0.0518 (P=0.044)	-	-	-	-0.0565 (P=0.037)	-0.0495 (P=0.019)	0.0641 (P=0.020)
Social Participation	-0.0612 (P=0.273)	-0.0519 (P=0.015)	-0.00857 (P=0.867)	-	-	-	-0.0560 (P=0.311)	-0.0495 (P=0.019)	-0.0236 (P=0.647)
Workload	-0.00819 (P=0.723)	-0.0519 (P=0.015)	-0.0535 (P=0.014)	-	-	-	-0.00396 (P=0.865)	-0.0495 (P=0.019)	-0.0547 (P=0.011)
Household Decision-Making	0.0750 (P=0.002)	-0.0519 (P=0.015)	-0.0462 (P=0.071)	-	-	-	0.0728 (P=0.002)	-0.0495 (P=0.019)	-0.0431 (P=0.088)
Men's Domains									
Ownership & Control of assets	-	-	-	-0.0353 (P=0.063)	-0.0527 (P=0.014)	-0.0155 (P=0.398)	-0.0294 (P=0.097)	-0.0495 (P=0.019)	-0.0246 (P=0.196)
Social Participation	-	-	-	-0.131 (P=0.002)	-0.0527 (P=0.014)	0.159 (P=0.001)	-0.125 (P=0.003)	-0.0495 (P=0.019)	0.161 (P=0.001)
Workload	-	-	-	-0.0366 (P=0.081)	-0.0527 (P=0.014)	-0.00576 (P=0.788)	-0.0363 (P=0.086)	-0.0495 (P=0.019)	0.0000629 (P=0.998)
Household Decision-Making	-	-		0.0115 (P=0.663)	-0.0527 (P=0.014)	-0.0367 (P=0.106)	0.00877 (P=0.735)	-0.0495 (P=0.019)	-0.0411 (P=0.062)

Leg 1 denotes the relationship between bargaining domains and food insecurity, the first leg of the indirect path.
Leg 2 denotes the relationship between food insecurity and child HAZ, the second leg of the indirect path.
Direct denotes the direct path from bargaining domains and child HAZ.

Table 4.9: Contribution of significant indirect legs of paths linking specific bargaining domains, food insecurity, and child HAZ (n=2,164)

Bargaining Domains	**Women's Bargaining**			**Men's Bargaining**			**Women's and Men's Bargaining**		
	Indirect Effect (P-value) [% of total effect]	Direct Effect (P-value)	Total Effect	Indirect Effect (P-value) [% of total effect]	Direct Effect (P-value)	Total Effect	Indirect Effect (P-value) [% of total effect]	Direct Effect (P-value)	Total Effect
Women's Domains									
Ownership and Control of Assets	0.00326 (P=0.101) [5.92%]	0.0518 (P=0.044)	0.0551	-	-	-	0.00280 (P=0.132) [3.88%]	0.0641 (P=0.020)	0.0721
Household decision-making	-0.00389 (P=0.035) [7.76%]	-0.0462 (P=0.071)	-0.0501	-	-	-	-0.00360 (P=0.040) [7.71%]	-0.0431 (P=0.088)	-0.0467
Men's domains									
Social Participation	-	-		0.00689 (P=0.055) [4.15%]	0.159 (P=0.001)	0.166	0.00620 (P=0.069) [3.71%]	0.161 (P=0.001)	0.167

Indirect effect is the product of coefficients of leg 1 and leg 2
Direct effect is the coefficient of the direct path
Total effect is the sum of direct and indirect effects

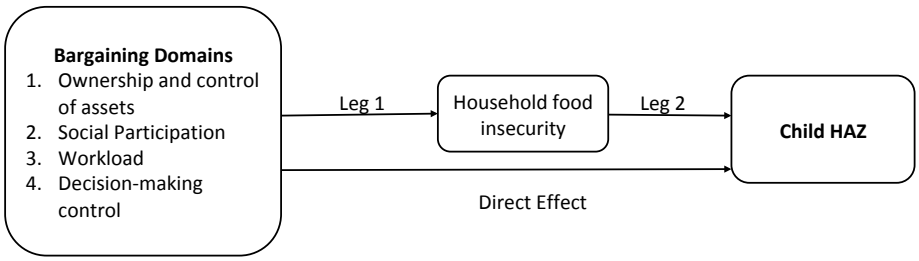

Figure 4.2: Path diagram for generalized structural equation modeling analysis

CHAPTER 5

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

5.1 Summary of Findings

We conducted a quantitative analysis to understand the relationship between gendered intra-household bargaining power and child feeding and nutrition in rural Nepal. We assessed how bargaining power operates via two specific mechanisms: 1) exposure to IYCF information for understanding the role of women's bargaining power in child feeding practices, and 2) household food insecurity to assess how women's and men's bargaining influences child nutritional status.

Women's social participation was positively associated with access to IYCF information, which was consequently associated with improved early initiation and dietary diversity. Higher men's social participation was associated with lower food insecurity, and in turn with greater HAZ. Women's ownership and control of assets was positively associated with child nutritional status, while men's ownership and control of assets did not have a significant relationship with child HAZ. Women's workload was negatively related to child HAZ thereby indicating possible trade-offs in time allocation and child care affecting child nutritional status. Men's workload did not have a significant relationship with child HAZ. Women's household decision-making was positively related to exclusive breastfeeding and early initiation, but was related to

greater food insecurity. Men's household decision-making was not related to food insecurity or child HAZ.

We found small but significant effects for the relationships between specific bargaining domains with IYCF practices and with child HAZ. Our results suggest that our measures capture intended constructs of intra-household bargaining power, i.e., our measures are non-random and have been used in previous research.[22,23,130] The small magnitude of our coefficients may be due to the examination of more distal social factors related to child nutrition which may not capture the full extent of a given domain through a given measure or indicator. Significant findings in our research suggest that these bargaining domains need further examination and evaluation for research and programmatic purposes to understand their effect on child nutrition and to determine the usefulness of focusing on specific domains for interventions to improve women's status in the household and the community.

5.2 Contribution to Literature

Our study contributes to the existing literature on gender and nutrition by 1) providing a comprehensive understanding of intra-household bargaining beyond commonly used measures of education and decision-making power, 2) contributing to address the research gap by examining mechanisms linking bargaining domains and child feeding and nutrition, and 3) providing evidence on the role of men in child nutrition, a topic that is considerably understudied.

Evidence on women's status and its relationship with child feeding and nutrition has largely focused on women's autonomy or household decision-making.[89,90,109,187,188] Our study contributes to this existing evidence on women's empowerment or bargaining

power using multiple domains of bargaining that capture the multifaceted nature of bargaining to include not only household decision-making, but also economic resources, social participation, workload, and time. Prior studies in Nepal based on the *Suaahara* project sample have focused on women's empowerment in agriculture to include domains similar to our studies on asset ownership, social participation, and workload, which have shown association with specific domains and child nutritional status.[22,23] Our research delves deeper to assess possible mechanisms that link the specific bargaining domains with IYCF practices and child nutritional status, thereby addressing the research gap in empowerment literature on understating specific linkages between bargaining and child nutrition.[82,129] We also assess specific domains of men's bargaining power, which provides a comprehensive analysis of overall household dynamics for men and women and suggests that incorporating multiple domains of household bargaining for men and women is critical to understand how gendered intra-household bargaining influences child nutrition beyond autonomy or household decision-making.

We studied men's bargaining power and its relationship with child nutrition. We provide evidence on domains other than those commonly studied such as paternal education.[20,189,190] The positive relationship between men's social participation and child nutritional status suggests a possible increase in social capital to access knowledge or material resources obtained through group membership. The effect of men's group membership on food insecurity provides evidence on a factor not previously studied and highlights the need for further research to understand *how* social participation influences food security for evidence-based programming that could engage men.

Our research suggests that exposure to ICYF is a critical precursor to gaining more knowledge and consequently improving IYCF practices. Having empirical evidence for this relationship is important because care practices are crucial in the first 24 months of life, not only for health, but also for overall growth and development.

5.3 Limitations

We analyzed a cross-sectional dataset and therefore making causal inferences would not be applicable. Having follow-up data would have enabled us to understand any possible change in overall bargaining power over time due to changes in social context or through program or intervention for women and men. It would also have enabled us to understand how different bargaining domains may influence one another since there is reciprocity between domains. We also recognize that IYCF practices may relate to child nutritional status in our sample, and using longitudinal data would help rigorously test this relationship. We found that there was low agreement between spouses on their decision-making control, which could either be a result of differential cognition between men and women about the decisions or be due socially desirable responses provided to highlight greater personal autonomy.

Domestic violence is an important domain of household bargaining. Experiences with domestic violence are associated with distress and with low food insecurity.[185,186,191,192] Understanding the effect of domestic violence experience would be crucial to not only understand its effect of child feeding and nutrition, but also to understand the interrelationship between other bargaining domains and domestic violence.

5.4 Implications for Future Research

Future research could focus on improving certain measures of bargaining power, especially related to household decision-making, which yielded some unexpected findings in our research. Improvement in cognitive interviewing and improved data collection technique should be used to improve the understanding of questions and generate responses that truly reflect an individual's control over decision-making in the household.

Future research can expand the measures for understanding the social dimension of women's bargaining power to include measures of structural social capital including social network characteristics and duration of social participation. Frequency of group membership activities and duration could be measured against time and opportunity costs of participation in community groups versus the expected nutrition benefit through participation. Measures of cognitive social capital aspects of trust, reciprocity, and social support will further enable understanding the psychosocial aspects and cognitive processes, which could then be suitable to testing mechanisms related nutrition knowledge and awareness with regards to child feeding.

Food security is an important mediator between bargaining power and child nutritional status, and therefore related aspects such as intra-household food allocation should also be studied in relation to the mother and child when analyzing women's bargaining power. Maternal and child diet diversity are related[193] and may be related to food allocation; therefore understanding maternal food allocation is critical to account for the societal gender bias and traditional customs and norms, which may limit women's access to food.

Men's social participation was a significant predictor of child nutritional status and food security. Future studies could consider to routinely incorporating questions on men's role in child nutrition beyond common measures of paternal education or wage/income. Specific information such as actual time spent on child care may provide valuable information regarding the workload domain for men and women and allow the assessment of paternal contribution is child health and nutrition. Information can also be obtained on men's access, knowledge, and awareness of child feeding practices to understand the contribution of cognitive and access-related factors in child nutrition.

Intra-household bargaining involves the relative social and economic position of a person within a household. In this research, we studied the role of men, but in South Asian settings it is fairly common for a household to comprise of other influential figures. Elderly females such as grandmothers of children within a household may play an important in determining a mother's access to resources, her workload, and her knowledge. Information regarding understanding the relative influence of elderly women versus husband or men in the household could help gain important information of other factors influencing women's bargaining power.

Nepal has a high prevalence of migration that affects the household structure and dynamics.[194] Migration is associated with changes in female employment, overall household income, social capital, and women's workload,[195,196] all of which can relate to women's bargaining power. Future studies are needed to understand how bargaining power is influenced by different household structures due to migration, and how that relates to child nutrition.

When feasible, bargaining studies may be complemented with qualitative inquiry to understand the contextual factors that are likely to influence bargaining and provide a more nuanced view of the household dynamics of different family members.

5.5 Implications for Programs and Policies

The current research underscores the importance of women's bargaining in positively contributing to child nutrition, specifically highlighting that improvement women's social participation, workload, and ownership and control of assets can significantly lead to more positive outcomes for feeding practices and nutritional status. Our study provides further evidence that working in the area of women-centered community groups offers significant benefits to women and children to improve social and economic aspects of bargaining power. More context-specific strategies could be applied to improve asset ownership and women's participation in income generating activities based on local economies.

Programs supporting men's engagement in child nutrition through social participation may prove beneficial and contribute to improved child nutrition. Programs targeting men often include agriculture or livelihood groups; these groups could be made more comprehensive by involving targeted meetings of child health and nutrition, to combine nutrition-sensitive and nutrition-specific approaches in one setting. Programs promoting higher men's involvement in women's health by increasing men's participation in family planning and antenatal care visits, and involving men in child nutrition monitoring and care may also benefit by improving their knowledge and awareness regarding child nutrition.

The importance of exposure to ICYF information, especially with regards to social participation domains, suggests that programs aiming to improve IYCF practices should ensure that appropriate, targeted IYCF messages are delivered to mothers through various delivery platforms. Improving women's knowledge would not only require increasing women's bargaining power, but also investing in strengthening health systems by improving availability and access to services and personnel, which can provide appropriate knowledge, services, and on-going to support to follow and maintain appropriate IYCF practices. Since improving access to IYCF information is critical, resources should be mobilized to improve messaging through mass media by national governments and non-governmental agencies, which has shown to improve IYCF knowledge and practices.[170,197]

Since women's status is determined by the sociocultural context, efforts should also be made in addressing basic issues such as education and adolescent health through policy changes at the local and national level, to empower women possibly before marriage and childbearing to maximize the time available for optimal child health and nutrition. Given the strong momentum to address gender inequalities and reduce child undernutrition, programs and policies should focus on evidence-based strategies that aim to improve specific domains of intra-household bargaining to achieve targeted results in child nutrition.

REFERENCES

1. Ministry of Health Nepal, New ERA Nepal, ICF International. *Nepal Demographic and Health Survey 2016*.; 2017. https://dhsprogram.com/publications/publication-FR336-DHS-Final-Reports.cfm. Accessed November 27, 2017.
2. Headey DD, Hoddinott J. Understanding the rapid reduction of undernutrition in Nepal, 2001-2011. *PLoS One*. 2015;10(12). doi:10.1371/journal.pone.0145738.
3. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B. Developmental potential in the first 5 years for children in developing countries. *Lancet*. 2007;369(9555):60-70. doi:10.1016/S0140-6736(07)60032-4.
4. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340-357. doi:10.1016/S0140-6736(07)61692-4.
5. Hoddinott J, Maluccio J, Behrman JR, et al. *The Consequences of Early Childhood Growth Failure over the Life Course*.; 2011.
6. Martorell R. The Nature of Child Malnutrition and its Long-Term Implications. *Food Nutr Bull*. 1999;20(3):288-292. doi:10.1177/156482659902000304.
7. Bhutta ZA, Das JK, Rizvi A, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? *Lancet*. 2013;382(9890):452-477. doi:10.1016/S0140-6736(13)60996-4.
8. Bhutta ZAZ, Ahmed T, Black RER, et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 2008;371(9610):417-440. doi:10.1016/S0140-6736(07)61693-6.
9. Dewey KG. Reducing stunting by improving maternal, infant and young child nutrition in regions such as South Asia: evidence, challenges and opportunities. doi:10.1111/mcn.12282.
10. Engle PL, Menon P, Haddad L. Care and nutrition: concepts and measurement. *World Dev*. 1999;27(8):1309-1337.
11. Black RE, Alderman H, Bhutta ZA, et al. Maternal and child nutrition: building momentum for impact. *Lancet*. 2013;382(9890):372-375. doi:10.1016/S0140-6736(13)60988-5.
12. Richards E, Theobald S, George A, et al. Going beyond the surface: Gendered intra-household bargaining as a social determinant of child health and nutrition in low and middle income countries. *Soc Sci Med*. 2013;95:24-33. doi:10.1016/j.socscimed.2012.06.015

13. Menon P, Bamezai A, Subandoro A, Ayoya MA, Aguayo V. Age-appropriate infant and young child feeding practices are associated with child nutrition in India: insights from nationally representative data. *Matern Child Nutr*. 2015;11(1):73-87. doi:10.1111/mcn.12036.

14. Pandey S, Tiwari K, Senarath U, et al. Determinants of infant and young child feeding practices in Nepal: Secondary data analysis of Demographic and Health Survey 2006. *Food Nutr Bull*. 2010;31(2):334-351.

15. Joshi N, Agho KE, Dibley MJ, Senarath U, Tiwari K. Determinants of inappropriate complementary feeding practices in young children in Nepal: secondary data analysis of Demographic and Health Survey 2006. *Matern Child Nutr*. 2012;8(s1):45-59. doi:10.1111/j.1740-8709.2011.00384.x.

16. Khanal V, Sauer K, Zhao Y, et al. Exclusive breastfeeding practices in relation to social and health determinants: a comparison of the 2006 and 2011 Nepal Demographic and Health Surveys. *BMC Public Health*. 2013;13(1):958. doi:10.1186/1471-2458-13-958.

17. Tolhurst R, Amekudzi YP, Nyonator FK, Bertel Squire S, Theobald S. "He will ask why the child gets sick so often": The gendered dynamics of intra-household bargaining over healthcare for children with fever in the Volta Region of Ghana. *Soc Sci Med*. 2008;66(5):1106-1117. doi:10.1016/j.socscimed.2007.11.032.

18. 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. doi:10.1016/j.socscimed.2005.04.006.

19. Allendorf K. Couples' Reports of Women's Autonomy and Health-care Use in Nepal. *Stud Fam Plann*. 2007;38(1):35-46. doi:10.1111/j.1728-4465.2007.00114.x.

20. Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *Lancet*. 2008;371(9609):322-328. doi:10.1016/S0140-6736(08)60169-5.

21. Aslam M, Kingdon GG. Parental education and child health — understanding the pathways of impact in Pakistan. *World Dev*. 2012;40(10):2014-2032. doi:10.1016/j.worlddev.2012.05.007.

22. Malapit HJL, Kadiyala S, Quisumbing AR, Cunningham K, Tyagi P. Women's Empowerment Mitigates the Negative Effects of Low Production Diversity on Maternal and Child Nutrition in Nepal. *J Dev Stud*. 2015;51(8):1097-1123. doi:10.1080/00220388.2015.1018904.

23. Cunningham K, Ploubidis GB, Menon P, et al. Women's empowerment in agriculture and child nutritional status in rural Nepal. *Public Health Nutr*. 2015;18(17):3134-3145. doi:10.1017/S1368980015000683.

24. Cunningham K, Headey D, Singh A, Karmacharya C, Pandey Rana P. Maternal and Child Nutrition in Nepal: Examining drivers of progress from the mid-1990s to 2010s. *Glob Food Sec*. 2017;13:30-37. doi:10.1016/j.gfs.2017.02.001.

25. Government of Nepal; UNDP. *Millennium Development Goals (MDG) Progress Report 2013*.; 2013. http://www.np.undp.org/content/nepal/en/home/library/mdg/mdg-progress-report-2013.html.

26. Pelletier DL, Frongillo EA, Schroeder DG, Habicht JP. The effects of malnutrition on child mortality in developing countries. *Bull World Health Organ*. 1995;73(4):443-448. http://www.ncbi.nlm.nih.gov/pubmed/7554015. Accessed July 18, 2016.

27. Rush D. Nutrition and maternal mortality in the developing world. *Am J Clin Nutr*. 2000;72(1 Suppl):212S-240S. http://www.ncbi.nlm.nih.gov/pubmed/10871588. Accessed July 18, 2016.

28. Jones AD, Ickes SB, Smith LE, et al. World Health Organization infant and young child feeding indicators and their associations with child anthropometry: a synthesis of recent findings. *Matern Child Nutr*. August 2013:1-17. doi:10.1111/mcn.12070.

29. *WHO | Indicators for Assessing Infant and Young Child Feeding Practices*. World Health Organization; 2015.

30. Cattaneo A, Quintero-Romero S. Protection, promotion and support of breastfeeding in low-income countries. *Semin Fetal Neonatal Med*. 2006;11(1):48-53. doi:10.1016/j.siny.2005.10.007.

31. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. *Lancet*. 2008;371(9608):243-260. doi:10.1016/S0140-6736(07)61690-0.

32. Quigley MA, Hockley C, Carson C, Kelly Y, Renfrew MJ, Sacker A. Breastfeeding is associated with improved child cognitive development: A population-based cohort study. *J Pediatr*. 2012;160(1):25-32. doi:10.1016/j.jpeds.2011.06.035.

33. Dewey KG, Cohen RJ, Brown KH, Rivera LL. Effects of exclusive breastfeeding for four versus six months on maternal nutritional status and infant motor development: results of two randomized trials in Honduras. *J Nutr*. 2001;131(2):262-267. http://www.ncbi.nlm.nih.gov/pubmed/11160544. Accessed July 25, 2016.

34. Shrimpton R, Victora CG, De Onis M, Lima RC, Blö M, Clugston G. Worldwide Timing of Growth Faltering: Implications for Nutritional Interventions. http://pediatrics.aappublications.org/content/pediatrics/107/5/e75.full.pdf. Accessed February 26, 2018.

35. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. *J Nutr*. 2004;134(10):2579-2585. http://www.ncbi.nlm.nih.gov/pubmed/15465751. Accessed July 19, 2016.

36. Vazir S, Engle P, Balakrishna N, et al. Cluster-randomized trial on complementary and responsive feeding education to caregivers found improved dietary intake, growth and development among rural Indian toddlers. *Matern Child Nutr*. 2013;9(1):99-117. doi:10.1111/j.1740-8709.2012.00413.x.

37. Imdad A, Yakoob MY, Bhutta ZA, et al. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC Public Health*. 2011;11(Suppl 3):S25. doi:10.1186/1471-2458-11-S3-S25.

38. Disha A, Rawat R, Subandoro A, Menon P. Infant and young child feeding (IYCF) practices in Ethiopia and Zambia and their association with child nutrition: Analysis of demographic and health survey data. *African J Food, Agric Nutr Dev*. 2012;12(2):5895-5914.

39. Kumar D, Goel NK, Mittal PC, Misra P. Influence of infant-feeding practices on nutritional status of under-five children. *Indian J Pediatr*. 2006;73(5):417-421. doi:10.1007/BF02758565.

40. Zongrone A, Winskell K, Menon P. Infant and young child feeding practices and child undernutrition in Bangladesh: insights from nationally representative data. *Public Health Nutr*. 2012;15(9):1697-1704. doi:10.1017/S1368980012001073.

41. Stewart CP, Iannotti L, Dewey KG, Michaelsen KF, Onyango AW. Contextualising complementary feeding in a broader framework for stunting prevention. *Matern Child Nutr*. 2013;9(S2):27-45. doi:10.1111/mcn.12088.

42. UNICEF. *THE STATE OF THE WORLD'S CHILDREN 1998*. https://www.unicef.org/sowc/archive/ENGLISH/The State of the World%27s Children 1998.pdf.

43. Ruel MT, Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *Lancet*. 2013;382(9891):536-551. doi:10.1016/S0140-6736(13)60843-0.

44. Locks LM, Pandey PR, Osei AK, et al. Using formative research to design a context-specific behaviour change strategy to improve infant and young child feeding practices and nutrition in Nepal. *Matern Child Nutr*. 2015;11(4):882-896. doi:10.1111/mcn.12032.

45. Mason KO, Smith HL. WOMEN'S EMPOWERMENT AND SOCIAL CONTEXT: RESULTS FROM FIVE ASIAN COUNTRIES*. 2003.

46. Sen S. Gender-inclusive nutrition activities in South Asia. 2012;(July).

47. Headey DD. Developmental Drivers of Nutritional Change: A Cross-Country Analysis. *World Dev*. 2013;42:76-88. doi:10.1016/j.worlddev.2012.07.002.

48. Klasen S. Low Schooling for Girls, Slower Growth for All? Cross-Country Evidence on the Effect of Gender Inequality in Education on Economic Development. *World Bank Econ Rev*. 2002;16(3):345-373. doi:10.1093/wber/lhf004.

49. Self S, Grabowski R. Does education at all levels cause growth? India, a case study. *Econ Educ Rev*. 2004;23(1):47-55. doi:10.1016/S0272-7757(03)00045-1.

50. Moss NE. Gender equity and socioeconomic inequality: a framework for the patterning of women's health. *Soc Sci Med*. 2002;54(5):649-661. doi:10.1016/S0277-9536(01)00115-0.

51. Garikipati S. The Impact of Lending to Women on Household Vulnerability and Women's Empowerment: Evidence from India. *World Dev*. 2008;36(12):2620-2642. doi:10.1016/j.worlddev.2007.11.008.

52. Pitt MM, Khandker SR. The Impact of Group-Based Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter? *J Polit Econ*. 1998;106(5):958-996.

53. Milman A, Frongillo EA, de Onis M, Hwang J-Y. Differential improvement among countries in child stunting is associated with long-term development and specific interventions. *J Nutr*. 2005;135(6):1415-1422. http://www.ncbi.nlm.nih.gov/pubmed/15930446. Accessed July 20, 2016.

54. Boyle MH, Racine Y, Georgiades K, et al. The influence of economic development level, household wealth and maternal education on child health in the developing world. *Soc Sci Med*. 2006;63:2242-2254. doi:10.1016/j.socscimed.2006.04.034.

55. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;382(9890):427-451. doi:10.1016/S0140-6736(13)60937-X.

56. Frost MB, Forste R, Haas DW. Maternal education and child nutritional status in Bolivia: finding the links. *Soc Sci Med*. 2005;60(2):395-407. doi:10.1016/j.socscimed.2004.05.010.

57. Ruel MT, Habicht JP, Pinstrup-Andersen P, Gröhn Y. The mediating effect of maternal nutrition knowledge on the association between maternal schooling and child nutritional status in Lesotho. *Am J Epidemiol*. 1992;135(8):904-914. http://www.ncbi.nlm.nih.gov/pubmed/1585903. Accessed July 18, 2016.

58. Kabeer N. Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gend Dev*. 2005;13(1):13-24.

59. Haddad L. Women's Status: Levels, Determinants, Consequences for Malnutrition, Interventions, and Policy. *Asian Dev Rev*. 1999;17(12):96-131.

60. 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. doi:10.1111/j.1728-4457.2001.00687.x.

61. Subramanian S V., Ackerson LK, Smith GD, et al. Association of Maternal Height With Child Mortality, Anthropometric Failure, and Anemia in India. *JAMA*. 2009;301(16):1691. doi:10.1001/jama.2009.548.

62. Chen LC, Chowdhury A, Huffman SL. Anthropometric assessment of energy-protein malnutrition and subsequent risk of mortality among preschool aged children. *Am J Clin Nutr*. 1980;33(8):1836-1845. http://www.ncbi.nlm.nih.gov/pubmed/6773410. Accessed July 19, 2016.

63. Addo OY, Stein AD, Fall CH, et al. Maternal Height and Child Growth Patterns. *J Pediatr*. 2013;163(2):549-554.e1. doi:10.1016/j.jpeds.2013.02.002.

64. Meinzen-Derr JK, Guerrero ML, Altaye M, Ortega-Gallegos H, Ruiz-Palacios GM, Morrow AL. Risk of infant anemia is associated with exclusive breast-feeding and maternal anemia in a Mexican cohort. *J Nutr*. 2006;136(2):452-458. http://www.ncbi.nlm.nih.gov/pubmed/16424127. Accessed July 19, 2016.

65. De Pee S, Bloem MW, Sari M, Kiess L, Yip R, Kosen S. The high prevalence of low hemoglobin concentration among Indonesian infants aged 3-5 months is related to maternal anemia. *J Nutr*. 2002;132(8):2215-2221. http://www.ncbi.nlm.nih.gov/pubmed/12163665. Accessed July 19, 2016.

66. Walker SP, Wachs TD, Meeks Gardner J, et al. Child development: risk factors for adverse outcomes in developing countries. *Lancet*. 2007;369(9556):145-157. doi:10.1016/S0140-6736(07)60076-2.

67. Doss C. Intrahousehold Bargaining and Resource Allocation in Developing Countries. *World Bank Res Obs*. 2013;28(1):52-78. doi:10.1093/wbro/lkt001.

68. Haddad L, Hoddinott J, Alderman H. *Intrahousehold Resource Allocation: An Overview*.; 1994.

69. Agarwal B. "Bargaining" and Gender Relations: Within and Beyond the Household. *Fem Econ*. 1997;3(1):1-51. doi:10.1080/135457097338799.

70. Allendorf K. Do Women's Land Rights Promote Empowerment and Child Health in Nepal? *World Dev*. 2007;35(11).

71. Mabsout R, van Staveren I. Disentangling Bargaining Power from Individual and Household Level to Institutions: Evidence on Women's Position in Ethiopia. *World Dev*. 2010;38(5):783-796. doi:10.1016/j.worlddev.2009.11.011.

72. Quisumbing AR, Maluccio JA. *Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries*.; 2000.

73. Hoddinott J, Haddad L. Does female income share influence household expenditures? Evidence from Côte d'Ivoire. *Oxf Bull Econ Stat*. 1995;57(1):77-96. doi:10.1111/j.1468-0084.1995.tb00028.x.

74. Imdad A, Yakoob MY, Bhutta ZA. Impact of maternal education about complementary feeding and provision of complementary foods on child growth in developing countries. *BMC Public Health*. 2011;11(Suppl 3):S25. doi:10.1186/1471-2458-11-S3-S25.

75. Acharya P, Khanal V, Arimond M, et al. The effect of mother's educational status on early initiation of breastfeeding: further analysis of three consecutive Nepal Demographic and Health Surveys. *BMC Public Health*. 2015;15(1):1069. doi:10.1186/s12889-015-2405-y.

76. Seebens H. Intra-household bargaining, gender roles in agriculture and how to promote welfare enhancing changes. 2010. www.fao.org/economic/esa. Accessed September 8, 2016.

77. Sayer LC. Gender, Time and Inequality: Trends in Women's and Men's Paid Work, Unpaid Work and Free Time. *Soc Forces*. 2005;84(1):285-303. doi:10.1353/sof.2005.0126.

78. Samman E, Presler-Marshall E, Jones N, et al. *Women's Work Mothers, Children and the Global Childcare Crisis*. London; 2016. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/10333.pdf. Accessed July 28, 2016.

79. Locks LM, Pandey PR, Osei AK, et al. Using formative research to design a context-specific behaviour change strategy to improve infant and young child feeding practices and nutrition in Nepal. *Matern Child Nutr*. 2015;11(4):882-896. doi:10.1111/mcn.12032.

80. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health Place*. 2007;13(2):341-355. doi:10.1016/j.healthplace.2006.02.005.

81. Beegle K, Frankenberg E, Thomas D. Bargaining Power Within Couples and Use of Prenatal and Delivery Care in Indonesia. *Stud Fam Plann*. 2001;32(2):130-146. doi:10.1111/j.1728-4465.2001.00130.x.

82. Cunningham K, Ruel M, Ferguson E, Uauy R. Women's empowerment and child nutritional status in South Asia: a synthesis of the literature. *Matern Child Nutr*. 2014;11:1-19. doi:10.1111/mcn.12125.

83. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. *Matern Child Nutr*. February 2014. doi:10.1111/mcn.12113.

84. Alsop R, Heinsohn N. *Measuring Empowerment in Practice : Structuring Analysis and Framing Indicators*. Washington D.C.; 2005.

85. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. *Dev Chang*. 1999;30(May):435-464.

86. Mosedale S. Assessing women's empowerment: towards a conceptual framework. *J Int Dev*. 2005;17(2):243-257. doi:10.1002/jid.1212.

87. Van den Bold M, Quisumbing AR, Gillespie S. *Women's Empowerment and Nutrition: An Evidence Review*. Washington D.C.; 2013.

88. Quisumbing AR, De La Brière B. *Women's Assets and Intra-Household Allocation in Rural Bangladesh: Testing Measures of Bargaining Power*.

89. Shroff M, Griffiths P, Adair L, Suchindran C, Bentley M. Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Matern Child Nutr*. 2009;5(1):64-74. doi:10.1111/j.1740-8709.2008.00161.x.

90. 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. doi:10.1016/j.socscimed.2011.05.040.

91. Kumar N, Scott S, Menon P, et al. Pathways from women's group-based programs to nutrition change in South Asia: A conceptual framework and literature review. *Glob Food Sec*. 2017. doi:10.1016/j.gfs.2017.11.002.

92. Lin N. Building a Network Theory of Social Capital. *Connections*. 1999;22(1):28-51. http://www.insna.org/PDF/Connections/v22/1999_I-1-4.pdf. Accessed November 27, 2017.

93. Harpham T, De Silva M, Jones N, Garlick C. *Maternal Social Capital and Child Wellbeing in Comparative Perspective*. London; 2006.

94. Galab S, Antony P, Wilson I, et al. *Exploring Linkages between Maternal Social Capital and Children's Nutritional Status in Andhra Pradesh*.; 2006.

95. Moestue H, Huttly S, Sarella L, Galab S. "The bigger the better" – mothers' social networks and child nutrition in Andhra Pradesh. *Public Health Nutr*. 2007;10(11):1274-1282. doi:10.1017/S1368980007702896.

96. Haider R, Ashworth A, Kabir I, et al. Effect of community-based peer counsellors on exclusive breastfeeding practices in Dhaka, Bangladesh: a randomised controlled trial [see commments]. *Lancet (London, England)*. 2000;356(9242):1643-1647. doi:10.1016/s0140-6736(00)03159-7.

97. Morrow AL, Guerrero ML, Shults J, et al. Efficacy of home-based peer counselling to promote exclusive breastfeeding: a randomised controlled trial. *Lancet (London, England)*. 1999;353(9160):1226-1231. doi:10.1016/S0140-6736(98)08037-4.

98. Acharya A, Lalwani T, Dutta R, et al. Evaluating a Large-Scale Community-Based Intervention to Improve Pregnancy and Newborn Health Among the Rural Poor in India. *Am J Public Health*. 2015;105(1):144-152. doi:10.2105/AJPH.2014.302092.

99. Saha S, Kermode M, Annear PL. Effect of combining a health program with a microfinance-based self-help group on health behaviors and outcomes. *Public Health*. 2015;129(11):1510-1518. doi:10.1016/j.puhe.2015.07.010.

100. Malhotra A, Schuler SR, Boender C. *Measuring Women's Empowerment as a Variable in International Development*.; 2002.

101. Blackden M, Wodon Q, Blackden CM. *Gender, Time Use, and Poverty: Introduction*.; 2006. https://mpra.ub.uni-muenchen.de/11080/. Accessed August 1, 2016.

102. Bardasi E, Wodon Q. Working Long Hours and Having No Choice: Time Poverty in Guinea. *Fem Econ*. 2010;16(3):45-78. doi:10.1080/13545701.2010.508574.

103. White H, Masset E. Assessing interventions to improve child nutrition: a theory-based impact evaluation of the Bangladesh Integrated Nutrition Project. *J Int Dev*. 2007;19(5):627-652. doi:10.1002/jid.1344.

104. Blackden CM, Wodon Q. *Gender, Time Use, and Poverty in Sub-Saharan Africa*. (Wodon Q, Blackden CM, eds.). World Bank Publications; 2006. doi:10.1596/978-0-8213-6561-8.

105. Nepal Ministry of Health and Population, New Era, ICF International. *Nepal Demographic and Health Survey 2011*.; 2012.

106. Sethuraman K, Lansdown R, Sullivan K. Women's empowerment and domestic violence: the role of sociocultural determinants in maternal and child undernutrition in tribal and rural communities in South India. *Food Nutr Bull*. 2006;27(2):128-143.

107. Aboud FE, Akhter S, Grantham-McGregor S, et al. A cluster-randomized evaluation of a responsive stimulation and feeding intervention in bangladesh. *Pediatrics*. 2011;127(5):e1191-7. doi:10.1542/peds.2010-2160.

108. Bentley ME, Wasser HM, Creed-Kanashiro HM. Responsive Feeding and Child Undernutrition in Low- and Middle-Income Countries. *J Nutr*. 2011;141(3):502-507. doi:10.3945/jn.110.130005.

109. Dancer D, Rammohan A. Maternal autonomy and child nutrition. *Indian Growth Dev Rev*. 2009;2(1):18-38. doi:10.1108/17538250910953444.

110. Mashal T, Takano T, Nakamura K, et al. Factors associated with the health and nutritional status of children under 5 years of age in Afghanistan: family behaviour related to women and past experience of war-related hardships. *BMC Public Health*. 2008;8(1):301. doi:10.1186/1471-2458-8-301.

111. Adhikari M, Khanal V, Karkee R, et al. Factors associated with early initiation of breastfeeding among Nepalese mothers: further analysis of Nepal Demographic and Health Survey, 2011. *Int Breastfeed J*. 2014;9(1):21. doi:10.1186/s13006-014-0021-6.

112. Patel A, Badhoniya N, Khadse S, et al. Infant and young child feeding indicators and determinants of poor feeding practices in India: secondary data analysis of National Family Health Survey 2005-06. *Food Nutr Bull*. 2010;31(2):314-333. doi:10.1177/156482651003100221.

113. Ruel MT. *Is Dietary Diversity an Indicator of Food Security or Dietary Quality? A Review of Measurement Issues and Research Needs*.; 2002.

114. Kennedy E, Peters P. Household food security and child nutrition: the interaction of income and gender of household head. *World Dev*. 1992;20(8):1077-1085. doi:10.1016/0305-750X(92)90001-C.

115. Talukder A, Haselow NJ, Osei AK, et al. Homestead food production model contributes to improved household food security and nutrition status of young children and women in poor populations. *http://factsreports.revues.org*. 2010;(Special Issue 1).

116. Thorne-Lyman AL, Valpiani N, Sun K, et al. Household Dietary Diversity and Food Expenditures Are Closely Linked in Rural Bangladesh, Increasing the Risk of Malnutrition Due to the Financial Crisis. *J Nutr*. 2010;140(1):182S-188S. doi:10.3945/jn.109.110809.

117. Quisumbing AR, Brown LR, Feldstein HS, Haddad L, Peña C. *Women: The Key to Food Security*. Washington, D.C.; 1995.

118. Meshram II, Kodavanti MR, Chitty GR, et al. Influence of feeding practices and associated factors on the nutritional status of infants in rural areas of Madhya Pradesh state, India. *Asia Pac J Public Health*. 2015;27(2):NP1345-61. doi:10.1177/1010539513486174.

119. Meedya S, Fahy K, Kable A. Factors that positively influence breastfeeding duration to 6 months: A literature review. *Women and Birth*. 2010;23(4):135-145. doi:10.1016/j.wombi.2010.02.002.

120. Pisacane A, Continisio GI, Aldinucci M, D'Amora S, Continisio P. A controlled trial of the father's role in breastfeeding promotion. *Pediatrics*. 2005;116(4):e494-8. doi:10.1542/peds.2005-0479.

121. Mitra AK, Khoury AJ, Hinton AW, Carothers C. Predictors of Breastfeeding Intention Among Low-Income Women. *Matern Child Health J*. 2004;8(2):65-70. doi:10.1023/B:MACI.0000025728.54271.27.

122. Tolhurst R, Nyonator FK. Looking within the household: gender roles and responses to malaria in Ghana. *Trans R Soc Trop Med Hyg*. 2006;100(4):321-326. doi:10.1016/j.trstmh.2005.05.004.

123. 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. doi:10.1016/j.socscimed.2012.09.017.

124. Ruel MT, Alderman H. Maternal and Child Nutrition 3 Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *Lancet*. 2013;382:536-551. doi:10.1016/S0140-6736(13)60843-0.

125. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household food security indicators. *Int J Food Safety, Nutr Public Heal*. 2009.

126. Ministry of Health and Population- Nepal, New Era, ICF International. *Nepal Demographic and Health Survey, 2011*.; 2012.

127. Cunningham K, Kadiyala S, Chakrabarti S, et al. *Suaahara Baseline Survey Report*. Washington DC; 2013. http://pdf.usaid.gov/pdf_docs/PA00KC2C.pdf. Accessed July 13, 2016.

128. Onis M. WHO Child Growth Standards based on length/height, weight and age. *Acta Paediatr*. 2007;95(S450):76-85. doi:10.1111/j.1651-2227.2006.tb02378.x.

129. Taukobong HFG, Kincaid MM, Levy JK, et al. Does addressing gender inequalities and empowering women and girls improve health and development programme outcomes? *Health Policy Plan*. 2016;31(10):1492-1514. doi:10.1093/heapol/czw074.

130. Bhagowalia P, Menon P, Quisumbing A. *What Dimensions of Women's Empowerment Matter Most for Child Nutrition? Evidence Using Nationally Representative Data from Bangladesh*.; 2012. http://agris.fao.org/agris-search/search.do?recordID=QB2015107363. Accessed July 14, 2016.

131. Leder S, Clement F, Karki E. Reframing women's empowerment in water security programmes in Western Nepal. *Gend Dev*. 2017;25(2):235-251. doi:10.1080/13552074.2017.1335452.

132. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3*.; 2007. www.fantaproject.org. Accessed July 12, 2016.

133. Harris-Fry H, Shrestha N, Costello A, Saville NM. Determinants of intra-household food allocation between adults in South Asia – a systematic review. *Int J Equity Health*. 2017;16. doi:10.1186/s12939-017-0603-1.

134. Miller LC, Joshi N, Lohani M, et al. Women's education level amplifies the effects of a livelihoods-based intervention on household wealth, child diet, and child growth in rural Nepal. *Int J Equity Health*. 2017;16. doi:10.1186/s12939-017-0681-0.

135. Vanderweele TJ. *Explanation in Causal Inference: Methods for Mediation and Interaction*. New York, NY, USA: Oxford University Press; 2015.

136. Vir SC. Improving women's nutrition imperative for rapid reduction of childhood stunting in South Asia: coupling of nutrition specific interventions with nutrition sensitive measures essential. *Matern Child Nutr*. 2016;12(S1):72-90. doi:10.1111/mcn.12255.

137. Malhotra A, Mather M. Do Schooling and Work Empower Women in Developing Countries? Gender and Domestic Decisions in Sri Lanka. *Sociol Forum*. 1997;12(4):599-630. doi:10.1023/A:1022126824127.

138. Bryce J, Coitinho D, Darnton-Hill I, Pelletier D, Pinstrup-Andersen P. Maternal and child undernutrition: effective action at national level. *Lancet*. 2008;371(9611):510-526. doi:10.1016/S0140-6736(07)61694-8.

139. Hoddinott J, Maluccio JA, Behrman JR, Flores R, Martorell R. Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults. *Lancet*. 2008;371(9610):411-416. doi:10.1016/S0140-6736(08)60205-6.

140. Teijlingen van E, Simkhada B, van Teijlingen E, Porter M, Simkhada P. Major problems and key issues in Maternal Health in Nepal. *Kathmandu Univ Med J*. 2006;4(14):258-263.

141. Demilew YM. Factors associated with mothers' knowledge on infant and young child feeding recommendation in slum areas of Bahir Dar City, Ethiopia: cross sectional study. *BMC Res Notes*. 2017;10(1):191. doi:10.1186/s13104-017-2510-3.

142. Wu Q, Scherpbier RW, van Velthoven MH, et al. Poor infant and young child feeding practices and sources of caregivers' feeding knowledge in rural Hebei Province, China: findings from a cross-sectional survey. *BMJ Open*. 2014;4(e005108):e005108. doi:10.1136/bmjopen-2014-005108.

143. Sraboni E, Malapit HJ, Quisumbing AR, Ahmed AU. Women's Empowerment in Agriculture: What Role for Food Security in Bangladesh? *World Dev*. 2014;61:11-52. doi:10.1016/j.worlddev.2014.03.025.

144. Duong D, Binns CW, Lee A. Utilization of delivery services at the primary health care level in rural Vietnam. *Soc Sci Med*. 2004;59(12):2585-2595. doi:10.1016/J.SOCSCIMED.2004.04.007.

145. Berhane Y, Gossaye Y, Emmelin M, Hogberg U. Women's health in a rural setting in societal transition in Ethiopia. *Soc Sci Med*. 2001;53(11):1525-1539. doi:10.1016/S0277-9536(00)00441-X.

146. Komatsu H, Malapit HJL, Theis S. How Does Women's Time in Reproductive Work and Agriculture Affect Maternal and Child Nutrition? Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal. *SSRN Electron J*. December 2015. doi:10.2139/ssrn.2741272.

147. Jones A, Agudo Y, Galway L, Bentley J, Pinstrup-Andersen P. Heavy agricultural workloads and low crop diversity are strong barriers to improving child feeding practices in the Bolivian Andes. *Soc Sci Med*. 2012;75(9):1673-1684. doi:10.1016/J.SOCSCIMED.2012.06.025.

148. Avula R, Menon P, Saha KK, et al. A program impact pathway analysis identifies critical steps in the implementation and utilization of a behavior change communication intervention promoting infant and child feeding practices in Bangladesh. *J Nutr*. 2013;143(12):2029-2037. doi:10.3945/jn.113.179085.

149. Hackett KM, Mukta US, Jalal CSB, Sellen DW. A qualitative study exploring perceived barriers to infant feeding and caregiving among adolescent girls and young women in rural Bangladesh. *BMC Public Health*. 2015;15(1):771. doi:10.1186/s12889-015-2115-5.

150. Sanghvi T, Jimerson A, Hajeebhoy N, Zewale M, Nguyen GH. Tailoring Communication Strategies to Improve Infant and Young Child Feeding Practices in Different Country Settings. *Food Nutr Bull*. 2013;34(3_suppl2):S169-S180. doi:10.1177/15648265130343S204.

151. Brennan L, McDonald J, Shlomowitz R. Infant feeding practices and chronic child malnutrition in the Indian states of Karnataka and Uttar Pradesh. *Econ Hum Biol*. 2004;2(1):139-158. doi:10.1016/j.ehb.2003.09.003.

152. Sharma SK, Sawangdee Y, Sirirassamee B. Access To Health: Women's Status And Utilization of Maternal Health Services In Nepal. *J Biosoc Sci*. 2007;39(5):671. doi:10.1017/S0021932007001952.

153. Singh A, Klemm RD, Mundy G, Pandey Rana P, Pun B, Cunningham K. Improving maternal, infant and young child nutrition in Nepal via peer mobilization. *Public Health Nutr*. November 2017:1-11. doi:10.1017/S1368980017002993.

154. Lutter CK, Iannotti L, Creed-Kanashiro H, et al. Key principles to improve programmes and interventions in complementary feeding. *Matern Child Nutr*. 2013;9(S2):101-115. doi:10.1111/mcn.12087.

155. Nair N, Tripathy P, Pradha H, et al. Effect of participatory women's groups and counselling through home visits on children's linear growth in rural eastern India (CARING trial): a cluster-randomised controlled trial. *Lancet Glob Heal*. 2017;5:e1004-e1016. doi:10.1016/S2214-109X(17)30339-X.

156. Brody CM, De Hoop T, Vojtkova M, Warnock R, Dunbar M. Economic Self-Help Group Programs for Improving Women' s Empowerment: A Systematic Review. *Campbell Syst Rev*. 2015;11(9).

157. Kanani S, Singh R, Baqar S, Mahajan U, Belwal LM. *Using Participatory Learning and Action to Empower Women's Groups to Improve Feeding Practices in Madhya Pradesh*.; 2015. http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/.

158. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health Place*. 2007;13(2):341-355. doi:10.1016/j.healthplace.2006.02.005.

159. Duong D V, Lee AH, Binns CW. Determinants of breast-feeding within the first 6 months post-partum in rural Vietnam. *J Paediatr Child Health*. 2005;41(7):338-343. doi:10.1111/j.1440-1754.2005.00627.x.

160. Na M, Jennings L, Talegawkar SA, Ahmed S. Association between women's empowerment and infant and child feeding practices in sub-Saharan Africa: an analysis of Demographic and Health Surveys. *Public Health Nutr*. 2015;18(17):3155-3165. doi:10.1017/S1368980015002621.

161. Senarath U, Agho KE, Akram D-S, et al. Comparisons of complementary feeding indicators and associated factors in children aged 6-23 months across five South Asian countries. *Matern Child Nutr*. 2012;8(s1):89-106. doi:10.1111/j.1740-8709.2011.00370.x.

162. Acharya DR, Bell JS, Simkhada P, van Teijlingen ER, Regmi PR. Women's autonomy in household decision-making: a demographic study in Nepal. *Reprod Health*. 2010;7(1):15. doi:10.1186/1742-4755-7-15.

163. Ahmed S, Creanga AA, Gillespie DG, Tsui AO. Economic Status, Education and Empowerment: Implications for Maternal Health Service Utilization in Developing Countries. Shea BJ, ed. *PLoS One*. 2010;5(6):e11190. doi:10.1371/journal.pone.0011190.

164. Abate KH, Belachew T. Women's autonomy and men's involvement in child care and feeding as predictors of infant and young child anthropometric indices in coffee farming households of Jimma Zone, South West of Ethiopia. Renzaho AMN, ed. *PLoS One*. 2017;12(3):1-16. doi:10.1371/journal.pone.0172885.

165. Currie D, Wiesenberg S. Promoting women's health-seeking behavior: research and the empowerment of women. *Health Care Women Int*. 2003;24(10):880-899. doi:10.1080/07399330390244257.

166. Vitta BS, Benjamin M, Pries AM, Champeny M, Zehner E, Huffman SL. Infant and young child feeding practices among children under 2 years of age and maternal exposure to infant and young child feeding messages and promotions in Dar es Salaam, Tanzania. *Matern Child Nutr*. 2016;12(S2):77-90. doi:10.1111/mcn.12292.

167. Malhotra N. Inadequate feeding of infant and young children in India: lack of nutritional information or food affordability? *Public Health Nutr*. 2013;16(10):1723-1731. doi:10.1017/S1368980012004065.

168. Kabir A, Maitrot MRL. Factors influencing feeding practices of extreme poor infants and young children in families of working mothers in Dhaka slums: A qualitative study. Wieringa F, ed. *PLoS One*. 2017;12(2):e0172119. doi:10.1371/journal.pone.0172119.

169. Garg S, Agarwal P, Singh M. Maternal health-care utilization among women in an urban slum in Delhi. *Indian J Community Med*. 2007;32(3):203. doi:10.4103/0970-0218.36829.

170. Nguyen PH, Kim SS, Nguyen TT, et al. Exposure to mass media and interpersonal counseling has additive effects on exclusive breastfeeding and its psychosocial determinants among Vietnamese mothers. *Matern Child Nutr*. 2016;12(4):713-725. doi:10.1111/mcn.12330.

171. Story WT. Social capital and the utilization of maternal and child health services in India: A multilevel analysis. *Health Place*. 2014;28:73-84. doi:10.1016/j.healthplace.2014.03.011.

172. Scanlan SJ. Women, Food Security, and Development in Less-Industrialized Societies: Contributions and Challenges for the New Century. *World Dev*. 2004;32(11):1807-1829. doi:10.1016/j.worlddev.2004.05.009.

173. Quisumbing AR, Maluccio JA. Resources at Marriage and Intrahousehold Allocation: Evidence from Bangladesh, Ethiopia, Indonesia, and South Africa*. *Oxf Bull Econ Stat*. 2003;65(3):283-327. doi:10.1111/1468-0084.t01-1-00052.

174. Chandrasekhar S, Aguayo VM, Krishna V, Nair R. Household food insecurity and children's dietary diversity and nutrition in India. Evidence from the comprehensive nutrition survey in Maharashtra. *Matern Child Nutr*. 2017;13:e12447. doi:10.1111/mcn.12447.

175. Webb-Girard A, Cherobon A, Mbugua S, Kamau-Mbuthia E, Amin A, Sellen DW. Food insecurity is associated with attitudes towards exclusive breastfeeding among women in urban Kenya. *Matern Child Nutr*. 2012;8(2):199-214. doi:10.1111/j.1740-8709.2010.00272.x.

176. Nyyssölä M. *Women's Status and Children's Food Security in Nepal*.; 2007.

177. Iram U, Butt MS. Determinants of household food security. *http://dx.doi.org/101108/03068290410546011*. 2013.

178. Avotri JY, Walters V. "You just look at our work and see if you have any freedom on earth'': Ghanaian women's accounts of their work and their health. *Soc Sci Med*. 1999;48(9):1123-1133. doi:10.1016/S0277-9536(98)00422-5.

179. Singh A, Ram F. Men's Involvement during Pregnancy and Childbirth: Evidence from Rural Ahmadnagar, India Population Review Men's Involvement during Pregnancy and Childbirth: Evidence from Rural Ahmadnagar, India. *Popul Rev*. 2009;48(1):83-102. doi:10.1353/prv.0.0016.

180. Rajbhandari BP. Bio-intensive Farming System : Validation of Its Approaches in Increasing Food Production , Improving Food Security and Livelihoods. *Nepal J Agric Sci*. 2011;9:112-124.

181. Sthapit BR, Joshi KD, Witcombe JR. Farmer Participatory Crop Improvement. III. Participatory Plant Breeding, a Case Study for Rice in Nepal. *Exp Agric*. 1996;32(4):479. doi:10.1017/S001447970000154X.

182. Eklund P, Imai K, Felloni F. Women's organisations, maternal knowledge, and social capital to reduce prevalence of stunted children: evidence from rural Nepal. *J Dev Stud*. 2007;43(3):456-489. doi:10.1080/00220380701204406.

183. Coates JC, Webb P, Houser RF, Rogers BL, Wilde P. "He said, she said": who should speak for households about experiences of food insecurity in Bangladesh? *Food Secur*. 2010;2(1):81-95. doi:10.1007/s12571-010-0052-9.

184. Becker S, Fonseca-Becker F, Schenck-Yglesias C. Husbands' and wives' reports of women's decision-making power in Western Guatemala and their effects on preventive health behaviors. *Soc Sci Med*. 2006;62(9):2313-2326. doi:10.1016/j.socscimed.2005.10.006.

185. Ackerson LK, Subramanian S V. Domestic violence and chronic malnutrition among women and children in India. *Am J Epidemiol*. 2008;167(10):1188-1196. doi:10.1093/aje/kwn049.

186. Sobkoviak RM, Yount KM, Halim N. Domestic violence and child nutrition in Liberia. *Soc Sci Med*. 2012;74(2):103-111. doi:10.1016/j.socscimed.2011.10.024.

187. Doan RM, Bisharat L. Female autonomy and child nutritional status: The extended-family residential unit in Amman, Jordan. *Soc Sci Med*. 1990;31(7):783-789. doi:10.1016/0277-9536(90)90173-P.

188. Ziaei S, Contreras M, Zelaya Blandón E, Persson L-Å, Hjern A, Ekström E-C. Women's autonomy and social support and their associations with infant and young child feeding and nutritional status: community-based survey in rural Nicaragua. *Public Health Nutr*. 2015;18(11):1979-1990. doi:10.1017/S1368980014002468.

189. E K, K D. Fathers support infant and young child feeding: their contributions to better outcomes. 2012. https://www.popline.org/node/645547. Accessed November 27, 2017.

190. Engle PL. Influences of mothers' and fathers' income on children's nutritional status in Guatemala. *Soc Sci Med*. 1993;37(11):1303-1312. doi:10.1016/0277-9536(93)90160-6.

191. Kasturirangan A, Krishnan S, Riger S. The impact of culture and minority status on women's experience of domestic violence. *Trauma Violence Abuse*. 2004;5(4):318-332. doi:10.1177/1524838004269487.

192. Paudel GS. Domestic Violence against Women in Nepal. *Gend Technol Dev*. 2007;11(2):199-233. doi:10.1177/097185240701100204.

193. Nguyen PH, Avula R, Ruel MT, et al. Maternal and Child Dietary Diversity Are Associated in Bangladesh, Vietnam, and Ethiopia. *J Nutr*. 2013;143:1176-1183. doi:10.3945/jn.112.172247.

194. Thieme S, Wyss S. Migration Patterns and Remittance Transfer in Nepal: A Case Study of Sainik Basti in Western Nepal. *Int Migr*. 2005;43(5):59-98. doi:10.1111/j.1468-2435.2005.00342.x.

195. Maharjan A, Bauer S, Knerr B. Do Rural Women Who Stay Behind Benefit from Male Out-migration? A Case Study in the Hills of Nepal. *Gend Technol Dev*. 2012;16(1):95-123. doi:10.1177/097185241101600105.

196. Lokshin M, Glinskaya E. The Effect of Male Migration on Employment Patterns of Women in Nepal. *World Bank Econ Rev*. 2009;23(3):481-507. doi:10.1093/wber/lhp011.

197. Menon P, Nguyen PH, Saha KK, et al. Impacts on Breastfeeding Practices of At-Scale Strategies That Combine Intensive Interpersonal Counseling, Mass Media, and Community Mobilization: Results of Cluster-Randomized Program Evaluations in Bangladesh and Viet Nam. Osrin D, ed. *PLOS Med*. 2016;13(10):e1002159. doi:10.1371/journal.pmed.1002159.

APPENDIX A
EMPOWERMENT SECTION OF SURVEY QUESTIONNAIRE

Empowerment Module of the *Suaahara* Survey

Relevant sections from the module are provided below.

1. Economic domain module

	402	402.1	402.2	402.3	402.4	402.5	402.6
S.N.	Productive Capital	Does anyone in your household currently have any _____? Yes.....1 No.....2	Who would you say owns most of the _____? **(Code list below)**	Who can decide whether to sell _____ most of the time? **(Code list below)**	Who can decide whether to give away _____most of the time? **(Code list below)**	Who can decide to mortgage or rent out _____most of the time? **(Code list below)**	Who contributes most to decisions regarding a new purchase of _____? **(Code list below)**
1.	Agricultural land	☐	☐☐	☐☐	☐☐	☐☐	☐☐
2.	Other land not used for agriculture	☐	☐☐	☐☐	☐☐	☐☐	☐☐
3.	Large livestock (e.g. oxen, cattle, buffalo, horse)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
4.	Small livestock (goats, pigs, sheep, chickens, ducks, pigeons)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
5.	Fish pond or fishing equipment	☐	☐☐	☐☐	☐☐	☐☐	☐☐
6.	Farm equipment (non-mechanized)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
7.	Farm equipment (mechanized e.g. tractor)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
8.	Non-farm business equipment (e.g. roti oven, sewing machine, solar panels, blacksmith equipment)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
9.	House (and other structures)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
10.	Large consumer durables (ex: fridge, TV, sofa)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
11.	Small consumer durables (ex: radio, cookware)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
12.	Mobile phone	☐	☐☐	☐☐	☐☐	☐☐	☐☐
13.	Transportation (motorized or not motorized, e.g. bicycle, motorcycle, car, horse cart)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
14.	Jewelry (silver)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
15.	Jewelry (gold)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
16.	Savings (in bank, at home, etc.)	☐	☐☐		☐☐		

Code list for 402.2, 402.3, 402.4, 402.5 and 402.6

01 = Self
02 = Spouse
03 = Self and spouse jointly
04 = Other male household member
05 = Other female household member
06 = Self and other household member(s)
07 = Spouse and other household member(s)
08 = Self, spouse and other household member(s)
09 = Someone (or group of people) outside the household
10 = Self and other outside people
11 = Spouse and other outside people
12 = Self, spouse and other outside people.

2. Social domain module

411		411.1	411.2	411.3	411.4
S.N.	Group Membership	Is there a ____ in your community? Yes.....1 No.....2 **Next group**	Are you a member/active member of any _____? Yes member .....1 Yes active member.....2 No.....3 411.4 **(Explain that "active member" means one who attends meetings, participates in discussions, volunteers, etc.)**	How much input do you have in making decisions in this _____? **(Go to next group)** **(Code list below)**	Why are you not a member of _____? **(Code list below**
1.	Agricultural/livestock/fisheries producer group (including marketing groups)	☐	☐	☐☐	☐☐
2.	Water users' group	☐	☐	☐☐	☐☐
3.	Land/forest users' groups	☐	☐	☐☐	☐☐
4.	Credit or microfinance group	☐	☐	☐☐	☐☐
5.	Mutual help or insurance group (including burial societies)	☐	☐	☐☐	☐☐
6.	Trade and business association	☐	☐	☐☐	☐☐
7.	Civic group (improving community) or charitable group (helping others)	☐	☐	☐☐	☐☐
8.	Religious group	☐	☐	☐☐	☐☐
9.	Mother's group	☐	☐	☐☐	☐☐
10.	Other women's group (only if it does not fit into one of the other categories)	☐	☐	☐☐	☐☐
96	Other (Specify) _____	☐	☐	☐☐	☐☐

Code list for 411.3

01 = No input
02 = Input into very few decisions
03 = Input into some decisions
04 = Input into most decisions
05 = Input into all decisions
06 = Decision not made

Code list for 411.4

01 = Not interested
02 = No time
03 = Unable to raise entrance fees
04 = Unable to raise reoccurring fees
05 = Group meeting location not convenient
06 = Family dispute/not allowed to join
07 = Not allowed because of sex
96 = Other (Specify)_____

3. Workload domain module

416	**Activities**	**Early Morning (4am -8am) (Total 240 minutes)**	**Mid Morning (8am-12pm) (Total 240 minutes)**	**Afternoon (12pm-4pm) (Total 240 minutes)**	**Evening (4pm-8pm) (Total 240 minutes)**	**Night (8pm-4am) (Total 480 minutes)**
1	Sleeping and resting	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
2	Personal care (eating/drinking/hygiene)	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
3	School (also homework)	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
4	Work as employed for others	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
5	Work as self employed	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
6	Farming/livestock/fishing	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
7	Domestic work (shopping/getting service, cooking, weaving, sewing)	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
8	Care for children/adults/elderly	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
9	Leisure (e.g., watching T.V./ listening to radio/reading/ roaming around/playing/talking on phone)	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
10	Social and religious activities	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
96	Other (Specify) _____	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
	Total Time	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐

4.Household decision-making control module

	412	412.1	412.2	412.3	412.4	412.5
				Read aloud: I am going to give you some reasons why you act as you do in the activities I just mentioned. You might have several reasons for doing what you do and there is no right or wrong answer. Please tell me to what extent you agree with these statements.		
S.N.	Activities	Who normally takes the decision regarding _____? **(If self, write 01 and skip to next activity)** **(Code list below)**	To what extent can you make decisions regarding ____ if you want(ed) to? **(Code list below)**	Regarding ___ I do what I do partly because I will get in trouble if I do differently. **(Code list below)**	Regarding _____ I do what I do so others don't think poorly of me. **(Code list below)**	Regarding _____ I do what I do because I personally think it is the right thing to do. **(Code list below)**
1.	Agricultural production (what to grow and types of crops to plant)					
2.	Taking crops to the market (when and who will take crops to market)					
3.	Livestock raising					
4.	Non-farm business activity					
5.	Your own (singular) wage or salary employment					
6.	Major household expenditures (e.g., refrigerator, T.V.)					
7.	Minor household expenditures (e.g., food for daily consumption or other household necessities)					
8.	Use of family planning products					
9.	Your health and nutrition					
10.	Children's health care					
11.	Feeding children					
12.	How to keep yourself from domestic violence					
13.	To go to your mother's or friend's house					

Code list for 412.1

01 = Self
02 = Spouse
03 = Self and spouse jointly
04 = Other male household member
05 = Other female household member
06 = Self and other household member(s)
07 = Spouse and other household member(s)
08 = Self, spouse and other household ember(s)
09 = Someone (or group of people) outside the household
10 = Self and other outside people
11 = Spouse and other outside people
12 = Self, spouse and other outside people
95 = Decision not made

Code list for 412.2

01 = Not at all
02 = To a small extent
03 = To some extent
04 = To a large extent

Code list for 412.3, 412.4 and 412.5

01 = Strongly disagree
02 = Disagree
03 = Somewhat agree/disagree
04 = Agree
05 = Strongly agree