MATERNAL EMPOWERMENT, CHILDCARE PRACTICES, AND CHILD NUTRITION IN RURAL NEPAL: EXAMINING THE PATHWAYS

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Abstract

Tackling persistent child undernutrition in South Asia will require a deeper understanding of structural determinants, including maternal resources and childcare practices. This study aimed to: (1) synthesise the evidence linking women's empowerment and child nutritional status in South Asia; (2) investigate associations of women's empowerment in agriculture and child nutrition in rural Nepal; (3) determine whether these associations differ by dimension of empowerment or nutritional indicator; and (4) explore whether child feeding and WASH facilities and practices mediate these associations.

Our review of prior empirical studies on women's empowerment and child anthropometry in South Asia showed a general association, but heterogeneous and inconsistent findings. Thus, additional research and harmonisation of how women's empowerment is defined and measured are needed.

Using a cross-sectional dataset, we constructed the Women's Empowerment in Agriculture Index's (WEAI) 5 Domains of Empowerment (5DE) sub-index to investigate the association between maternal empowerment and child LAZ, WAZ, and WLZ in rural Nepal. The aggregate 5DE was positively associated with LAZ and WAZ. Three component indicators had positive associations: leisure time satisfaction (LAZ), production autonomy (LAZ), and access to credit (LAZ/WAZ). We then used causal mediation techniques to test whether two childcare practices - feeding and WASH practices - mediated these associations. Both feeding and WASH facilities and practices were independtly positively associated with child LAZ; neither feeding nor WASH facilities and practices mediated the credit or production autonomy pathways but an indirect pathway from maternal satisfaction with leisure time to child LAZ was found for WASH facilities and practices.

This is the first South Asian study to investigate multiple domains of empowerment and assess pathways from care resources via childcare practices to child nutrition. Findings suggest that particular dimensions of empowerment may influence child nutrition more than others in particular contexts. Addressing child undernutrition in Nepal requires interventions to promote optimal feeding and WASH behaviours but also to address women's disempowerment.

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Acronyms and Abbreviations

BF	Breastfeeding
CF	Complementary Feeding
DHS	Demographic and Health Surveys
DPT	Diphtheria, Pertussis, and Tetanus
DrPH	Doctorate of Public Health
EBPHP	Evidence Based Public Health Policy
FAO	Food and Agricultural Organization
FCHV	Female Community Health Volunteer
GM	Growth Monitoring
GPI	Gender Parity Index
HAZ	Height-for-Age Z-scores
HKI	Helen Keller International
IFPRI	International Food Policy Research Institute
IUNS	International Union of Nutritional Science
IYCF	Infant and Young Child Feeding
LAZ	Length-for-Age Z-scores
LCIRAH	Leverhulme Centre for Integrative Research on Agriculture and Health
LMPD	Leadership Management and Professional Development
LSHTM	London School of Hygiene and Tropical Medicine
MDG	Millennium Development Goals
MTOT	Master Training of Trainers

NAGA	Nutrition Assessment and Gap Analysis
NCRSP	Nutrition Collaborative Research Support Program
NEWAH	Nepal Water for Health
NGO	Non-Governmental Organization
NHRC	Nepal Health Research Council
NPCS	Nutrition Promotion and Consultancy Service
NTAG	Nepali Technical Assistance Group
OPA	Organisational and Policy Analysis
PMDC	*Programa Multisectorial Descnutricion Cero*
PPS	Population Proportional to Size
SCI	Save the Children International
UN	United Nations
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VDC	Village Development Committees
WASH	Water, Sanitation, and Hygiene
WAZ	Weight-for-Age Z-scores
WEAI	Women's Empowerment in Agriculture Index
WFP	World Food Programme
WHO	World Health Organization
WHZ	Weight-for-Height Z-scores
WLZ	Weight-for-Length Z-scores

<2y	Under two years of age
<5y	Under five years of age
5DE	Five Domains of Empowerment
6-24m	Six to twenty-four months of age

Acknowledgements

Many individuals and institutions supported my pursuit of a doctoral degree. A special thank you to The Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), who provided financial support for my studies, and to the International Food Policy Research Institute (IFPRI), who funded my fieldwork.

My supervisors Elaine Ferguson, George Ploubidis, and Ricardo Uauy have provided tremendous guidance and support throughout my time at the London School of Hygiene and Tropical Medicine (LSHTM). I greatly appreciate the time, patience, and constant encouragement from each. Marie Ruel, a member of my advisory committee, also fully embraced my thesis research project providing invaluable feedback and insights. Their knowledge, expertise, and dedication to this type of work and my academic and professional growth over the last several years will not be forgotten. Because of their support, I have learned an incredible amount about maternal and child health and nutrition and honed my research skills in ways unimaginable only a few years ago.

I am also grateful to many colleagues and collaborators who provided academic and personal support throughout the process. In particular, I owe thanks to another advisory committee member, Bhavani Shankar; co-authors on papers included in my thesis, Purnima Menon and Suneetha Kadiyala; and other colleagues at IFPRI, LCIRAH, and LSHTM including but not limited to Jeff Waage, Alan Dangour, Jody Harris, Hazel Malapit, Wahid Quabili, Agnes Quisumbing, and Parul Tyagi.

It was my privilege to meet and work with many collaborators in Nepal during my fieldwork for the *Suaahara* baseline survey. A specific thanks goes to the entire *Suaahara* staff and in particular, Lynn, Kirk, Ravindra, and Pooja, as well as the incredibly talented and hard working New Era team. I am also grateful to all of the research study participants and female community health volunteers; this type of research would not be possible without their generous collaboration. The warmth, generosity, and commitment of the Nepalese people is inspiring and promising for the future of this beautiful country.

Finally, I am indebted to all my family and friends around the world who have supported me in countless ways to pursue this dream. The emails, phone calls, texts, facebook posts, and other means of reaching out have made this journey for a doctoral degree much less isolating than it could have been. Each individual is an important part of the best support network one could ask for and for which I am eternally appreciative. Lastly, a particularly special expression of gratitude to Clai – without his continual love and support I may not have ever moved to London, much less made it through the last few years.

Sincerely,

DrPH Integration Statement

Throughout the Doctorate of Public Health (DrPH) program, I focused on grasping public health nutrition as a discipline, with a particular interest in understanding determinants of child nutritional wellbeing and how programs and policies can best deal with child undernutrition and its contributing factors.

My initial focus was to strengthen my knowledge of public health nutrition. The first component of LSHTM's DrPH program involved two compulsory modules: (1) Evidence Based Public Health Policy/Practice (EBPHP) and (2) Leadership, Management and Professional Development (LMPD). EBPHP provided the foundation for understanding how policy-makers can utilise scientific research and the factors that may facilitate or hinder mobilisation of stakeholders who can effect change, such as presenting findings at the right time and in an appropriate style and language. LMPD introduced organisational management and leadership concepts and facilitated development of individual leadership and management skills. This course enabled me to have a deeper understanding of my personal strengths and weaknesses for future public health leadership positions. I enrolled in the following additional courses to improve my disciplinary knowledge: Epidemiology, Statistics for Epidemiology and Public Health, Public Health Nutrition, Maternal and Child Health, Water and Sanitation, Qualitative Research Methods, Research Design and Analysis, and Statistical Methods in Epidemiology. Each course provided insights into the breadth of public health nutrition as a discipline, its history, and importantly, how researchers and practitioners are currently addressing an array of complex nutritional problems globally.

While taking these various courses, I also pressed ahead with the second aspect of LSHTM's DrPH program – the Organization and Policy Analysis (OPA) project. The OPA is a research project providing DrPH students with an opportunity to apply knowledge gained from the LMPD and EBPHP courses to a particular public health institutional setting. For me, this involved relocating to Bolivia for several months. In Bolivia, I conducted a qualitative assessment of the organizational capacities of the partners who were designing and implementing *Programa Multisectorial Desnutricion Cero* (PMDC), a national multi-sectoral maternal and child nutrition program. Study findings highlighted the importance of leadership, organisational processes, program management, and organisational strength in order to reap maximum benefit from investments in large-scale multi-sectoral nutrition initiatives. Study results were written into reports in both English and Spanish and shared with key stakeholders in several presentations made during a return visit for this explicit purpose. The findings were also presented as a poster presentation at the 2013 International Union of Nutritional Sciences (IUNS) conference and at LSHTM's 2014 research degree

student poster day. These findings will also be submitted for publication, in order to share them more widely.

With the OPA completed, I began the third and final part of the DrPH program – the research thesis. My aim was to build upon work done in the first two years of the doctoral program but to hone new skills. Thus, my thesis project also focused on a multisectoral nutrition initiative aimed at poor, marginalised, rural populations, but my attention shifted from the management and policy design aspects to a focus on determinants of poor nutritional status that need to be addressed for a successful intervention to be designed and implemented. For this research, IFPRI hired me as a conultanct for the baseline survey for an evaluation of a large-scale multi-sectoral maternal and child nutrition initiative throughout rural Nepal. Therefore, I relocated to Nepal for several months to oversee the design and implementation of a baseline survey both because of my responsibilities with IFPRI and because I would use this dataset for my research thesis.

In this thesis, I focused on the association of women's empowerment and child nutritional status. Women's empowerment has been theoretically and conceptually noted as a determinant of nutrition, but empirical studies of this association are limited and existing studies often only capture a single dimension of empowerment. In my thesis, I particularly focused on the relationship between women's empowerment in agriculture and growth status of young children residing in rural Nepal. Results showed that particular dimensions of women's empowerment in agriculture were associated with child (<2y) nutritional status, but this association differed by both dimension of women's empowerment and by indicator of nutrition. In the final part of the thesis, the analyses revealed that neither child feeding nor household water, sanitation, and hygiene (WASH) facilities and practices mediated most of the associations between women's empowerment in agriculture and child (6-24m) length-for-age z-scores (LAZ). Therefore, to address child undernutrition in rural Nepal, policies and programmes must continue to focus on diets and healthy environments, but the independent association of women's disempowerment and child undernutrition indicates that this too should be a priority for policymakers and program designers.

When looking back and comparing the work done for both studies, the synergies between Bolivia and Nepal were many. Fieldwork revealed similarities in topography and agro-ecology, dietary patterns, types of employment, lifestyles, and adaptations to hardships. Furthermore, the populations were quite similar from a health and nutrition perspective with high levels of child stunting and anaemia. Maternal and child undernutrition were more pronounced in rural areas of both countries than in urban areas. Inadequate road networks, extreme isolation and remoteness, and dispersion of communities across difficult terrains presented challenges for the health systems in reaching certain population groups. Both countries have

active health and nutrition agendas: President Morales of Bolivia initiated national level laws and policies and Nepal joined the Scaling Up Nutrition global community. In both Nepal and Bolivia the governments, multilateral agencies, bilateral donors, and local and international non-governmental organizations have implemented multi-sectoral programmes and policies emphasising the importance of non-health sectors, i.e. education and agriculture, if child undernutrition is truly to be eradicated. As a researcher in these countries, I benefited from the time spent with many policy and program stakeholders as well as thousands of Nepalese who agreed to respond to our household survey.

With an objective of training future public health leaders, LSHTM created the DrPH program in recognition that strong research skills were necessary but insufficient; abilities to translate research findings into messages for engagement of diverse audiences, as well as leadership to coordinate and manage large projects and teams, were equally vital. The sophisticated, cutting-edge quantitative analytical techniques required for the Nepal project were selected to complement the strong qualitative analysis skills gained from the Bolivia work. This combination has equipped me with a unique set of skills needed for future leadership in the planning and implementation of impact evaluations and the reviewing and interpreting of the literature on health and nutrition programs and policies. Furthermore, I have gained overall knowledge and skills for understanding and interacting at the macro level of policy makers as well as at the micro level of understanding the ways in which complex public health nutrition problems have emerged and persisted in specific contexts.

Thus far, the literature review has been accepted for publication in *Maternal and Child Nutrition*. The findings presented in the first empirical paper were presented in an oral presentation at the 2013 20th International Congress of Nutrition in Granada, Spain and recently submitted for publication in the journal *Public Health Nutrition*. The plan for the third paper prepared for this thesis is also to present the research findings at international conferences and submit it for journal publication. Finally, opportunities for follow-up engagements in Nepal to provide direct feedback are being pursued.

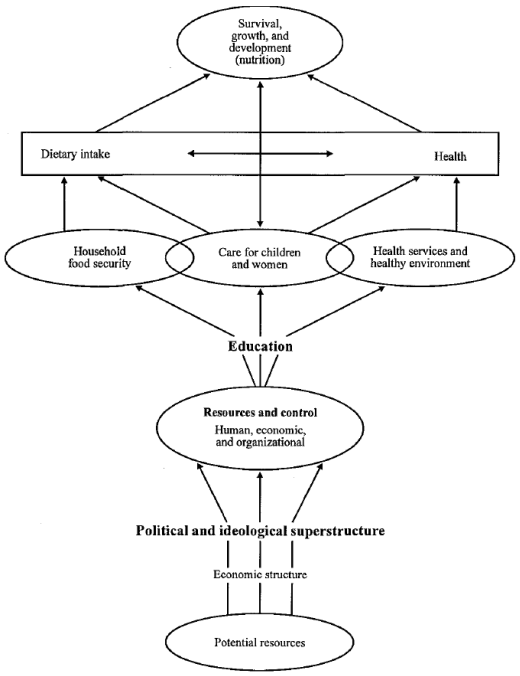
Chapter 1: Study Background

Introduction

Hunger and undernutrition are chronic public health problems and major impediments to human development. Estimates indicate that presently among children under five years (<5y) of age globally, one in four suffers from stunting (being short for age), one in five is underweight (being light for age), and one in ten is wasted (thin for height). The largest numbers are found in South Asia and Sub-Saharan Africa. Malnutrition, which is largely preventable, affects about 170 million preschool children and causes about five million preventable deaths per year across these countries. Those who survive might fail to achieve their full mental and physical potential. Long-term consequences of poor nutrition include reduced educational aptitude, loss of economic productivity and adult income, and lower birth weight of offspring, which for the developing world implies a major loss of human capital across generations.[1–5]

Prevention of undernutrition remains a problem in part because of our limited knowledge of its determinants. An early 1990s UNICEF conceptual framework of the determinants of nutritional status (Figure 1) notes two immediate determinants - dietary intake and health - and three underlying determinants of nutritional status - household food security, care for children and women, and health services and a healthy environment. These determinants interact with each other in complex ways and are further influenced by more fundamental social, economic, and political factors.[6–9]

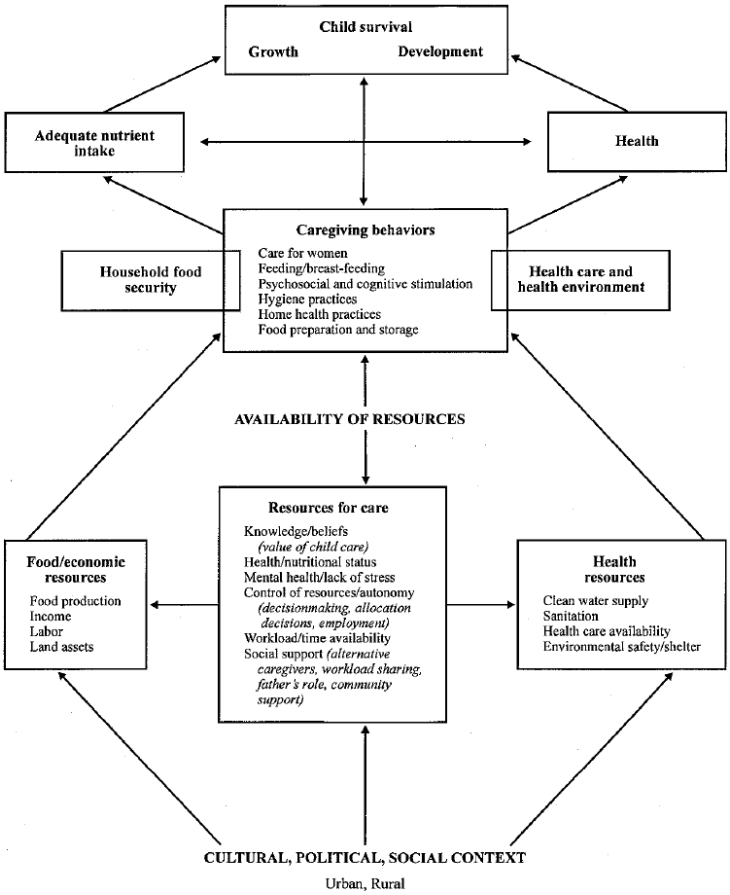
Figure 1: Determinants of nutritional status



Source: UNICEF. (1990). A UNICEF Policy Review Strategy for Improved Nutrition of Children and Women in Developing Countries (pp. 1–38).

Two of the underlying determinants, household food security and health services and a healthy environment, have received greater attention in both research and policy/program arenas than the third identified underlying determinant of nutritional status – care for children and women. Care, originally defined in the UNICEF model as the provision of time, attention, and support at the household and community level to meet physical, mental, and social needs, has gained increasing attention for its potential role in explaining persistent malnutrition. Engle and colleagues' work updates the original UNICEF model by unpacking the concept of care and disentangling care behaviours and the resources needed to engage in these care behaviours (Figure 2).[7] Caregiving behaviours are particular practices mostly related to how one looks after a child including: feeding, psychosocial and cognitive stimulation, hygiene practices, home health practices, and food preparation and storage. Care resources are the caregiver's own means to draw upon to engage in care practices including educational status, knowledge and beliefs, health and nutritional wellbeing, mental health, control of resources and autonomy, workload and time availability, and social support structures.

Figure 2: Determinants of nutritional status including an extended model of care



Source: Engle, P. L., Menon, P., & Haddad, L. (1997). Care and Nutrition: Concepts and Measurement. Figure, 2. IFPRI Occasional Paper 33. International Food Policy Research Institute: Washington, DC. Reproduced with permission from IFPRI. (http://www.ifpri.org/sites/default/files/publications/oc33.pdf).

This newer framework illustrates the nuances of care as a determinant of nutritional status and articulates specific domains of caregiving behaviours and care resources. However, challenges remain for this complex endeavour of analysing and measuring care. The metrics for measuring these different domains of care are not well established which in turn has limited studying how care might influence child nutritional status.

Study Rationale

Optimal childcare is difficult to define universally as what is considered appropriate differs by context and culture. Empirical studies to test the complex relationships outlined in Figure 2 above are sparse and the relative contribution of these diverse determinants of undernutrition in different contexts remains poorly understood. Nutrition programmes and policies have further lagged behind in addressing the dimensions of care due to a lack of agreement on how to intervene to improve care practices and care resources and how to design evaluations to effectively capture and measure care.[7,10]

Recent studies of women's empowerment and the contributing role disempowerment may play in child undernutrition have focused on three of the care resource domains in this model – control of resources and autonomy, workload and time availability, and social support.[11] Globally, the role of women's empowerment as a potential key determinant of child undernutrition has been increasingly recognised, especially in South Asia where women's empowerment is particularly low. In South Asia, child undernutrition has persisted despite economic progress and women's disempowerment has been theorised to be a key impediment to progress in addressing undernutrition.[11,12]

However, little research has been done on the influence of women's empowerment on child nutritional status in South Asia. No studies have yet investigated the causal pathway hypothesised in the Engle et al. care framework noted above, that of women's empowerment influencing caregiving practices and in turn, child nutriitonal status. Given the limited empirical evidence base, there is a need for studies to explore the complex relationships between women's empowerment, caregiving practices, and child nutritional status.

Aim and Objectives

This study aims to explore how women's empowerment and child nutritional status relate in South Asia and specifically assess how care-related nutritional determinants influence young child nutrition in rural Nepal, in order to provide evidence that will contribute to informing child nutrition policies and programmes.

This study's primary objectives include:

1. to synthesise the evidence linking women's empowerment and the nutritional status of children

under five years of age (<5y) in South Asia;

2. to investigate whether women's empowerment in agriculture is associated with the nutritional status of children under two years of age (<2y) in rural Nepal;
3. to determine whether the association between women's empowerment in agriculture and the nutritional status of children (<2y) in rural Nepal differs by dimension of women's empowerment in agriculture or child nutritional status indicator; and
4. to explore whether the caregiving practices of child feeding and household water, sanitation, and hygiene (WASH) facilities and practices mediate any associations between women's empowerment in agriculture and child nutritional status for children 6 to 24 months of age (6-24m) in rural Nepal.

Structure of the Thesis

This thesis follows the research paper style; three manuscripts prepared for publication in peer-reviewed journals are incorporated as chapters along with the remainder of the thesis materials. Chapter two has been accepted for publication in *Maternal and Child Nutrition* and chapter four was recently submitted for publication in *Public Health Nutrition*. Chapter five is in preparation for journal submission. Each manuscript prepared for publication and included as a thesis chapter begins with a cover sheet on publication details and a preface linking the particular manuscript to the previous chapter.

Chapter one provides background information as well as the rationale, aims, and objectives of this thesis. It also includes the candidate's role in the research study, a note on collaborating institutions, and information about ethical clearance and funding. Chapter 2 presents a published literature review assessing and synthesising the empirical evidence linking women's empowerment and child nutritional status in South Asia. Chapter 3 provides detailed information on the research study methodology including study design, sampling, fieldwork processes and logistics, data management and analysis, data quality assurance, and ethical considerations.

Chapters 4 and 5 present the primary research results. These two chapters use quantitative data analyses techniques to assess the complex relationships between women's empowerment in agriculture and child (<2y) nutritional status among rural Nepalese households. Chapter 6 is a discussion section that integrates the findings from chapters 2, 4, and 5 to draw policy and programmatic implications of the study findings. It also addresses the study's strengths and limitations and makes suggestions for further research.

Role of the Candidate

The candidate conceptualized the study design, with input from project colleagues and academic supervisors. She defined the research question; led development of the survey questionnaires; participated in survey sampling; oversaw the training of survey field workers; and monitored data collection and data management. With support from supervisors and colleagues, she completed all of the quantitative data analysis and reporting in the thesis.

Specifically, the candidate wrote the initial drafts of each section of the thesis, including the three papers for publication; drafts were finalised via an iterative process of incorporating feedback from co-authors.

Collaborating Institutions and Funding

For this study collaborating institutions include: the London School of Hygiene & Tropical Medicine (LSHTM), the International Food Policy Research Institute (IFPRI), and the Leverhulme Centre for Integrated Research on Agriculture and Health (LCIRAH). Furthermore, collaborators in Nepal included a local survey firm, New Era, and the program implementation organizations associated with *Suaahara*, including but not limited to Save the Children International (SCI) and Helen Keller International (HKI).

Fieldwork for this survey was funded by IFPRI, who received funding from *Suaahara* on a sub-contract from the United States Agency for International Development (USAID) to carry out the baseline survey for an impact evaluation of the programmatic interventions. The Leverhulme Centre for Integrated Research on Agriculture and Health (LCIRAH) provided additional financial support for the doctoral study.

Chapter 2: Literature Review

Preface

As noted in Chapter 1, child undernutrition remains a major public health burden for millions of children in developing countries. Despite progress in reducing child undernutrition in some regions of the world, South Asia lags behind: at least one in three South Asian children under five years of age are stunted and nearly the same percentage are wasted. Some evidence shows that women's low social status and disempowerment may be a key contributor to persistent child undernutrition in this region. However, the published evidence base for South Asia has not been examined holistically or systematically.

Therefore, in Chapter 2, I present a review of published studies conducted to assess the relationship of women's empowerment and child nutritional status in South Asia. This review aims to: 1) synthesise the evidence linking women's empowerment and child nutritional status in South Asia and 2) suggest directions for future research. Examining the empirical work to date on women's empowerment and child nutritional status in South Asia, this literature review provides a comprehensive synthesises of prior findings and discusses the diversity of conceptualisations of women's empowerment and methods used by authors to measure it.

Declaration of submission for publication

1. For a 'research paper' already published

1.1. Where was the work published? .....

1.2. When was the work published? .....

1.2.1. If the work was published prior to registration for your research degree, give a brief rationale for its inclusion

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1.3. Was the work subject to academic peer review? .....

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2. For a 'research paper' prepared for publication but not yet published

2.1. Where is the work intended to be published? Maternal and Child Nutrition

2.2. Please list the paper's authors in the intended authorship order
(1) Kenda Cunningham (2) Marie Ruel (3) Elaine Ferguson (4) Ricardo Uauy

2.3. Stage of publication – Not yet submitted / Submitted / Undergoing revision from peer reviewers' comments / In press

3. For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)

K.C. conducted the review and drafted the paper with guidance and feedback from co-authors throughout. All authors participated in selection of the review topic, joint re-reading of key studies, and reviewing of drafts, and all have read and approved of the final version of the paper and its submission.

NAME IN FULL (Block Capitals) KENDA JEAN CUNNINGHAM

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CANDIDATE'S SIGNATURE  Date …March 24, 2013

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Manuscript

Title page

Title:
Women's empowerment and child nutritional status in South Asia: a synthesis of the literature

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Review Article

Women's empowerment and child nutritional status in South Asia: a synthesis of the literature

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Abstract

Women's disempowerment is hypothesised to contribute to high rates of undernutrition among South Asian children. However, evidence for this relationship has not been systematically reviewed. This review of empirical studies aims to: (1) synthesise the evidence linking women's empowerment and child nutritional status in South Asia and (2) suggest directions for future research. We systematically searched Global Health, Embase (classic and Ovid), MEDLINE, Campbell Collaboration, Popline, Eldis, Web of Science, EconLit and Scopus. We generated 1661 studies for abstract and title screening. We full-text screened 44 of these, plus 10 additional studies the authors were aware of. Only 12 studies fulfilled our inclusion criteria. We included English materials published between 1990 and 2012 that examined the relationship(s) of at least one women's empowerment domain and nutritional status among South Asian children. Data were extracted and synthesised within three domains of empowerment: control of resources and autonomy, workload and time, and social support. The results showed women's empowerment to be generally associated with child anthropometry, but the findings are mixed. Inter-study differences in population characteristics, settings or methods/conceptualisations of women's empowerment, and the specific domains studied, likely contributed to these inconsistencies. This review also highlights that different women's empowerment domains may relate differently to child nutritional status. Future research should aim to harmonise definitions of women's empowerment, which key domains it should include, and how it is measured. Rigorous evaluation work is also needed to establish which policies and programmes facilitate women's empowerment and in turn, foster child nutritional well-being.

Keywords: women's empowerment, child nutrition, South Asia.

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Introduction

More than 3 million preventable child deaths annually can be attributed to child undernutrition. Current estimates indicate that nearly 165 million children under 5 are stunted and 52 million wasted (Black *et al*. 2013). Malnutrition in early life limits mental and physical development, educational achievement and economic productivity later in life, fuelling intergenerational cycles of poverty and malnutrition (Hoddinott *et al*. 2011).

Over the past several decades, child nutritional status in developing countries has improved. However, South Asia lags behind other regions in achieving improvements in child nutrition. Current estimates indicate that 37% of South Asian children under 5 are stunted and 46% underweight (Gulati 2010; Stevens *et al*. 2012). Efforts to unravel the Asian

Enigma, in which economic gains have not resulted in expected reductions in child malnutrition, have pointed to a number of factors contributing to persistent child undernutrition including poor water, sanitation and hygiene practices (including open defecation), which contribute to high burdens of gastrointestinal diseases and environmental enteropathy in particular (Bhutta 2006; Checkley *et al.* 2008; Dangour *et al.* 2012). Women's low social status was one of the key factors identified early on as a potential key contributor to malnutrition in the region (Ramalingaswami *et al.* 1996). Economic and political structures and socio-cultural norms often allow for inequalities resulting in women's lack of access to (or control over) resources, inability to make household decisions and limited social support. This in turn may result in household decisions that do not provide the necessary resources to support child nutrition and growth. For example, without access to monetary resources, mothers may be unable to purchase appropriate food to meet the special needs of their young children or engage in optimal health-seeking behaviour (Smith *et al.* 2003a,b; Bhutta *et al.* 2004; Bhagowalia *et al.* 2012).

The 1990 UNICEF framework lists care as one of the three major determinants of malnutrition. Later, the analytic framework was expanded to distinguish between *care practices* and maternal *resources for care* as determinants of child nutritional well-being (UNICEF 1990; Engle *et al.* 1997). Care practices, critically important for optimal child nutrition and development, are behaviours such as feeding practices, hygiene practices and stimulation of children. Maternal care resource are characteristics that may affect how mothers are able to care for their children and include: (1) education and knowledge; (2) physical health; (3) mental health and three domains related to women's empowerment; (4) autonomy and control of household resources; (5) workload and time availability; and (6) social support networks (Fig. 1). This framework is useful for better understanding the relationship between gender and nutrition in South Asia (Sen 2012).

Evidence suggests that women's low status and disempowerment in South Asia may be a strong contributor to the persistent problem of poor child nutrition in this region (Ramalingaswami *et al.* 1996; Haddad 1999; Smith *et al.* 2003a,b). However, the specific aspects of women's empowerment that are important for childcare practices and nutritional status remain poorly understood and the evidence base has not been examined holistically. This review focuses on South Asia and attempts to fill these gaps by bringing together and critically reviewing relevant original studies in order to: (1) synthesise the evidence regarding the association of women's empowerment and child nutritional status in South Asia, and (2) generate recommendations for future research. This review is timely, given the renewed interest in understanding the significance of women's empowerment for child nutrition and the recognised need to refine approaches to measure and document women's empowerment (United States Agency for International Development, International Food Policy Research Institute, Development & Oxford Poverty and Human Development Initiative 2012). A comprehensive assessment of the existing empirical work is a prerequisite to understanding the evidence base and guiding the design of programmes and policies that focus on empowering women and reducing maternal and child undernutrition in South Asia.

Key messages

- Women's empowerment is associated with child nutritional status in South Asia, but this relationship might vary across the different domains of women's empowerment.
- The strength of the association of women's empowerment and child nutritional status may depend on the child's age and contextual factors.
- There is a need for additional research using consistent concepts and indicators for women's empowerment, and rigorous and standardised methods for analysis and evaluation of the relationship of women's empowerment to child nutritional status.

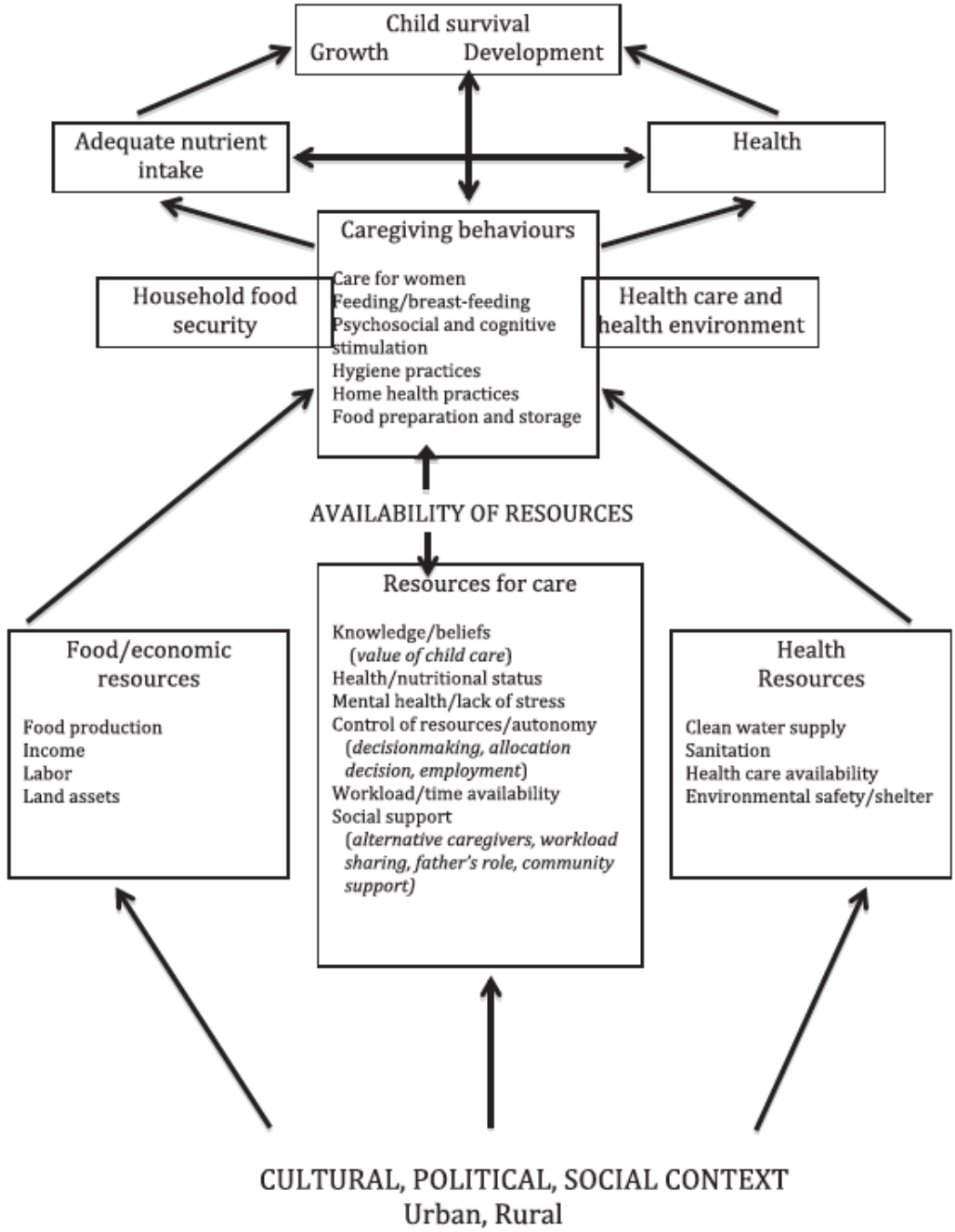

Fig. 1. Determinants of child nutritional status.
Source: Engle P., Menon P. & Haddad L. (1997) Care and Nutrition: Concepts and Measurement. Figure, 2. IFPRI Occasional Paper 33. International Food Policy Research Institute: Washington, DC. Reproduced with permission from the International Food Policy Research Institute (http://www.ifpri.org/sites/default/files/publications/oc33.pdf).

Methods

Terms, concepts and indicators

Women's empowerment is a complex construct and there is no universally accepted definition of the term or agreement regarding which domains and subdomains comprise one's empowerment. The literature on women's empowerment, however, usually refers to notions of power, agency, control and decision making (Kabeer 1999; Malhotra *et al.* 2002; Alsop & Heinsohn 2005; Alsop *et al.* 2006; Samman & Santos 2009). Kabeer (1999, p. 437) defines empowerment as a process, namely, 'the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them'. Consistent with this definition, our review also uses the term women's empowerment to refer to individual capacity to introduce change to improve one's social and economic status and gain autonomy. However, we focus on characteristics of empowerment that a woman has at a particular time. Specifically, this review uses a conceptual framework (Fig. 1) developed by Engle *et al.* (1997) to focus on three domains of empowerment identified as determinants of nutritional well-being: control of resources and autonomy, workload and time, and social support.

The complexity of defining women's empowerment and its many domains has led to challenges in identifying indicators and methods for measuring women's empowerment. Often, indirect or proxy measures, such as level of education, age at marriage or differential mortality between men and women, have been used because of the complexity of measuring empowerment directly. Recognising the limitations of indirect measures, new tools have recently been designed and tested to directly measure empowerment and examine its multidimensionality (Malhotra *et al.* 2002; United States Agency for International Development, International Food Policy Research Institute, Development & Oxford Poverty and Human Development Initiative 2012). With these conceptual issues in mind, and applying the review's inclusion criteria, this study synthesises findings from select studies that used direct measurements of women's empowerment that relate to the three domains of control of resources and autonomy, workload and time, and social support.

Search strategy and study details

We systematically searched the following databases in January 2013: Global Health, Embase (classic and Ovid), MEDLINE, Campbell Collaboration, Popline, Eldis, Web of Science, EconLit and Scopus, using key terms for each conceptual aspect of the research question: women's empowerment, child nutritional status and South Asia (Table 1). References of the included studies were hand searched and additional related articles were screened for inclusion.

All studies were downloaded into EndNote; duplications were eliminated; and title, abstract and full-text screening conducted. Restrictions based on study design or sample size were not used so as to maximise the inclusion of evidence. However, studies that used aggregate data at the community or regional level, as opposed to the household or individual level, were

Table 1. Search terms

Women's		Empowerment		Child		Nutrition		South Asia	
Wom?n	W/5	Empower*	AND	Child*	AND	Nutrition*	AND	South* Asia*	AND
Female		Employ*		Infan*		Anthropomet*		Afghanistan*	
Gender		Authorit*				Micronutrient*		Bangladesh*	
Matern*		Control*				Maln*		Bhutan*	
Mother*		Decision*				Wast*		India*	
		Power*				Stunt*		Maldives*	
		Leadership				Underweight		Nepal*	
		Autonomy*				Grow*		Pakistan*	
								Sri Lanka*	

excluded. Based on an initial preliminary search of the literature and consultations with gender and nutrition experts, we limited our search to exclude studies published before 1990 as these studies focused on indirect proxies of women's status, e.g. maternal education, but not women's empowerment. Our inclusion criteria were: (1) peer-reviewed empirical study published in English between 1 January 1990 and 31 December 2012; (2) included national or sub-national data on at least one South Asian country; (3) assessed the nutritional status of children under 5 years of age using anthropometric measurements; (4) included assessment of at least one women's empowerment domain at the household level identified in the conceptual framework (Fig. 1) as a study aim or study variable; and (5) examined relationship(s) of at least one women's empowerment domain and one indicator of child nutritional status.

Data extraction

To synthesise prior primary studies on this topic, we first extracted the following study information into a pro forma: reference; design and methods; data source, research setting and sample size; confounders included in the analysis; type of analysis; women's empowerment domain(s) and variable(s); nutritional outcome(s) measured; crude and adjusted findings; and direction and statistical significance of results (Tables 2–4).

Results

Search and overview of studies

The initial searches generated a total of 1661 potential studies, but only 12 met all the inclusion criteria. During title screening, at least half of the potential studies were excluded because they did not meet the study location or population criteria. Abstract screening eliminated nearly half of the remaining studies for these same reasons or because child anthropometry was not reported. The remaining potential studies ($n = 44$) and other studies of which the authors were already aware ($n = 10$) were downloaded and full-text screened. At this stage a study was usually eliminated either because it did not directly measure women's empowerment or because it did not present household-level data (Fig. 2). The first author conducted the title, abstract and full-text screening, and any complications were resolved via discussion and joint re-reading of studies with co-authors.

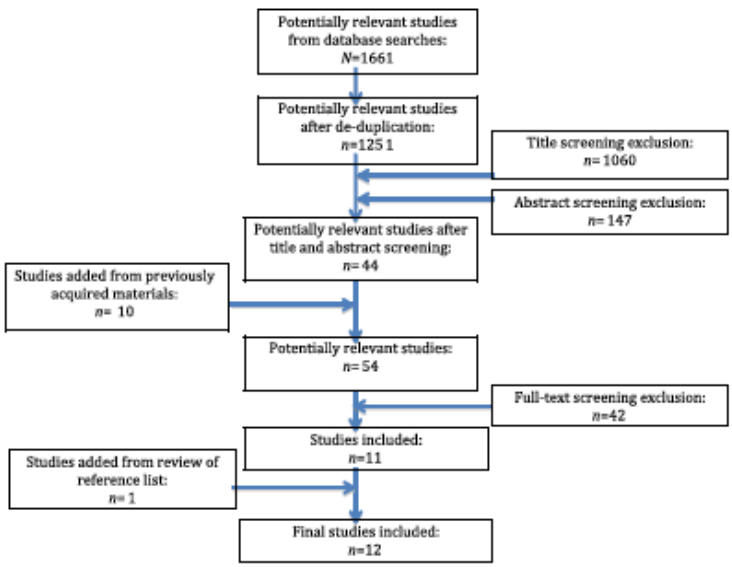

Fig. 2. Study selection process.

Table 2. Studies relating women's empowerment (social support networks) and child nutritional status in South Asia

Reference†	Design/methods	Data: source, setting, sample	Confounders	Type of analysis	Women's empowerment	Outcome	Crude results	Adjusted results	Direction/ significance of results
(Moestue *et al.* 2007) (social networks)	Cross-sectional data and Young Lives dataset, stratified random sampling, used WHO standards for anthropometry, multivariable regression analysis	Young Lives study and this study, India: Andhra Pradesh (urban and rural), about 1 year, 280	Child age and sex; maternal education, age and caste; housing quality, land ownership, number of economic sectors, HH composition, rural/urban and clustering	Linear regression: β (SE)	Network size (number of members)	LAZ	0.18 (0.07)	0.21 (0.07)	Positive, ***
					Network literacy (percentage who can read and write)	LAZ	0.57 (0.26)	0.56 (0.25)	Positive, **
					Network non-family (percentage unrelated to mother)	LAZ	−0.01 (0.00)	−0.01 (0.00)	Negative, **
(De Silva & Harpham 2007) (social capital)	Analysis of Young Lives data restricted to biological mothers of 6–18-month-olds with complete data, study examines structured and cognitive social capital, used the SASCAT tool but validated findings via factor analysis and qualitative cognitive interviews, nutritional status calculated using 1977 NCHS reference, multivariate linear regression models with robust standard errors to adjust for clustered sampling	Young Lives study, India: Andhra Pradesh, 6–18 months, 1846	Child age, sex and breastfeeding practice; maternal education level, number of occupations and self-assessment of socio-economic status; HH poverty group, number of school-aged children and number of infants	Linear regression: β (CI)	Community group membership (1 group vs. 0)	LAZ	0.07 (−0.06, 0.21)	0.06 (−0.09, 0.21)	
						WAZ	0.06 (−0.05, 0.17)	0.05 (−0.06, 0.15)	
					Community group membership (2+ groups vs. 0)	LAZ	0.22 (−0.14, 0.59)	0.19 (−0.23, 0.61)	
						WAZ	0.04 (−0.21, 0.29)	−0.15 (−0.28, 0.25)	
					Citizenship activity involvement (talked or joined vs. not involved)	LAZ	−0.05 (−0.25, 0.14)	−0.25 (−0.43, −0.07)	Negative, ***
						WAZ	−0.02 (−0.17, 0.12)	−0.05 (−0.18, 0.08)	
					Citizenship activity involvement (talked and joined vs. not involved)	LAZ	0.11 (−0.07, 0.28)	0.07 (−0.11, 0.24)	
						WAZ	0.02 (−0.11, 0.14)	−0.07 (−0.19, 0.06)	
					Support from individuals (1 individual vs. 0)	LAZ	−0.10 (−0.30, 0.08)	0.08 (−0.09, 0.24)	
						WAZ	−0.04 (−0.18, 0.10)	0.02 (−0.10, 0.15)	
					Support from individuals (2+ individuals vs. 0)	LAZ	−0.12 (−0.29, 0.05)	−0.05 (−0.20, 0.10)	
						WAZ	−0.04 (−0.17, 0.10)	−0.01 (−0.12, 0.11)	
					High cognitive social capital (high vs. low/medium)	LAZ	0.15 (−0.14, 0.45)	0.21 (−0.08, 0.49)	Positive, **
						WAZ	0.13 (−0.08, 0.34)	0.19 (0.00, 0.39)	

CI, confidence interval; HH, household; LAZ, length for age *z*-score; NCHS, National Center for Health Statistics; SASCAT, Short Social Capital Assessment Tool; SE, standard error; WAZ, weight for age *z*-score; WHO, World Health Organization. * $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$. †Domains noted in parentheses are those given in the original study as opposed to the domain classifications made by this review.

Table 3. Studies relating women's empowerment (workload and time availability) and child nutritional status in South Asia

Reference†	Design/methods	Data: source, setting, sample	Confounders	Type of analysis	Women's empowerment	Outcome	Crude results	Adjusted results	Direction/ significance of results
(Sethuraman *et al.* 2006) (women's empowerment)	Qualitative and quantitative study of rural and tribal subjects including interviews and anthropometric measurements, multivariate and logistic regression, *z*-scores created using the NCHS reference standards	This study, India: Karnataka (rural), 6–24 months, 820	Maternal weight; maternal and child haemoglobin levels; immunisation status; energy-dense foods; nutrient-dense foods; breastfeeding practices; who feeds child; antenatal care and cost; family type and food purchasing; women's control over food supply, private health care, time, cost and health decisions; water and sanitation; family structure and income	Linear regression: β (*t*-test) (Note: crude analysis is *F* not β)	Employment and income	WAZ	22.7	−0.12 (−3.70)	Negative, ***
					Previous employment	WAZ	12.1		
(Bose 2011)	Assessing women's status using different measures for getting at this concept; multilevel analysis to examine both macro- and micro-components simultaneously	NFHS 2005–2006, India (urban and rural), 0–5 years, ambiguous	Female child, maternal education, son preference, class, family composition, religion, joint family, mother's age, community, region and urban	Hierarchical linear modelling: β (SE)	Mother's work: working or not (dummy variable)	WAZ	0.14 (0.03)	0.14 (0.04)	Positive, ***

F, Fisher test; NCHS, National Center for Health Statistics; NFHS, National Family Health Survey; SE, standard error; WAZ, weight for age *z*-score. $^{*}P < 0.10$; $^{**}P < 0.05$; $^{***}P < 0.01$. †Domains noted in parentheses are those given in the original study as opposed to the domain classifications made by this review.

Table 4. Studies relating women's empowerment (autonomy and control of household resources) and child nutritional status in South Asia

Reference†	Design/methods	Data: source, setting, sample	Confounders	Type of analysis	Women's empowerment	Outcome	Crude results	Adjusted results	Direction/ significance of results
(Desai & Johnson 2005) (women's empowerment)	Analysis of DHS survey data re: women's responsibilities in the HH; cross-country analysis; hierarchical linear models to distinguish between individual and community-level influences	DHS, year ambiguous, India, 13–36 months, 15 940 NDHS, year ambiguous, Nepal, 13–36 months, 4876	Inter-clustering, HH wealth, maternal and paternal education, child birth period, and community-level women's decision making	Linear models: coefficient	HH decision making: final decision re: own health care, large HH purchases, daily HH purchases and visits to family or relatives (dummy variable if at least 1 of 4)	HAZ HAZ		0.09 0.06	Positive, *
(Sethuraman *et al.* 2006) (women's empowerment)	(Study details above)				HH position and decision-making involvement Women's decisions	WAZ WAZ	17.0 7.1	0.08 (2.55)	Positive, **
(Shroff *et al.* 2011)	Cross-sectional baseline data for a longitudinal randomised intervention trial, confirmatory factor analysis for maternal autonomy items and regression analysis with growth variables, WHO 2005 growth standards used	This study, India: Andhra Pradesh (rural), 3–5 months, 600		Random-effects GLS models: β (95% CI)	HH decision making (confirmatory factor analysis)	LAZ WAZ WLZ	−0.04 (−0.16, 0.08) 0.11 (−0.01, 0.24) 0.17 (0.04, 0.31)	−0.06 (−0.18, 0.05) 0.17 (0.04, 0.30) 0.26 (0.16, 0.42)	Positive, ** Positive, **

(Begum & Sen 2009)	Secondary analysis of DHS data	BDHS 2000, Bangladesh (urban and rural), 0–5 years, ambiguous sample size	Maternal age, education, work status, exposure to media, nutritional status, access to health care, child sex, number of children ever born, access to sanitation and income–poverty status	Percentage comparison: %; linear regression for HAZ; β	HH decision making re: own health care, child health care, large HH purchases, daily HH purchases, freedom to visit relatives and friends [values of 2 if alone, 1 if jointly or 0 if by someone else to generate aggregated decision-making scores between 0 and 10 used to create a scale of none (0), low (1–5), medium (6–9) and high (10)]	Stunting (severe) Wasting (severe) Under-weight (severe)	45.9% (21.0%) vs 44.3% (17.2%) vs. 39.4% (16.7%) vs. 41.4% (11.8%) 10.9% (1.3%) vs 10.3% (1.0%) vs. 10.9% (1.3%) vs. 8.9% (0.6%) 49.2% (14.4%) vs 47.5% (12.8%) vs. 42.4% (11.0%) vs. 42.0% (8.9%)	0.03 vs. 0.03 vs. 0.09 vs. –	
(Bose 2011)	(Study details above)				HH decision-making autonomy re: own health care, major HH purchases, daily HH purchases, visiting family or friends and freedom of movement [scores for decisions of travel alone (2), jointly (1) and decisions by someone else or not allowed to go (0); aggregated using Cronbach's alpha]	WAZ	–0.00 (0.01)	–0.00 (0.01)		
(Shroff *et al.* 2009)	Secondary analysis of a nationally representative dataset using multivariate logistic regressions, first South Asian study to measure four theory driven autonomy domains using the same dataset	NFHS 1998–1999, India: Andhra Pradesh (rural and urban), <36 months, 821	Child sex, age and birth order; mat education, age and religion; HH socio-economic status and urban–rural residence	Logistic regression: OR (95% CI) (Note: if only crude analysis, percentage and *P*-value shown)	Financial autonomy: to set money aside for use as she wishes (allowed vs. not) HH decision making re: jewellery or other major HH purchases (involved vs. not)	Stunting Stunting	0.68 (0.51, 0.91) 41% vs. 41% (0.94)	0.73 (0.55, 0.98)	Positive, **	

Table 4. Continued

Reference[†]	Design/methods	Data: source, setting, sample	Confounders	Type of analysis	Women's empowerment	Outcome	Crude results	Adjusted results	Direction/ significance of results
(Shroff *et al.* 2011)	(Study details above)				Financial autonomy (confirmatory factor analysis)	LAZ WAZ WLZ	0.05 (–0.04, 0.15) 0.02 (–0.07, 0.12) –0.01 (–0.12, 0.09)	0.02 (–0.07, –0.11) –0.01 (–0.10, 0.10) –0.04 (–0.17, 0.07)	
(Danser & Rammohan 2009)	Uses 2006 NDHS data and econometric techniques to look at maternal autonomy as a determinant of child undernutrition in rural Nepal, used WHO Child Growth standards	NDHS 2006, Nepal (rural), 6–59 months, 4360	Current maternal employment; religion, maternal age, father's occupation, parental education, wealth, child age, child sex, maternal body mass index, gender of siblings, five geographical regions and birth order	Ordinary least squares: β (SE); logit estimation OR (SE)	HH decision making – final say alone or jointly re: large HH purchases (dummy variable)	HAZ; stunting WHZ	–0.09 (0.05)	0.02 (0.06); 0.99 (0.11)	Negative, ***
					HH decision making – final say alone or jointly re: daily HH purchases (dummy variable)	HAZ; stunting WHZ	0.09 (0.04)	–0.03 (0.05); 0.98 (0.10)	Positive, **
(Sethuraman *et al.* 2006) (women's empowerment)	(Study details above)				Mobility within village Family type and village mobility	WAZ WAZ	24.7 9.4	0.09 (2.78)	
(Shroff *et al.* 2009)	(Study details above)				Permission re: going to market (needs vs. doesn't)	Stunting	0.64 (0.41, 1.00)	0.59 (0.38, 0.93)	Positive, **
					HH decision making re: going/staying with parents/ siblings (involved vs. not)	Stunting	42% vs. 39% (0.30)		
					Permission re: visiting relatives/friends (needs vs. doesn't)	Stunting	34% vs. 41% (0.18)		
(Shroff *et al.* 2011)	(Study details above)				Mobility autonomy (confirmatory factor analysis) Actual mobility (confirmatory factor analysis)	LAZ WAZ WLZ LAZ WAZ WLZ	0.07 (–0.04, 0.18) –0.04 (–0.14, 0.06) –0.15 (–0.27, –0.03) 0.03 (–0.07, 0.13) –0.05 (–0.17, 0.06) –0.09 (–0.20, 0.02)	0.14 (0.04, 0.24) –0.03 (–0.14, 0.09) –0.20 (–0.34, –0.06) 0.00, (–0.08, 0.09) –0.04 (–0.14, 0.06) –0.06 (–0.18, 0.06)	Positive, ** Negative, **

(Brennan *et al.* 2004)	Secondary data analysis to assess IYCF practices and maternal involvement in health decisions, multivariate logit analysis controlling for confounders	NFHS 1998–1999, India: Uttar Pradesh and Karnataka (urban and rural), <3 years, 3244 (2221, 1023)	Child age, sex and birth order; maternal age at child birth, education, BMI, residence, religion, caste or tribe, media exposure, standard of living, and state	Logit regressions: controlled percentage differences	HH decision making: decision made alone or jointly vs. by other re: mother's own health care	Stunting (severe)			0.40% (−0.01%)	Positive, **
					HH decision making: decision made alone vs. by other re: mother's own health care	Stunting			0.20%	
(Shroff *et al.* 2009)	(Study details above)				HH decision making re: obtaining health care for yourself (involved vs. not)	Stunting	40% vs. 41% (0.94)			
(Dancer & Rammohan 2009)	(Study details above)				HH decision-making autonomy – final say alone or jointly re: own health care (dummy variable)	HAZ; stunting		0.14 (0.05); 1.28 (0.09)		Positive, ***; Positive, ***
						WHZ	0.03 (0.04)			
					Difficulty seeking medical help for self: getting permission to access care (dummy variable of not a problem or small problem vs. big problem)	HAZ; stunting		−0.03 (0.06); 0.99 (0.12)		
						WHZ	0.01 (0.05)			
					Difficulty seeking medical help for self: distance to facility (dummy variable of not a problem or small problem vs. big problem)	HAZ; stunting		0.06 (0.05); 1.03 (0.09)		Positive, **
						WHZ	0.09 (0.04)			
					Difficulty seeking medical help for self: taking transport (dummy variable of not a problem or small problem vs. big problem)	HAZ; stunting		−0.13 (0.05); 0.83 (0.09)		Negative, ***; Positive, **
						WHZ	−0.00 (0.04)			
					Difficulty seeking medical help for self: going alone (dummy variable of not a problem or small problem vs. big problem)	HAZ; stunting		−0.02 (0.04); 0.99 (0.07)		Negative, **
						WHZ	−0.06 (0.03)			

Table 4. Continued

Reference†	Design/methods	Data: source, setting, sample	Confounders	Type of analysis	Women's empowerment	Outcome	Crude results	Adjusted results	Direction/ significance of results
(Mashal *et al.* 2008) (agency)	Multi-stage sampling for children born in the previous 5 years with war-related experiences, WHO standards for anthropometric data collection and generating z-scores, multivariate logistic regression models to evaluate independent associations and adjusted odds ratio calculations	This study, Afghanistan: Kabul Province (rural and urban), <5 years, 2373	Child age and sex; maternal age, education, whether child marriage and preference for female physician; HH socio-economic status, whether running water; lack of basic needs, forced to leave preferred residence, migration inside and migration out of country	Logistic regression: OR (CI)	HH autonomy re: obtaining health care for children without needing permission or to be accompanied (binary variable)	Stunting Wasting Under-weight	1.77 (1.34, 2.32) 1.45 (0.95, 2.21) 1.88 (1.36, 2.61)	1.38 (1.01, 1.90) 1.67 (1.00, 2.81) 1.46 (1.00, 2.14)	Positive Positive Positive
(Shroff *et al.* 2011)	(Study details above)				Childcare decision making (confirmatory factor analysis)	LAZ WAZ WLZ	0.05 (−0.05, 0.15) −0.00 (−0.11, 0.10) −0.02 (−0.13, 0.09)	0.10 (0.01, 0.19) 0.06 (−0.04, 0.17) −0.00 (−0.13, 0.12)	Positive, **
(Shroff *et al.* 2009)	(Study details above)				HH decision making re: cooking (involved vs not)	Stunting	41% vs 39% (0.54)		
(Sethuraman *et al.* 2006) (women's empowerment)	(Study details above)				Control over food supply	WAZ	22.7		
(Aslam & Kingdon 2012)	Stratified sampling, anthropometry standardised with WHO multi-country growth reference standards, instrumental variable techniques to examine how treating maternal empowerment as exogenous underestimates its effect on child weight	This study 2006–2007, Pakistan: Punjab and North West Frontier Province (urban and rural), 0–5 years, 1000	Child sex and age; HH size; maternal and paternal height, education, TV watching, scores on health knowledge test; rural or not, location, per capita expenditure; maternal literacy, labour market participation, family member's education; and parental scores on ravens tests	Community fixed-effect estimates: β (*t*-stat)	HH decision-making influence on number of children to have (dummy variable of 1 if the mother perceived to have her preference on number of children taken into account)	HAZ WAZ	0.12 (0.70) 0.36 (2.26)	0.09 (0.51) 0.32 (2.01)	 Positive, **

BDHS, Bangladesh DHS; BMI, body mass index; CI, confidence interval; DHS, Demographic and Health Surveys; GLS, generalized least squares; HAZ, height for age z-score; HH, household; IYCF, infant and young child feeding; LAZ, length for age z-score; NDHS, Nepal DHS; NFHS, National Family Health Survey; OR, odds ratio; SE, standard error; TV, television; WAZ, weight for age z-score; WHO, World Health Organization; WHZ, weight for height z-score; WLZ, weight for length z-score. *P < 0.10; **P < 0.05; ***P < 0.01. †Domains noted in parentheses are those given in the original study as opposed to the domain classifications made by this review.

Several publications included in this review used secondary data analysis of large household datasets, such as the Demographic and Health Surveys, but some used data from context-specific cross-sectional surveys. Because none of the studies included interventions, a hierarchy of study designs could not be done. Many of the studies were conducted in India, but studies in Nepal, Pakistan, Bangladesh and Afghanistan were also included. Studies in Bhutan, Maldives and Sri Lanka were not found. About half of the studies were of children under 5 and the others used a subset of this age range, usually children under 3. Some studies used prevalence of stunting, wasting and underweight, but the most common measures of child nutritional status were mean anthropometric *z*-scores of height/length for age (HAZ/LAZ), weight for age (WAZ) and/or weight for height/length (WHZ/WLZ). Only two studies presented results disaggregated by child sex, and therefore, the review did not examine sex-disaggregated results (Brennan *et al.* 2004; Dancer & Rammohan 2009). Although some studies included additional statistical models, we only reviewed crude and final results. Despite searching for studies from 1990 onwards, the studies that met the eligibility criteria were published from 2004 to 2012, highlighting the increased use of direct measurements of women's empowerment and linking women's empowerment and child nutrition in the last decade.

Given great differences in the included studies' definitions and ways of measuring women's empowerment, location, age range of sampled children and anthropometric outcomes measured, the grouping of the studies and synthesis of key messages was challenging. We therefore opted for grouping studies based on the domains of women's empowerment specified in the conceptual framework: control of resources and autonomy, workload and time, and social support (Tables 2–4).

Social support

Maternal social support (e.g. childcare assistance, providing information or emotional support) may influence childcare practices and in turn child nutrition (Engle *et al.* 1997). Two studies assessed the association of social support with child anthropometry and the results were mixed (Table 2). Using Young Lives study data, one study found larger and more literate social networks to be associated with better LAZ of 1-year-old children in Andhra Pradesh, but social networks with a larger proportion of non-family members were negatively associated with child LAZ (Moestue *et al.* 2007). The authors did not comment extensively on this negative finding but it may be that those with more non-family members in their social networks have less assistance at home and that this help within the home is more important for child nutrition than the non-family member support. Another study, using the same data, showed a negative association between maternal involvement in social groups and LAZ in 6–18-month-old children. The authors hypothesised that this was due to additional stressors generated from community engagement. Other measured sub-domains of social support including membership in community groups, individual support and cognitive social capital (i.e. perceptions and feelings of trust or belonging to a community) were not associated with LAZ; of these four social support indicators, high maternal cognitive social capital was associated with higher WAZ (De Silva & Harpham 2007).

Workload and time

The relationship between maternal employment and child nutritional status is complex: employment can increase income (and control over income), but may also decrease maternal time for childcare (Engle *et al.* 1997). Only two studies examined the relationship between women's workload and child nutritional status in South Asia (Table 3). Both studies found that maternal employment was associated with poorer WAZ in young children. The first study, conducted in rural Karnataka, India, showed a negative association between maternal employment and WAZ in children 6–24 months of age (Sethuraman *et al.* 2006), whereas the second study documented that mothers who worked for pay in India were more likely to have a child under 5 with poor WAZ, compared with mothers who were not working (Bose 2011). Note that this finding may reflect reverse causality: mothers

who have to work for pay may be poorer and more resource constrained and therefore more likely to have a malnourished child than non-working mothers.

Control of resources and autonomy

This domain relates to women's status in the household compared with other members in aspects such as control over income, access to resources and decision-making power (Engle *et al.* 1997). Most studies ($n = 10$) on women's empowerment and child nutrition in South Asia covered this domain; some examined overall control, autonomy and decision making whereas others looked at specific sub-domains such as control of resources, mobility autonomy, financial autonomy and decision making, women's own health care, childcare including health seeking, and food purchasing and preparation (Table 4).

Five studies used composite indices or other data reduction methods to combine various indicators on household decision making into one variable. Desai & Johnson (2005) noted that children whose mothers had final decision-making power in at least one of the sub-domains examined (maternal own health care, large household purchases, daily household purchases and freedom to visit relatives and friends) had children with higher HAZ in India, but not in Nepal. Similarly, Sethuraman *et al.* (2006) found maternal position within the household and involvement in decision making to be protective for child WAZ in India. In Andhra Pradesh, Shroff *et al.* (2011) found that the ability to make household decisions was positively associated with child WAZ and WLZ but not LAZ. On the other hand, Begum & Sen's (2009) analysis of Bangladesh Demographic and Health Survey data did not reveal any statistically significant associations between an aggregated decision-making autonomy score (which combined autonomy regarding her own health care, child health care, large household purchases, daily household purchases and her freedom to visit relatives and friends) with stunting, wasting or underweight. These findings are consistent with Bose's (2011) results; this recent Indian study used an aggregate autonomy index including decision making on a similar set of aspects (own health care, major household purchases, daily household purchases, visiting family or friends and freedom of movement to market, health facility and outside of village) and found no association with the likelihood of children being underweight (low WAZ).

Control over resources is another important aspect of women's empowerment, which has thus far been examined in only three studies from South Asia. In Andhra Pradesh, Shroff *et al.* (2009) found that mothers with financial autonomy, defined as the ability to set money aside for use as they wish, had lower odds of their child under 3 being stunted. By contrast, maternal involvement in decision making regarding the purchase of jewellery or other large household items was not associated with stunting. In a later study, the same group found no association between a woman's financial autonomy and child LAZ, WAZ or WLZ (Shroff *et al.* 2011). By contrast, a study in Nepal documented two associations between WHZ and maternal decision making: a positive association for daily household purchases and a *negative* association for large household purchases. No associations were found with child HAZ (Dancer & Rammohan 2009). These findings suggest that additional underlying issues related to maternal control of resources that may not have been captured by the analyses affect the association between women's empowerment and child nutrition outcomes.

The mobility autonomy sub-domain was examined in three studies, all in India. In a first study, Shroff *et al.* (2009) found that mothers in Andhra Pradesh who had decision-making power regarding their ability to go to the market had lower odds of having a stunted child under 3, but no association was found for the other mobility variables studied (needing permission to visit friends and relatives or decision making on going to visit relatives). In a more recent study, Shroff *et al.* (2011) reported that mothers who were able to go to places without asking permission had children 3–5 months of age with better LAZ, but no associations were found with actual mobility, defined as being able to go to the same places alone. Furthermore, this study did not find mobility autonomy or actual mobility to be associated with child WAZ, but a high score on mobility autonomy was associated with lower child WLZ. This negative

finding may reflect that more mobile mothers spend less time with the child and/or have non-optimal alternative childcare providers. By contrast, a study in Karnataka, India, showed that mobility freedom within the village was associated with better child WAZ (Sethuraman *et al.* 2006).

Three studies assessed whether a woman's ability to control her own health care was related to child nutritional status. In Uttar Pradesh and Karnataka, Brennan *et al.* (2004) found that a woman's sole or joint decision making for her own health care, compared with someone else making the decisions, increased the risk of her children under 3 being stunted. The authors do not comment on these counter-intuitive findings, but it may be that more empowered mothers have less time for childcare or are outside the home more frequently and without adequate substitute childcare. A similar study among children of this same age in Andhra Pradesh found no association between a woman's ability to control her own health care and child stunting (Shroff *et al.* 2009). Dancer & Rammohan (2009), using nationally representative Nepal data, found that women's ability to make decisions regarding their own care decreased the odds of their child being stunted, but was not associated with child WHZ. They also found that among four different factors potentially limiting maternal ability to seek medical care (getting permission, going alone, distance, transport), only transport increased the odds of child stunting. For child WHZ, they found a negative association among women who were constrained in their ability to receive medical care alone, and a positive association among women who reported distance to a health facility was a barrier. These findings may be less about women's decision-making power or autonomy, but rather, they may reflect constraints that women face in accessing health care due to mobility restrictions or lack of roads and transportation. They did not find an association with decision-making autonomy regarding her own health care or whether she was required to get permission to access care (2009).

Five South Asian studies assessed the relationship of maternal decision making on childcare, food supply and other household matters and child nutritional status. Mashal *et al.* (2008) found that a lack of maternal decision-making autonomy regarding obtaining health care for her children aged less than 5 was positively associated with child stunting, wasting and underweight in Afghanistan. Furthermore, the latter study by Shroff *et al.* (2011) showed a woman's decision-making power regarding the care of her children, including food allocation and health seeking, to be positively associated with LAZ of infants 3–5 months of age in Andhra Pradesh. Two studies in India looked at a woman's control over food supply and cooking decisions and neither found any important relationship with child nutritional status (Sethuraman *et al.* 2006; Shroff *et al.* 2009). Aslam & Kingdon's (2012) study in Pakistan found maternal perception of her influence on the number of children she births to be positively associated with WAZ among children under 5, but not associated with HAZ.

Discussion

Our review finds evidence that women's empowerment in the household is generally associated with child nutritional status, in spite of the wide disparity (and imperfection) in the methods and indicators used to measure women's empowerment in the existing literature on South Asia. The review also shows that different domains of women's empowerment may relate differently to child nutritional well-being and that the strength and direction of associations may vary by child age, household wealth and a series of other contextual factors. The bulk of the studies that have looked at the association between women's empowerment and child nutrition focus on women's autonomy, control and decision-making power. Overall, maternal involvement in decision making (measured using different scales and composite indices and looking at a variety of sub-domains of decision making) is generally associated with child nutritional status, although some studies show a lack of association. Studies of specific aspects of maternal decision making, control and autonomy have mixed results and are so few per sub-domain that conclusions are difficult to draw. Several studies have shown that maternal autonomy and decision making within the household measured with composite indicators

are important for child nutritional status, especially in India. Mobility autonomy and financial autonomy results suggest that the relationship with child nutrition may be context specific. Decision making regarding a woman's health care-seeking behaviour for herself or for her children is inconclusive, and this may be due to the small number of studies exploring these sub-domains.

Social support studies are even more limited. Evidence indicates that social support networks may influence the nutritional status of young children, at least in India, but that the relationship may be complex. Although involvement in social support networks, community activities or groups may create an enabling environment for child nutrition and growth by providing an opportunity for women to gain knowledge and skills, some studies show that social network obligations may be negatively associated with child nutritional status, possibly due to trade-offs in workload and time for childcare, and/or the poor quality of childcare substitutes. Similarly, the direction of effect of maternal employment outside the home on child nutrition may be affected by trade-offs between increased income (and control over income) and time for childcare, and by the quality of alternate childcare providers. The studies reviewed suggest a positive association with child WAZ, but the net impact on child nutrition needs further exploration, particularly in contexts other than India.

When considering all studies across domains together, some patterns emerge. The social support studies taken together suggest that characteristics of maternal social networks may be more associated with child nutritional well-being than maternal citizenship activities; however, there are only two studies and they are both specific to children less than 2 years of age residing in Andhra Pradesh. The two studies on maternal employment have opposite findings regarding the relationship of maternal employment to child nutritional status; however, one study is nationally representative and the other among households residing rurally in one state. Therefore, it is difficult to draw a conclusion. However, it is the study of younger children that shows a positive association and this may highlight that their need for childcare is greater than that of older children. Studies measuring maternal decision making using aggregate indices also hint at the same overall conclusion: those limited to younger children show positive associations with various indicators of child nutritional status, whereas both studies using data on children 0–5 years of age do not find statistically significant associations. Once again, perhaps children of younger ages have a more immediate need for care provided by the mother. For the remaining sub-domains of autonomy – control of resources, mobility autonomy and control of one's own health care – patterns have yet to emerge

Our review adds to the existing literature highlighting the potential importance of women's empowerment for nutrition in South Asia. Researchers identified the feminisation of poverty and the overall poor status of women in South Asia as a barrier to social development and human capital formation, several decades ago (Ramalingaswami *et al.* 1996; Bhutta *et al.* 2004). A study by Haddad (1999) found that women's status in Asia was particularly low compared with other regions, and that this might contribute to poor child health and nutrition, including intrauterine growth retardation and low birthweight. In a multi-country analysis, Smith *et al.* (2003a,b) combined several proxy indicators for women's status into a composite index and found stronger associations for women's status and child nutritional status in South Asia than in any other part of the world. Several additional studies of women's empowerment and child nutritional status in South Asia have used indirect measurements as proxies of women's (dis)/empowerment, such as media exposure, domestic violence and local exogamy. Thus far, evidence is inconclusive regarding the importance of these indirect measures, although two studies that used nationally representative data confirmed the widely documented positive association between maternal education and child undernutrition in South Asia as well as globally (Begum & Sen 2009; Bose 2011; Ruel & Alderman 2013).

A recent global review by Van den Bold *et al.* (2013) summarised existing evidence of the impact of development programmes such as cash transfer programmes, agriculture interventions and microfinance programmes on women's empowerment and nutrition. The review found evidence from relatively few

studies that cash transfers and agriculture programmes can improve women's empowerment, but none of the evaluations specifically looked at whether or not the positive impacts on women's empowerment, in turn, translated into improved child nutrition outcomes. Little is known about the impact of microcredit programmes on women's empowerment or nutrition, due to the scarcity of studies that have looked at these outcomes.

Our findings concur with those previous reviews and global analyses and contribute at least two additions: (1) an exclusive focus on direct measurements of women's empowerment following a conceptual framework intended to identify key determinants of child nutritional status, and (2) a systematic review of all empirical evidence in South Asia linking women's empowerment and child nutrition.

A mixed picture emerges regarding whether and how women's empowerment is linked to child nutritional outcomes in South Asia. Some of the inconsistencies in findings between individual studies may be due to population or context-specific factors; for instance, a broader location and larger age range may mask population heterogeneity and prevent identifying some associations that other, more focused studies find. Similarly, studies that cover a wide age range of children and/or do not disaggregate the data by child age may fail to identify the potentially significant associations between women's empowerment and nutrition among younger children. Given that younger children are more dependent on their mothers, they may be more likely to benefit from a mother who is empowered and able to take the right decisions regarding child feeding, care and health care seeking, which is consistent with the well-documented window of opportunity for improving nutrition, i.e. during pregnancy and the first 2 years of a child's life (Ruel 2010).

Differences in indicators may also make comparisons between studies difficult to interpret. Although many studies use multiple indicators to represent different aspects of women's empowerment, others use composite indices. For example, in an early study Shroff *et al.* (2009) constructed binary autonomy variables and used individual logistic regression models to look at the association between individual women's empowerment domains and child nutrition. In their latter study (Shroff *et al.* 2011), they used confirmatory factor analysis to reduce eight mobility autonomy and eight actual mobility questions into two variables. Differences in indicators, measurement and analytical approaches may, at least partly, explain some of the inconsistencies in findings.

Our review highlights several methodological weaknesses in the body of literature, which prevent firm conclusions. First, all publications available used cross-sectional data, which makes it difficult to specify the direction of the relationships identified and prevent statements of causality. Second, although most of the studies controlled for important confounding factors and provided adjusted regression results, some key variables such as socio-economic factors or geographic location were sometimes omitted from the models, which could bias the findings. Finally, as mentioned earlier the absence of a standard definition of women's empowerment, the use of different sets of indicators measuring different sub-domains of women's empowerment and the wide variety of analytical methods used makes comparisons between studies difficult. Also, given that different domains have different implications for child nutritional status, exploring the consequences of each particular domain may provide complementary insight to looking at standard consequences of all the different domains of empowerment, as done in this review.

This review shows that several research gaps need to be filled. First, certain domains of women's empowerment are under-studied and in need of urgent attention. Women's workload and time available, control over food and lack of freedom of movement are examples of aspects of empowerment which may relate to a mother's ability to ensure optimal health of her children, but for which the evidence is scant. Second, there is an urgent need to harmonise definitions, key sub-domains of empowerment, indicators and measurement approaches. Third, studies should use rigorous analytical approaches; for instance, association studies should appropriately control for all relevant confounders using appropriate multiple regression analyses and rigorous evaluation work should be conducted to establish the causal relation-

ships between development programmes, women's empowerment and child nutrition. Finally, more studies analysing women's empowerment in various domains, i.e. workload and time and decision making and control, are needed to further our understanding of how individual women's empowerment domains relate to one another and which domains may be most important for particular outcomes of interest (Bhagowalia *et al.* 2012; Sraboni *et al.* 2012).

This review suggests that women's empowerment in the household may be an important determinant of child nutritional well-being in South Asia, and that its influence may differ by context, child age and other household and maternal characteristics. Based on the current evidence, a programmatic and policy focus on mothers of younger children (under 2 years of age) is warranted; specifically, improvements in their decision-making autonomy, more balanced workloads and stronger social support networks may be more likely to result in improvements in child nutritional status than for older children. The review highlights several research gaps that urgently need to be filled. This observation, however, should not prevent immediate investments in empowering women in South Asia, given the multiple benefits that such investments may generate. Empowerment of women is an important goal in its own right and may also be a key mechanism for ensuring healthier and better nourished South Asian children. Programmes and policies aiming to reduce child undernutrition in South Asia should not be narrowly focused on specific nutrition interventions and on improving diets, but should consider the ways in which household dynamics, including empowerment of women, could influence whether and for whom the interventions will succeed.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

KC conducted the review and drafted the paper with guidance and feedback from co-authors throughout. All authors participated in selection of the review topic, joint re-reading of key studies and reviewing of drafts, and all have read and approved of the final version of the paper and its submission.

References

Alsop R. & Heinsohn N. (2005) *Measuring empowerment in practice: structuring analysis and framing indicators*. (February) pp. 1–123.

Alsop R., Bertelsen M. & Holland J. (2006) *Empowerment in Practice from Analysis to Implementation*. World Bank: Washington, DC.

Aslam M. & Kingdon G.G. (2012) Parental education and child health – understanding the pathways of impact in Pakistan. *World Development* **40** (10), 2014–2032.

Begum S. & Sen B. (2009) Maternal health, child well-being and chronic poverty: does women's agency matter? *The Bangladesh Development Studies* **32** (4), 69–93.

Bhagowalia P., Menon P., Quisumbing A.R. & Soundararajan V. (2012) *What dimensions of women's empowerment matter most for child nutrition? Evidence using nationally representative data from Bangladesh*. (June).

Bhutta Z.A. (2006) Effect of infections and environmental factors on growth and nutritional status in developing countries. *Journal of Pediatric Gastroenterology and Nutrition* **43**, S13–S21.

Bhutta Z.A., Gupta I., De'Silva H., Manandhar D., Awasthi S., Hossain S.M. *et al.* (2004) Maternal and child health: is South Asia ready for change? *BMJ (Clinical Research Ed.)* **328**, 816–819.

Black R.E., Victora C.G., Walker S.P., Bhutta Z.A., Christian P., de Onis M. *et al.* (2013) Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet* **382** (9890), 427–451.

Bose S. (2011) The effect of women's status and community on the gender differential in children's nutrition in India. *Journal of Biosocial Science* **43** (5), 513–533.

Brennan L., McDonald J. & Shlomowitz R. (2004) Infant feeding practices and chronic child malnutrition in the Indian states of Karnataka and Uttar Pradesh. *Economics and Human Biology* **2**, 139–158.

Checkley W., Buckley G., Gilman R.H., Assis A.M., Guerrant R.L., Morris S.S. *et al.* (2008) Multi-country analysis of the effects of diarrhoea on childhood stunting. *International Journal of Epidemiology* **37** (4), 816–830.

Dancer D. & Rammohan A. (2009) Maternal autonomy and child nutrition: evidence from rural Nepal. *Indian Growth and Development Review* **2** (1), 18–38.

Dangour A.D., Green R., Häsler B., Rushton J., Shankar B., Waage J. *et al.* (2012) Linking agriculture and health in low- and middle-income countries: an interdisciplinary research agenda. *The Proceedings of the Nutrition Society* **71** (2), 222–228.

De Silva M.J. & Harpham T. (2007) Maternal social capital and child nutritional status in four developing countries. *Health and Place* **13**, 341–355.

Desai S. & Johnson K. (2005) Women's decision making and child health: familial and social hierarchies. In: *A Focus on Gender – Collected Papers on Gender Using DHS Data* (ed. S. Kishor), pp. 15–33. ORC Macro: Calverton.

Engle P.L., Menon P. & Haddad L. (1997) *Care and Nutrition: Concepts and Measurement*. pp. 1–60. International Food Policy Research Institute: Washington, DC.

Gulati J.K. (2010) Child malnutrition: trends and issues. *Anthropologist* **12** (2), 131–140.

Haddad L. (1999) Women's status: levels, determinants, consequences for malnutrition, interventions, and policy. *Asian Development Review* **17** (1/2), 96–131.

Hoddinott J., Maluccio J., Behrman J.R., Martorell R., Melgar P., Agnes R. *et al.* (2011) *The consequences of early childhood growth failure over the life course*. (March) pp. 1–48.

Kabeer N. (1999) Resources, agency, achievements: reflections on the measurement of women's empowerment. *Development and Change* **30**, 435–464.

Malhotra A., Schuler S.R. & Boender C. (2002) *Measuring women's empowerment as a variable in international development*. pp. 1–59.

Mashal T., Takano T., Nakamura K., Kizuki M., Hemat S., Watanabe M. *et al.* (2008) 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* **8**, 301.

Moestue H., Huttly S., Sarella L. & Galab S. (2007) 'The bigger the better'-mothers' social networks and child nutrition in Andhra Pradesh. *Public Health Nutrition* **10** (11), 1274–1282.

Ramalingaswami V., Jonsson U. & Rohde J. (1996) *Commentary: The Asian enigma*.

Ruel M.T. (2010) The Oriente study: program and policy impacts. *Journal of Nutrition* **140**, 415–418.

Ruel M.T. & Alderman H. (2013) Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *Lancet* **6736** (13), 1–16.

Samman E. & Santos M.E. (2009) *Agency and empowerment: a review of concepts, indicators and empirical evidence*. pp. 1–48.

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

Sethuraman K., Lansdown R. & Sullivan K. (2006) 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 and Nutrition Bulletin* **27** (2), 128–143.

Shroff M., Griffiths P., Adair L., Suchindran C. & Bentley M. (2009) Maternal autonomy is inversely related to child stunting in Andhra Pradesh, India. *Maternal & Child Nutrition* **5** (1), 64–74.

Shroff M.R., Griffiths P.L., Suchindran C., Nagalla B., Vazir S. & Bentley M.E. (2011) Does maternal autonomy influence feeding practices and infant growth in rural India? *Social Science and Medicine* **73** (3), 447–455.

Smith L.C., Ramakrishnan U., Ndiaye A., Haddad L. & Matrorell R. (2003a) *The Importance of Women's Status for Child Nutrition in Developing Countries*. IFPRI Reports 131: Washington, DC.

Smith L.C., Ramakrishnan U., Ndiaye A., Haddad L. *et al.* (2003b) *The importance of women's status for child nutrition in developing countries*. pp. 1–178.

Sraboni E., Quisumbing A. & Ahmed A. (2012) *The women's empowerment in agriculture index for Bangladesh's feed the future zone of influence*. pp. 1–25.

Stevens G.A., Finucane M.M., Paciorek C.J., Flaxman S.R., White R.A., Donner A.J. *et al.* (2012) Trends in mild, moderate, and severe stunting and underweight, and progress towards MDG 1 in 141 developing countries: a systematic analysis of population representative data. *Lancet* **380** (9844), 824–834.

UNICEF (1990) *A UNICEF policy review strategy for improved nutrition of children and women in developing countries*. pp. 1–38.

United States Agency for International Development, International Food Policy Research Institute, Development & Oxford Poverty and Human Development Initiative (2012) *Women's empowerment in agriculture index*.

Van den Bold M., Quisumbing A.R. & Gillespie S. (2013) *Women's empowerment and nutrition: an evidence review*. (September) pp. 1–80.

Chapter 3: Study Methods

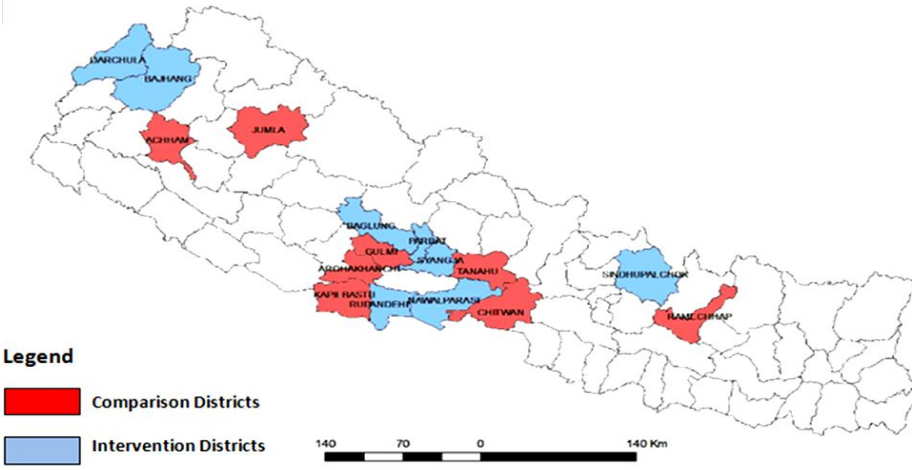
Study Design and Sampling

This quantitative observational study used survey data collected for the baseline survey of an impact evaluation of *Suaahara*, a USAID funded multi-sectoral intervention aiming to improve maternal and child (<5y) health and nutrition in rural communities across Nepal's three agro-ecological zones – mountains, hills, and *terai*. These data were analysed using multivariate regression analyses and structural equation modelling techniques to answer the specific research questions of this thesis.

New Era and IFPRI collaboratively carried out the *Suaahara* baseline survey. As an IFPRI consultant, I was based in Nepal (March-July, 2012) and my survey fieldwork included: finalising questionnaires, facilitating field team trainings, obtaining ethical clearance, and monitoring data collection and management.

The baseline survey was conducted in eight pre-selected phase 1 *Suaahara* intervention districts (Darchula, Bajhang, Baglung, Parbat, Syangja, Rupandehi, Nawalparasi, and Sindhupaldhok) and eight matched comparison districts (Achham, Jumla, Gulmi, Arghakhochi, Kapilbastu, Tanahu, Chitwan, and Ramechhap). The intervention and comparison districts were matched on their agro-ecology/topography, human development index ranking, size of land holdings, under two population total, level of poverty, per cent of population marginalized, and radio ownership.[1] District matching was done in consultation with *Suaahara* collaborators and others working on health and nutrition research in Nepal. The 16 survey districts covered all three agro-ecological zones: four *terai* districts, four mountain districts, and eight hill districts (Figure 1).

Figure 1: Survey map of Nepal

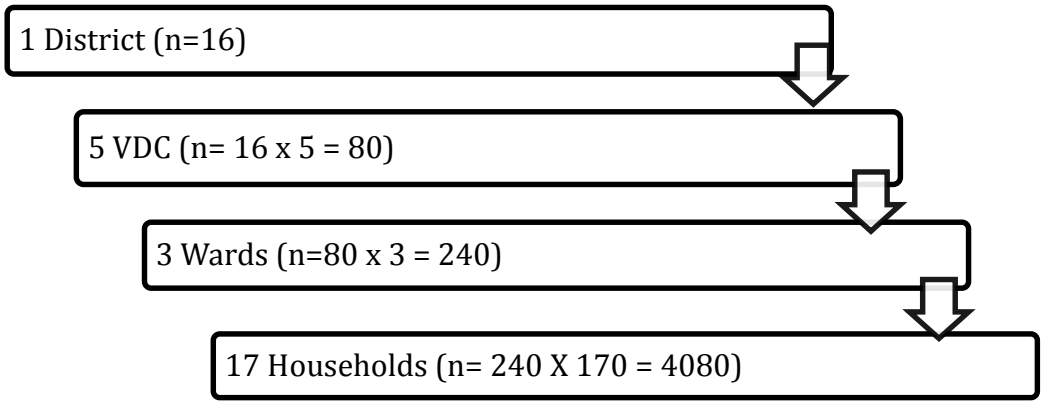


[1] Although Bajura was an early implementation district, it was not selected for the baseline survey because Helen Keller International was already implementing an agricultural program there. For the survey, we replaced Bajura with Bajhang, a phase two *Suaahara* implementation district in the same ecological zone.

The sample size for the baseline survey was based on current rates of under-five stunting from available Demographic and Health Survey (DHS) data, the expected rates of change after *Suaahara* interventions, and the power to detect statistically significant changes. Stunting currently affects 41 per cent of children (<5y) in Nepal.[13] Using a two-tailed test, we calculated that a sample of 2,040 children per group (4,080 total) would have an estimated power of 89.87 to detect a statistically significant ($p<0.05$) improvement in the prevalence of stunting from 41.0 to 36.5 per cent among children (<5y) over the five year intervention period between baseline and endline surveys in the intervention group. Within this sample of 4080 households with children (<5y), around forty per cent had children (<2y). For further sampling details please see appendix 2.

Multi-stage cluster sampling was used with the primary sampling unit of districts (16). The second-stage sampling unit was Village Development Communities (VDCs) (5 per district); the third-stage sampling unit was wards (3 per VDC), and the final-stage sampling unit was households with children (<5y) (17 per ward) (Figure 2).

Figure 2: Sampling methodology



While districts were purposively selected, we randomly selected VDCs and wards using probability proportional to size (PPS). Specifically, for each of the 16 selected survey districts, an alphabetical listing was made of all the VDCs and the number of households per VDC. Then, VDCs were selected as follows: the sampling interval (k) was obtained by dividing the total households in the district by the desired sample size of 5. A random number (x) between one and the sampling interval (k) was chosen as the starting point, and the sampling interval (k) was then added cumulatively and repeatedly $(x+K)^{th}$, $(x+2K)^{th}$, and so on until 5 VDCs had been selected. The process for selecting 3 wards per VDC followed the same process of listing and selecting by using a sampling interval, random number, and other steps.

For random selection of the 17 households with children (<5y) per ward, upon arrival in each ward, the field team supervisor, with the support of Female Community Health Volunteers (FCHVs) and other local officials if necessary, listed all households with children (<5y) by making door-to-door visits to generate a census. At a minimum, the household list included the names of the household head, child(ren) (<5y), and mother of the child(ren). Using this list, the supervisor placed each household number into a hat and asked an independent person to draw 17 household numbers, which would be the households included in the survey. Additional household numbers were drawn and recorded in the case that a respondent household was unavailable (on all three attempts made by an e numerator) and replacing the respondent household became necessary.

Within each household, if there was more than one child (<5y), the enumerator randomly selected one of the children (<5y) as the index child by numbering all household children (<5y) and drawing one number from a hat. The mother of this index child and her husband were selected as the respondents for the two household surveys.

Questionnaire Design

To design the questionnaires, formative research and published literature on Nepal's health, nutrition, and food security situation were reviewed.[14–22] Questions from previous IFPRI evaluation questionnaires as well as Nepal's 2011 Demographic and Health Survey (DHS) were adapted to capture individual, household, and community level events, behaviours, and factors that may be influencing the health and nutritional status of mothers and children in Nepal and to measure women's empowerment in agriculture. In collaboration with local and international partners, the baseline survey questionnaires went through multiple iterations and field tests. Questionnaires were originally drafted in English, translated into Nepali, and back translated again into English.

The survey included two household questionnaires, one for the mother and one for a household decision-maker. The mother's questionnaires were administered to the biological mother of the randomly selected index child. These interviews involved three parts: 1) a face-to-face interview using the structured mother's questionnaire: 2) a much shorter face-to-face interview with the mother's mother-in-law (or mother's mother, if her mother-in-law was unavailable) using a structured questionnaire; and 3) anthropometric measurements of the mother and all children (<5y) in the household (see appendix 3) and haemoglobin measurements of the mother and any index children 6 months to 5 years of age. The household decision-maker questionnaires were administered to the husband of the mother of the index child. When unavailable, another male major household economic decision-maker was selected and when no males

were available in the household, a female major household economic-decision maker was selected. These interviews involved two parts: 1) a face-to-face interview using the structured men's questionnaire and 2) spot check observations to assess household construction and key water, sanitation, and hygiene indicators and iodine tests of the household's salt (see appendix 4).

The structured mother's questionnaires involved collection of data on maternal knowledge, attitudes, and practices regarding: child health, childcare, infant and young child feeding, family planning, and hygiene behaviours. Additional data was collected on: maternal and child food consumption in the previous 24 hours, household food security, access to information, maternal healthcare use, tobacco and alcohol use, and access to and use of water and sanitation facilities. In interviews of the household decision-maker, topics included: household composition, asset ownership, receipt of social assistance, and agricultural practices and use of land. All household decision-maker interviews also involved spot check observations to assess household construction, presence of toilets, and sanitation and hygiene practices. Furthermore, in both household interviews, a series of survey questions regarding empowerment in household level agriculutral activities was asked. However, if the household decision-maker questionnaire was asked to a woman, these empowerment questions were not asked of the female decision-maker, as it was not necessary to have empowerment data on two women of the same household.

Recruitment and Training

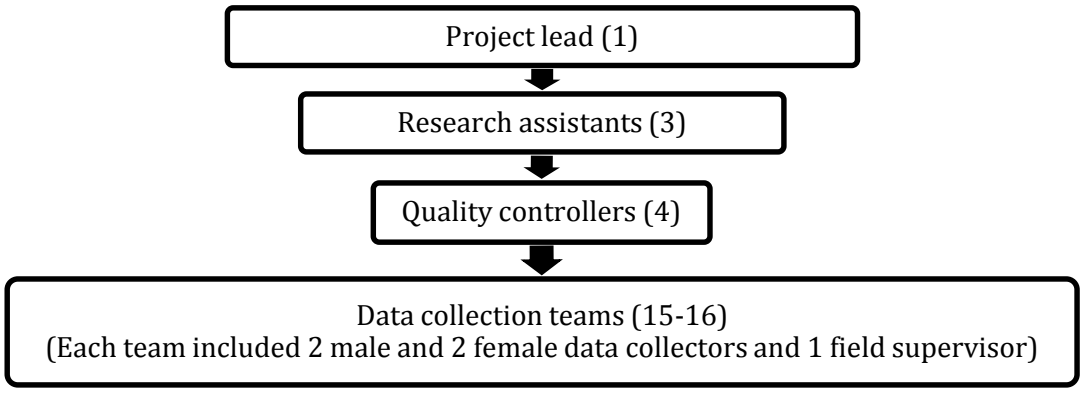
New Era recruited potential field workers to attend trainings in Kathmandu using the following selection criteria for enumerators and supervisors: 1) prior experience working with New Era on similar health, nutrition, and food security surveys; 2) understanding and fluency of the various local languages used throughout the parts of Nepal where the survey would be; and 3) ability to commit to the entire training and fieldwork periods without returning to Kathmandu.

A master training of trainers (MTOT) for around 20 persons was held in Kathmandu for two weeks to present an overview of the survey objectives, methodology, tools, and sampling. The MTOT involved detailed discussions of each survey question, as well as all potential responses for each question in the four questionnaires used in this survey: mothers, men (or household decision-maker), FCHVs, and community leaders. Mock interviews and roleplaying were some of the participatory methods used. Based on training discussions, an iterative revision process of all survey instruments took place. Finally, survey field-testing in Kavre and Parsa districts, feedback from the field tests, and decisions on survey revisions to be made concluded the MTOT.

About 90 potential fieldworkers were trained in Kathmandu for 25 days between April 29 and June 11, 2012. This training used diverse methods such as mock interviews and roleplay. The topics covered included: an overview of the survey objectives, methodology, and tools; interview techniques and field procedures; sampling methodology; and detailed discussions on each survey question and all potential answers. The enumerators were also extensively trained and standardised to measure and record maternal and child (<5y) height/length and weight. For these measurements, calibrated digital weighing scales (Seca gmbh & Co. kg model 881 1021659; precision ± 100 grams) and height/length boards (ShorrBoard produced by Weight and Measure LLC; precision ± 0.1 cm) were used. For children less than 24 months of age, supine length was measured instead of standing height. To prepare for haemoglobin testing of the mothers as well as any index children at least six months of age, enumerators were trained and practiced taking blood samples via a finger prick. HemoCue machines were used to read the micro cuvettes and enumerators were trained to make a referral to the nearest health facility if the raw haemoglobin reading indicated a risk of anaemia. In the final days of training, enumerators provided feedback on the questionnaires based on their mock interviews and field tests. The last day of training was devoted to fieldwork logistics.

Nira Joshi, New Era's project lead, and three research assistants evaluated and selected 79 of the individuals who had been trained as enumerators for the Suaahara survey: 60 data collectors, 15 supervisors, and 4 quality controllers (Figure 3).

Figure 3: Organisational fieldwork structure



New Era's project lead and three research assistants managed the fieldwork logistics. Additional New Era staff in the Kathmandu office supported data entry, data management, and other logistics. The four quality controllers were responsible for overseeing the supervisors and data collection across all field sites and teams. They also re-interviewed about 5 per cent of the households on a selection of survey questions. Teams of one supervisor and four enumerators, usually two female and two male enumerators, conducted the fieldwork. The supervisors were responsible for cluster-level logistics, conducting the FCHV and

community leader interviews, checking the completed surveys of his/her team members, and overall team leadership and management. S/he was also responsible for ensuring accurate ward sampling, listing, and identification of households, in addition to working closely with local authorities at the district, VDC, and ward levels. Enumerators were responsible for administering the two household questionnaires, anthropometric measurements, and haemoglobin testing.

Fieldwork

Upon arrival into each of the survey areas and prior to administering the survey questionnaires, the survey teams met with appropriate district, VDC, and ward level officials and leaders, including FCHVs. During these meetings, the New Era teams explained the *Suaahara* project, the purpose of the survey, and logistics in that area. The cooperation and support of FCHVs and other community leaders was requested and generously given. After getting settled in a particular community, the FCHVs helped the survey team identify the number of villages and toles in the ward and conduct the household census from which survey households were randomly selected.

In each ward, a data collection team worked collaboratively to complete all 17 sets of household interviews, in addition to two other interviews necessary for the impact evaluation but not used in the thesis – 1 FCHV interview and 1 community leader group interview. Upon finishing the household interviews, the enumerators ensured that the questionnaires were completed before leaving each home. In the evenings, the supervisors reviewed the completed household questionnaires for accuracy, legibility, and logistical consistency. If any problems were found, the enumerators returned to the household and resolved the discrepancies the following day.

All data were collected from June to October 2012, which is during the monsoon season characterised by heat and daily rainfall. In all agro-ecological zones this is the main season for planting rice paddy. Data were collected concurrently in all agro-ecological zones. Given that the survey was only conducted in one season and how strongly seasonality can influence production patterns, food availability, illness and other related agriculture, health, and nutrition phenomena, findings from this study cannot be extrapolated to other seasons. A few challenges encountered included: 1) extreme weather such as very hot temperatures in the *terai* and heavy rains resulting in landslides, destruction of roads, and other environmental effects throughout most of the districts, 2) difficult terrain, lack of roads and transportation, and scattered households especially in remote areas, 3) some very large clusters with about 1000 households and/or covering large geographic areas requiring more time than planned for listing all households in a ward and reaching the household for interview, and 4) difficulties in getting appointments with some respondents

who travelled away from home for work. Despite these field challenges, the fieldwork progressed fairly smoothly and data quality was uncompromised.

Data Management

Fieldwork and data management activities overlapped. After two weeks of data collection, and after field level editing of questionnaires for completeness and consistency, the questionnaires were sent to the New Era office in Kathmandu, where they were registered and stored. Data management for the household questionnaires involved: (1) designing data entry programs, (2) coding, (3) entry and validation, and (4) archiving and cleaning.

One data management quality controller was responsible for overseeing all data management operations. Two data coding supervisors and one data entry supervisor oversaw the larger coding and entry teams respectively and reported to the primary data management quality controller. New Era contracted additional personnel specifically for data coding and data entry. Two types of trainings took place for the data management personnel: a) the data management quality controller was trained in questionnaire content alongside the fieldworkers in the main trainings prior to field work to ensure an understanding of the logic behind the questionnaire and b) all data coding and entry staff were trained by their respective supervisors in the handling of the questionnaires and data entry program.

New Era's data management quality controller designed data entry programs for the household in FoxPro in three main stages: a) creating fields based off of the questionnaires, b) formatting the screen, and c) programming skip patterns and other design features. The quality controller entered an initial set of questionnaires so that she could tease out any problems and improve the system before training the supervisors, who then also coded and entered some data in order to further refine and improve the program by alerting the quality controller whenever they noticed any malfunctions.

Full data coding was conducted for all questionnaires as they reached Kathmandu. All personnel were asked to be alert for data management problems and raise them with their supervisor, although they were not permitted to make any changes on their own. If the supervisor agreed there was a potential problem, the issue was taken to the quality controller who in turn would discuss any data quality concerns with the survey team leader before making decisions.

Data entry followed immediately and included 100 per cent double data entry for all survey questionnaires, done on New Era computers using the FoxPro software. Data entry began on July 17, 2012, after initial sets of data coding were completed, and this process was completed in December 2012. Data entry software

prompted the entry personnel when attempting to enter something that conflicted with a prior entry or was invalid for that particular question. For example, error messages would appear whenever wrong identifiers were entered or if the number of children in the roster was not equal to the number of children indicated on the front page. New Era's project team leader created extra variables for any common responses given that were not answer options in the original questionnaire.

The two datasets from data entry were compared and a report generated to enable verification of any discrepancies in the two entries. The quality controller managed the verification process and data entry was considered acceptable only once any differences between the two entries were resolved. For data verification, screens were specially designed to prompt the verifier whenever discrepancies arose between the first and second entries. If differences were identified, the entry personnel would verify the data from the questionnaire and input the accurate data. Where discrepancies were not easy to resolve, the supervisors and/or quality controllers would provide guidance.

Archiving of the entered data from questionnaires was responsive to the specific structure of the questionnaire. Because of the need to recognize the different levels of the data from different sections/modules, data were stored in various data files and in each of these files, variables were given a name consisting of a letter before the question number: W for women's questionnaire, H for household questionnaire, G for grandmother, and I for index child, for example. New Era initially fully labelled the data in English and then transferred the datasets into SPSS for cleaning. Cleaning was done to ensure logical consistency for responses to different survey questions.

Data Quality Assurance

Data quality measures were put into place for each aspect of the fieldwork. First, although enumerators were asked to work as efficiently as possible, interviewers were reassured that they could move a bit slower for collection of data in the first cluster to ensure good data quality. Second, each evening the field supervisors were responsible for collecting the questionnaires and checking them for completion, legibility, and consistency. The supervisors held evening team meetings and followed-up on any inconsistencies or missing information on the questionnaires. Furthermore, quality controllers randomly visited some of the sampled households (about 5 per cent) and re-interviewed the respondents on a set of questions. The original and re-interviewed questionnaires were then matched and differences in answers resolved, sometimes requiring a return visit to the household. Third, for anthropometry, when the initial double measurements had a difference outside of the acceptable range, a third measurement was taken and the

two closest measurement readings were recorded. For height/length a difference of more than 2 cm was not acceptable, whereas for weight the recordings did not vary given the use of digital scales.

During data management, double entry helped ensure errors were minimised, if not eradicated. Supervisors also performed frequent consistency checks during data entry. Some of the key variables in the data were used to identify case-related problems such as duplicates, making sure each case was uniquely identified. Also, the data entry supervisor made sure the data were frequently backed up as the data entry process progressed while also helping the data entry personnel stay on top of the process. To be sure there was no chance of losing any of the entered data, data entry personnel made frequent data backups.

Data Analysis

Using STATA 13[23] and the cleaned raw household data files, I further cleaned the data, generated necessary variables, and conduced the analyses. Among the more critical steps involved at this stage of data cleaning was ensuring agreeability and utility of the household roster, against which all other modules would be matched. Other standard data cleaning procedures included checks of ranges and extreme values in variable distributions, questionnaire skip patterns, and consistency of responses across survey modules.

Prior to data analysis for the thesis, new variables were generated from the household datasets at the child, maternal, and household levels to enable summarisation of results in a more concise manner:

Child level variables:

- Child age and age squared: Generated by subtracting the date of the child's birth, collected during the mother's interview either by viewing the immunization card or by maternal recall, from the date of the mother's interview. Child age is as a continuous variable noting how old the child is in months. To address the non-linear relationship between child age and anthropometry, another continuous child age variable was created by squaring child age.
- Child sex: Recorded in the roster collected during the male survey, this is a binary variable noting whether the child is a boy or girl.
- Child height: An average of the two child supine length measurements collected during anthropometric assessment, this continuous variable is in centimetres rounded to the nearest tenth. For any child only measured once, this single measurement was used.
- Child weight: Collected during anthropometric assessment by finding the difference on a digital scale between the mother's weight when she is measured alone versus her weight while holding

the child, this is a continuous variable of size in kilograms rounded to the nearest tenth. For any child only measured once, this single measurement was used.

- Child anthropometric z-scores: The child's length and weight are used to derive z-scores, which were calculated using the 2006 World Health Organization (WHO) child growth standards reference for his/her age and sex. Individual child data on sex, age, and length and weight measurements were converted into continuous length-for-age z-score (LAZ), weight-for-age z-score (WAZ), and weight-for-length z-score (WLZ) variables using the Stata zscore06 program. In the few instances of biologically implausible anthropometric results (LAZ <-6/>6, WLZ <-5/>5 or WAZ <-6/>5), these values were replaced as missing and the children dropped from analysis.[24] The skewedness and heteroskedacity of the sample ranges were checked. Binary variables for stunting, wasting, and underweight were also constructed to denote whether or not the child's z-score was greater than -2 standard deviations from the mean.
- Child breastfeeding status: Based on the mother's answer to a question of whether the child was still breastfeeding, this is a binary variable.
- Child health status: During the mother's interview, she was asked whether in the previous two weeks the child had diarrhoea (defined for her as loose or watery stools at least four times in a 24 hour period) or fever. This binary variable reflects whether a child was suffering from fever or diarrhoea based on whether the mother gave a positive response to either of these two questions.
- Child dietary diversity: Mothers were asked to describe what their child consumed, regardless of place of consumption, in the previous 24 hours, or day before if yesterday was an unusual day for any reason. Using this 24-hour qualitative recall data of the child's diet, foods consumed that belong to one of seven food groups (7FG) – grains (cereals and tubers); pulses (legumes and nuts); vitamin A-rich fruits and vegetables; other fruits and vegetables; dairy; eggs; and flesh foods (meat, fish, and poultry) – were categorised accordingly. For this categorisation, the World Health Organization (WHO) guidelines were followed[25] and multiple Nepali and international agricultural and nutrition experts consulted for items that were difficult to classify. For children 6 to 24 months of age, to create a continuous dietary diversity indicator to represent dietary quality, we calculated the number of groups out of the 7FG from which foods were consumed in the last 24 hours; each food group could only be counted once.
- Infant and Young Child Feeding (IYCF) practices: To assess general child feeding practices among children under two years of age, the 8 core WHO IYCF binary indicators were constructed for the appropriate sub age ranges including: early initiation of breastfeeding for children 0 to 24 months (defined as put to the breast within the first hour of birth); exclusive breastfeeding for children 0 to

6 months (defined as having received only breast milk during the previous 24 hours); continued breastfeeding of children at 1 year measured for those 12 to 15 months of age; introduction of food (solid, semi-solid or soft) between 6 and 8 months; minimum diet diversity (defined as eating food from at least 4 different food groups in the previous 24 hours) for children 6 to 24 months; minimum acceptable diet (defined to include meal frequency and diversity with different criteria for three sub age ranges) for children 6 to 24 months; and consumption of iron rich foods for children 6 to 24 months of age.[25]

Maternal level variables:

- Maternal empowerment in agriculture: A series of 11 binary variables representing 10 component indicators plus aggregate empowerment based on the newly-developed Women's Empowerment in Agriculture Index's sub-index called the Five Domains of Empowerment (5DE). This index captures the roles and extent of women's engagement in the agricultural sector in five domains: (1) decisions over agricultural production, (2) access to and decisionmaking power over productive resources, (3) control over use of income, (4) leadership in the community, and (5) time use. For details regarding construction of the 5DE, see appendix 5.
- Maternal age: A continuous variable based on maternal recall of her completed age in years. For descriptive purposes, a categorical variable was also generated to see what percentage of mothers of young children fall into the following categories: under 20 years of age; 20-24 years of age; 25-29 years of age; and 30 years of age and older.
- Maternal height: An average of the two height measurements, collected during anthropometric assessment, this continuous variable is in centimetres rounded to the nearest tenth.
- Maternal education: Based on what was reported in the household roster as the highest level completed, any answers of never attended school, non-formal education only, pre-primary, and started school but not completed grade one were grouped together and labelled as 0 years of formal schooling. For those few who had attended formal education beyond twelve years, 4 years were added for bachelors degree, 1 year added for masters degree, and 3 years added for PhD. Next, a continuous variable on number of years of education was constructed to create a range of 0 to 20 years of formal schooling. A categorical variable was also created to categorise mothers as having: no formal education; some primary education; completed primary (grades 1-5) education; some secondary education; completed secondary education (grades 6-10); or completed class 12 certificate or higher education.

- Maternal agricultural occupation: Based on information reported in the survey roster, this is a binary variable capturing whether the mother's occupation (primary or secondary) was in agriculture.

Household level variables:

- Household water, sanitation, and hygiene (WASH) facilities and practices: Based on information collected during both household interviews, we constructed ten binary variables related to whether particular household WASH behaviours were being practiced. These variables were based on spot check observations for pratices 1-7 or self-reporting for practices 8-10: (1) improved water source at the house, (2) drinking water pot covered if water stored at household level; (3) household has a toilet that is clean; (4) house is free of both animal and human faeces; (5) water and either soap or ash available in the house; (6) living area free of garbage; (7) living area free of animals; (8) children (<5y) do not openly defecate; (9) proper disposal of child (<5y) stools; and (10) maternal recall of five key times for washing hands (after defecation, after cleaning a child who defecated, before cooking/preparing food, before eating, and before feeding a child). To generate a continuous variable (range=0-10), we then constructed an index summing these ten household WASH practices.
- Household head: As identified in the roster, this binary variable identifies whether the household head was male or female.
- Household wealth: A variable summing asset ownership information that was collected during the male household interview. It was created as a crude proxy for wealth level given that the survey did not collect income and expenditure data. It is a continuous variable which sums up the number of assets owned including livestock, non-agricultural assets, small agricultural tools, and large agricultural productive assets.
- Household religion: Based on information collected in the roster, a binary variable was created to identify whether the household head's religion was Hinduism or not. Although four religions were initially coded, because more than 90 per cent of households were Hindu, the other three religions – Buddhism, Islam, and Christianity – were grouped as non-Hindu.
- Household caste/ethnicity: Originally, nearly 60 different groups were identified as the caste/ethnicity of the household head. The Nepal caste census groupings usually categorise these disparate caste and ethnic groups into six groupings: (1) upper caste groups; (2) relatively advantaged Janajatis; (3) religious minorities; (4) disadvantaged non-Dalit Terai caste groups; (5) disadvantaged Janajatis; and (6) Dalit.[26] We created the same categories but merged adjoining

groups 2 and 3 (relatively advantaged Janajatis and religious minorities), as both groups were relatively small in comparison to the other groups and were comparable regarding social exclusion, poverty, and other characteristics.

- Household agro-ecological zone: This is a categorical variable to identify whether the household's district of residency was in the *terai*/lowlands, hills, or mountains.
- Household development zone: Households were categorised based on the 5 official Nepal development zones: (1) eastern (2) central (3) western (4) mid-western and (5) far western.
- Household size: For this survey, a household was defined as a group of people who live together under the same roof and take food from the same pot. A household member was defined as: someone who had 1) lived in the household for at least 6 months, 2) shared food from the same pot as others under the roof, and 3) resided there regularly at least half of the time during the 6 months (3-4 days of each week for 6 months, 3 full months of the 6 months, etc.). Even non-blood relatives (such as servants, lodgers, or agricultural labourers) were included if they met these three requirements. Exceptions for individuals included as household members even if not meeting the definition were: a new-born child less than 6 months old; someone who joined the household through marriage less than 6 months ago; and servants, lodgers, and agricultural labourers currently in the household and who will be staying in the household for a longer period but arrived less than 6 months ago. Similarly, exceptions for individuals excluded as household members even if meeting the definition are: a person who died very recently; someone who has left the household through marriage; and servants, lodgers, and agricultural labourers who have left the household. Based on these definitions, a roster was collected to register all household members and this continuous variable is a sum of the total number of household members identified.
- Household number of children under five years of age: Using the household roster, data entry personnel created a categorical variable in the original dataset to denote how many children under five years of age resided in each household. For this study, we have created a binary variable categorising households as having one or more than one child below the age of five years.
- Household use of alternate adult childcare provider: In the mother's interview a question was asked regarding whether the mother normally leaves the child alone or with someone else when needing to be away from the child. A follow up question was asked to identify the age and relations of this primary alternate caretaker. Based on responses to these two questions, a binary variable was created to clarify whether the primary alternate childcare provider is an adult (defined as being at least 12 years of age).

- Household production diversity index: We constructed an index of household production diversity by categorising food produced at the household level into the same 7 food categories that were used for construction of child dietary diversity: grains (cereals and tubers); pulses (legumes and nuts); vitamin A-rich fruits and vegetables; other fruits and vegetables; dairy; eggs; and flesh foods (meat, fish, and poultry).
- Household food insecurity access scale (HFIAS): To gather information related to household food security, the standard Food and Nutrition Technical Assistance (FANTA) questions were used to calculate particular food insecurity conditions followed, a scale score, and prevalence rates.[27] However, in our survey we asked the mother of the index child instead of the household head and asked about the previous 30 days rather than the previous one year.

Results on means with standard deviations and proportions were generated for initial descriptive statistical analysis. There were very few unreasonable outliers in continuous variable distributions. However, they were removed when they were deemed inaccurate data, using pre-defined criteria. For instance, any child anthropometric z-scores greater than what is biologically plausible (5/6 standard deviations) were removed. Univariate and multivariate linear regressions were done to assess associations between women's empowerment in agriculture and LAZ, WAZ, and WLZ of children under two years of age, adjusting for pre-determined confounding factors and taking into account potential effects of district-level clustering. In the final set of statistical analyses, these same associations were tested but with the age range limited to young children 6 to 24 months of age. Causal mediation techniques were used to formally test whether two childcare practices – child feeding and household WASH facilities and practices – mediated the association of dimensions of women's empowerment in agriculture found to be associated with LAZ among children 6 to 24 months of age. Additional details regarding the analyses done for each aspect of the thesis is described in each of the relevant chapters.

Ethical Considerations

IFPRI's internal review board and the Nepal Health Research Council (NHRC) granted ethical permission to conduct the *Suaahara* baseline survey. The London School of Hygiene and Tropical Medicine (LSHTM) also ethically approved the *Suaahara* baseline survey household questionnaires, which were used for the thesis. These ethical approvals helped to ensure that the rights and safety of the study participants were ensured and that the research was feasible and useful (see appendix 1).

In all aspects of this research project – designing the question and study, conducting the research, analysing the findings and disseminating the findings – various dimensions of ethical principles were kept

in mind. Autonomy, beneficence, non-maleficence and justice are some of the key principles that guided the ethical considerations of this research project. For example, informed consent to participate in the study was requested only after ensuring that the study aims, methods, and processes of confidentiality were disclosed and that the potential interviewee had understood the study and voluntarily consented. Clear, unambiguous language was used and informed consent was formally documented prior to beginning any interview. The respondent's signature was requested, but when the respondent was unwilling or unable to sign, the signature of an independent observer was obtained. Confidentiality was ensured during interviewing by not allowing anyone else to be present and during data management and analysis by making records anonymous, storing records securely, and keeping anonymity throughout reporting.

Throughout the research project, minimal harm to the respondent was prioritized. While harm is minimal in this type of survey, the economical or social damage from taking time away from work to participate in the interview was acknowledged and a small gift given for participation. In addition to following this principle of non-maleficence, the principle of beneficence was also used. The study's aim is to ensure positive benefit and new knowledge from the findings for the study populations and in doing so required that all involved in the research be competent professionals. Furthermore, under the principle of justice, the study aims to reduce health inequalities by focusing on a low-income population and will aim to share the results with the study population or with health and nutrition programmers working with the study population.

Chapter 4: Women's Empowerment in Agriculture and Child Nutritional Status in Rural Nepal

Preface

The comprehensive systematic review of existing studies, presented in Chapter 2, found evidence of an association between women's empowerment and child nutritional status in South Asia. However, we also found that the direction and strength of association may differ among different populations and contexts as well as for different dimensions and indicators of women's empowerment or child nutritional wellbeing. While a fairly consistent picture emerges and the findings align with those of a very recent global review of the relationship of women's autonomy and child nutrition[28], the evidence is not robust. There is disparity and imperfection in methods and indicators used to measure women's empowerment. Several weaknesses and gaps in this evidence base on women's empowerment and child nutrition in South Asia remain.

Therefore, in this chapter, the aim is to facilitate a deeper understanding of how women's empowerment and young child nutritional status are associated in one particular South Asian context. Using data on more than 1,000 mother-child dyads, in this part of the thesis, the association between women's empowerment in agriculture and child (<2y) nutritional status in rural Nepal is investigated. We use multivariate regression models to test the associations between some dimensions of women's empowerment included in the Women's Empowerment in Agriculture Index (WEAI) and child anthropometry, controlling for child, maternal, and household level factors that may confound the relationship of interest.

This will be the first South Asian nutrition study to conceptualise women's empowerment as a multi-dimensional phenomena incorporating decision-making, workload and time allocation, and social support structures. Furthermore, this focus on women's empowerment in the agricultural domain, rather than broad empowerment, is unique and particularly valuable given the importance of agriculture to rural economies and the daily lives of rural Nepalese women.

Declaration of submission for publication

1. For a 'research paper' already published

1.1. Where was the work published? .....
1.2. When was the work published? .....
1.2.1. If the work was published prior to registration for your research degree, give a brief rationale for its inclusion
……
1.3. Was the work subject to academic peer review? .....
1.4. Have you retained the copyright for the work? **Yes / No**
If yes, please attach evidence of retention.
If no, or if the work is being included in its published format, please attach evidence of permission from copyright holder (publisher or other author) to include work

2. For a 'research paper' prepared for publication but not yet published

2.1. Where is the work intended to be published? Public Health Nutrition

2.2. Please list the paper's authors in the intended authorship order
(1) Kenda Cunningham (2) Elaine Ferguson (3) George Ploubidis (4) Ricardo Uauy (5) Marie Ruel (6) Suneetha Kadiyala (7) Purnima Menon

2.3. Stage of publication – Not yet submitted / Submitted / Undergoing revision from peer reviewers' comments / In press

3. For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)

K.C. developed the research objectives, conducted the analysis, and drafted the paper with guidance and feedback from co-authors throughout. All authors participated in decisions related to the analysis, reviewing of drafts, and all have read and approved of the final version of the paper and its submission.

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STUDENT ID NO: lsh281247.

CANDIDATE'S SIGNATURE  Date …March 24, 2013

SUPERVISOR'S SIGNATURE  Date …March 24, 2013

WOMEN'S EMPOWERMENT IN AGRICULTURE AND CHILD NUTRITIONAL STATUS: THE CASE OF RURAL NEPAL

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Key words/phrases
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Conflict of interest
None

Authorship

K.C. contributed to study design and questionnaire development, facilitated fieldwork including data collection and management, developed research questions, conducted statistical analysis, and drafted and revised the manuscript. G.P., E.F., R.U., and provided guidance in defining the conceptual framework and guiding data analysis. S.K. contributed to study design and questionnaire development and supervised data collection and management. P.M. and M.R. led the overall impact evaluation design, and contributed to baseline survey design, questionnaire development and data analysis. All authors contributed to research question development, reviewed and edited manuscript drafts, and read and approved the final manuscript.

Manuscript

WOMEN'S EMPOWERMENT IN AGRICULTURE AND CHILD NUTRITIONAL STATUS: THE CASE OF RURAL NEPAL

Abstract:

Objective: To examine the association between women's empowerment in agriculture and nutritional status among Nepali children under 2.

Design: Cross-sectional survey of 4,080 households conducted from June to October 2012. Variables collected include: child and maternal anthropometric measurements; child age and sex; maternal age, education, occupation, and empowerment in agriculture; and household size, number of children, religion, caste, and agro-ecological zone. Associations between the Women's Empowerment in Agriculture Index (WEAI)'s Five Domains of Empowerment (5DE) index and its ten component indicators and child length-for-age z-scores (LAZ), weight-for-age z-scores (WAZ), and weight-for-length z-scores (WLZ) were estimated, using ordinary least squares regression models, with and without adjustments for key child, maternal, and household level covariates.

Setting: 240 rural communities across16 districts of Nepal

Subjects: Children <24 months of age and their mothers (n=1787)

Results: The overall 5DE was positively associated with LAZ (β=0.22, P=0.021) and WAZ (β=0.19, P=0.045), but not WLZ. Three component indicators were positively associated with LAZ: satisfaction with leisure time (β=0.28, P=0.003), access to and decisions regarding credit (β=0.17, P=0.031), and autonomy in production (β=0.11, P=0.046). The credit indicator (β=0.16, P=0.021) was also positively associated with WAZ. No indicator was associated with WLZ.

Conclusions: Women's empowerment in agriculture, as measured by the WEAI's 5DE and three of its ten component indicators, was significantly associated with LAZ and WAZ, highlighting the potential role of women's empowerment in improving child nutrition in Nepal. Additional studies are needed to determine whether interventions to improve women's empowerment will improve child nutrition.

Nearly half of all children under 5 years of age (<5y) are undernourished in South Asia.[1–3] These high levels of childhood under-nutrition relative to other parts of the world (i.e. Africa) are puzzling, especially given South Asia's recent economic gains.[4–6] Women's particularly low social status and disempowerment in this region, when compared to other regions, create barriers to social development and result in severe consequences for child health and nutrition including intrauterine growth retardation, low birth weight, and sub-optimal child growth.[4,6–8]

Greater maternal decision-making, control, and autonomy in the household likely improve child nutrition by improving childcare practices.[8,9] Some empirical studies have found women's status and empowerment to be associated with child height/length-for-age (HAZ/LAZ), weight-for-age (WAZ), or weight-for-height/length (WHZ/WLZ) z-scores in South Asia. However, these studies are limited and their findings inconsistent.[10–21] This may reflect inter-study differences in population characteristics, study settings, or indicators of women's empowerment used; it may also indicate that some aspects of women's empowerment are particularly context-specific.[8,14,22–24]

Kabeer's definition of empowerment as "the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them" is the most frequently referenced.[25] However, definitions, indicators, and methods used to measure women's empowerment vary across studies. These inconsistencies present challenges in interpreting the evidence base.[25–27] Indirect measurements, such as age at marriage and level of education, are inherently limited. These proxy measurements do not provide any concrete information regarding an individual's autonomy, control, or power; these variables generally reflect prior investments made into girls rather than a mother's current level of empowerment. Aggregate indices, increasingly used in women's empowerment studies, usually capture decision-making and autonomy but fail to assess other dimensions of women's empowerment, such as workload and social support. To address these limitations, a new index was recently developed to measure empowerment in a more multi-dimensional way, albeit in the context of rural agriculture. This aggregate index – the Women's Empowerment in Agriculture Index (WEAI) – was specifically developed to standardise the terminology and domains included in defining and measuring women's empowerment. The WEAI aims to measure constraints related to women's roles in agriculture to better understand their relationship with a variety of outcomes including agriculture production, women's own well-being, and that of their children.[26,27] However, evidence relating the index to particular health and nutrition outcomes is only beginning to emerge, with no published studies having yet explored the association between the WEAI 5DE and child nutrition.

In Nepal, although agricultural employment has been declining since 2006, agriculture remains the primary occupation and source of income, with more than three out of every four households engaged in agricultural activities. About 90% of women engage in agricultural production activities and women perform 70% of labour related to livestock production. The level of under-nutrition among Nepalese children (<5y) is very high: 57% are stunted, 14% wasted, and 37% underweight.[28–30] The heavy reliance on agriculture for both food consumption and income generation and the large contribution of women to agriculture means that gender roles and women's empowerment in agricultural activities may be important determinants of child health and nutrition in Nepal.[28,30–32]

In this study, we use the WEAI to specifically test the association of various indicators of women's empowerment in agriculture with child nutritional status in rural Nepal. In doing so, this paper aims to: (1) investigate whether women's empowerment[1] in agriculture is associated with the nutritional status of children under two years of age residing in rural Nepal and (2) determine whether the direction and strength of association differs by indicator of women's empowerment in agriculture.

Methods

Survey design and sampling

We used data from a baseline cross-sectional survey of an evaluation of *Suaahara,* a USAID-funded multi-sectoral maternal and child (<5y) health and nutrition intervention. The survey was conducted in 16 districts of Nepal from mid-June to early-October (the rainy season) of 2012. Anthropometric measurements (length/height and weight) were collected from mothers and children (<5y) and interviewer-administered questionnaires were used to gather information from the mothers and a major household decision-maker. Households were selected to participate in the survey using multi-stage cluster sampling. Districts, which were the primary sampling units, were purposively selected into two groups: 1) 8 *Suaahara* intervention districts (Darchula, Bajhang, Baglung, Parbat, Syangja, Rupandehi, Nawalparasi and Sindhupaldhok) and 2) 8 comparison districts (Achham, Jumla, Gulmi, Arghakhochi, Kapilbastu, Tanahu, Chitwan, and Ramechhap) matched based on their similarities with intervention districts related to social, economic, and agro-ecological characteristics. Using probability proportional to size (PPS) techniques we randomly selected 5 rural village development committees (VDCs) within each district and 3 rural wards within each of the VDCs. Finally, we listed all households in each ward with a child <5y and

[1] This paper uses women and mother as interchangeable. This is accurate in this instance because our survey targeted only households with at least one child less than five years of age and therefore, all women in this dataset are mothers. However, given our focus on mothers, the findings may not be generalizable to all Nepalese women.

randomly selected 17 of these households per ward. When more than one child <5y resided in the household, the index child was selected at random. In total, the sample included 4,080 households across 240 wards.

For this study, we restricted our analysis to households with an index child under two years of age (<2y) (n=1787). This sub-sample was selected because most growth faltering occurs during the first 24 months of age and current household characteristics and women's empowerment would likely be more closely associated with the recent process of growth faltering.[33,34]

Ethical approval was obtained from the International Food Policy Research Institute (IFPRI), the Nepal Health Research Council (NHRC), and The London School of Hygiene and Tropical Medicine (LSHTM). All respondents gave their informed verbal consent to survey participation.

Anthropometric assessment

Duplicate measurements of maternal and child weight and height (supine length of children) were taken using standardized calibrated digital weighing scales (Seca gmbh & Co. kg model 881 1021659; precision ± 0.1 cm) and length boards (ShorrBoard produced by Weight and Measure LLC; precision ± 100 grams). Child age was derived from maternal recall or, when available, from a birth certificate (n=874; 49% of children <2y).

Length-for age z-scores (LAZ), weight-for-age z-scores (WAZ), and weight-for-length z-scores (WLZ) were computed using the World Health Organization (WHO) growth reference standards. Stunting, wasting, and underweight were defined as z-scores below -2 standard deviations (SD) from the median of the reference population.[33,35–37]

Child, maternal, and household characteristics

For this survey, trained enumerators (n=70) conducted two household interviews, one of the mother of the index child and one of a major household decision-maker, who was the husband of the interviewed mother (27%), or when unavailable, another male household decision-maker (34%). When no males were available in the household, another female household decision-maker was selected (39%). Questionnaires were extensively field tested, revised, translated and back translated to ensure data quality. During the maternal interviews, data were collected on maternal knowledge, attitudes, and practices regarding: child health, childcare, infant and young child feeding, family planning, and hygiene behaviours. Additional data was collected on: maternal and child food consumption in the previous 24 hours, household food security, access to information, maternal healthcare use, tobacco and alcohol use, and access to and use of water and sanitation facilities. In

120 interviews of the household decision-maker, topics included: household composition, asset
121 ownership, receipt of social assistance, and agricultural practices and use of land. All interviews
122 also involved spot check observations to assess household construction, presence of toilets, and
123 sanitation and hygiene practices.

124 Furthermore, in both household interviews, a series of survey questions regarding empowerment in
125 household level agriculutral activities were asked. In households where a female answered the
126 household decision-maker questionnaire, these empowerment in agriculture questions were not
127 asked. These questions were developed for the construction of the WEAI, an aggregate weighted
128 sum of two sub-indexes: the five domains of empowerment (5DE), which accounts for 90% of the
129 full WEAI score, and the gender parity index (GPI), which accounts for the remaining 10% of the
130 WEAI. Additional details regarding index construction and validation are available elsewhere.[38] In
131 this study, we used the 5DE because it relies exclusively on the maternal interviews. Dual-adult
132 households, required for constructing the GPI, were not available in 37% of the surveyed
133 households with a child (<2y) because of high levels of exit migration.

134 We constructed 11 binary variables to assess women's empowerment in agriculture: the aggregate
135 5DE index and its ten component indicators. The 5DE covers the domains of: production, resources,
136 income, leadership, and time. To capture these five domains, the 5DE has 10 component indicators:
137 (1) input into productive decisions; (2) relative autonomy in production decisions; (3) ownership of
138 assets; (4) decision-making regarding purchasing, selling, or transferring of assets; (5) access to and
139 decisions on credit; (6) control over income; (7) membership in community groups; (8) comfort
140 speaking in public; (9) time devoted to work activities; and (10) satisfaction with leisure time.[23,27,39]
141 The 5DE uses a nested weighting structure for aggregation: each of the five domains is weighted
142 equally and each indicator is weighted equally within its domain. There is a minimum threshold for
143 each component indicators to determine if an individual is adequately empowered in that particular
144 indicator (Table 1). The aggregate 5DE then deems an individual empowered if the individual has
145 adequate achievements in 80% of the weighted indicators.

146 ***Statistical analysis***

147 Statistical analysis were done using Stata13.[40] Children with anthropometric z-scores values outside
148 the biologically plausible range (LAZ <-6/>6, WLZ <-5/>5 or WAZ <-6/>5) were excluded from
149 analysis as recommended by the WHO.[35,36] No log transformations were necessary because all z-
150 scores were normally distributed.

151 Descriptive analysis was done for key child, maternal, and household variables. The association
152 between each of the eleven indicators of women's empowerment in agriculture and child LAZ,
153 WAZ, and WLZ was tested using ordinary least squares (OLS) bivariate and multivariate regression
154 analysis. In all models we controlled for district-level clustering. In the multivariate OLS
155 regressions we also adjusted for various child, maternal, and household factors likely to confound
156 the relationship between women's empowerment in agriculture and child nutritional status based on
157 a literature review of similar studies and our knowledge of the local context.[6,10–21] We included
158 child sex, age, and age squared (to address the non-linear relationship between child age and
159 anthropometry); maternal age, height, and level of education based on highest level of formal
160 schooling completed (none or less than one year, some primary, completed primary (grade 5), some
161 secondary, or completed secondary (grade 10) or higher); and household number of children <5y
162 (one or more than one), agro-ecological zone of residency (mountains, hills, *terai*), and wealth
163 status. To capture wealth an asset index was constructed as the sum of household ownership of:
164 livestock types, durable goods, agricultural productive tools, and non-agricultural productive goods.

165 Finally, we tested two-way interactions with factors for which we had hypothesized a priori could
166 potentially modify the association between women's empowerment in agriculture and child
167 nutritional status; interactions between the overall 5DE and child sex, child age, maternal education,
168 maternal age, household wealth status, caste, agro-ecological zone, and whether agriculture is the
169 mother's primary or secondary occupation or not.

170 **Results**

171 ***Participant characteristics***

172 Children were on average 12 months of age and boys and girls were distributed equally (Table 2).
173 Mothers were on average 25 years old and nearly one-third of the mothers had no formal education
174 or less than one year of schooling. Nearly 80% of mothers claimed agriculture as their primary or
175 secondary occupation. Close to half of the mothers were from upper caste groups and less than one-
176 fifth was Dalit, i.e. the lowest caste group in Nepal. Half of the households resided in the hills and
177 one quarter resided in mountain and *terai* areas, respectively. Only about one in three households
178 had more than one child (<5y) and the average household was close to six members.

179 The mean LAZ and WAZ were -1.42 and WLZ was -0.89 (Table 3), reflected in approximately one
180 third of children being stunted or underweight and just over one in six children being wasted.

181 Less than 10% of mothers were defined as empowered in agriculture, according to the 5DE (Table
182 3). Among the ten component indicators included in the 5DE, the highest levels of empowerment

were found in: asset ownership (85%), satisfaction with amount of time available for leisure (83%), confidence speaking in public (80%), and input into production decisions (79%). The lowest levels of empowerment related to indicators of: group membership (21%), access to and decision-making on credit (30%), autonomy in production decisions (31%), and workloads greater than 10.5 hours per day (38%).

Women's empowerment in agriculture and child anthropometry

In bivariate analyses, women's empowerment in agriculture overall (5 DE) was positively associated with child LAZ (β=0.38; 95%CI=0.14-0.63) and WAZ (β=0.30; 95%CI=0.09-0.51), but not WLZ (Table 4). After adjusting for child, maternal and household characteristics, the positive associations between the 5DE and LAZ (β=0.22 SD; 95%CI=0.04-0.40) and WAZ (β=0.19 SD; 95%CI=0.01-0.38) remained significant. In these adjusted models, child age was negatively associated with LAZ, WAZ, and WLZ, but child sex was only associated with LAZ. Maternal height and education were positively associated with both LAZ and WAZ. Maternal age and having completed some secondary education were associated with WLZ. Having two or more children <5y residing in the household was negatively associated with WAZ. Living in the hills, in comparison to those living in the mountains, was positively associated with LAZ (Table 4).

Further analysis of each of the 5DE's ten component indicators showed that specific dimensions of women's empowerment in agriculture were significantly associated with LAZ and WAZ, but none of the ten indicators were associated with WLZ (Table 5). In the adjusted models, three component indicators were positively associated with LAZ: 1) autonomy in production, defined as motivation to take certain actions because of one's own values and desires rather than to please others or avoid harm by others (β=0.11 SD; 95%CI=0.00-0.23); 2) access to and decision-making power regarding credit (β=0.17 SD; 95%CI=0.02-0.33); and 3) maternal satisfaction regarding the amount of time she has available for leisure activities, such as visiting neighbours or listening to the radio (β=0.28 SD; 95%CI=0.11-0.44). The remaining seven indicators – input into household production decisions; asset ownership; ability to purchase, sell, or transfer household assets; control over income; membership in community groups; confidence speaking in public; or workload – were not associated with LAZ. Access to and decision-making regarding credit was also positively associated with child WAZ (β=0.16 SD; 95%CI=0.03-0.29), but no association was found with any of the remaining nine indicators (Table 5). None of the interactions hypothesized were statistically significant.

Discussion

This analysis documents the association of different dimensions of women's empowerment in agriculture and the nutritional wellbeing of children (<2y) in rural Nepal, using the main sub-index of the newest index available – the WEAI – to measure this complex, multi-dimensional phenomena. Results show that in rural Nepal women's empowerment in agriculture, as measured by the aggregate WEAI 5DE index, is positively associated with child (<2y) LAZ and WAZ, but not WLZ. Furthermore, three of the ten component indicators of the WEAI 5DE are positively associated with child LAZ: autonomy in production decisions, access to and decision-making on credit, and satisfaction with time available for leisure activities. One component indicator – access to and decision-making power regarding credit – is also positively associated with child WAZ, but none of the indicators is associated with WLZ. These results confirm previous findings from studies in South Asia: women's empowerment is associated with child nutritional status but the association may differ by the indicators used for both women's empowerment and child nutritional status.[25]

The 5DE index includes two indicators within its agricultural production domain: (1) sole or joint input in productive decisions, and (2) autonomy, defined as the extent to which one's behaviours related to agricultural decision-making are internally versus externally motivated.[41,42] Greater household decision-making power among women generally fosters improvements in child health and nutrition[42]; some but not all South Asian studies show this positive association.[10,11,13–15] In Nepal, maternal input into household decision-making is found to be positively associated with child HAZ,[15] but the relationship may vary by decision-making domain, such as large versus small household purchases, and by nutritional indicator.[16] In this study, input into household production decisions is not associated with LAZ, WAZ, or WLZ; however, autonomy in production is associated with LAZ but not WAZ or WLZ. These results concur with findings from prior studies by showing a positive relationship between maternal decision-making and child LAZ and further specify the importance of autonomy within the agricultural domain, in this setting. Our findings also reveal a nuance: the extent to which a woman's motivation for agricultural decision-making is autonomous (versus controlled), and not merely her having input into productive decisions, is important for translating her participation in agricultural production activities into nutritional benefit. This indicator, unlike typical decision-making indicators, captures the agency constraints still faced by even sole decision-makers (for example, the many women living without a male in the household in rural Nepal) because of social norms or coercion.[41]

The 5DE resource domain includes two asset-related indicators and a credit indicator: (1) ownership of major household assets, (2) decision-making over buying, selling, or transferring owned productive assets, and (3) access to and decision-making about credit. Neither of the two asset indicators is associated with child anthropometry, but access to and decision-making power

regarding credit is associated with both LAZ and WAZ. To our knowledge no other study has explored the relationship between maternal decision-making power regarding household credit and child nutritional status in South Asia. However, the positive association regarding credit and child nutritional status may reflect that women who are able to obtain credit have a higher economic or social status or that a mother's increase in access to this additional financial resource may enable her to engage in optimal childcare practices such as seeking medical care and producing or buying nutritious foods. The findings in this domain suggest that financial resources may be a pre-requisite to acting on one's decision-making ability; perhaps neither owning a major asset, e.g. land, nor decision-making power over that asset is sufficient to overcome resource constraints and allow translation into child nutritional well-being.[41]

The 5DE has a separate domain for income, with a single indicator: (1) sole or joint control over the use of income. Control over income and expenditures is not associated with any measure of child anthropometry in this study, once wealth status is controlled for. This suggests that while lack of income and financial resources may be an obstacle to child growth in rural Nepal, control over the use of income may not be a key barrier or high levels of poverty may attenuate its influence.

While previous studies note that greater control of resources by women can result in positive child outcomes,[32,43] these studies do not differentiate between assets, credit, and income, as done in the WEAI 5DE. Instead they focus on decision-making autonomy for certain types of household expenditures, without attention to the original source of the resource. For example, several South Asian studies group decisions on large and daily household purchases into an aggregate household decision-making index; findings from these studies on the associations with child nutritional status are mixed.[10,14,15] A 2009 study finds that mothers in Andhra Pradesh with the ability to set money aside have lower odds of their child being stunted,[13] but a later study using the same data finds no association between financial autonomy and LAZ, WAZ, or WLZ.[12] A study in Nepal finds an overall lack of association between maternal financial decision-making and HAZ. However, this same study finds a positive association between maternal control of daily household purchases and WHZ, but a negative association between her control of large household purchases and WHZ.[16] While these studies do address women's control of resources, comparison with our study is not possible: 1) our analysis is limited to younger children (<2y) as opposed to <5y or small age sub-groups, e.g. 3 to 5 months of age, and 2) our study focused on decision-making regarding specific types of financial resources (assets, credit, and income) rather than decision-making in general. The disparate findings related to women's control of resources and child nutritional wellbeing from this study and prior ones suggest a complex set of relationships that may differ by context, age of

children, specific resource analysed (e.g. credit, income, and assets), and indicators and analytical methods used.

The leadership domain of the 5DE index includes two indicators: (1) membership in community groups and (2) level of comfort speaking in public. Neither indicator is associated with child LAZ, WAZ, or WLZ, but these may not be dimensions of women's empowerment one would expect to directly relate to child nutrition as neither necessarily translates into improvements in diet or health among household members. In fact, community engagement and leadership theoretically could have positive or negative effects on child nutrition; engagement could increase one's social status or access to information, but it could also take time away from the provision of childcare. Some prior studies note that specific aspects of a woman's social network composition or her broader social capital may be important for child growth.[17,19,44] One study in India finds larger and more literate social networks to be positively associated with LAZ, but greater proportions of non family-members in a mother's social network to be negatively associated with LAZ.[19] Our findings are consistent with findings from a study in Andhra Pradesh reporting no association between maternal community group membership and LAZ among 6 to 18 month old children.[17]

Lastly, the time domain of the 5DE is comprised of two indicators: (1) workload, measured as whether one worked more than 10.5 hours in the previous 24 hours and (2) satisfaction with the amount of time available for leisure activities such as visiting friends and relatives or listening to the radio. Although time devoted to work may influence child nutritional status, as optimal childcare practices are time intensive, no prior study has investigated this hypothesis in a South Asian setting. We find no association in this study with child LAZ, WAZ, or WLZ. These findings may be explained by maternal under or overestimations of time spent on work or perhaps the indicator, constructed assuming that a heavy workload reflects disempowerment, is not apropriate for all contexts. Although a heavy workload may mean less time for non-work activities, there is also a counterbalancing income effect not captured by the indicator. In this study, maternal satisfaction with leisure time is associated with LAZ but not WAZ or WLZ. This finding suggests that independent of number of hours spent on work, a mother's perception regarding whether or not she has free time is important for child nutrition. Perhaps perception of and satisfaction with free time, rather than the exact number of non-working hours, is an indicator of agency, lack of stress, and mental wellbeing. Maternal mental wellbeing in turn can influence child growth.[45–47] Although two prior studies find maternal employment to positively relate to child WAZ in India, these studies only explore whether the mother works and not the time devoted to work.[10,11] No South Asian studies assess satisfaction with leisure time and its relationship with child nutritional status.

315 Maternal education and height are also found to be determinants of young child nutritional status in
316 this study. Maternal height captures both genetic factors as well as long-term deprivation, and
317 education reflects long-term investments in girls and women. Both small stature and lack of
318 education in women perpetuate the inter-generational transmission of poor nutrition. These more
319 general, longer-term gender inequalities are associated with child nutrition in our study, which is
320 consistent with prior studies.[17,19,47,48].

321 Seven of the ten indicators of women's empowerment in agriculture were not associated with child
322 nutritional status in this study; this raises the question as to whether the associations are truly non-
323 existent in this population or whether the indicators fail to adequately capture the constructs they
324 are meant to reflect. Some aspects of women's empowerment in agriculture may not be particularly
325 important for child nutrition in Nepal. For instance, it may be that mother's degree of comfort with
326 speaking in public is not a key determinant of her ability to make decisions regarding her children's
327 health and nutrition wellbeing. Alternatively, it is possible that some of the 5DE indicators do not
328 capture certain aspects of women's empowerment in agriculture accurately enough for this context.
329 This study looked at both a composite index (5DE) and its ten individual indicators; the intent of the
330 index is to capture the multiple dimensions of empowerment. However, this type of aggregated
331 index may be less helpful if some of the dimensions are not relevant to a given context or to the
332 oucome studied. It may also be that a certain threshold of empowerment is necessary for women's
333 empowerment to translate into benefit for child wellbeing.

334 This study has several strengths including its large sample size and being the first South Asian
335 study to examine the association of women's empowerment in agriculture and child nutritional
336 status. Furthermore, in this study we took advantage of the newest tool available for measuring
337 women's empowerment in agriculture: the 5DE component of the WEAI index. The key strengths
338 of the WEAI are that it: 1) is the first and only survey-based tool specifically designed to measure
339 women's empowerment in agriculture; 2) explicitly recognises the multi-dimensionality of
340 empowerment; and 3) includes both a composite index and disaggregated indices, which allow for
341 disaggregation and a deeper understanding of the relative contributions of different dimensions of
342 (dis)empowerment in a particular context.

343 This study also has some limitations. First, its cross-sectional nature means that direction and
344 causality of effects are uncertain. Second, the findings may not be fully generalisable even to Nepal
345 because it was conducted during the rainy season and seasonality is known to influence agricultural
346 production, income, food consumption, and health and nutritional status, especially acute
347 malnutrition. Third, unknown and unmeasured confounding factors may also affect the results.

348 Despite these limitations, given that this is the first study to examine these dynamics in South Asia,
349 it is valuable as it generates a deeper understanding of how women's empowerment in agriculture is
350 associated with child nutrition in rural Nepal. The large sample size, quality control measures, and
351 comprehensive set of child, maternal and household level variables in this survey and controlled for
352 in this analysis generates confidence that the results are robust.

353 Furthermore, the WEAI suffers from limitations typical of aggregate/composite indices as well as
354 limitations related to designing an index intended to enable cross-country: (1) it merely reflects
355 women's empowerment in a particular domain at a particular time and provides no information
356 regarding non-agricultual aspects of women's empowerment, and (2) although designed for each
357 indicator to contribute to the aggregate measurement in the same way, some dimensions of
358 empowerment may be so context-specific that some indicators may reflect different phenomenon in
359 different settings. Additional adaptation research and validation of the WEAI across different
360 contexts will be necessary to continue to refine and enhance the tool's usefulness and comparability
361 across contexts. However, in the context of rural Nepal, which is heavily agrarian and with women
362 doing most of the agricultural labor, a specific focus on empowerment related to household
363 agricultural practices can be enlightening for future programs and policies. Also, in this sample, all
364 the WEAI 5DE indicators did contribute positively to the overall index and therefore, we have
365 confidence that these indicators have captured the intended dimensions of empowerment. Finally,
366 gender parity and negotiations between women and men are important elements of women's
367 empowerment; in this study we are unable to look at these household dynamics because of the high
368 levels of emigration and the resulting low proportion of dual households in the survey.

369 *Future research and policy implications*

370 In summary, our study provides empirical evidence that women's empowerment in agriculture is
371 associated with young child (<2y) nutritional status in rural Nepal. Based on our results,
372 researchers, programmers, and policymakers working on improving child nutrition in Nepal should
373 pay particular attention to improving specific dimensions of women's empowerment in agriculture
374 such as autonomy in production decisions, access to and decision-making control regarding
375 household credit, and satisfaction with the amount of time available for leisure activities. Given that
376 our association study does not confirm causality, further research is needed to test the gains in child
377 nutrition that can be achieved by targeted interventions aimed at improving women's empowerment
378 in agriculture in Nepal. Additional research is also needed to: (1) determine whether the
379 relationships between women's empowerment in agriculture and child nutritional status found in
380 rural Nepal are consistent in other South Asian contexts, (2) disentangle the relationship between

381 women's empowerment in agriculture and women's empowerment more broadly in the same
382 population and setting; and (3) understand the mechanisms through which women's empowerment
383 in agriculture influences child nutritional status in Nepal.

384 The Government of Nepal recognises that health and nutrition play an integral role in national
385 development and that addressing the country's persistent problem of poor health and nutrition will
386 require investments across multiple sectors. Nepal's recent Multi-Sectoral Nutrition Plan explicitly
387 recognises the multi-causal etiology of child under-nutrition and promotes coordination and
388 collaboration across institutions and sectors including education, health, agriculture, and water and
389 sanitation.[49] These formal acknowledgements of the necessity for action across sectors, and the
390 Government of Nepal's focus on rights-based inclusiveness and gender equity to tackle the diverse
391 and more structural determinants of child under-nutrition are promising. Based on our findings,
392 these policies and plans to implement programs that support social inclusion and the empowerment
393 of women are a step in the right direction. Addressing longer-term structural causes of poor child
394 growth, such as women's disempowerment, may be challenging given deeply rooted socio-cultural
395 norms. However, given the heavily agrarian nature of Nepal's economy and that nearly all women
396 in rural Nepal are engaged in agricultural activities, our findings suggest that empowering women
397 in agriculture should be a priority both for women's own social status and well-being and to
398 improve the nutritional status of Nepalese children and future generations.

References:

1. Black RE, Alderman H, Bhutta Z a, Gillespie S, Haddad L, Horton S, et al. Maternal and child nutrition: building momentum for impact. Lancet. 2013 Jun;6736(13):13–5.

2. Gulati JK. Child malnutrition: trends and issues. Anthropologist. 2010;12(2):131–40.

3. Stevens G a, Finucane MM, Paciorek CJ, Flaxman SR, White R a, Donner AJ, et al. Trends in mild, moderate, and severe stunting and underweight, and progress towards MDG 1 in 141 developing countries: a systematic analysis of population representative data. Lancet. Elsevier Ltd; 2012 Jul 4;380(9844):824–34.

4. Ramalingaswami V, Jonsson U, Rohde J. Commentary: The Asian enigma. UNICEF; 1996.

5. Haddad L, Peña C, Nishida C, Quisumbing A, Slack A. Food security and nutrition implications of intrahousehold bias: a review of literature Agnes Quisumbing , and Alison Slack Food Consumption and Nutrition Division International Food Policy Research Institute. Washington D.C.; 1996.

6. Smith LC, Ramakrishnan U, Ndiaye A, Haddad L, Martorell R, Mayufis RG, et al. The importance of women's status for child nutrition in developing countries. Washington, D.C.: International Food Policy Research Institute; 2003. p. 1–178.

7. Haddad L. Women's status: levels, determinants, consequences for malnutrition, interventions, and policy. Asian Dev Rev. 1999;17(1/2):96–131.

8. Smith LC, Ramakrishnan U, Ndiaye A, Haddad L. The importance of women's status for child nutrition. Food Nutr Bull. 2003;24(3):287–8.

9. Engle PL, Menon P, Haddad L. Care and Nutrition: Concepts and Measurement. World Dev. 1999 Aug;27(8):1309–37.

10. Bose S. The effect of women's status and community on the gender differential in children's nutrition in India. J Biosoc Sci. 2011 Sep;43(5):513–33.

11. 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):128–43.

12. 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. Elsevier Ltd; 2011 Aug;73(3):447–55.

13. 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 Jan;5(1):64–74.

14. Begum S, Sen B. Maternal health, child well-being and chronic poverty: does women's agency matter? Bangladesh Dev Stud. 2009;32(4):69–93.

15. Desai S, Johnson K. Women's decision making and child health: familial and social hierarchies. A Focus on Gender. 2005. p. 55–68.

16. Dancer D, Rammohan A. Maternal autonomy and child nutrition: evidence from rural Nepal. Indian Growth Dev Rev. 2009;2(1):18–38.

17. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. Heal Place. 2007;13:341–55.

18. Mashal T, Takano T, Nakamura K, Kizuki M, Hemat S, Watanabe M, 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 Jan;8(301).

19. 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 Nov;10(11):1274–82.

20. 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;2:139–58.

21. Aslam M, Kingdon GG. Parental education and child health — understanding the pathways of impact in Pakistan. World Dev. Elsevier Ltd; 2012;40(10):2014–32.

22. The World Bank, UNFAO and I. Gender in Agriculture Sourcebook. Washington, D.C.: International Bank for Reconstruction and Development, The World Bank; 2009.

23. Sraboni E, Quisumbing A, Ahmed A. The women's empowerment in agriculture index for Bangladesh's feed the future zone of influence. Washington D.C.; 2012 p. 1–25.

24. Barrett CB, Carter MR, Timmer CP. A century-long perspective on agricultural development. Am J Agric Econ. 2010 Mar 18;92(2):447–68.

25. Kabeer N. Resources, agency, achievements: reflections on the measurement of women's empowerment. Dev Chang. 1999;30(May):435–64.

26. Malhotra A, Schuler SR, Boender C. Measuring women's empowerment as a variable in international development. 2002. p. 1–59.

459 27. United States Agency for International Development, International Food Policy Research Institute,
460 Development, Oxford Poverty and Human Development Initiative. Women's empowerment in
461 agriculture index. Washington D.C.; 2012.

462 28. Paudel LM, ter Muelen U, Wollny C, Dahal H, Gauly M. Gender aspects in livestock farming:
463 pertinent issues for sustainable livestock development in Nepal. Livest Res Rural Dev. 2009;21(40).

464 29. Herath S. Women in livestock development in Asia. J Commonw Vet Assoc. 2007;24(1):29–37.

465 30. Tulachan P, Batsa A. Gender differences in livestock production management in the Chitwan district
466 of Nepal. J Farming Syst Res. 1994;4(3):121–35.

467 31. Miller BBA. The Gender and Social Dimensions to Livestock Keeping in South Asia: Implications for
468 Animal Health Interventions. 2011 p. 1–48.

469 32. Quisumbing AR. Household decisions, gender, and development: a synthesis of recent research.
470 Washington D.C.: International Food Policy Research Institute; 2003.

471 33. WHO Expert Committee on Physical Status. Physical status: the use and interpretation of
472 anthropometry. Geneva: World Health Organization; 1995 p. 1–47.

473 34. Ruel MT. The Oriente study: program and policy impacts. J Nutr. 2010;140:415–8.

474 35. Mei Z, Grummer-strawn LM. Standard deviation of anthropometric Z-scores as a data quality
475 assessment tool using the 2006 WHO growth standards: a cross country analysis. Bull World Health
476 Organ. 2013;85(6):1–7.

477 36. WHO Multicentre Growth Reference Study Group. WHO child growth standards: Length/height-for-
478 age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods
479 and development. Geneva; 2006 p. 1–336.

480 37. WHO Multicentre Growth Reference Study Group. WHO child growth standards based on
481 length/height, weight and age. Acta Paediatr. 2006;Suppl 405:76–85.

482 38. International Food Policy Research Institute. Women's Empowerment in Agriculture Index.
483 Washington, D.C.: International Bank for Reconstruction and Development, The World Bank; 2012.
484 p. 1–12.

485 39. Bhagowalia P, Menon P, Quisumbing AR, Soundararajan V. What dimensions of women's
486 empowerment matter most for child nutrition? evidence using nationally representative data from
487 Bangladesh. Washington D.C.: International Food Policy Research Institute; 2012.

488 40. StataCorp. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.; 2013.

41. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. The Women's Empowerment in Agriculture Index. World Dev. 2013 Dec;52:71–91.

42. Vaz A, Alkire S, Quisumbing A, Sraboni E. Measuring Autonomy: Evidence from Bangladesh.

43. Yoong J, Rabinovich L, Diepeveen S. The impact of economic resource transfers to women versus men: a systematic review. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London; 2012 p. 1–113.

44. 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 Apr;43(3):456–89.

45. Patel V, Rahman A, Jacob KS, Hughes M. Effect of maternal mental health on infant growth in low income countries: new evidence from South Asia. 2004;328(April):820–3.

46. Ruel MT, Alderman H. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? Lancet. Elsevier Ltd; 2013 Jun;6736(13):1–16.

47. Rahman A, Iqbal Z, Bunn J, Lovel H, Harrington R. Impact of maternal depression on infant nutritional status and illness. Arch Gen Psychiatry. 2004;61.

48. Rajaram S, Zottarelli LK, Sunil TS. Individual, household, programme and community effects on childhood malnutrition in rural India. Matern Child Nutr. 2007 Apr;3(2):129–40.

49. Government of Nepal National Planning Commission. Multi-sectoral Nutrition Plan. 2012 p. 1–97.

Table 1: Women's Empowerment in Agriculture Index Five Domains of Empowerment

Domain	Indicator	Weight
Production	Input in productive decisions	1/10
	Autonomy in production	1/10
Resources	Ownership of assets	1/15
	Right to purchase, sale, or transfer agricultural assets	1/15
	Access to and decisions on credit	1/15
Income	Control over use of income	1/5
Leadership	Group membership	1/10
	Comfort speaking in public	1/10
Time	Workload	1/10
	Leisure	1/10

Source: Adapted from Alkire et al. 2013

Table 2: Socio-demographic characteristics

Variables	N	Mean (SD)/ %
Child characteristics		
Age in months	1787	12.3 (6.7)
Sex: boys	1787	50.7%
Maternal characteristics		
Height (cm)	1786	151.6 (5.5)
Age in years (15-52)	1787	24.9 (5.6)
Years of education	1787	5.0 (4.2)
Level of formal schooling	1787	
Less than grade one		32.0%
Some primary		13.7%
Completed primary (1-5)		7.7%
Some secondary		25.4%
Completed secondary (6-10)		10.9%
Completed class 12 or higher		10.5%
Agricultural occupation (primary or secondary)	1787	79.2%
Household characteristics		
Religion: Hinduism	1787	91.1%
Caste	1787	
Upper caste groups		46.7%
Relatively advantaged *Janajatis*		6.4%
Religious minorities and disadvantaged non-Dalit *terai* groups		4.6%
Disadvantaged *Janajatis*		22.9%
Dalit		19.5%
Agro-ecological zone of residence	1787	
Mountains		25.1%
Hills		50.6%
Terai		24.3%
Average household size	1787	5.7 (2.4)
Number of under 5s in the household	1787	
One		64.6%
Two or more		35.4%

Table 3: Child anthropometric and maternal empowerment characteristics

Variables	N	Mean (SD)/ %
Outcome: child nutritional status		
Length-for-age Z-score	1776	-1.42 (1.32)
Weight-for-age Z-score	1778	-1.42 (1.14)
Weight-for-length Z-score	1761	-0.89 (1.12)
Stunting prevalence	1776	32.3%
Underweight prevalence	1778	30.3%
Wasting prevalence	1761	15.2%
Women's empowerment in agriculture	1312	
Empowered in overall WEAI 5DE		9.2%
Empowered in specific indicators		
Input into production decisions		79.2%
Autonomy in production		31.3%
Ownership of assets		84.7%
Right to purchase, sale, or transfer agricultural assets		56.9%
Access to and decisions on credit		30.1%
Control over use of income		59.3%
Group membership		21.0%
Speaking in public		79.5%
Workload (<10.5 hours in paid and unpaid labour)		38.0%
Leisure (satisfaction with time available)		83.4%

Table 4: Associations between WEAI 5DE (Five Domains of Empowerment) and LAZ, WAZ, and WLZ among children 0-24 months of age

	Length-for-age Z scores (N=1308)		Weight-for-age Z scores (N=1308)		Weight-for-length Z scores (N=1296)	
	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)
Women's Empowerment in Agriculture (5DE)	0.3849**	0.2218*	0.2993**	0.1911*	0.0449	0.0169
	(0.1378 - 0.6320)	(0.0387 - 0.4049)	(0.0874 - 0.5111)	(0.0053 - 0.3769)	(-0.1652 - 0.2550)	(-0.2312 - 0.2650)
Child age (months)		-0.1048**		-0.0904**		-0.0761*
		(-0.1533 - -0.0562)		(-0.1475 - -0.0332)		(-0.1375 - -0.0148)
Child age squared		0.0011		0.0019		0.0023*
		(-0.0008 - 0.0030)		(-0.0003 - 0.0040)		(0.0001 - 0.0044)
Child sex		0.1482*		0.0645		0.0076
		(0.0284 - 0.2681)		(-0.0993 - 0.2282)		(-0.1640 - 0.1793)
Maternal age (years)		0.0088		-0.0092		-0.0184**
		(-0.0072 - 0.0249)		(-0.0220 - 0.0036)		(-0.0303 - -0.0065)
Maternal height (cm)		0.0491**		0.0260**		-0.0016
		(0.0413 - 0.0570)		(0.0151 - 0.0368)		(-0.0162 - 0.0130)
Maternal formal education						
Some primary		0.3934**		0.3186*		0.1075
		(0.1523 - 0.6346)		(0.0054 - 0.6318)		(-0.2807 - 0.4957)
Completed primary		0.2307*		0.3019*		0.1875
		(0.0008 - 0.4605)		(0.0226 - 0.5811)		(-0.1055 - 0.4804)
Some secondary		0.4669**		0.3922**		0.2173*
		(0.2379 - 0.6959)		(0.1606 - 0.6239)		(0.0260 - 0.4086)
Completed secondary		0.5409**		0.4394*		0.1545
		(0.1632 - 0.9186)		(0.1044 - 0.7744)		(-0.0926 - 0.4016)
Completed class 12 or higher education		0.5654**		0.2966*		0.0693
		(0.1934 - 0.9374)		(0.0486 - 0.5446)		(-0.2481 - 0.3868)
Household wealth status		0.0097		0.0018		-0.0032
		(-0.0019 - 0.0214)		(-0.0093 - 0.0130)		(-0.0134 - 0.0070)
Household number of children under 5y: 2 or more		-0.0978		-0.1634*		-0.1031
		(-0.2138 - 0.0181)		(-0.3257 - -0.0011)		(-0.2632 - 0.0571)
Household agro-ecological zone of residence						
Hills		0.4012*		0.3377		0.071
		(0.0034 - 0.7990)		(-0.0491 - 0.7245)		(-0.2021 - 0.3441)
Terai		0.4939		0.1212		-0.3026
		(-0.0224 - 1.0103)		(-0.3787 - 0.6211)		(-0.6708 - 0.0656)

Note: * $p < 0.05$, **$p < 0.001$

Note: All models are adjusted and control for district-level clustering; Adjusted models also control for child sex and age; maternal age, height, and education; and household wealth status, number of children under five, and agro-ecological zone of residence.

Note: Comparison groups are: boys for sex, no education for formal education, mountains for agro-ecological zone of residence, and one for number of children under 5 years.

Table 5: Associations between WEAI 5DE indicators and LAZ, WAZ, and WLZ among children 0-24 months of age

	Length-for-age Z-scores (N=1308)		Weight-for-age Z-scores (N=1308)		Weight-for-length Z-scores (N=1296)	
	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)	Unadjusted Model Coef (95% CI)	Adjusted Model Coef (95% CI)
Production						
Input into productive decisions	-0.117	0.0822	-0.1022	0.0086	-0.1223	-0.0858
	(-0.3670 - 0.1329)	(-0.0946 - 0.2590)	(-0.3010 - 0.0965)	(-0.1421 - 0.1593)	(-0.3078 - 0.0632)	(-0.2507 - 0.0790)
Autonomy in production	0.1505	0.1138*	0.1494	0.1581	0.0676	0.0927
	(-0.0939 - 0.3950)	(0.0021 - 0.2255)	(-0.0457 - 0.3444)	(-0.0021 - 0.3183)	(-0.1249 - 0.2602)	(-0.0884 - 0.2738)
Resources						
Ownership of assets	0.1761	0.0259	0.1662	0.07	0.0513	0.0291
	(-0.1599 - 0.5120)	(-0.3147 - 0.3665)	(-0.0990 - 0.4315)	(-0.0997 - 0.2397)	(-0.1564 - 0.2590)	(-0.1910 - 0.2492)
Purchase, sale, or transfer of assets	-0.0783	-0.0177	-0.0584	0.0322	-0.0906	-0.0051
	(-0.3214 - 0.1649)	(-0.1701 - 0.1347)	(-0.3341 - 0.2174)	(-0.1629 - 0.2274)	(-0.3002 - 0.1190)	(-0.1802 - 0.1701)
Access to and decisions about credit	0.1491	0.1745*	0.1281	0.1612*	0.0236	0.0672
	(-0.0185 - 0.3167)	(0.0181 - 0.3309)	(-0.0215 - 0.2777)	(0.0283 - 0.2942)	(-0.0851 - 0.1323)	(-0.0490 - 0.1834)
Income						
Control over use of income	0.2445**	0.1544	0.1613*	0.1181	-0.0341	-0.0153
	(0.1462 - 0.3429)	(-0.0093 - 0.3181)	(0.0139 - 0.3086)	(-0.0414 - 0.2777)	(-0.2106 - 0.1424)	(-0.1857 - 0.1550)
Leadership						
Group membership	0.1093	0.0688	0.1334	0.1057	0.098	0.0797
	(-0.1309 - 0.3495)	(-0.1146 - 0.2522)	(-0.0900 - 0.3568)	(-0.0800 - 0.2913)	(-0.0841 - 0.2800)	(-0.1185 - 0.2778)
Confidence speaking in public	0.3190*	0.0656	0.1663	-0.0672	-0.0412	-0.141
	(0.0635 - 0.5745)	(-0.1048 - 0.2361)	(-0.0911 - 0.4237)	(-0.2455 - 0.1111)	(-0.2520 - 0.1696)	(-0.3084 - 0.0264)
Time						
Workload	0.1846	-0.0577	0.1173	-0.0299	-0.0452	-0.0747
	(-0.0187 - 0.3879)	(-0.2210 - 0.1057)	(-0.0581 - 0.2928)	(-0.1605 - 0.1008)	(-0.1973 - 0.1070)	(-0.2141 - 0.0647)
Leisure time	0.4543**	0.2772**	0.3240*	0.2069	0.0542	0.017
	(0.2559 - 0.6526)	(0.1111 - 0.4433)	(0.0287 - 0.6194)	(-0.0273 - 0.4411)	(-0.2044 - 0.3128)	(-0.1843 - 0.2183)

Note: * $p < 0.05$, ** $p < 0.001$

Note: All models are adjusted and control for district-level clustering; Adjusted models also control for child sex and age; maternal age, height, and education; and household wealth status, number of children under five, and agro-ecological zone of residence.

Chapter 5: Do caregiving practices mediate the association of women's empowerment in agriculture and child stunting in rural Nepal?

Preface

As noted in chapter 4, women's empowerment in agriculture, as measured by the aggregate Women's Empowerment in Agriculture Index's (WEAI) 5 Domains of Empowerment (5DE) sub-index, is positively associated with young child (<2y) LAZ. Three of the 5DE's component indicators – satisfaction with leisure time, access to and decision-making on credit, and autonomy in production decision – also have significant positive associations with child (<2y) LAZ.

Chapter 5 includes empirical analyses assessing the same associations, but this time limiting the sample to children 6 to 24 months of age. However, in this chapter, we also try to further our understanding of the pathways through which these aspects of women's empowerment in agriculture may be influencing child nutritional status. In order to do so, we formally test whether two specific care practices – child feeding and household water, sanitation, and hygiene (WASH) facilities and behaviours – mediate the association between dimensions of women's empowerment in agriculture found to be directly associated with LAZ among children (6-24m) in rural Nepal.

This is the first study to test the care pathways theorised in the conceptual framework by Engle and colleagues more than a decade ago. Thus, this study will help to fill gaps relating to the determinants of poor child nutritional status by providing evidence of how some of the care resources (particularly, women's empowerment/autonomy/control) relate to specific childcare practices (child feeding and WASH facilties and behaviours), and in turn, child nutritional status. These analyses could shed light on what types of policy and programmatic interventions may be necessary for further reductions in child undernutrition in Nepal and help those aiming to address poor child nutrition in Nepal anticipate the mechanism through which particular interventions could result in desired outcomes.

Declaration of submission for publication

1. For a 'research paper' already published

1.1. Where was the work published? .....

1.2. When was the work published? .....

1.2.1. If the work was published prior to registration for your research degree, give a brief rationale for its inclusion

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1.3. Was the work subject to academic peer review? .....

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(1) Kenda Cunningham (2) George Ploubidis (3) Elaine Ferguson (4) Ricardo Uauy (5) Marie Ruel (6) Purnima Menon (7) Suneetha Kadiyala

2.3. Stage of publication – Not yet submitted / Submitted / Undergoing revision from peer reviewers' comments / In press

3. For multi-authored work, give full details of your role in the research included in the paper and in the preparation of the paper. (Attach a further sheet if necessary)

K.C. developed the research objectives, conducted the analysis, and drafted the paper with guidance and feedback from G.P and E.F throughout. All authors participated in decisions related to the analysis and will review and approve of the final version of the paper before submission for publication.

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CANDIDATE'S SIGNATURE  Date …March 24, 2013

SUPERVISOR'S SIGNATURE  Date …March 24, 2013

Manuscript

Do caregiving practices mediate the association of women's empowerment in agriculture and child stunting in rural Nepal?

Introduction

Stunting, a reflection of the cumulative effects of under nutrition over time, is a known contributor to poor health and development, including not only mortality but physical and mental consequences such as poor educational achievements and greater disease risk for survivors.[1–3] Stunting remains a major nutritional burden in Nepal where 41% of children (<5) are stunted and 16% are severely stunted. This stark situation is undoubtedly caused by a multitude of factors including inadequate diets, poor complementary feeding and childcare practices, insufficient access to health services, lack of clean water, poor access to sanitation and hygiene facilities, and low levels of education.[4–6]

Particularly, the low status of women in this region also contributes to poor child nutritional status.[7,8] In Nepal, about 80% of households reside in rural areas and agriculture is the primary occupation for at least one in three men and more than three out of every four women.[4] Nearly all rural Nepalese women engage in some household agricultural production activities, including performing more than 70% of labour related to livestock production.[9,10] Their ability to influence decisions about the production and marketing of agricultural products or the use of household financial resources are some of the ways through which agricultural production can affect child nutrition.[11–14] Maternal care resources including control of household resources and autonomy, workload, and social support are underlying determinants of nutritional status (Figure 1).[15,16]

In previous analyses using the same data set that is used in the present publication, women's empowerment in agriculture was associated with the nutritional status of children under two years of age. Three specific dimensions – autonomy in household production decisions, satisfaction with time available for leisure activities, and access to and decision-making on credit – were positively associated with child (<2y) length for age z-scores (LAZ).[17] The present paper expands this work and explores the pathways through which women's empowerment in agriculture may be influencing child growth by testing if the positive associations between the three dimensions of women's empowerment in agriculture and child (<2y) LAZ operate via improvements in two particular childcare practices – feeding and water, sanitation, and hygiene (WASH) facilities and practices, for children 6 to 24 months of age.

Maternal production autonomy, defined as whether household agricultural production-related actions are based on internal desires rather than external coercion,[14] is hypothesised to improve child nutrition via greater overall household autonomy, access to resources and markets, and ability to control one's own time. Production autonomy may also be reflecting a strong sense of self-efficacy and psychological

wellbeing which could influence the mother's thoughts and behaviours related to child care.[18,19] Maternal satisfaction with the amount of time she has available for leisure activities may reflects her stress levels or her overall mental and psychological wellbeing. This, in turn, may be positively associated with child nutrition because she can be more engaged in childcare practices or because she herself has better health, is more productive, and has more positive social connections.[19 20] A mother's ability to access and make decisions regarding credit may reflect her higher economic or social status. Financial or social resources are a pre-requisite to being able to act on one's decision-making abilities and in turn, translate decision-making power into child nutritional wellbeing; for example, increased credit may enable a mother to buy nutritious complementary foods.

In this study, we aimed to test the potential association of ten indicators of women's empowerment in agriculture with LAZ of children six to twenty-four months (6-24m) of age. Furthermore, for each association found between a dimension of women's empowerment in agriculture and child (6-24m) LAZ, we empirically tested whether the care practices of child feeding or household water, sanitation, and hygiene (WASH) practices mediated the association. Understanding the extent to which specific mediators are responsible for established associations between certain aspects of women's empowerment and young child LAZ in Nepal is important to guide policy and programmatic interventions to improve women's autonomy in order to improve child nutrition. No study has yet examined caregiving practices as mediating pathways between women's empowerment and child growth status.

Methods

Data source and study sample

We used data from a cross-sectional baseline survey of an evaluation of ***Suaahara,*** a USAID-funded multi-sectoral intervention aiming to improve health and nutrition outcomes among mothers and children (<5y). This survey was conducted in 16 districts of Nepal throughout the three agro-ecological zones during the rainy season of 2012 (June-October). Anthropometric measurements (length/height and weight) were collected from mothers and their children (<5y) and two household interviews were conducted at each household. Trained enumerators (n=70) fluent in the local languages conducted two household interviews, one of the mother of the index child and one of her husband, or when unavailable, another major household decision-maker with preference given to a male decision-maker. The survey questionnaires used in these interviews were field tested, revised, translated, and back translated. The survey questionnaire administered to mothers included questions related to child health, care giving practices, infant and young child feeding practices, hygiene practices, household food security, maternal dietary diversity, maternal health, household access to information, and household access to water and sanitation facilities. The questionnaire administered to major household decision makers included questions regarding household composition, asset ownership, receipt of social assistance, and agricultural practices and use of land, as

well as spot check observations to further assess household construction, availability of toilets, and sanitation and hygiene practices. Both household interviews included a set of questions regarding empowerment in household agricultural activities.

Multi-stage cluster sampling was used to select 4,080 households across 240 wards, each household with at least one child less than five years of age. These districts (n=16) were purposively selected: Darchula, Bajhang, Baglung, Parbat, Syangja, Rupandehi, Nawalparasi and Sindhupaldhok because they were the phase 1 ***Suaahara*** intervention districts and Achham, Jumla, Gulmi, Arghakhochi, Kapilbastu, Tanahu, Chitwan, and Ramechhap as the comparison districts matched on the basis of their social, economic, and agro-ecological similarities with the intervention districts. Next, village development committees (VDCs) (n=5 per district) were randomly selected using probability proportional to size (PPS) techniques. Following the same methods, rural wards (n=3 per VDC) were selected randomly. Finally, following a census of all households in each ward with a child (<5y), households (n=17 per ward) were randomly chosen. In households with more than one child (<5y), the index child was selected at random.[21] For this study, we restricted our analysis to households with an index child between 6.0 and 23.9 months of age (6-24m) (n=1402), given that most growth faltering occurs during the first two years of life and that the complementary feeding pathway examined is intended only for children 6 months of age or older.[22,23]

The ethics committees of the International Food Policy Research Institute (IFPRI), the Nepal Health Research Council (NHRC), and the London School of Hygiene and Tropical Medicine (LSHTM) approved this study. All respondents gave their informed consent to survey participation.

Measures and Variables

Outcome – Linear growth

All mothers and each index child included in the survey had duplicate measurements of their weight and height/supine length taken using standardized calibrated digital weighing scales (Seca gmbh & Co. kg model 881 1021659; precision ±100 grams) and height/length boards (ShorrBoard produced by Weight and Measure LLC; precision ± 0.1 cm). Child age was noted from a birth certificate (n=621; 44.3% of children 6-24m) or when unavailable by maternal recall. Length-for age z-scores (LAZ), weight-for-age z-scores (WAZ), and weight-for-length z-scores (WLZ) for children (6-24m) were computed using the World Health Organization (WHO) growth reference standards. Children with values outside the biologically plausible range (LAZ <-6/>6, WLZ <-5/>5, or WAZ <-6/>5) were excluded from analysis as recommended by the WHO.[24,25] Log transformations were not necessary because all z-scores were normally distributed. Stunting, wasting, and underweight were defined as z-scores below -2 standard deviations (SD) from the mean of the reference population.[22,24–26]

Primary Exposure – Women's Empowerment in Agriculture

The series of survey questions regarding empowerment in agriculture were those necessary for construction of the aggregate Women's Empowerment in Agriculture Index (WEAI). The WEAI is comprised of two sub-indexes: the five domains of empowerment (5DE) index (90% of the WEAI) and the gender parity index (GPI) (10% of the WEAI).[27] Due to Nepal's high levels of male emigration, dual-adult households were not available in 39% of the surveyed households with a child (6-24m). Therefore, we could not construct the gender parity index without losing a substantial portion of our sample and in turn, used the 5DE for this study. The 5DE uses the mothers' answers to the set of empowerment in agriculture questions. For aggregation, the 5DE uses a nested weighting structure: each of the five domains is weighted equally and each indicator is weighted equally within its domain. An individual is considered empowered in each of the ten indicators if she meets a minimum threshold (Table 1).[28–30]

We constructed binary variables for the aggregate 5DE index and each of its ten component indicators, with each variable representing whether the mother met a pre-established cut-off to be deemed empowered in that dimension of women's empowerment in agriculture. In the causal mediation models we used the three 5DE component indicators of women's empowerment in agriculture which had a statistically significant association with child (6-24m) LAZ after adjusting for confounders: autonomy in household agricultural production, access to and decision-making regarding household credit, and satisfaction with leisure time availability.

Mediators –Dietary Diversity and Water, Sanitation, and Hygiene (WASH) Practices

This survey included a qualitative 24-hour dietary recall of foods consumed in the previous day. These foods were grouped into the following categories: grains, pulses, animal flesh, eggs, vitamin A rich fruits and vegetables, other fruits and vegetables, and dairy. Then, a seven food group (7FG) dietary diversity index was constructed as a continuous variable to represent child feeding practices. This is one of a set of eight indicators recommended by the World Health Organisation (WHO) to measure Infant and Young Child Feeding (IYCF) practices and previous studies have shown the 7FG to be a reliable indicator of diet quality and a predictor of child growth status in lower-income countries.[31–34,33]

To measure household water, sanitation, and hygiene (WASH) facilities and practices (or proxies for practices), we constructed ten yes/no binary variables to create an index which is a sum of these household WASH characteristics to create a continuous variable. Each practice was measured in the survey by spot check observations (1-7 below) or self-reporting (8-10 below): (1) improved water source at the house, (2) drinking water pot covered if water stored at household level; (3) household has a toilet that is clean; (4) house is free of both animal and human faeces; (5) water and either soap or ash available in the house; (6) living area free of garbage; (7) living area free of animals; (8) children (<5y) do not openly defecate; (9) proper disposal of child (<5y) stools; and (10) maternal recall of five key times of day for washing hands

(after defecation, after cleaning a child who defecated, before cooking/preparing food, before eating, and before feeding a child).

Confounders

Based on a literature review of similar studies, our knowledge of the local context, and study design, we controlled for district-level clustering and various child, maternal, and household factors likely to confound the associations between the three women's empowerment in agriculture related explanatory variables, the mediators, and the outcome of child (6-24m) LAZ.[37–49] Given that we tested various associations, the confounding variables identified for each model were similar but not identical. The following confounders were included in at least one model: child age, age squared, sex, breastfeeding status, and health status; maternal age, education, and height; and household wealth, agro-ecological zone of residency, number of children under five years of age, size, adult (>12y) alternate childcare provider, food security, production diversity, and sex of the household head.

Statistical Modelling

Statistical analyses were undertaken using Stata13.[50] Based on a conceptual framework created by Engle and colleagues (Figure 1) denoting the relationships between maternal care resources (i.e. control of resources, autonomy, social support, and mental health), childcare practices (i.e. feeding and WASH facilities and practices), and child nutritional status, we initially tested for a relationship between WEAI 5DE and any of its ten component indicators of women's empowerment in agriculture and child (6-24m) LAZ using adjusted ordinary least squares (OLS) multivariate regression models.

Next, we created a priori conceptual frameworks for the three dimensions of women's empowerment in agriculture that had significant associations with child LAZ to empirically test whether child feeding and/or household WASH facilities and practices mediate the associations in this setting (Figures 2, 3, and 4). We then used a linear structural equation model to formally test each of these two potential mediating paths. For the association between each of the three primary 5DE explanatory variables and LAZ, we controlled for child age, age squared, and sex; maternal age, education, and height; and household wealth, agro-ecological zone, and number of children under five years of age. To examine the causal pathways of the three primary explanatory variables and two mediators, as well as between the two mediators and child (6-24m) LAZ, we controlled for different child, maternal, and household characteristics among those listed above based on what would potentially confound each of the specific associations (Figures 2, 3, and 4).

Results

Participant characteristics

The mean LAZ and WAZ were -1.6 and mean WLZ was -1.0 (Table 1). More than one in three children were stunted and underweight and wasting affected nearly one in five children. More than one in three of the surveyed children had been ill with diarrhoea and/or fever in the last two weeks. Almost all children were being breastfed at the time of the survey but less than half had the minimally acceptable dietary diversity score of at least four food groups, and just over one-third of the children had a minimally acceptable diet. Barely one in five children had consumed foods rich in iron in the previous twenty-four hours. Almost one-third of mothers had no formal education or less than one year of schooling. Nearly all mothers were involved in household agricultural activities; more than four-fifths claimed agriculture was their primary or secondary occupation. Males head more than three-fifths of households and on average households had fewer than six members. Nearly two-thirds of the households had only one child less than 5 years of age. A little more than half of the households resided in the hills and more than half resided in the western development zone. Nearly three quarters of households were not experiencing food insecurity. However, diversity in food production was quite low with households on average producing foods from three out of seven food groups.

Among mothers, less than one in ten were categorized as empowered in agriculture, according to the 5DE (Table 2). Among the WEAI 5DE's ten component indicators, the highest levels of empowerment were found in: asset ownership (85%), satisfaction with available leisure time (82%), confidence speaking in public (80%), and input into production decisions (81%). The lowest levels of empowerment related to indicators of: group membership (21%), access to and decision-making on credit (30%), autonomy in production decisions (30%), and workloads greater than 10.5 hours per day (35%).

Women's empowerment in agriculture and child LAZ

Women's empowerment in agriculture overall, as measured by the WEAI 5DE, had a significant positive association with child (6-24m) LAZ (β=0.24; P<0.05) (Table 3). Among the 5DE's ten component indicators, only three dimensions of women's empowerment in agriculture had independent significant positive associations with child (6-24m) LAZ: satisfaction with the amount of time she has to engage in leisure activities (β=0.34; P<0.001); autonomy in household production decisions (β=0.19; P<0.05); and ability to access and make decisions about household credit (β=0.17; P<0.05).

Women's empowerment in agriculture, child LAZ, and two potential childcare mediators

Standardised structural equation models showed significant positive associations for three dimensions of women's empowerment in agriculture and child (6-24m) LAZ (Tables 4, 5, and 6; Figures 5, 6, and 7). Specific coefficients revealed different strengths of associations, but leisure time satisfaction (β=0.09; P<0.05), production autonomy (β=0.07; P<0.05), and access to and decision-making regarding household credit (β=0.07; P<0.05) all had a positive association with child LAZ.

The mediating variables representing the quality of a child's diet and the number of optimal household water, sanitation, and hygiene behaviours were both independently and positively associated with child LAZ. In all three of the estimated standardised regressions, the findings showed that a one standard deviation (SD) improvement in household WASH facilities and practices led to about a 0.20 SD increase in child LAZ ($P<0.001$). Similarly, a one SD increase in a child's dietary diversity score was associated with a 0.08 SD higher child LAZ ($P<0.05$).

Neither maternal autonomy in household production decisions nor her access to and decision-making regarding credit was significantly associated with either hypothesised childcare mediator (child dietary diversity or household WASH facilities and practices). However, maternal satisfaction with the amount of time available to engage in leisure activities influenced household WASH activities by 0.07 SD ($P<0.05$).

To formally assess mediation, we examined the indirect effects derived from a linear structural equation model. For both the production autonomy and credit models, there were no significant indirect associations between women's empowerment in agriculture, the two hypothesised mediators (child dietary diversity and household WASH facilities and practices), and child LAZ. However, maternal satisfaction with leisure time indirectly increased child LAZ by 0.05 SD ($P<0.05$).

Discussions and Conclusions

In this study, three dimensions of women's empowerment in agriculture – satisfaction with time available for leisure activities, autonomy in household production decisions, and access to and decision-making on credit – were associated with child (6-24m) LAZ. Therefore, we aimed to decompose the effect by empirically testing the potential role of child dietary diversity and household WASH facilities and practices as two hypothesised mediating pathways through which the three dimensions of women's empowerment in agriculture might relate to child LAZ. The results confirmed that, in addition to each of the three dimensions of women's empowerment in agriculture, both of the mediating variables (child dietary diversity and household WASH facilities and practices) are important predictors of child growth status. However, the two indirect pathways tested were not statistically significant. Thus, in this population, women's empowerment in agriculture does not influence child LAZ via improvements in child dietary diversity or household WASH facilities and practices.

Although the ways in which other South Asian child nutrition studies have looked at women's empowerment differ from our study in how women's empowerment is conceptualised and measured, our findings support the general direction of prior studies that there is an association between indicators of women's empowerment and child nutritional wellbeing in this region.[8] Thus far, no other study has looked at maternal satisfaction with leisure time and child nutritional status in South Asia. However, prior studies have assessed maternal decision-making autonomy. One study found maternal input into household decision-making to be positively associated with child HAZ in Nepal and India (only significant in India)[43];

our study supports these findings and adds information showing that agricultural decision-making autonomy is particularly relevant in rural Nepal. The extent to which a mother's household agricultural decisions are autonomously motivated (versus controlled) seems important for translating her participation in these activities into nutritional benefit for her young child. Several South Asian studies have looked at the association between financial autonomy or decision-making regarding household purchases and child nutritional status [41,48,51] and other studies have included financial autonomy as a factor in a broader decision-making index[37,38,43] and related it to child nutritional status; findings are mixed. Comparison of our findings to these is nearly impossible given that none of these studies have specifically assessed whether access to – and decision-making related to credit – are associated with child nutritional status.

The findings related to the importance of each of the mediators for child growth status support other studies and predominant nutritional science. One of the globally recommended optimal IYCF practices for children 6 to 24 months of age is feeding a diversity of complementary foods to help the child meet his/her daily nutrient requirements. Dietary diversity is often used as a measure of dietary quality, has been shown to accurately reflect micronutrient density in young children, and is associated with child nutritional status.[31,33,36,52,53] Prevailing evidence also points to proper water, sanitation, and hygiene practices as a means of preventing under nutrition because these practices can prevent gastro-intestinal infections and diarrhoea, enabling nutrient absorption. Other infectious diseases and asymptomatic infections also likely contribute to under nutrition, especially stunting.[54–57] In Nepal, both child feeding and water, sanitation, and hygiene facilities and practices are far less than optimal. Among children 6 to 24 months of age, less than one in three meet the minimum cut-off recommendation for dietary diversity.[6] As of 2010, only half of all households had improved latrines and less than one in five Nepalese regularly consumed treated water. The majority of Nepal's rural population still practices open defecation, increasing the risk of diarrhoeal disease, poor nutrient absorption, and stunting as well.[58,59] Our findings of the importance of child dietary diversity and household WASH facilities and practices for child nutritional status support investments to improve IYCF practices and WASH as part of the strategy to improve child nutrition in young children in rural Nepal.

Our lack of ability to confirm some of the pathways we had hypothesized as mediating the association between different dimensions of women's empowerment in agriculture and child LAZ and the lack of a single study to compare our findings with raises several questions and makes evident the need for additional studies. Further research is needed to validate these findings in diverse settings. Additional research is needed to investigate what alternate pathways may be mediating the relationship of women's empowerment in agriculture and child nutritional status, if not child feeding or household WASH facilities and practices. Intervention studies may be necessary to answer whether the pathways through which empowerment in agriculture may or may not influence child nutritional status would be the same or different for a broader conceptualisation of women's empowerment not limited to the domain of

agriculture. Finally, additional research may help elucidate which care resources are most important for enabling mothers to engage optimally in the care practices of child feeding and household WASH facilities and practices.

This is the first study to include analyses of the pathways through which women's empowerment in agriculture relates to child nutrition, contributing to a better understanding of the determinants of child under nutrition in this context. Insights on the underlying mechanisms for how empowerment does and does not translate into child nutritional benefit are important for providing guidance on how to design and implement policies and programs for the target population. Another unique strength of our study is the focus on one particular aspect of a woman's life – that of her productive activities in agriculture. Although understanding the importance of women's empowerment in the household overall including as a woman, producer, spouse, mother, consumer, and so on is also critically important, using a narrower definition of women's empowerment (e.g. in agriculture-related aspects) may provide more specific insights on the importance of empowering women in agriculture in order to achieve better nutritional outcomes for their children. This study also used the newest tool available for assessment of women's empowerment in agriculture by using the 5DE sub-index of the WEAI, which is the first survey-based tool explicitly designed to capture the multi-dimensionality of empowerment and assess empowerment in agriculture in developing countries.

However there are several limitations to this study. First, the 5DE variables used for the primary explanatory variables in the path analysis are binary variables with pre-set cut-offs determining if a woman is empowered in that dimension or not. These binary variables fail to capture more subtle variation across the population. There is also the potential for unaccounted confounders in our model, which unfortunately are not measured or measurable. However, given an extensive literature review of similar studies and our familiarity with the context, we feel confident that we included in our models most key potentially confounding factors at the child, maternal, and household levels. Also, most of the variables included in our models were based on self-reporting, with the exception of child LAZ which was measured directly, and some of the household practices included in the WASH index, which were based on spot-check observations. Self-reported practices may be subject to respondent memory inaccuracies or desirability bias (e.g. biasing response in favour of what is known to be optimal practice). Finally, the use of a cross-sectional dataset prevents us from assessing the direction of effects and seasonal variations, which are known to be important in Nepal for many of the variables used in our analyses (e.g. WASH facilities and practices, LAZ, and agricultural production).

This study seeks to understand a particular dynamic within the agriculture and nutrition nexus in the context of Nepal and among a specific population. Given local agricultural systems and practices and current rates of child under nutrition, moving beyond production analysis to examine household dynamics, such as empowerment, is critical.[60] Our findings suggest that and support the broader notion that poor

child nutrition is a complex phenomenon affected by multiple factors at various levels. Ultimately, for virtuous agriculture and nutrition or women's empowerment and nutrition cycles to reinforce each other in poor countries, such as Nepal, investments in agriculture, nutrition, childcare, and women's empowerment are necessary but a better understanding of how these investments intersect and can be leveraged for greater impact is needed.

In conclusion, our findings show that in this context maternal empowerment in three particular agricultural dimensions (satisfaction with time available for leisure activities, autonomy in household production decisions, and access to and decision-making on credit) are significantly associated with child (6-24m) nutritional status. Our findings also highlight two specific care practices (child dietary diversity and household WASH facilities and practices) as important predictors of child nutritional wellbeing. However neither of these care practices - child dietary diversity nor household WASH facilities and practices - mediate any of the associations between women's empowerment in agriculture and young child LAZ in rural Nepal. Our results suggest that, while these the hypothesised pathways may not exist in this context, improving both WASH facilities and practices and child feeding practices is critical, as seen by the association of these practices and young child LAZ. However, policies and programs should also independently focus on addressing women's disempowerment if child under nutrition is to be conquered.

References:

1. Black RE, Victora CG, Walker SP, Bhutta Z, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013 Jun;382(9890):427–51.

2. Bhutta Z a. Early nutrition and adult outcomes: pieces of the puzzle. Lancet. 2013 Mar 26;6736(13):10–1.

3. Hoddinott J, Behrman JR, Maluccio JA, Melgar P, Quisumbing AR, Ramirez-zea M, et al. Adult consequences of growth failure in early childhood. Am J Clin Nutr. 2013;98:1170–8.

4. Ministry of Health and Population, Nepal, New ERA and III. Nepal Demographic and Health Survey 2011. Kathmandu; 2012.

5. Population Division, Ministry of Health and Population G of N. Nepal Demographic And Health Survey 2006. Health (San Francisco). 2006 p. 1–437.

6. 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 Jan;8(Suppl 1):45–59.

7. Smith LC, Ramakrishnan U, Ndiaye A, Haddad L. The importance of women's status for child nutrition. Food Nutr Bull. 2003;24(3):287–8.

8. Cunningham K, Ruel M, Ferguson E, Uauy R. Women's empowerment and child nutritional status in South Asia: a synthesis of the literature. Forthcoming;

9. Paudel LM, ter Muelen U, Wollny C, Dahal H, Gauly M. Gender aspects in livestock farming: pertinent issues for sustainable livestock development in Nepal. Livest Res Rural Dev. 2009;21(40).

10. Miller BBA. The Gender and Social Dimensions to Livestock Keeping in South Asia: Implications for Animal Health Interventions. 2011 p. 1–48.

11. Gillespie S, Harris J, Kadiyala S. The Agriculture-Nutrition Disconnect in India What Do We Know? Washington D.C.; 2012. Report No.: 01187.

12. World Bank. From Agriculture to Nutrition: Pathways, Synergies, and Outcomes. World. Washington D.C.; 2007 p. 1–106.

13. Hoddinott J. Agriculture, Health, And Nutrition: Toward conceptualizing the linkages. 2020 Conference: Leveraging Agriculture for Improving Nutrition and Health. IFPRI; 2011.

14. Alkire S, Meinzen-Dick R, Peterman A, Quisumbing A, Seymour G, Vaz A. The Women's Empowerment in Agriculture Index. World Dev. 2013 Dec;52:71–91.

15. UNICEF. A UNICEF policy review strategy for improved nutrition of children and women in developing countries. 1990 p. 1–38.

16. Engle PL, Menon P, Haddad L. Care and Nutrition: Concepts and Measurement. World Dev. 1999 Aug;27(8):1309–37.

17. Cunningham K, Ferguson E, Ploubidis GB, Uauy R, Ruel M, Menon P, et al. Women's Empowerment in Agriculture and Child Nutritional Status: The Case of Rural Nepal. 2014;Forthcomin.

18. Malapit H, Kadiyala S, Quisumbing A, Cunningham K, Tyagi P. Women's empowerment in agriculture, production diversity and nutrition: Evidence from Nepal. J Dev Stud. 2014;Forthcomin.

19. Carlson GJ, Kordas K, Murray-Kolb LE. Associations between women's autonomy and child nutritional status: a review of the literature. Matern Child Nutr. 2014 Feb 13;

20. Helliwell J, Layard R, Sachs J. World Happiness Report 2013. 2013.

21. Cunningham K, Kadiyala S. Suaahara Baseline Survey Report. Washington D.C.: International Food Policy Research Institute; 2013. p. 1–135.

22. WHO Expert Committee on Physical Status. Physical status: the use and interpretation of anthropometry. Geneva: World Health Organization; 1995 p. 1–47.

23. Ruel MT. The Oriente study: program and policy impacts. J Nutr. 2010;140:415–8.

24. Mei Z, Grummer-strawn LM. Standard deviation of anthropometric Z-scores as a data quality assessment tool using the 2006 WHO growth standards: a cross country analysis. Bull World Health Organ. 2013;85(6):1–7.

25. WHO Multicentre Growth Reference Study Group. WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. Geneva; 2006 p. 1–336.

26. WHO Multicentre Growth Reference Study Group. WHO child growth standards based on length/height, weight and age. Acta Paediatr. 2006;Suppl 405:76–85.

27. International Food Policy Research Institute. Women's Empowerment in Agriculture Index. Washington, D.C.: International Bank for Reconstruction and Development, The World Bank; 2012. p. 1–12.

28. United States Agency for International Development, International Food Policy Research Institute, Development, Oxford Poverty and Human Development Initiative. Women's empowerment in agriculture index. Washington D.C.; 2012.

29. Sraboni E, Quisumbing A, Ahmed A. The women's empowerment in agriculture index for Bangladesh's feed the future zone of influence. Washington D.C.; 2012 p. 1–25.

30. Bhagowalia P, Menon P, Quisumbing AR, Soundararajan V. What dimensions of women's empowerment matter most for child nutrition? evidence using nationally representative data from Bangladesh. Washington D.C.: International Food Policy Research Institute; 2012.

31. Ruel M, Harris K, Cunningham K. Diet Quality in developing countries. In: Preedy VR, Hunter L-A, Patel VB, editors. Diet Quality: An Evidence-Based Approach, Volume 2. Springer; 2013. p. 239–61.

32. Marriott BP, White A, Hadden L, Davies JC, Wallingford JC. World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. Matern Child Nutr. 2012 Jul;8(3):354–70.

33. Jones AD, Ickes SB, Smith LE, Mbuya MNN, Chasekwa B, Heidkamp R a, 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. 2013 Aug 15;1–17.

34. Organization WH. Indicators for assessing infant and young child feeding practices - Part 2 Measurement. Geneva; 2010.

35. Kennedy G, Ballard T, Dop M. Guidelines for measuring household and individual dietary diversity. Organization. 2011.

36. Arimond M, Ruel MT. Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys. J Nutr. 2004;134(August):2579–85.

37. Begum S, Sen B. Maternal health, child well-being and chronic poverty: does women's agency matter? Bangladesh Dev Stud. 2009;32(4):69–93.

38. Bose S. The effect of women's status and community on the gender differential in children's nutrition in India. J Biosoc Sci. 2011 Sep;43(5):513–33.

39. 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;2:139–58.

40. Aslam M, Kingdon GG. Parental education and child health — understanding the pathways of impact in Pakistan. World Dev. Elsevier Ltd; 2012;40(10):2014–32.

41. Dancer D, Rammohan A. Maternal autonomy and child nutrition: evidence from rural Nepal. Indian Growth Dev Rev. 2009;2(1):18–38.

42. De Silva MJ, Harpham T. Maternal social capital and child nutritional status in four developing countries. Heal Place. 2007;13:341–55.

43. Desai S, Johnson K. Women's decision making and child health: familial and social hierarchies. In: Kishor S, editor. A Focus on Gender - Collected Papers on Gender Using DHS Data. Calverton: Macro; 2005. p. 15–33.

44. Mashal T, Takano T, Nakamura K, Kizuki M, Hemat S, Watanabe M, 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 Jan;8(301).

45. 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 Nov;10(11):1274–82.

46. 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):128–43.

47. 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. Elsevier Ltd; 2011 Aug;73(3):447–55.

48. 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 Jan;5(1):64–74.

49. Smith LC, Ramakrishnan U, Ndiaye A, Haddad L, Martorell R, Mayufis RG, et al. The importance of women's status for child nutrition in developing countries. Washington, D.C.: International Food Policy Research Institute; 2003. p. 1–178.

50. StataCorp. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.; 2013.

51. Shroff M, Griffiths P, Suchindran C, Nagalla B, Vazir S, Bentley M. Does rural autonomy influence feeding practices and infant growth in rural India? Soc Sci Med. 2011;73(3):447–55.

52. Ruel MT. Operationalizing Dietary Diversity: A Review of Measurement Issues. J Nutr. 2003;3911S–3926S.

53. Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for measurement of household food access: indicator guide version 2. Washington D.C.; 2006.

54. Black RE, Allen LH, Bhutta Z a, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2008 Jan 19;371(9608):243–60.

55. Dillingham R, Guerrant RL. Childhood stunting: measuring and stemming the staggering costs of inadequate water and sanitation. Lancet. 2004 Jan 10;363(9403):94–5.

56. Kau AL, Ahern PP, Griffin NW, Goodman AL, Gordon JI. Human nutrition, the gut microbiome and the immune system. Nature. 2011 Jun 16;474(7351):327–36.

57. Fewtrell L, Kaufmann RB, Kay D, Enanoria W, Haller L, Colford JM. Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis. Lancet Infect Dis. 2005 Jan;5(1):42–52.

58. Requejo J, Bryce J. Countdown to 2015: Decade Report 2000-2010 with country profiles. 2010.

59. USAID Feed the Future. Feed the Future Nepal FY 2010 Implementation Plan. Agriculture. 2010.

60. Fan S, Pandya-Lorch R. Reshaping Agriculture for Health. Reshaping Agriculture for Nutrition and Health. Washington, D.C.: IFPRI; 2012.

Table 1: Key child, maternal, and household characteristics

Variables	N	Mean (SD)/ %
Child characteristics		
Age (completed months)	1402	14.9 (5.2)
Sex: girls	1402	49.9%
Current breastfeeding status (=1 if breastfeeding)	1402	97.2%
Ill with diarrhoea or fever in last 2 weeks	1402	37.5%
IYCF Practices* (all 0-6m excluded from calculation)		
Early initiation of breastfeeding (0-23.9m)	1402	39.2%
Exclusive breastfeed (0-5.9m)	-	-
Continued breastfeeding at 1 year (12-14.9m)	258	99.6%
Introduction of solid/semisolid/soft foods (6-7.9m)	154	73.4%
Minimum diet diversity (>=4 food groups) (6-23.9m)	1402	45.6%
Minimum meal frequency (6-23.9m)	1402	72.2%
Minimum acceptable diet (6-23.9m)	1402	36.2%
Consumption of iron-rich foods (6-23.9m)	1402	19.5%
Immunization, Vitamin A, and Growth Monitoring		
BCG (Tuberculosis)	1402	95.1%
Polio (3 doses)	1402	89.9%
DPT-HepB-Hib (3 doses)	1402	89.1%
All 3 (BCG, Polio 3 doses, and DPT-HepB-Hib 3 doses)	1402	86.7%
Vitamin A in last distribution (6-23.9m)	1400	85.6%
Growth monitoring of weight	1402	85.2%
Maternal characteristics		
Height (cm) (range: 133.2-179.6)	1401	151.6 (5.5)
Age (completed years) (range: 15-52)	1402	25.1 (5.5)
Years of education completed (range 0-14)	1402	5.0 (4.2)
Level of formal schooling	1402	
Less than grade one		31.7%
Some primary		14.0%
Completed primary (grades 1-5)		7.8%
Some secondary		25.5%
Completed secondary (grades 6-10)		11.1%
Completed class 12 or higher education		9.9%
Agricultural as primary or secondary occupation (=1 if yes)	1402	80.9%
Involved in household agricultural activities (=1 if yes)	1402	93.9%
Household characteristics		
Wealth status (assets owned) (range: 0-63)	1402	18.0 (7.9)
HH head: male	1402	68.3%
Household size/ number of members (range: 2-25)	1402	5.7 (2.3)
More than one child under 5s in the household:	1402	34.6%
Alternate childcare: adult (>12y)	1402	83.3%
Production diversity index (range of 0-7 food groups)	1402	3.4 (1.5)
Religion: Hinduism	1402	91.2%
Caste	1402	
Upper caste groups		47.2%
Relatively advantaged Janajatis		6.1%
Religious minorities and disadvantaged non-dalit *terai* groups		4.2%
Disadvantaged Janajatis		23.1%
Dalit		19.4%
Altitude	1399	1101.0 (693.0)
Agro-ecological zone of residence	1402	

Mountains		25.1%
Hills		52.3%
Terai		22.6%
Geographic/development zone of residence	1402	
Eastern		0.0%
Central		19.3%
Western		55.6%
Mid-western		5.7%
Far western		19.5%
Food Access Insecurity (HFIAS Scores) (range 0-27)	1399	1.4 (3.0)
Food Access Insecurity (HFIAS Prevalence)	1400	
Secure		73.9%
Mild insecurity		14.9%
Moderate insecurity		9.1%
Severe insecurity		2.0%

Table 2: Descriptive of key explanatory and outcome variables

Variables	N	Mean (SD)/ %
Outcome: child nutritional status		
Length-for-age Z-score	1396	-1.63 (1.2)
Weight-for-age Z-score	1397	-1.57 (1.1)
Weight-for-length Z-score	1392	-0.98 (1.1)
Stunting prevalence	1396	37.8%
Underweight prevalence	1397	34.4%
Wasting prevalence	1392	16.3%
Primary explanatory: Women's empowerment in agriculture	1015	
Empowered in overall WEAI 5DE index		8.6%
Empowered in specific indicators		
Input into production decisions		81.4%
Autonomy in production		30.2%
Ownership of assets		84.9%
Right to purchase, sale, or transfer agricultural assets		57.2%
Access to and decisions on credit		30.1%
Control over use of income		59.7%
Group membership		20.7%
Speaking in public		80.4%
Workload (<10.5 hours in paid and unpaid labour)		35.1%
Leisure (satisfaction with time available)		82.1%
Mediators: childcare practices		
Feeding	1402	
Average dietary diversity (7 food group scale)		3.3 (1.2)
Zero food groups		2.0%
One food group		3.6%
Two food groups		17.3%
Three food groups		31.5%
Four food groups		30.0%
Five food groups		13.1%
Six food groups		2.2%
Seven food groups		0.3%
Water, sanitation and hygiene practices (scale of 1-10)		
Average score on 10 point scale	1381	5.2 (2.4)
Improved source of drinking water	1402	88.5%
Drinking water pot covered (spot check observation)	1391	48.6%
Improved clean toilet at dwelling (spot check observation)	1402	27.3%
HH is open defecation free for children (<5y)	1402	49.6%
Appropriate disposal of child (<5y) stools	1401	52.5%
Dwelling free of animal and human faeces (spot check observation)	1402	44.4%
Water and soap/ash available at dwelling hand washing area (spot check observation)	1397	45.9%
Maternal recall of all 5 critical times for hand washing	1402	18.9%
Dwelling free of garbage (spot check observation)	1398	67.9%
No animals inside dwelling (spot check observation)	1400	71.5%

Table 3 Associations between WEAI 5DE (Five Domains of Empowerment) and LAZ among children 6-24 months of age

Length-for-age Z-scores (N=1013)	Coef	P Value	CI	CI	R2
5DE (Five Domains of Empowerment)	0.24*	0.026	0.032	0.444	0.242
Production					
Input into productive decisions	0.01	0.921	-0.233	0.256	0.239
Autonomy in production	0.19*	0.023	0.030	0.349	0.244
Resources					
Ownership of assets	0.00	0.984	-0.382	0.389	0.239
Purchase, sale, or transfer of assets	-0.72	0.350	-0.231	0.087	0.240
Access to and decisions about credit	0.17*	0.029	0.195	0.311	0.243
Income					
Control over use of income	0.12	0.212	-0.074	0.308	0.241
Leadership					
Group membership	0.03	0.813	-0.222	0.279	0.239
Confidence speaking in public	0.05	0.604	-0.161	0.268	0.239
Time					
Workload (>10.5 hours per day)	0.07	0.388	-0.244	1.005	0.240
Leisure time satisfaction	0.34**	0.001	0.156	0.515	0.250

Note: * p < 0.05, **p < 0.001
Note: All models are adjusted and control for district-level clustering; Adjusted models also control for child sex and age; maternal age, height, and education; and household wealth status, number of children under five, and agro-ecological zone of residence.
Note: Comparison groups are: boys for sex, no education for formal education, mountains for agro-ecological zone of residence, poorest for wealth status, and one for number of children under 5 years.

Table 4: Path analysis: standardised associations between maternal satisfaction with leisure time availability and child (6-24m) LAZ

	Outcome: LAZ N=994		Mediator: Dietary Diversity N=994		Mediator: WASH N=994	
	Coef	P Value	Coef	P Value	Coef	P Value
Satisfaction with leisure time	0.089*	0.002	0.038	0.188	0.072*	0.006
Dietary diversity	0.081*	0.011				
WASH	0.201**	0.000				
Child age	-0.439*	0.016	0.323**	0.000	-0.013	0.632
Child age squared	0.136	0.451				
Child sex	0.083*	0.002	0.044	0.128	0.033	0.213
Child breastfeeding status	0.016	0.568				
Child health status	0.018	0.516				
Maternal height	0.225**	0.000				
Maternal age	0.000	0.992	0.006	0.845	0.100**	0.000
Maternal education	0.070*	0.038	0.181**	0.000	0.400**	0.000
Household wealth	0.022	0.439	0.068*	0.041	0.121**	0.000
Household number of under 5s	-0.005	0.868	-0.066*	0.036	-0.038	0.186
Household altitude	-0.128**	0.000	0.058	0.053	-0.221	0.000
Household food security	-0.014	0.615	-0.035	0.239		
Household head			-0.006	0.833	-0.055	0.044
Household alternative adult childcare			0.036	0.247	0.075*	0.009
Household number of total members			-0.044	0.198	-0.128	0.000

Note: * p ≤ 0.05, **p ≤ 0.001
Note: All models are adjusted and control for district level clustering

Table 5: Path analysis: standardised associations between maternal autonomy in household production and child (6-24m) LAZ

	Outcome: LAZ N=994		Mediator: Dietary Diversity N=994		Mediator: WASH N=994	
	Coef	P Value	Coef	P Value	Coef	P Value
Autonomy in production	0.065*	0.018	0.035	0.240	0.024	0.360
Dietary diversity	0.082*	0.007				
WASH	0.207**	0.000				
Child age	-0.447	0.014	0.316**	0.000	-0.015	0.582
Child age squared	0.137	0.448				
Child sex	0.075*	0.006	0.040	0.165	0.027	0.300
Child breastfeeding status	0.008	0.763	-0.015	0.610		
Child health status	0.017	0.538	-0.049	0.092		
Materal height	0.225**	0.000				
Maternal age	0.002	0.934	0.006	0.840	0.101**	0.000
Maternal education	0.064	0.059	0.179**	0.000	0.402**	0.000
Household wealth	0.020	0.467	0.056	0.099	0.119**	0.000
Household number of under 5s	-0.004	0.881	-0.068	0.032	-0.040	0.170
Household altitude	-0.138	0.000	0.047	0.124	-0.228**	0.000
Household food security	-0.015	0.580	-0.032	0.279		
Household head			-0.008	0.793	-0.052	0.056
Household production diversity			0.043	0.165		
Household alternative adult childcare			0.038	0.232	0.073*	0.010
Household number of total members			-0.046	0.181	-0.124**	0.000

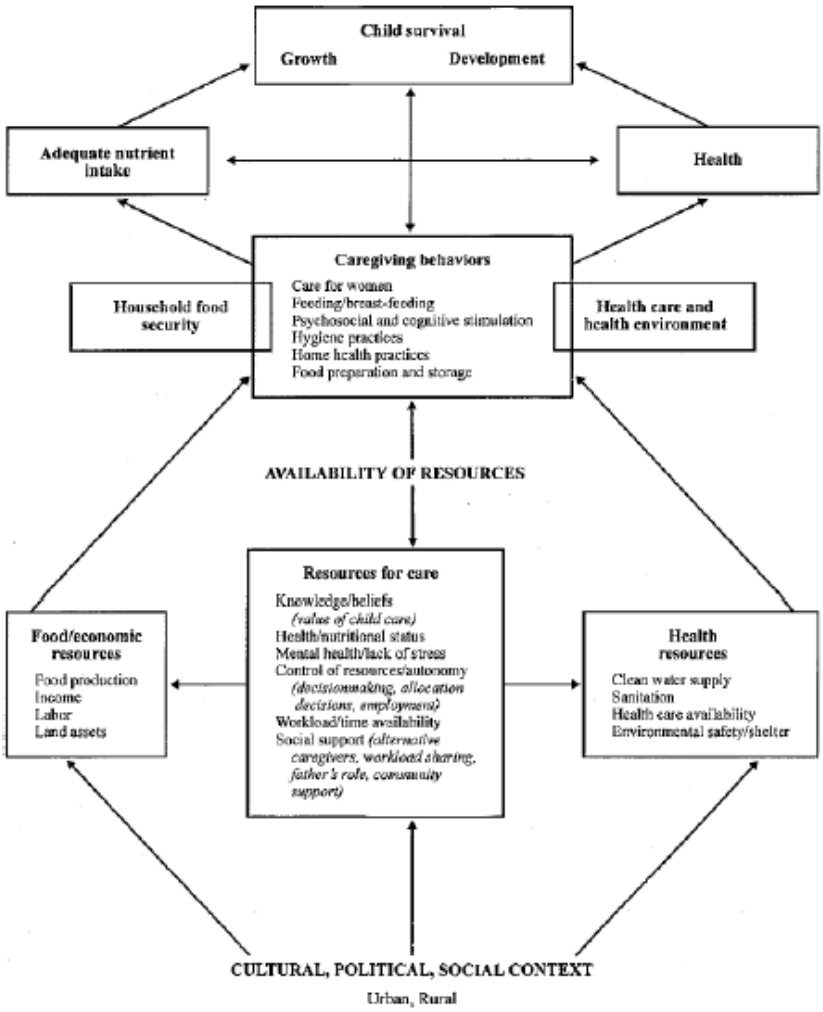
Note: * $p \leq 0.05$, ** $p \leq 0.001$
Note: All models are adjusted and control for district level clustering

Table 6: Path analysis of standardised parameters: associations between maternal access to and decision-making regarding household credit and child (6-24m) LAZ

	Outcome: LAZ N=994		Mediator: Dietary Diversity N=994		Mediator: WASH N=994	
	Coef	P Value	Coef	P Value	Coef	P Value
Credit: access and decision-making	0.070*	0.011	0.005	0.858	0.011	0.686
Dietary diversity	0.083*	0.006				
WASH	0.207**	0.000				
Child age	-0.443	0.015	0.321**	0.000	-0.016	0.549
Child age squared	0.136	0.451				
Child sex	0.078*	0.004	0.040	0.169	0.027	0.307
Child breastfeeding status	0.010	0.708				
Child health status	0.014	0.597				
Materal height	0.226**	0.000				
Maternal age	-0.008	0.794	0.007	0.820	0.102**	0.000
Maternal education	0.070*	0.038	0.205**	0.000	0.438**	0.000
Household wealth	0.031	0.272				
Household number of under 5s	-0.006	0.821	-0.076	0.016	-0.055	0.057
Household altitude	-0.132	0.000	0.061*	0.040	-0.210	0.000
Household food security	-0.013	0.628				
Household head			-0.010	0.744	-0.063	0.022
Household alternative adult childcare			0.047	0.137	0.090*	0.002
Household number of total members			-0.016	0.618	-0.076	0.010

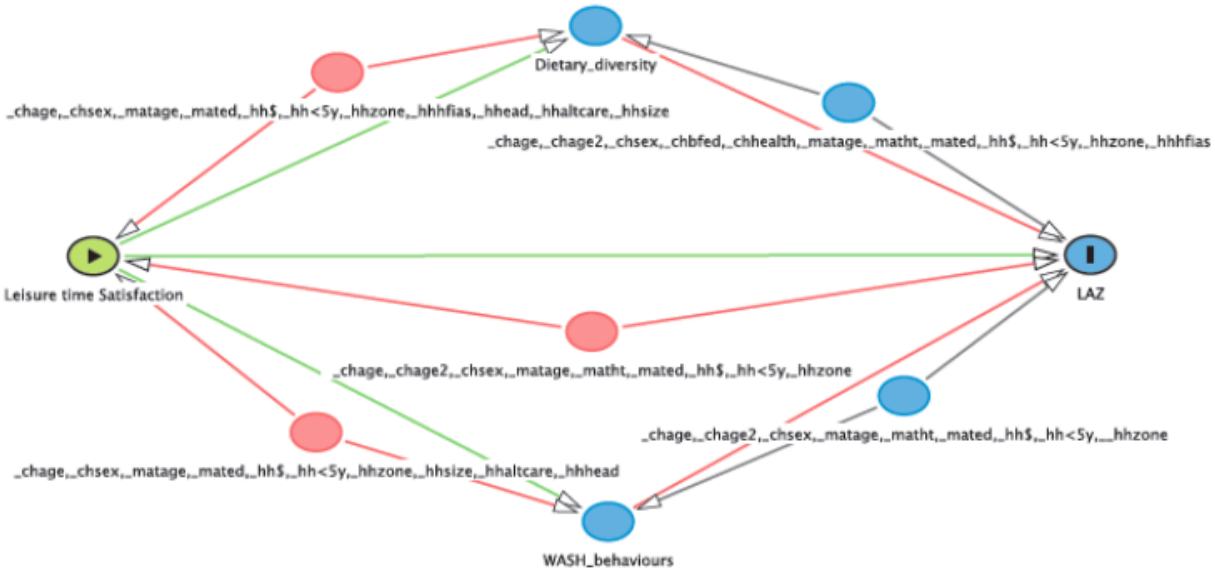
Note: * $p \leq 0.05$, ** $p \leq 0.001$
Note: All models are adjusted and control for district level clustering

Figure 1: Determinants of child nutritional status



Source: Engle, P., Menon, P., & Haddad, L. (1997). Care and Nutrition: Concepts and Measurement. Figure, 2. IFPRI Occasional Paper 33. International Food Policy Research Institute. Washington, D.C. Reproduced with permission from the International Food Policy Research Institute (www.ifpri.org/sites/default/files/publications/oc33.pdf).

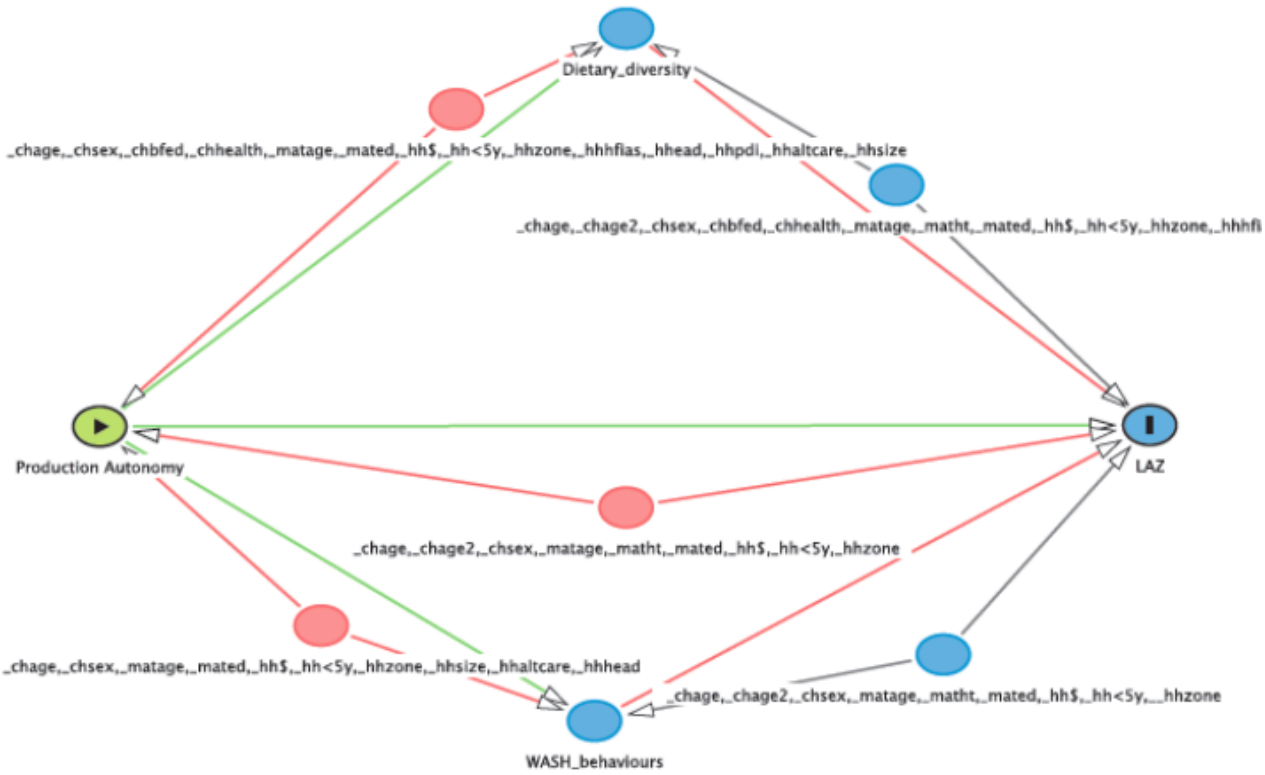
Figure 2: Maternal leisure time satisfaction and child LAZ – care practices mediation model



Legend:

chage	age of the child in months
chage2	age of the child in months squared
chsex	sex of the child
chbfed	breastfeeding status
chhealth	health status diarrhea or fever in last two weeks
matage	age of the mother in years
mated	formal education level of mother
matht	height of the mother in centimeters
hh$	wealth status of the household by assets owned
hh<5y	number of children under 5 years in the household
hhzone	agro-ecological zone of residency; altitude
hhaltcare	whether alternate childcare provider in the household is an adult
hhhfias	food security based on the Household Food Insecurity Access Scale
hhsize	total number of household members
hhhead	whether head of household is male or female

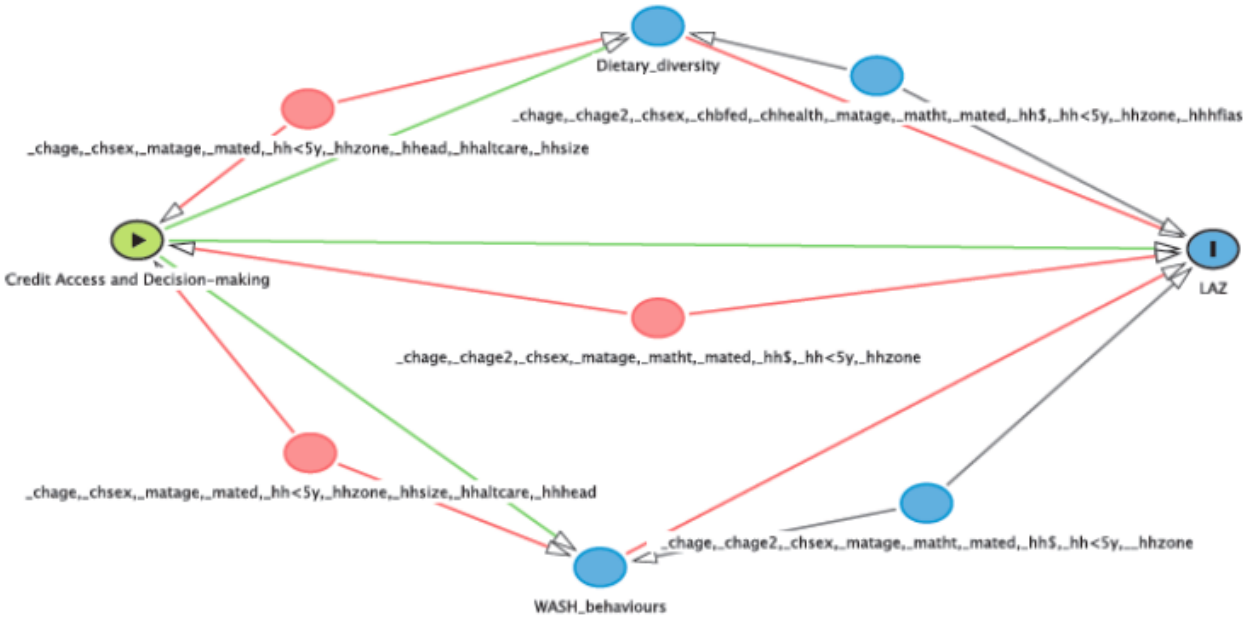
Figure 3: Maternal production autonomy and child LAZ – care practices mediation model



Legend:

chage	age of the child in months
chage2	age of the child in months squared
chsex	sex of the child
chbfed	breastfeeding status
chhealth	health status diarrhea or fever in last two weeks
matage	age of the mother in years
mated	formal education level of mother
matht	height of the mother in centimeters
hh$	wealth status of the household by assets owned
hh<5y	number of children under 5 years in the household
hhzone	agro-ecological zone of residency; altitude
hhaltcare	whether alternate childcare provider in the household is an adult
hhhfias	food security based on the Household Food Insecurity Access Scale
hhsize	total number of household members
hhhead	whether head of household is male or female
hhpdi	production diversity index based on household production of foods in 7 food groups

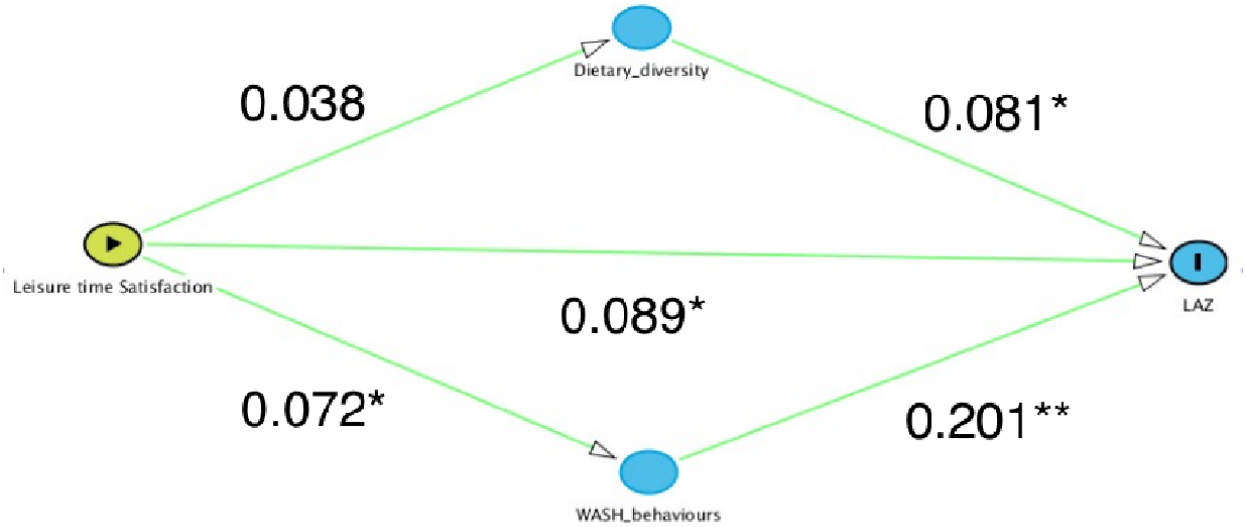
Figure 4: Maternal access to and decision-making on credit and child LAZ – care practices mediation model



Legend:

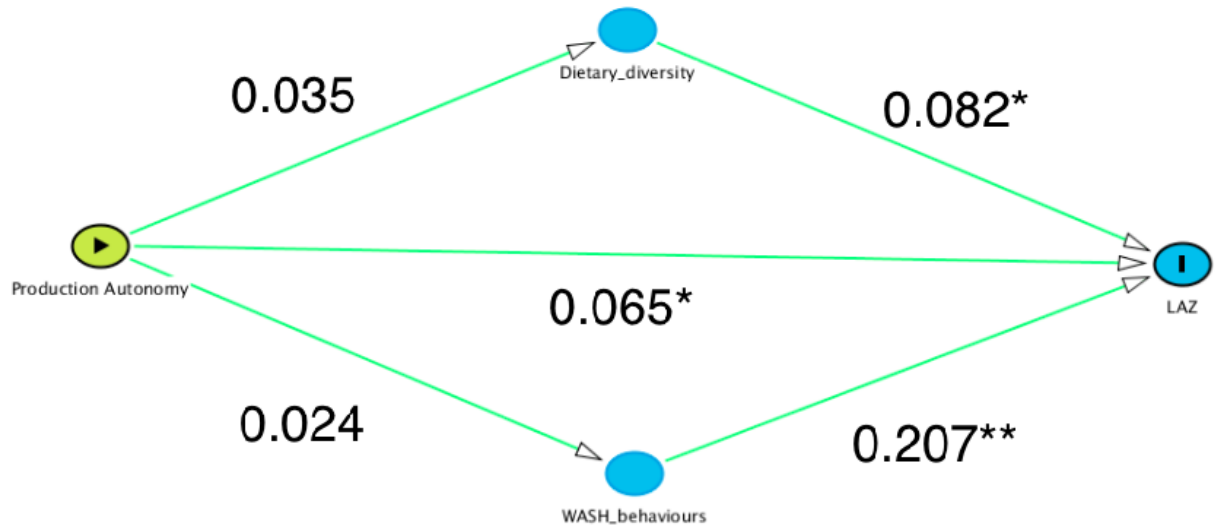
chage	age of the child in months
chage2	age of the child in months squared
chsex	sex of the child
chbfed	breastfeeding status
chhealth	health status diarrhea or fever in last two weeks
matage	age of the mother in years
mated	formal education level of mother
matht	height of the mother in centimeters
hh$	wealth status of the household by assets owned
hh<5y	number of children under 5 years in the household
hhzone	agro-ecological zone of residency; altitude
hhaltcare	whether alternate childcare provider in the household is an adult
hhhfias	food security based on the Household Food Insecurity Access Scale
hhsize	total number of household members
hhhead	whether head of household is male or female

Figure 5: Path analysis: standardised associations between maternal satisfaction with leisure time availability and child (6-24m) LAZ



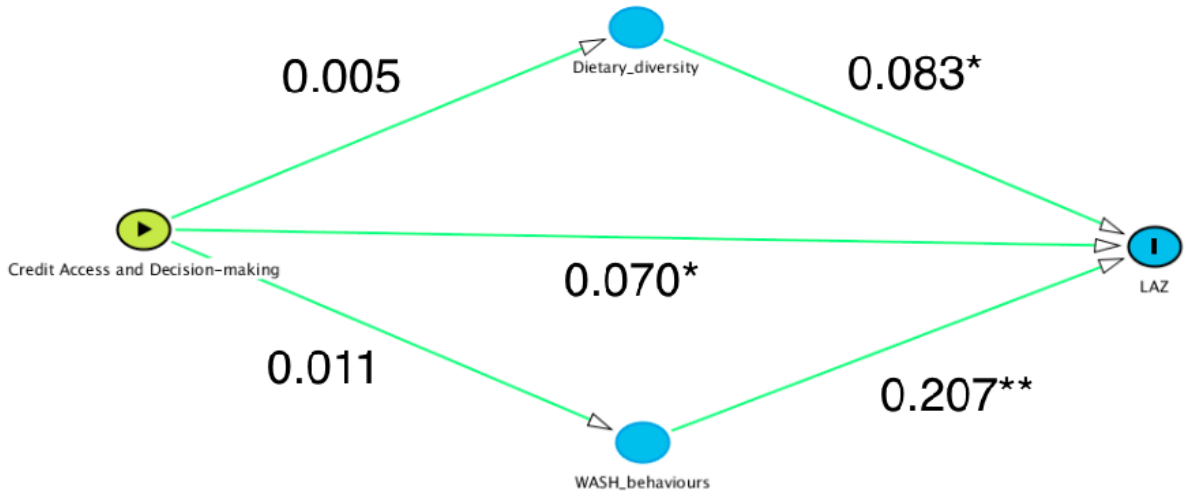
Note: * p ≤ 0.05, **p ≤ 0.001

Figure 6: Path analysis: standardised associations between maternal autonomy in household production and child (6-24m) LAZ



Note: * p ≤ 0.05, **p ≤ 0.001

Figure 7: Path analysis of standardised parameters: associations between maternal access to and decision-making regarding household credit and child (6-24m) LAZ



Note: * p ≤ 0.05, **p ≤ 0.001

Chapter 6: Discussion and Conclusions

South Asia has been burdened by documented poverty and high child mortality rates, for at least the past four decades. Despite substantial reductions in child mortality, today 1 in every 10 children in South Asia dies before the age of five. This region also accounts for about one-third of deaths globally for this age range.[2,3,29] Specifically, Nepal is ranked 157 out of 186 countries in the 2013 Human Development Index, which assesses living standards, education, and health (measured as life expectancy at birth).[30] The slow human development and high child mortality rates are not surprising in Nepal given the extent of poverty, a recently ended civil war, limited arable land, seasonal low agricultural yields, natural disasters, poor infrastructure, population growth, rapid urbanization, and limited social services. Furthermore, many Nepalese children under five who do survive will be faced with food insecurity, poor child feeding practices, and a host of social, structural, and contextual factors which result in undernutrition.[20,31–33]

Emerging evidence indicates that while agricultural production and diets are important to health and nutritional status, child growth and nutritional wellbeing are not exclusively about diets and micronutrients.[34] Rather, other phenomenon including poor water, sanitation, and hygiene facilities and practices, contributes substantially to persistent levels of poor child growth. The framework by Engle and colleagues hypothesised that caregiver resources (autonomy and control; workload and time availability; and social support) influence childcare practices (e.g. health seeking behaviours, child feeding, and hygiene practice), and that these childcare practices in turn influence child nutritional status. However, evidence to support these theorised pathways is scarce with no studies yet assessing the entire pathway of how a caregiver resource influence a caregiving practice and in turn, child nutritional status in South Asia. Specifically, a couple of published studies have looked at the relationship between a caregiver resource and the childcare practice of feeding in a South Asian setting[31,35,39] and a few others have assessed how child feeding and child nutritional status relate in South Asia.[36–38]

In South Asia, evidence is emerging that women's empowerment, a construct which often incorporates many of the same concepts included in the care framework, may be an under investigated but important determinant of child nutritional wellbeing. However, to date, published empirical studies on the association of women's empowerment and child nutritional status in South Asia are also limited and with mixed results. Furthermore no existing studies assess women's empowerment as a multi-dimensional phenomenon or focuses on women's empowerment in agriculture.

Therefore, this thesis aims to increase understanding of the relationship between women's empowerment and child growth in South Asia with a particular focus on agriculture and the care-related pathways through

which women's empowerment may be influencing child nutritional status in Nepal. The ultimate hope is to generate evidence that fills existing gaps to enable policymakers, researchers, and program implementers to make more informed intervention decisions related to the crises of persistent child undernutrition.

In this final chapter, I briefly synthesise the findings and relate them to the primary objectives of the thesis; highlight some overall strengths and weaknesses; discuss the implications, including policy and programmatic recommendations for addressing child undernutrition in Nepal; and finally, suggest direction for future research.

Synthesis of study findings by study objective

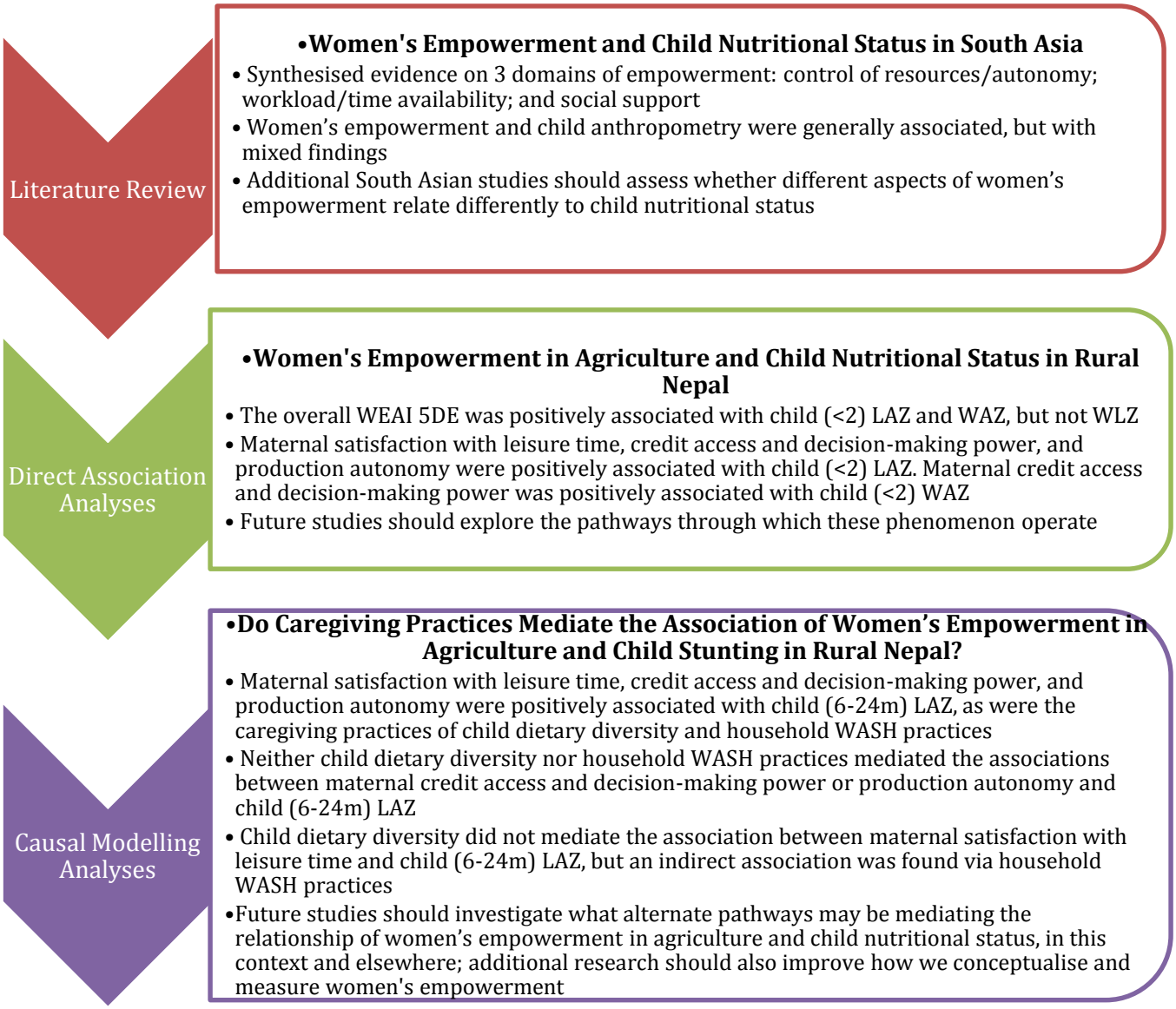
The main findings of this thesis are summarised in Figure 1 below. The first objective was to synthesise the evidence linking women's empowerment and child (<5y) nutritional status in South Asia and uncover gaps in the evidence base. The review of prior published studies on the topic of women's empowerment and child nutritional status showed that women's empowerment is generally associated with child growth status, but the findings were mixed. This review also noted that the assciations found have differed based on domain of women's empowerment and indicator of child nutritional status. Based on the current evidence, future research needs were noted including: additional South Asian studies outside of India, a harmonisation of definitions and measurements of women's empowerment, studies assessing empowerment as a multidimensional concept, research into the pathways through which women's empowerment may be influencing child nutrition, and intervention studies to establish which policies and programmes empower women and in turn, result in improvements in child nutritional status (Chapter 2).

The second and third objectives were to investigate whether women's empowerment in agriculture is associated with young child (<2y) nutritional status in rural Nepal and whether this association differs by dimension of women's empowerment in agriculture or child nutritional status indicator. Using empirical data, this investigation revealed that women's empowerment in agriculture, as measured by the WEAI's 5DE, was positively and significantly associated with both LAZ (β=0.22, P=0.021) and WAZ (β=0.19, P=0.045), but not WLZ. Furthermore, three of the ten WEAI 5DE component indicators were positively associated with LAZ: satisfaction with leisure time (β=0.28, P=0.003), access to and decisions regarding credit (β=0.17, P=0.031), and autonomy in production (β=0.11, P=0.046). The credit indicator (β=0.16, P=0.021) was also positively associated with WAZ. No indicator was associated with WLZ. These results showed that particular dimensions of women's empowerment in agriculture were more important for child nutritional status than other dimensions, in this context. These findings provided evidence to support further trials and intervention studies to confirm the potential role of women's empowerment as a means

of improving child nutrition in Nepal. What remains unknown are the pathways through which these associations occur; this information would facilitate more appropriate policy and programmatic interventions and in turn, ensure accurate targeting of resources for addressing child undernutrition (Chapter 4).

Therefore, the fourth and final objective of this study was to explore whether the dimensions of women's empowerment in agriculture associated with young child (<2y) LAZ in rural Nepal are mediated by the care practices of child feeding and household water, sanitation, and hygiene (WASH) facilities and practices for children 6 to 24 months of age. We first used regression analysis for the narrower age range of 6 to 24 months of age and found similar results of positive associations with LAZ for the full WEAI 5DE (β=0.24, P=0.026) and three of the ten component indicators: satisfaction with leisure time (β=034, P=0.001), access to and decisions regarding credit (β=0.17, P=0.029), and autonomy in production (β=0.19, P=0.023). We then formally tested child dietary diversity and household WASH facilities and practices as two hypothesised pathways for how each of the three dimensions of women's empowerment in agriculture relates to child (6-24m) LAZ. The results confirmed both mediating variables as important predictors of LAZ: child dietary diversity (β=0.08; P=0.05) and household WASH facilities and practices (β=0.20; P=0.001). However, the results also showed that there is no indirect path for any of the three dimensions of women's empowerment in agriculture and child LAZ via dietary diversity. WASH facilties and practices, however, were an indirect pathway but only for the association of maternal satisfaction with leisure time and child LAZ and not for the association between the other dimensions of women's empowerment in agriculture and child LAZ. This indicates that child dietary diversity and household WASH facilities and practices may not be the key pathways through which women's empowerment in agriculture influences young child LAZ, in this population. Therefore, policies and programs aiming to address child undernutrition in Nepal should continue to prioritise diversification of diets and optimal WASH practices. However, attention should also be given to addressing women's disempowerment or child undernutrition will not be fully addressed (Chapter 5).

Figure 1: Summary of main thesis findings



Study strengths and weaknesses

In this section, the main strengths and limitations of the thesis will be noted. Additional strengths and limitations specific to particular parts of the thesis have been noted within each chapter already.

Overall strengths

Strengths include that the dataset is quite large (N=4,080 households) and therefore, even analyses of a sub-set still involves a large enough sample to generate robust results. Data collection, including anthropometric measurements, followed standard approaches. We ensured that the same questionnaires were administered by similarly trained interviewers so that the same processes were followed in all survey districts.[40] Furthermore, several quality assurance measures were taken throughout data collection, data management, and data analyses processes. Another strength of this dataset is that, although it is not nationally representative, it covers all three agro-ecological zones of Nepal.

Despite the limitations identified below, this observational study provides additional insights into determinants of child undernutrition in South Asia. Given that the Asian Enigma has resulted in a search for the key non-economic drivers of such persistent and staggering rates of child undernutrition, these types of analyses contribute to our understanding of the potential for social, structural, and cultural determinants to explain this puzzling situation. The literature review and studies done in this thesis add to the very scarce published literature on women's empowerment and child nutritional status in South Asia. Only two prior published studies have assessed the relationship between any aspect of women's empowerment and child nutritional status in Nepal. Furthermore the studies in this thesis are the first to focus on women's empowerment in the domain of agriculture and its association with child nutritional status in South Asia, as well as being the first nutrition study to go beyond direct associations between exposure and outcome and empirically test hypothesised care-related pathways through which women's empowerment may be influencing child nutritional status.

Overall limitations

One limitation to the research done in this thesis is the use of a cross-sectional dataset, which limits us to associational analysis and prevents claims of causality. Another limitation is that the study locations were purposefully selected because of a particular planned intervention and therefore the study was not randomised at the district level and is also not nationally representative. Furthermore, this cross-sectional survey is only a one shot picture and only reflects what was happening in the rainy season. Seasonality of course plays a role in what is produced and consumed, but given resource constraints, carrying out more than one cross-sectional survey was not feasible.

Another limitation may be response bias as some respondents already knew at the time of the interview whether they would receive the intervention or not. This only affected some surveyed households and

there was no specific trend as to the households who knew. Therefore, it is unlikely that this situation influenced the results. Additionally, during data collection, all dates were recorded based on the Nepali calendar and conversion to a Western calendar date was done during analyses. Although date conversion cannot be precise given the Nepali calendar year begins at a different time than the Western calendar, has an unequal number of days across months, and so on, this rough conversion only changed an individual's age by a day or two. Thus, we do not expect that this influenced our findings.

The exclusive focus in this thesis on linear growth may be another limitation because this uni-dimensional perspective ignores other dimensions of a broader definition of growth such as motor skill development, linguistic advancements, and cognitive abilities. Given resource constraints and that the survey was already lengthy to cover many intervention-related topics, these data were not collected. However, given the newness examining the relationship between women's empowerment and child nutritional status, starting with linear growth was an important first step.

Diet

Given our interest in assessing dietary diversity, we collected one 24-hour recall for each mother and child, based on the standard WHO guidelines. A limitation is that we only collected qualitative dietary data and therefore, we have no information regarding quantities consumed or the micronutrient composition of foods, for example. Findings from previous studies have been mixed regarding whether dietary diversity is associated with child growth. However, updated research indicates that in developing countries, when socio-economic and other relevant household factors are controlled for, dietary diversity is a strong predictor of dietary quality, including micronutrient adequacy of maternal and child diets. Specifically, the WHO now recommends creation of a dietary diversity score using seven food groups for children 6 to 24 months of age.[25,41,42]

Water, sanitation, and hygiene

Collection and analysis of data related to water, sanitation, and hygiene is known to be challenging due to reporting biases and day to day variability in individual and household practices, for example. Therefore, spot-check observations conducted for this study, can complement the data obtained during interviews. Although repeated observations would be ideal to account for day to day variability, given that spot check observations require much less time and are relatively unobtrusive, they are considered valid and practical for assessments of personal hygiene. Finally, because of how quickly and unobtrusively they are conducted,

spot-check observations also avoid the typical concerns regarding observed behaviour being dissimilar to behaviour when one is not being observed.[10]

Women's Empowerment

Although we have used a large survey dataset in this thesis, we focused our attention on particular data points that would facilitate an analysis aiming to understand women's empowerment as a contributor to child nutritional status. Specifically, for this thesis, the Women's Empowerment in Agriculture Index (WEAI), the only survey based tool to capture women's empowerment in its multiple dimensions was a major focus. The WEAI enables us to more deeply understand women's empowerment in agriculture and capture data on an extremely complex topic in a relatively efficient manner and in a way that allows comparability across sites. The WEAI is ground in a combination of theory, expert opinion, programmatic realities, and prior research findings including of a pilot study also done in South Asia; these factors help provide some confidence in the instrument as well.

Although the WEAI is a step in the right direction for capturing empowerment as a multi-dimensional concept, this instrument has its limitations and may not capture the complexity of reality. To construct the full WEAI dual-adult households are needed in order to look at gender parity, but in Nepal, this may not represent an average rural household given the extremely high rates of male emigration. To address this concern and prevent losing more than one-third of the sample size because a man was not present in the household, we used only the maternal 5DE, which exclusively uses the empowerment data collected from mothers. Another drawback to the WEAI is that it relies on more than 200 survey question, which could result in respondent fatigue and influence the quality of data. Data for all parts of the index must be available for inclusion of an individual in the WEAI calculations and therefore, in practice, the sample size does drop quite substantially during analysis. Although this loss of sample is problematic, multiple imputation techniques are ill advised because empowerment is such a unique and complex phenomenon and thus, the proxies that underlie empowerment remain difficult to identify. Women in Nepal, and particularly mothers, and children face multiple constraints related to household agricultural production, but also in other aspects of life. Resource generating activities, including food production, are only one aspect of life. Mothers are also spouses, breast feeders or providers of complimentary foods, daughters, and individuals with unique hopes and dreams. The question is whether the factors that are included in the WEAI truly are the factors that determine women's empowerment in rural Nepal. Given that rural Nepal is a highly agrarian society and economy, we are confident that a woman's empowerment in agriculture is important even if not at the exclusion of her empowerment in other domains. To truly verify which aspects

of empowerment are the most pertinent in a given context, additional qualitative work, which was outside the scope of this study, would be necessary. In sum, although imperfect, the WEAI overcomes several disadvantages of traditional means of measuring empowerment and is a step in the right direction if we hope to unravel the role of gender in the agriculture-nutrition nexus.

Implications for addressing undernutrition in Nepal

In South Asia, nutrition is now at the top of governmental and non-governmental agendas alike with large investments into scaling up of policies and programs being made. Thus, a deeper understanding of the relationship between social, structural, and cultural factors and child nutritional wellbeing can help policymakers, program designers and implementers, and women themselves to make evidence-based decisions regarding the prioritisation of resources.

Child undernutrition is no doubt caused by a multitude of factors requiring investment across sectors and not exclusively from the health sector. The focus on the potential role of women's empowerment as a key determinant of child nutrition is relatively new and thus, new evidence is emerging and methods are evolving. Therefore, while four specific recommendations will be made below on implications of this study for child nutrition policies and programs in Nepal, flexibility and adaptability will be necessary, as it is not yet a field in which clear recommendations can be made with certainty. Similarly, the suggestions made below are particularly pertinent to rural areas and may or may not apply to urban households, particularly those of upper socio-economic status and/or not engaged in agricultural labour. However, recent evidence does indicate that the determinants of nutritional status in rural and urban Nepal are more similar than initially envisioned.[43]

1. Standard nutrition interventions, including promotion of diverse diets, should remain as priorities in Nepal. While this study points out social influences on child nutritional wellbeing, child dietary diversity, and household WASH practices were significantly associated with child LAZ. Therefore, investments in ensuring that the complementary foods given to young children are diverse as well as investments to build WASH related infrastructure and promote optimal WASH behaviours must be prioritised if reductions in undernutrition are to be achieved. Without access to toilets, proper feeding, or good hand washing, women's empowerment will not be able to fully address persistent child undernutrition.

2. Social inclusion and overall investments to promote gender equality are needed. Regardless of the relationship between women's empowerment and child nutritional status, maternal variables that

note prior investments in her as a girl or young woman, such as level of education or adequate nutrition to promote optimal growth in height, are consistently seen as key determinants of child nutritional status across studies in South Asia.

3. Women's empowerment merits greater attention in South Asia both as a worthy goal in itself and also because of the general association of women's disempowerment and poor child nutritional status. The poor status of women may indeed be at least a partial explanation for the Asian Enigma of economic growth not resulting in the expected levels of improvements in young child nutritional wellbeing. These findings for children under two years of age may be because younger children rely heavily on their mothers for childcare including feeding and health seeking. Given this, the Government of Nepal could perhaps capitalise on political and financial opportunities surrounding the various campaigns related to the first 1,000 days of life and emphasise women's empowerment and other social, structural, and cultural determinants of child nutrition outcomes.

4. While empowerment of women is an important goal in its own right, it may also result in better-nourished children. However, if the aim is to reduce child undernutrition, one must note that the relationship between women's empowerment and child nutritional status is complex and may differ by indicator of empowerment, indicator of child nutrition, child age, location and context, and a host of other child, maternal, and household characteristics. Therefore, empowerment-related interventions will need to be quite specific and start with domains and dimensions of women's empowerment for which evidence exists.

Research recommendations

In addition to the need for policy and programmatic investments to address the contributory role of women's disempowerment in child undernutrition in South Asia, our findings also highlight several gaps in the evidence base and provide important direction for future research agendas. There is a need for additional studies on women's empowerment and child nutrition in South Asia. Greater attention is needed in observational studies regarding which specific domains and sub-domains of women's empowerment are more related to child nutritional status, how these relationships operate, when and in what contexts, and so on. Intervention studies, thus far non-existent, are also necessary so that the importance of women's empowerment as a determinant of child nutritional status in South Asia can be more rigorously assessed. Complimentary strong qualitative work is also necessary to eliminate or confirm some of the many assumptions inherent in our understanding of what comprises empowerment. Future studies could also

assess how women's empowerment relates to other aspects of child growth and development in South Asia. Specific research recommendations include:

1. Harmonisation of indicators and methods for measuring women's empowerment. If researchers continue to use disparate means, comparability of results across studies will remain a challenge and prevent growth in our body of knowledge on women's empowerment and its relationship with child nutrition. However, this need for cross-comparability among studies will have to be balanced with the reality that women's empowerment may indeed be quite context-specific.

2. Prioritisation of under-represented dimensions of women's empowerment in the current body of literature. For example, while there are several nutrition studies in South Asia that examine women's empowerment with a focus on household decision-making, autonomy, or control, there are no studies that look at workload. Studies on social support networks are similarly scarce. Related to this, there are no studies on certain South Asia countries, e.g. Bhutan, Maldives, and Sri Lanka, whereas India seems to be well represented among prior studies. To investigate the Asian Enigma and build a literature base for the region, greater diversity of studies is paramount.

3. Qualitative research is also needed.[28] To truly investigate how and why particular norms and behaviours exist and thrive, interpreted, and accepted requires asking the right questions. Often, these research questions will require research beyond what is possible in quantitative research.

4. Rigorous studies and analytical methods are needed to assess whether investments into women's empowerment, and in particular women's empowerment in agriculture, translates into child nutritional benefit. For example, great investments have been made into agricultural production and micro-finance in South Asia but none of the program evaluations for these investments included assessments of health and nutrition making discussion of their influence on these important outcomes impossible.[44]

5. Additional studies to assess what the causal pathways between women's empowerment and child nutritional status are in a particular context could provide important insights for policymaking and programme design.

Conclusions

While child malnutrition is largely preventable, the determinants of child nutritional status are complex and thus far, not completely understood. This is true in South Asia, a region with the highest rates of child undernutrition and in which the expected levels of reductions in poor nutritional status have not followed the steep economic growth. While the original UNICEF framework noted food, care, and health as the key determinants of child nutritional wellbeing, an updated framework attempted to specify particular care practices and care resources needed by the mother to engage in these practices. This was the first study to systematically investigate the pathways theorised in this framework of how particular care resources – autonomy/control of resources; workload/time availability; and social support – may influence child nutritional status via caregiving practices such as the two particular ones in this thesis – child feeding and household WASH facilities and practices.

The findings and methods used in this thesis may serve to advance the academic discussion of this topic and inspire additional research. Finally, in order to see improvements in the nutritional wellbeing of children in Nepal and throughout South Asia, programs and policies should continue to prioritise specific nutrition interventions including dietary improvements through agricultural practices and WASH behaviour and hardware investments. However, attention should also be given to household dynamics, such as women's empowerment, as this may be an additional means to ensure that opportunities to overcome social, cultural and structural impediments to reductions in child undernutrition are seized upon.

Bibliography

1. Sheeran J. The challenge of hunger. *Lancet*. 2008;371(9608):180–1. doi:10.1016/S0140-6736(07)61870-4.

2. Black RE, Morris SS, Bryce J. Child survival I Where and why are 10 million children dying every year ? *Lancet*. 2003;361:2226–2234.

3. Faijer DJ, Bay G, Miller T. *Levels and Trends in Child Mortality*.; 2011:1–24.

4. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. *Lancet*. 2008;371(9609):340–57. doi:10.1016/S0140-6736(07)61692-4.

5. Morris SS, Cogill B, Uauy R. Effective international action against undernutrition: why has it proven so difficult and what can be done to accelerate progress? *Lancet*. 2008;371(9612):608–21. doi:10.1016/S0140-6736(07)61695-X.

6. UNICEF. *A UNICEF policy review strategy for improved nutrition of children and women in developing countries*.; 1990:1–38.

7. Engle PL, Menon P, Haddad L. *Care and nutrition: concepts and measurement*. Washington, D.C.; 1997:1–60.

8. Dangour AD, Green R, Häsler B, Rushton J, Shankar B, Waage J. Linking agriculture and health in low- and middle-income countries: an interdisciplinary research agenda. *Proc Nutr Soc*. 2012;71(2):222–8. doi:10.1017/S0029665112000213.

9. Charmarbagwala R, Ranger M, Waddington H, White H. *The Determinants of Child Health and Nutrition: A Meta-Analysis*.; :1–62.

10. Ruel MT, Arimond M. *Measuring Childcare Practices: Approaches, Indicators, and Implications for Programs*.; 2003:1–94.

11. Smith LC, Ramakrishnan U, Ndiaye A, Haddad L. The importance of women's status for child nutrition. *Food Nutr Bull*. 2003;24(3):287–288.

12. Ramalingaswami V, Jonsson U, Rohde J. Commentary: The Asian enigma. 1996.

13. Ministry of Health and Population, Nepal, New ERA and III. *Nepal Demographic and Health Survey 2011*. Kathmandu; 2012.

14. Helen Keller International. *Integration of Animal Husbandry into Home Gardening Programs to Increase Vitamin A Intake from Foods: Bangladesh, Cambodia and Nepal*.; 2003:1–4.

15. Helen Keller International. Homestead Food Production Program in Central and Far-Western Nepal increases food and nutrition security. 2004;2(1):1–8.

16. Helen Keller International. *Breastfeeding and Complementary Feeding Practices are less than Adequate Among Mothers of Children 12-23 Months in the Baitadi District of Nepal*.; 2010.

17. Pokharel RK, Houseon R, Harvey P, et al. *Nepal Nutrition Assessment and Gap Analysis*.; 2009.

18. Adhikari SR, Maskay NM. Health sector policy in the first decade of Nepal's multiparty democracy. Does clear enunciation of health priorities matter? *Health Policy*. 2004;68(1):103–12. doi:10.1016/j.healthpol.2003.09.008.

19. Jones KM, Specio SE, Shrestha P, Brown KH, Lindsay H. Nutrition knowledge and practices, and consumption of vitamin A – rich plants by rural Nepali participants and nonparticipants in a kitchen-garden program. *Food Nutr Bull*. 2005;26(2):198–208.

20. Government of Nepal National Planning Commission. *Multi-sectoral Nutrition Plan*.; 2012:1–97.

21. Martorell R, Leslie J, Moock PR. Characteristics and determinants of child nutritional status in Nepal. *Am J Clin Nutr*. 1984;39:74–86.

22. Nepal Central Bureau of Statistics, United Nations World Food Programme N, The World Bank. *Small area estimation of poverty, caloric intake and malnutrition in Nepal*.; 2006.

23. StataCorp. Stata Statistical Software: Release 13. 2013.

24. WHO Multicentre Growth Reference Study Group. *WHO child growth standards: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development.* Geneva; 2006:1–336.

25. Organization WH. *Indicators for assessing infant and young child feeding practices - Part 2 Measurement*. Geneva; 2010.

26. Central Bureau of Statistics. Nepal caste/ethnic groupings.

27. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide*. Washington D.C.; 2007:1–36.

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

29. Bhutta Z a, Ahmed T, Black RE, et al. What works? Interventions for maternal and child undernutrition and survival. *Lancet*. 2008;371(9610):417–40. doi:10.1016/S0140-6736(07)61693-6.

30. United Nations Development Programme. *Human Development Report 2013. The rise of the south: human progress in a diverse world*. New York; 2013:1–216.

31. 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(Suppl 1):45–59. doi:10.1111/j.1740-8709.2011.00384.x.

32. Feed the Future. *Nepal FY 2011–2015 Multi-Year Strategy*.; 2011.

33. USAID Feed the Future. *Feed the Future Nepal FY 2010 Implementation Plan*.; 2010.

34. Olney DK, Kariger PK, Stoltzfus RJ, et al. Development of nutritionally at-risk young children is predicted by malaria, anemia, and stunting in Pemba, Zanzibar. *J Nutr*. 2009;139:763–772. doi:10.3945/jn.107.086231.of.

35. Panter-Brick C. Women's work and child nutrition: The food intake of 0–4 year old children in rural Nepal. *Ecol Food Nutr*. 1992;29(1):11–24.

36. Marriott BP, White A, Hadden L, Davies JC, Wallingford JC. World Health Organization (WHO) infant and young child feeding indicators: associations with growth measures in 14 low-income countries. *Matern Child Nutr*. 2012;8(3):354–70. doi:10.1111/j.1740-8709.2011.00380.x.

37. Range SK. K, Naved R, Bhattarai S. *Child Care Practices Associated with Positive and Negative Nutritional Outcomes for Children in Bangladesh: A Descriptive Analysis*. Washington, D.C.; 1997.

38. Sah N. *Determinants of Child Malnutrition in Nepal: A Case Analysis from Dhanusha, Central Terai of Nepal*.; 2005.

39. Yegammai C, Chitra K. Nutritional status of the infants of employed and unemployed mothers. *Indian J Nutr Diet*. 2005;42(2):47–53.

40. Ravallion M. *The Mystery of the Vanishing Benefits : Ms Speedy Analyst's Introduction to Evaluation*.; :1–40.

41. Arimond M, Ruel MT. Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys 1 , 2. 2004;(August):2579–2585.

42. Ruel M, Harris K, Cunningham K. Diet Quality in developing countries. In: Preedy VR, Hunter L-A, Patel VB, eds. *Diet Quality: An Evidence-Based Approach, Volume 2*. Springer; 2013:239–261.

43. Srinivasan CS, Zanello G, Shankar B. Rural-urban disparities in child nutrition in Bangladesh and Nepal. *BMC Public Health*. 2013;13(1):581. doi:10.1186/1471-2458-13-581.

44. Van den Bold M, Quisumbing AR, Gillespie S. *Women's empowerment and nutrition: an evidence review*. Washington D.C.; 2013:1–80.

Appendix 1: Ethical Approvals

London School of Hygiene and Tropical Medicine

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LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Observational / Interventions Research Ethics Committee

Kenda Cunningham
Research Student
NPHIR/EPH
LSHTM

20 June 2012

Dear Ms Cunningham

Study Title: **LINKING AGRICULTURAL DIVERSITY, DIETARY DIVERSITY, AND CHILD NUTRITIONAL OUTCOMES: A HOUSEHOLD LEVEL STUDY IN NEPAL**
LSHTM ethics ref: **6199**

Thank you for your email 19 June 2012, responding to the Observational Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

Approval is dependent on local ethical approval having been received, where relevant.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
LSHTM ethics application	n/a	08/05/2012
Protocol		08/05/2012
Information Sheet		08/05/2012
Consent form		08/05/2012
Suaahara Baseline Survey		27/05/2012

After ethical review

Any subsequent changes to the application must be submitted to the Committee via an E2 amendment form. All studies are also required to notify the ethics committee of any serious adverse events which occur during the project via form E4. At the end of the study, please notify the committee via form E5.

Yours sincerely,

[redacted]

Professor Andrew J Hall
Chair
ethics@lshtm.ac.uk
http://intra.lshtm.ac.uk/management/committees/ethics/

International Food Policy Research Institute

International Food Policy Research Institute
Federalwide Assurance (FWA) No. FWA00005121
Institutional Review Board (IRB): 00003487

IRB/Proposal Number: _____

Application Cover Sheet

Please submit this form along with the attachments indicated below to:

Institutional Review Board (IFPRI IRB)
Attn: Dr. Erick Boy
2033 K Street, N.W.
Washington, DC 20006
E-mail: e.boy@cgiar.org

Please submit:

1) **This "Application Cover Sheet"**

2) **Relevant application form depending on the type of review being requested:**

____ **Full Review** (activity involving more than minimal risk).
Attach completed "Application for IRB Review" (Form 2) and Investigator's Certification Statement (page 14 of Form 2)

__x__ **Minimal Risk Review** (activity involving minimal risk)
Attach completed "Application for IRB Review" (Form 2), Investigator's Certification Statement (page 14 of Form 2), & Minimal Risk Review Checklist.

____ **Request for Exempt Status** (researcher estimates that proposal can be exempt)
Attach completed "Request for Exempt Status" (Form 3) and Exempt Status Checklist

____ **Request for Modification** (change to protocol or study forms)
Attach completed "Request for Modification" (Form 4), a new "Application Cover Sheet" (FORM 1), a copy of the previously completed and approved "Application for IRB Review" (Form 2).

____ **Request for Continuing Review** (study continuation or closure)
Attach completed "Request for Continuing Review" (Form 5), & copy of the ***previously*** completed and approved "Application for IRB Review" (Form 2).

3) **One (1) copy of completed Informed Consent Form (in English and in the language in which it will be used)**

4) **One (1) copy of the protocol**

International Food Policy Research Institute IRB/Proposal Number: _____
Federalwide Assurance (FWA) No. FWA00005121
Institutional Review Board (IRB): 00003487

Application for IRB Review

Section One: Application Information

Division: PHND

Title of Proposal: Suaahara Baseline

Principal Investigator or IFPRI contact: Suneetha Kadiyala

Collaborating Institution: New Era

Study Duration: From May 25th 2012 To September 3 2012

Study Location: Country Nepal Region Terai, Hills, Mountains

Funding Status:

_____ Award Pending

_____ Award Pending but funding approved (written confirmation received)

x Funded Start date: March 1, 2012 End date: September 30,

Name of Funding Agency: Save the Children International

Project Number (if applicable): 6141-001

Section Two: Information for IRB Review

Please answer each specific question and use additional sheets as needed. A response of "See attached project description or grant application" is not sufficient.

1. Objectives of Research: (Summary)

USAID/Nepal, in collaboration with the Government of Nepal and a consortium of partners, is implementing a five-year integrated nutrition program, SUAAHARA (Sudddha Santulit Aahar Hamro Jeevan Rakchya ko Baliyo Aadhar) in twenty rural districts of Nepal with poor nutrition indicators aiming to improve and sustain the health and well being of the Nepali people. Suaahara integrates maternal and child nutrition; water, sanitation, and hygiene; agriculture; family planning and reproductive health; and health services to improve maternal and child nutritional outcomes, including stunting and anemia through diverse multi-sectoral activities at the household and community level.

Therefore, the overall objective of this Suaahara baseline survey is to obtain baseline data on key indicators of nutritional impact including stunting, wasting and underweight among children under 5 years of age, BMI of mothers, and anemia among mothers and children 6-59 months. Information will be collected on various indicators associated with poverty; agriculture; social assistance; food security and dietary diversity; water, sanitation and hygiene; and health care, infant and young child feeding and nutrition. This survey aims to establish a benchmark based on which the project will be monitored and evaluated. The analyses of data from this survey will generate knowledge products that inform Suaahara programming decisions.

2. Selection of Study Subjects

a. Approximate number of subjects: 4080 children 0-5 years old; 4080 women of child bearing age, 240 Female Community Health Volunteers
b. Age range of subjects 0-80 years of age_____

c. Do you anticipate enrolling any of the following in the study?
d.

i. Pregnant women? ■
ii. Fetuses ☐
iii. Children (specify age group)____0-59m_____ ■
iv. Prisoners ☐
v. Mentally disabled persons? ☐
vi. Economically or educationally disadvantaged persons ■

e. What are your selection (inclusion) criteria?

This study will include a survey sample size of approximately 4080 households. The selected survey districts include eight districts where Suaahara will implement its programs and eight matched comparison districts, where Suaahara will not be operational. Within these 16 districts, a random sample of 5 village district councils (VDC) per district, 3 wards per VDC, and 17 households with an index child under 5 years old will be randomly selected.

For the survey of the Female Community Health Volunteers (FCHV), one FCHV from each primary sampling unit (ward) will be randomly selected.

For the group community questionnaire, key informants include: Local leaders, government officials, NGO workers, teachers, nurses/health workers, etc. who are most knowledgeable about community level factors that could modify or affect health and nutrition outcomes.

f. What exclusion criteria apply? Explain the rationale for these criteria.

Households that do not have children 0-59 months of age

g. What are the primary languages of the participants?

Nepali

3. Recruitment and Compensation

a. How will potential participants be identified?

Potential participants for the household survey will be identified for the survey by approaching households selected from the sampling frame, and inquiring about willingness to be interviewed for the survey.

Potential participants for the FCHV survey will be identified by approaching FCHVs selected from the sampling frame, and inquiring about willingness to be interviewed for the survey.

Potential participants for the Community survey will be identified by identifying, approaching and inviting at least the following members of a community: Local community leaders, government officials, FCHVs, traditional birth attendants, NGO workers, nurses/health workers, school teachers, agricultural extension officers, and veterinary/livestock officers.

b. Will study participants be paid? If yes, how much?

Study participants will not be paid

c. Will non-monetary inducements or incentives be offered to participants? If yes, describe.

Household Survey participants might receive a small token of appreciation (e.g., pencils and notebooks) for participation. FCHV survey participants will be given a certificate of appreciation Community survey participants will receive a group lunch.

d. Will other services, compensations be offered to individuals, households or communities? If yes, describe.

No other services or compensations will be offered.

4. Research Procedures and Data collection

a. Does the research involve an intervention? Yes _____ No __x___

i. If so, what is the unit of intervention (individual, household, community?)

N/A

ii. What is the method of allocation of the intervention to individuals, households or communities (e.g., random, self-selection, other)?

N/A

b. List the different component of the research procedures, e.g. what activities, measurements will be done to the participants and how much time will be required of the participants for each activity?

The key activities in the research procedures are as follows:

1) Interview with male adult in the household (2hours)
2) Interview with female adult in the household (2 hours)
3) Anthropometric and hemoglobin measurements of mothers and children (30 minutes for all together)
4) Interview with FCHV (approximately1 hour)
5) Interview with community leaders (2 hours)

c. What other expectations, requirements are there from participants?

There are no other expectations or requirements.

d. Will you access existing stored records, data, or specimens for secondary research use? If yes, specify the source.

No

e. Will HIV serostatus be evaluated or be an eligibility criteria for study subjects? If yes, provide the rationale for testing and outline procedures to be followed, including procedures for protecting privacy of study subjects.

No

f. Will your activity involve collection and analysis of biological specimens for research purposes? If so, which types of specimens? Describe training/qualifications required for staff who will collect specimens and/or protocols to ensure safety of staff and subjects.

Yes, finger prick capillary blood samples. Hemoglobin levels will be measured in children below five years of age and their mothers using HemoCue (HemoCue Ltd., Anglhom Swden). Before drawing the blood, the palm side of the finger from where the blood will be drawn will be wiped with an alcohol prep swab. The end of the finger will then be punctured with a sterile needle and a drop of the blood will be collected with HemoCue microcuvette. The microcuvette will then be placed in the HemoCue photometer where the results will be displayed. The children and mothers (either pregnant or non-pregnant) will be classified into normal, mild moderate and severe anemic based on the WHO standard. Cut-off point for hemoglobin level will be adjusted to account for the altitude of the clusters[1]. The results will be recorded in the household questionnaire.

As part of the training of enumerators (15 days) led by New Era, the enumerators will be trained in proper procedures, safety for themselves and the participants, as well as safe needle disposal. The procedures used for the Nepal Demographic Health Survey 2011 will be replicated.

g. Will your activity involve collection/storage of specimens for future research analysis? If yes, how does your informed consent document address this issue?

[1] The results of hemoglobin level will be interpreted to the respondents by field workers if they wanted to know their test result.

No. The blood samples will not be stored for future analysis.

5. Risk vs. Benefit Analysis

Risks to participants may include physical risks, emotional or psychological risks such as stress, discomfort, or invasion of privacy; and social risks, such as jeopardy to insurability, employability, or social status. Sources of risk may include drugs, venipuncture, biopsy or other invasive procedures, over-treatment if treatment is based on symptomatic diagnosis; sources of risk may also include questionnaires on sensitive topics, recordings (audio, video or photography), or risk associated with failure to maintain confidentiality.

a. Summarize the nature and amount of risk (including social, emotional, psychological, or physical) or substantial stress or discomfort involved in participation in research.

We do not anticipate any substantial risks in terms of social, emotional, psychological or physical risks. There could be stress associated with the duration of the survey data collection or the anthropometry/Hemoglobin module, but interviewers will be trained to carefully assess respondent stress and to reschedule interview data collection to meet respondent needs.

b. Are there any anticipated adverse effects? If yes, indicate section of proposal where these are described.

None anticipated.

c. Summarize planned provisions for monitoring for possible adverse effects during and after data collection.

None anticipated.

d. Summarize planned provisions for addressing acute health or other problems when identified through data collection (such as severely malnourished children, identification of severe micronutrient malnutrition, domestic violence which may be associated with the intervention, etc.)

While in the field completing the survey, if the New Era enumeration team finds severely undernourished, ill, or battered children, the team supervisor will refer these children to the local health post.

e. Will there be extra costs to the subject or families related to their participation in the study (e.g. transport). If yes describe.

No

f. Summarize the nature of the benefits for the participants, their community or for humanity. Explain how the benefits outweigh the risks.

The main benefits for participants and their communities is from the larger benefits of the Suaahara baseline survey and the ways in contributes to the Suaahara intervention as well as broader policy analysis and decisions. The survey will form a critical basis for a body of research that is intended to shape policy and programming decisions in Nepal, reaching multiple sectors, such as water, sanitation, and hygiene, agriculture, health and nutrition.

6. Confidentiality

a. Describe the steps taken to assure that participation by study subjects will be kept confidential. Be specific.

Any identifiable information that we get as a part of this study will be kept confidential; we will not share it with any private or public agency.

Data will be collected using standard paper questionnaires. Once data collection in a household has been completed, the questionnaires will be submitted to the field supervisor. No one outside of that particular field team, including even other New Era field teams, will be allowed access to the data.

Identifiers will be used to uniquely identify individuals and households. Once the data sets have been created, any information allowing the identification of an individual or household (such as names and address) will be stripped from the datasets. A separate dataset linking identifiers with the information allowing identification of individuals or households (names, address, etc.) will be securely kept by New Era. This will allow the investigators to follow up with the respondents should it be necessary.

Any information obtained in connection with this study will be used in a manner that does not publicly disclose any participant's identity which will be kept confidential.

b. What safeguards are used to protect against identifying directly or indirectly, any participant in the research project?

During training of the field staff, we will emphasize the importance of confidentiality. Only a very limited number of people will have access to the data that would allow the identification of participants. The data will be kept in secure locations.

Once the personal information has been stripped from the data sets and the paper questionnaires have been destroyed (2 years after completion of data collection), direct or indirect identification should be impossible. As explained above, the information allowing the identification of the participants will be kept at New Era offices.

c. Describe provisions for control over access to documents and data. What safeguards are used to protect information from disclosure to others not involved with this research project?

- Fieldworkers and supervisors will only keep questionnaires while working on them. Once submitted to the New Era office, they will no longer have access to them.
- The New Era data entry team will be carefully monitored to prevent them from taking data home.
- The computers in the data center will be hooked up to a closed network. This means that they will not be connected to the internet.
- Any data that is shared with external collaborators on the project will be stripped of identifiers.
- Everybody involved with study documents and study data will be trained on the importance of confidentiality.

d. Describe procedures to remove or destroy at the earliest possible opportunity, consistent with the purposes of the study, information that would enable a participant to be identified.

A system of unique identifiers will be used. Once the data sets have been created, any information allowing the identification of an individual or household (such as names and address) will be stripped from the data sets used for data analysis. Paper questionnaires and the data set with the information allowing the identification of the participants will be kept at NewEra for at least two years in case there is any information which needs to be checked. An electronic copy of the dataset will be provided by New Era to IFPRI and/or Save the Children.

7. Informed Consent

Informed consent is required for all research involving human subjects. All applicable items on the attached list of required elements (p. 7 of this form) must be included in the informed consent document. ***Documentation of informed consent is required for all research projects unless a waiver of documentation of consent is obtained (section 8).***

a. What type of consent will be used?

_____Written consent signed by participant or participant's legal guardian

__x_____Oral consent with documented signature by the participant or participant's legal guardian (i.e. participant or legal guardian gives oral consent in front of witness who documents consent for each participant/legal guardian)

(In this study it will be oral consent and the signature will be that of a witness, usually another HH member, neighbor, etc.)

_____Oral consent statement or written study overview not requiring documented signature (waiver of documentation of consent) *If chosing this option, complete section 8 below.*

b. Describe the consent process: What and when will the consent process occur?

Interviewers will be responsible for obtaining consent by reading the statement on the consent form to all potential participants and asking for permission for the interview. For the household survey participants, permission will also be asked to take anthropometric measurements and blood samples from the mothers and her eligible children. Procedures to be used, potential benefits and risks if any, and an explanation that the participant can opt out at any point will be included. If the participants agree to, the interview will precede. The interviewer will sign a statement that s/he has read the informed consent statement to the respondent and that the respondent has agreed. A witness will also sign that informed consent was obtained. In addition to the formal informed consent statement, respondents will be given an opportunity to ask any questions about the survey that will help them decide whether or not they want to participate.

c. Who will obtain consent?

The fieldworkers visiting the households.

d. Will a witness be present? If yes, who will serve as witness?

Yes, and the witness will sign the informed consent. Usually the witness will be another household member (adult only), field supervisor, community leader, or a neighbor.

e. Describe any measures other than the consent form used to confirm the participant's understanding of the research. Attached copies of written materials used for this purpose.

We will rely on the consent form to confirm participant's understanding of the research. Survey teams will also discuss the survey with community leaders.

8. <u>Request for waiver of documentation of consent: N.A.</u>

If requesting a waiver of the requirement for documentation of consent, explain how this research meets the criteria for waiver (see criteria below):

IFPRI's IRB may waive the requirements for documentation of consent if the investigator confirms that:

a) The only record linking the subject and the research would be the consent document, and the principal risk would be potential harm resulting from a breach of confidentiality.

OR

b) The research presents no more than minimal risk of harm to subjects (as determined by the IRB) and involves no procedures for which written consent is normally required outside the research context.

9. **Local ethical review**

a. Has this research activity undergone ethical review by a local institution (collaborator or other if collaborator does not have an institutional review board), or is such a review planned?

Yes ____x___ No _____

If No, please explain why no local ethical review is planned.

If Yes, what institution is responsible for this review?

Nepal Health Research Council – New Era (the survey firm conducting the survey) has already submitted the application for approval

10. Use and benefits of research findings to study participants

a. How will your research results benefit the subjects/informants of the research?

Households and communities in the intervention areas will receive the Suaahara program. But for some participants, especially in the comparison group there are no direct benefits of this study other than mothers knowing their own or their children's nutritional status

b. What plans do you have for feeding back research findings to informants and/or other stakeholders in the research setting?

All research findings will be fed back to the various organizations involved in Suaahara a their collaborators via workshops, meetings, publications, briefs, etc. Dissemination plar yet to be finalized but will be at the end of 2012 and could involve providing feedback in those communities which participated in the survey.

Elements of Informed Consent Forms

1. **Purpose of research**: Provide a clear, concise explanation of the research including the name of the study and its main objectives.
2. **Methods, procedures**: Describe methods, procedures of the study. Explain what will be happening to the subject during the study, and indicate the time commitment of each component and other expectations from participants. If study involves an experimental design and/or random allocation of subjects to different intervention groups, explain procedures in language that participants can understand.
3. **Risks**: Describe the frequent and/or important risks, side effects or discomforts of the study procedures.
4. **Benefits**: Describe any benefit from participating.
5. **Voluntary participation**: State that the subject's participation is voluntary, that the subject may refuse to participate before the study begins, discontinue at any time, or skip any questions that may make him/her feed uncomfortable, with no affect or penalty or los of benefits to him/her.
6. **Request for information**: state that the subject is allowed to ask questions concerning th study, both before agreeing to be involved and during the course of the study (see require contact information in #11 below).
7. **Confidentiality**: describe how subject's confidentiality will be protected
8. **Use of the information**: describe how the data will be used when the study is completed.
9. **Use of recording devices** (where applicable): describe how audio or video equipment wil be used and what will be done with the tapes upon completion of the study (destroyed, erased, archived, etc.) and after which period of time (number of years). Provide a separat signature line on the consent form for the subject to agree to be video/audio taped or photographed.
10. **Copy of the signed and dated consent form**: indicate that the subject will receive a copy of the signed and dated consent form.
11. **Contact information**: provide the name(s) of the investigator(s) and contact information.
12. **Additional contact information**: indicate that the subject may contact the IRB Chair at IFPRI with any concerns or complaints. Include email address, phone number and websit
13. **Approval**: Indicate at the bottom of the form: "Consent form approved by IFPRI IRB on [date]".

Note: If subject is under 18 years of age, parental consent is required.

International Food Policy Research Institute
Federalwide Assurance (FWA) No. FWA00005121
Institutional Review Board (IRB): 00003487

IRB/Proposal Number: _____

INVESTIGATOR'S CERTIFICATION STATEMENT – FULL OR MINIMAL RISK REVIEW

I hereby certify that:

- all procedures performed under this study will be conducted by individuals legally and responsibly entitled to do so;
- the study will not be initiated until IFPRI's IRB's Certificate of Approval is received;
- the consent form used in the study will bear IFPRI's IRB's stamp indicating date of approval;
- any modification to the study protocol, e.g. change in principal investigator, research methodology, subject recruitment procedures, etc., will be submitted to IFPRI's IRB for its approval prior to implementation (except where necessary to eliminate apparent immediate hazards to subjects, in which case IFPRI's IRB will be notified immediately after implementation)
- any adverse reactions experienced by subjects involved in the research will be immediately reported to IFPRI's IRB
- all IFPRI's IRB decisions, conditions and requirements will be complied with; and
- all research will conform to legal and other requirements governing human research in the country in which it is conducted.

[redacted]

Principal Investigator's signature (or IFPRI's main contact)

_____Suneetha Kadiyala_____ 05/10/2012 _____
Name (type or print) Date

Note that IRB approval needs to be renewed every year during the full duration of the research project. A "Request for Continuing Review" (FORM 5) needs to be submitted to IFPRI's IRB no later than 30 days prior to expiration of the current approval (i.e. 11 months from today)

FOR USE BY IRB OFFICIALS ONLY:
Date for receiving "Request for Continuing Review" _____

International Food Policy Research Institute
Federalwide Assurance (FWA) No. FWA00005121
Institutional Review Board (IRB): 00003487

IRB/Proposal Number: _____

Application Status (For IRB Use Only)

Approved: ✓ Date: 05/25/2012 Approval Expires: 09/30/2012

Denied: _____ Date: _____

Referred for further review: Date: _____ Minimal Risk Review ___ Full Review ___

Comments:
Please submit IRB approval from local ethics review committee when obtained (by July 30th, 2012).

ERICK E[redacted]

MAY 25, 2012

Signature over printed name
IRB Chair or Member

Date

MINIMAL RISK REVIEW CHECKLIST

(Submit this checklist only if you are applying for minimal risk review)

Definition of Minimal Risk

A risk is minimal where the probability and magnitude of harm or discomfort anticipated in the proposed research are not greater, in and of themselves, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

Research activities must present no more than minimal risk to humans AND involve only procedures listed in one or more of the following categories in order to be eligible for minimal risk review. If NONE of the following apply, submit the application for full review. The categories in the list apply regardless of the age of subjects, except as noted. Inclusion on the list does not mean that an activity is automatically defined as minimal risk. Inclusion on this list merely means that the activity is eligible for review through the minimal risk review procedure when the specific circumstances of the proposed research involve no more than minimal risk to human subjects.

The minimal risk review procedure may not be used where identification of the subjects and/or their responses would reasonably place them at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, insurability, reputation, or be stigmatizing, unless reasonable and appropriate protections will be implemented so that risks relate to invasion of privacy and breach of confidentiality are no greater than minimal.

NOTE: *The standard requirement for informed consent applies regardless of the type of review – full or minimal risk – used by IFPRIs IRB.*

Research Categories Eligible for Minimal Risk Review

__x_ Research employing survey, interview, oral history, focus group methods

__x_ Research on individual or group characteristics or behavior (such as research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior)

___ Collection of data from voice, video, digital, or image recordings made for research purposes

___ Research involving materials (data, documents, records or specimens) that have been collected previously by IFPRI or other research institutions

_x__ Research involving measurements of body composition (weight, height, skinfold thicknesses or other non-invasive methods)

___ Research involving collection of biological specimens (urine, stools, saliva) for research purposes by noninvasive means

_x__ Research involving collection of blood samples by finger stick, heel stick, ear stick, or venipuncture from:

___ Healthy, non-pregnant adults who weigh at least 110 pounds, from whom amou drawn will not exceed 550 ml in an 8-week period, collected no more frequentl than 2 times per week

___ Other adults and children, considering the age, weight, and health of the subject the collection of procedure, the amount of blood to be collected, and the frequer with which it will be collected. The amount drawn will not exceed the lesser of ml or 3 ml per kg in an 8 week period, collected no more frequently than 2 time per week.

Nepal Health Research Council

Nepal Health Research Council
Estd. 1991

NHRC

Ref. No. 1186

14 May 2012

Ms. Suneetha Kadiyala
Principal Investigator
International Food Policy Research Institute
New Delhi, India

Ref: Approval of Research Proposal entitled **Suaahara Baseline Survey Implementation**

Dear Ms. Kadiyala,
It is my pleasure to inform you that the above-mentioned proposal submitted on 16 April 2012 (**Reg. no. 39 /2012** please use this Reg. No. during further correspondence) has been approved by NHRC Ethical Review Board on 9 May 2012 (2069-01-27).

As per NHRC rules and regulations, the investigator has to strictly follow the protocol stipulated in the proposal. Any change in objective(s), problem statement, research question or hypothesis, methodology, implementation procedure, data management and budget that may be necessary in course of the implementation of the research proposal can only be made so and implemented after prior approval from this council. Thus, it is compulsory to submit the detail of such changes intended or desired with justification prior to actual change in the protocol.

If the researcher requires transfer of the bio samples to other countries, the investigator should apply to the NHRC for the permission.

Further, the researchers are directed to strictly abide by the National Ethical Guidelines published by NHRC during the implementation of their research proposal and submit progress report and full or summary report upon completion.

As per your research proposal, total research amount is NRs. 14,264,800.00 and NHRC processing fee is NRs.415,480.00.

If you have any questions, please contact the research section of NHRC

Thanking you.

Sincerely Yours,

[redacted]
Dr. Shanker Pratap Singh
Member Secretary

Tel.:977-1-4254220, 4227460, Fax: +977-1-4262469, RamShah Path, P.O. Box 7626, Kathmandu, Nepal.
Website: http: www.nhrc.org.np, Email : nhrc@nhrc.org.np

Appendix 2: Survey Sampling Details

The sampling estimation for the overall survey was based on current rates of stunting, the expected rates of change after *Suaahara* interventions, and the power to detect those changes. Using stunting as the outcome variable, and available DHS data, the sample size was determined such that it would yield an improvement of stunting in children under 5 by a minimum of 6 percentage points (41 per cent to 35 per cent) with power of .80 to .90 respectively. According to the 2011 DHS, the national stunting rate for children 0-59 months of age is 41 per cent. Using a two-tailed test, we calculated that a sample of 2,040 children per group (4,080 total) will have an estimated 89.87 per cent of power to detect a statistically significant ($p<0.05$) minimum improvement in the prevalence of stunting from 41 per cent to 36.5 per cent among children under 5 years of age between baseline and endline among the intervention group. This sample size also has an estimated power of 98.86 to detect a statistically significant ($p<0.05$) improvement in stunting prevalence from 41 to 35 per cent among the same population. Given the secular trend for stunting is about 1.8 pp in Nepal, the comparison areas can be expected to have a stunting level of about 33.5 after 4 years. Using this as a benchmark, the sample size offers a statistical power of ($p<0.05$) to detect a difference of 5 percentage points between *Suaahara* and comparison areas.

The eight intervention districts were selected because they are phase one for the intervention and the eight control districts were matched based on similar agro-ecological, economic, and social characteristics. Within these matched districts, a random sample of 5 VDCs per district and in turn 3 wards per VDC were chosen using population proportion to size sampling. Finally, for each ward, 17 households were randomly selected. An alphabetical listing was made of all the VDCs and the number of households per VDC for each survey district. Then, VDCs were selected as follows: the sampling interval (k) was obtained by dividing the total households in the district by the desired sample size of 5. A random number (x) between one and the sampling interval (k) was chosen as the starting point, and the sampling interval (k) was then added cumulatively and repeatedly $(x+K)^{th}$, $(x+2K)^{th}$, and so on until 5 VDCs had been selected. The process for selecting 3 wards per VDC followed the same process of listing and selection by using a sampling interval, random number, etc.

Appendix 3: Questionnaire for Mother of the Index Child

Household No.: ☐☐☐☐☐

Suaahara Baseline Survey
Save the Children/IFPRI/New ERA – 2012

Questionnaire for Mother of the Index Child

Informed Consent Form

Namaste! My name is……. I am here from New ERA, a Nepali research organization based in Kathmandu. Together with the International Food Policy Research Institute (IFPRI), Save the Children (SCI), and other organizations, we are collecting data for a research study**.** The information will be used to set up health, nutrition and agriculture/income generation programs in certain communities of Nepal. Your household has been chosen by a random selection process. You are one of over 4,000 households included in this survey and we are also interviewing Female Community Health Volunteers (FCHVs) and other community leaders at the ward level.

During this study, I will ask you questions related to diverse topics including maternal and child health and nutrition; household food security; water, sanitation, and hygiene; infant and young child feeding; access to information; and women's empowerment. I will also ask a few question regarding maternal and child health and nutrition to your mother-in-law or mother, if available. We will also measure your height and weight and that of all household children aged 0-59 months. We will use a sterilized needle to collect a drop of blood by pricking the end of your finger and the finger of your children aged 6-59 months, selected randomly as the index and non-index child. The blood will be tested using a hemocue machine to assess haemoglobin/iron in his/her blood and you will know if they have anemia. It is not so painful and will not cause any harm.

We are inviting you to be a participant in this study. We value your opinion and there are no wrong answers to the questions we will be asking in the interview. We will use approximately 3:00 hours of your time to collect all the information. There will be no risk as a result of your participating in the study. Your participation in this research is completely voluntary. You are free to withdraw your consent and discontinue participation in this study at any time.

The information given by you will be strictly treated as confidential and will be used only for the study. Your responses will not be linked with your name/address and will be kept separately in a locked room and will be destroyed once all the data has been collected and analyzed. Finally, if we choose to take any pictures of the survey process, these photos will only be taken with your permission and will be only used for study purposes and your name or address will not be identified with the photo at any point.

Your participation will be highly appreciated. The answers you give will be used for planning health and nutrition related programs and services.

Are you (mother) willing to participate in the study? 1. Yes 2. No

Are you (grandmother) willing to participate in the study 1. Yes 2. No 3. No grandmother available

Signature of the interviewer: _____ Date: ____/_____/2069

Signature of the witness: _____

Operational Definition of the Study Participant:

Mother: A woman having at least one living child 0-59 completed months of age who was randomly selected as the index-child.

Index child: A child 0-59 completed months of age chosen through random sampling.

Non-Index child: A child 0-23 completed months of age who has the same birth mother and resides in the same household as the index child, but is not a twin/triplet/etc. of the index child.

Male Respondent: Spouse of the sample mother; if not available, another adult male who is responsible for making major household economic decisions.

Grandmother: Mother-in-law of the sample mother/woman; if not available, mother of the sample mother/woman.

Household: A group of people who live together under the same roof and take food from the "same pot."

Household member: someone who has a) lived in the household for at least 6 months, b) shares food from the same pot as others under the roof, and c) resided there regularly at least half of the time during the 6 months (3-4 days of each week for 6 months, 3 full months of the 6 months, etc.). Even persons who are not blood relatives (such as servants, lodgers, or agricultural laborers) are included if they meet these three requirements.

Exceptions include (Consider as household member):

- A newborn child less than 6 months old
- Someone who has joined the household through marriage less than 6 months ago
- Servants, lodgers, and agricultural laborers currently in the household and will be staying in the household for a longer period but arrived less than 6 months ago

Non-household member: someone who stays in the same household but does not bear any costs for food or does not take food from the same pot. For example, if two brothers stay in the same house with their families but they do not share food costs and they cook separately, then they are considered two separate households. Generally, if one person stays more than 3 months out of the last 6 months outside the household, they are not considered household members even if other household members consider them as household members.

Exceptions include (Do not consider as household member):

- A person who died very recently
- Someone who has left the household through marriage
- Servants, lodgers, and agricultural laborers who have left the household

NOTE: For this survey, these household definitions are very important. The criteria could be different from other studies you may be familiar with, but you should keep in mind that you should not include those people who do not meet these criteria. Please discuss any questions with your supervisor.

Indicators

District (name and number)_____	☐☐
VDC (name and number)_____	☐☐
Ward (number)_____	☐
Village/Tole (name)_____ .	☐☐☐
Cluster (number)	☐
Region: Mountain = 1, Hill = 2, *Terai* = 3	☐☐
Name of household head_____	☐☐
Name of primary caretaker _____ PID No.	☐☐
Name of mother of the index child _____ PID No.	☐☐
Name of index child _____PID No.	☐
Name of non-index child _____PID No.	☐
Sex of index child (Male =1; Female = 2)	☐
Sex of non-index child (Male =1; Female = 2)	☐
Mother residing in maternal household (Permanent = 1; Temporary = 2; No = 3)	☐
Number of children 24-59 months of age living in the household	☐☐
Number of children 0-23 months of age living in the household	☐☐
Religion of Household Head: Hinduism =01, Buddhism =02, Islam =03, Christianity =04, Other (Specify)_____ 96	
Caste of household head _____(Code list in manual)	

Interview Visits

	1	2	3	Final Visit
Date	_____/_____/2069 DD MM YY	_____/_____/2069 DD MM YY	_____/_____/2069 DD MM YY	Day ☐☐ Month ☐☐ Year 2 0 6 9
Interviewer's Name	_____	_____	_____	Interviewers code number ☐☐
Result*	☐☐	☐☐	☐☐	Result* ☐
Next Visit: Date	_____	_____		Total number of Visits ☐
Time	_____	_____		

*Result Codes:
01. Completed
02. Not at home at time of visit
03. Postponed
04. Refused
05. Interview is partially completed
96. Other (Specify) _____

Language of interview** _____	☐☐
Native language of respondent** _____	☐☐
Translator (Used =1, Partially used = 2, Not used = 3)	☐
**Language Code: Nepali = 01; Bhojpuri = 02, Maithali = 03, Tharu = 04, Tamang = 05, Newari = 06, Mager = 07, Abadhi = 08; Limbu = 09, Other (Specify) _____ = 96	

Supervisor	QC	Office Editor	Data Entry
Name: _____ ☐☐ Date: _____/_____/2069 DD MM YY	Name: _____ ☐☐ Date: _____/_____/2069 DD MM YY	☐☐☐	☐☐☐

Table of Contents

Interview start time: Hour ☐☐ **Minutes** ☐☐

Module 1: Child Health and Childcare

Section A: Child Health

Read aloud: Now I would like some information about your child (Name's) health. Please bring any immunization cards of your children, if you have them.

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
101	When was (Name) born? **(Copy from card if available, if not probe for date of birth. If mother does not know date of birth probe/ask for age in completed months. If mother cannot remember the birth date, please write 98. Please indicate how information was obtained.)** **(If the age recorded in the roster is inconsistent with the age here, resolve inconsistencies.)**	Date of birth.....___/____/_____ DD MM YY Age in completed months..... ☐☐ Date of birth as in card.....1 Date of birth as per mother recall 2	Date of birth ..... ___/____/_____ DD MM YY Age in completed months..... ☐☐ Date of birth as in card ..... 1 Date of birth as per mother recall..... 2	
102	Do you have a card where (Name)'s vaccinations are written down?	Yes, Seen .....1 (Skip to 104) ←┘ Yes, Not seen .....2 (Skip to 107) ←┘ No card.....3	Yes, Seen..... 1 (Skip to 104) ←┘ Yes, Not seen..... 2 (Skip to 107) ←┘ No card..... 3	
103	Did you ever have a vaccination card for (Name)?	Yes ..... 1 (Skip to 107) ←┘ No 2	Yes .....1 (Skip to 107) ←┘ No.....2	
104	(1) Copy dates from the card (2) Write '44' in 'Day' column if card shows that a dose was given, but no date is recorded. (3) If there is only year and month but no day write year and month and write '98' in the day column.			

	Index Child									Non-index Child								
	Day		Month		Year					Day		Month		Year				
BCG									BCG									
Polio 1									Polio 1									
Polio 2									P olio 2									
Polio 3									Polio 3									
DPT 1/HEP B1									DPT 1/HEP B1									
DPT 2/HEP B2									DPT 2/HEP B2									
DPT 3/HEP B3									DPT 3/HEP B3									
DPT 1/HEP B1/ Hib1									DPT 1/HEP B1/ Hib1									
DPT 2/HEP B2/ Hib2									DPT 2/HEP B2/ Hib2									
DPT 3/HEP B3/ Hib3									DPT 3/HEP B3/ Hib3									
Measles									Measles									
Japanese Encephalitis									Japanese Encephalitis									

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
105	Check Q.No. 104	All recorded ⚑ (Go to. 109) Other ⚑	All recorded ⚑ (Go to. 109) Other ⚑	
106	Has (Name) had any vaccinations that are not recorded on this card, including vaccinations given in a national immunization day campaign? **(Record 'Yes' only if the respondent mentions at least one of the vaccinations in Q.No. 104 that are not recorded as having been given.)**	Yes .....1 (Probe for vaccination and write '66' in the corresponding day column in 104) (Go to 109) No .....2 (Go to 109) Don't know.....98	Yes ..... 1 (Probe for vaccination and write '66' in the corresponding day column in 104) (Go to 109) No..... 2 (Go to 109) Don't know 98	
107	Did (Name) ever have any vaccinations to prevent him/her from getting diseases, including vaccinations received in a national immunization day campaign?	Yes .....1 No .....2 (Go to 109) Don't know.....98	Yes ..... 1 No..... 2 (Go to 109) Don't know 98	
108 108.1	Please tell me if (Name) had any of the following vaccinations: A BCG vaccination against tuberculosis, an injection in the right arm that usually causes a scar?	Yes .....1 No .....2 Don't know.....98	Yes ..... 1 No..... 2 Don't know 98	
108.2	Polio vaccine, that is, drops in the mouth?	Yes .....1 No .....2 (Go to 108.4) Don't know.....98	Yes ..... 1 No..... 2 (Go to 108.4) Don't know 98	
108.3	How many times was the polio vaccine given?	Number of times ..... ☐	Number of times..... ☐	
108.4	A DPT/HEP B/Hib vaccination, an injection given in the left thigh, usually at the same time as polio drops?	Yes .....1 No .....2 (Go to 108.6) Don't know.....98	Yes ..... 1 No..... 2 (Go to108.6) Don't know 98	
108.5	How many times was the DPT/HEP B/Hib vaccination given?	Number of times ..... ☐	Number of times..... ☐	
108.6	A measles injection, that is, a shot in the right thigh at the age of 9 months or older – to prevent him/her from getting measles?	Yes .....1 No .....2 Don't know.....98	Yes ..... 1 No..... 2 Don't know 98	
108.7	A Japanese encephalitis vaccination, that is, an injection given in the upper arm between the age of 12-23 months of age?	Yes .....1 No .....2 Don't know.....98	Yes ..... 1 No..... 2 Don't know 98	

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
109	Did (Name) receive a vitamin A capsule from the mass distribution campaign during Baishak? **(Show the Vitamin A capsule.)**	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No.....2 Don't know 98	
110	Was (Name) given any drug for intestinal worms in the last 6 months (including any de-worming)? **(Probe to check for any de-worming drugs given during Vitamin A distribution or other program/campaign.)** **(Show the Tablet.)**	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No.....2 Don't know 98	
111	In the last 7 days, was (Name) given iron syrup?	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No.....2 Don't know 98	
112	Have you ever heard of Vita Mishran or Bal Vita? **(Show Vita Mishran sachet /Bal Vita sachet.)**	Yes .....1 No ..... …2		→ 115
113	In the last 7 days, was (Name) given Vita Mishran or Bal Vita?	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No.....2 Don't know 98	
114	Is Vita Mishran or Bal Vita available (given freely) in this community?	Yes .....1 No .....2 Don't know.....98		→ 116
115	If VitaMishran or Bal Vita were available (given freely) would you want to give it to him/her?	Yes .....1 No 2		
Read aloud: The next several questions are about child measurement and illness.				
116	When was the last time (Name)'s weight was taken by a health professional (including FCHV)?	Month..... ☐☐ Year..... ☐☐☐☐ Don't know.....98 Never.....95	Month ..... ☐☐ Year ..... ☐☐☐☐ Don't know ..... 98 Never 95	
117	When was the last time (Name)'s height was taken by a health professional (including FCHV)?	Month..... ☐☐ Year..... ☐☐☐☐ Don't know.....98 Never.....95	Month ..... ☐☐ Year ..... ☐☐☐☐ Don't know ..... 98 Never 95	
Ask Q.No. 118 only in the case if either weight or height was measured; otherwise, go to Q.No. 119.				
118	Were you told about the child's growth, meaning the increase in weight and/or height the last time it was taken?	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No.....2 Don't know 98	
119	When you compare (Name) with the other children of this village of his/her age, would you say his/her health is not good, average, good or very good?	Not good ..... 1 Average/OK ..... 2 Good ..... 3 Very good ..... 4 Don't know..... 98	Not good.....1 Average/OK.....2 Good.....3 Very good.....4 Don't know 98	

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
120	On a normal day, how is (Name)'s appetite? **(If the child is only breastfeeding, also ask this question related to the appetite for mother's milk.)**	Not good ..... 1 Average/OK ..... 2 Good ..... 3 Very good ..... 4 Don't know..... 98	Not good.....1 Average/OK.....2 Good.....3 Very good.....4 Don't know 98	
121	When (Name) refuses to eat or fusses about eating what do you usually do to get him/her to eat? **(Multiple answers possible. Don't read possible answers.)**	Breastfeed the child..... 1 Beat the child ..... 2 Threaten the child ..... 3 Force the child to eat..... 4 Give other types of food.. 5 Entertain/play with the child..... 6 Caress the child..... 7 Don't do anything different..... 8 Other (Specify)_____ 96	Breastfeed the child .....1 Beat the child.....2 Threaten the child.....3 Force the child to eat.....4 Give other types of food ..5 Entertain/play with the child .....6 Caress the child.....7 Don't do anything different .....8 Other (Specify)_____ 96	
122	When (Name) does not have a good appetite over a few days/weeks (not just once or one day), what do you usually do?	Give sweets..... 1 Give vitamins..... 2 Take to health facility ..... 3 Take to traditional doctor 4 Discuss with the FCHV... 5 Discuss with other mothers ..... 6 Do nothing ..... 7 Child always has an appetite..... 8 Other (Specify)_____96	Give sweets.....1 Give vitamins.....2 Take to health facility .....3 Take to traditional doctor.4 Discuss with the FCHV ...5 Discuss with other mothers .....6 Do nothing.....7 Child always has an appetite .....8 Other (Specify)_____96	
123	Who usually feeds the child semi-solid or solid food?	Nobody, he/she eats alone..... 1 Fed by another child..... 2 Fed by mother ..... 3 Fed by grandmother ..... 4 Fed by another adult..... 5 Fed by servant/maid ..... 6 Does not eat foods yet..... 7	Nobody, he/she eats alone .....1 Fed by another child .....2 Fed by mother.....3 Fed by grandmother.....4 Fed by another adult .....5 Fed by servant/maid.....6 Does not eat foods yet.....7	
124	Has (Name) had diarrhea in the last 2 weeks, meaning loose or watery stools at least 4 times in a 24 hour period?	Yes .....1 No .....2 (Go to 136) ⟵ Don't know.....98	Yes..... 1 No ..... 2 (Go to 136) ⟵ Don't know 98	
125	Was there any blood in the stools?	Yes ..... 1 No ..... 2 Don't know..... 98	Yes.....1 No .....2 Don't know 98	
126	Now I would like to know how much (Name) was given to drink during the diarrhea (including breast milk). Was he/she given less than usual to drink, about the same amount, or more than usual to drink? **(If less, Probe: Was he/she given much less than usual to drink or somewhat less.)**	Much less ..... 1 Somewhat less..... 2 About the same ..... 3 More..... 4 Nothing to drink..... 5 Don't know..... 98	Much less.....1 Somewhat less .....2 About the same .....3 More .....4 Nothing to drink.....5 Don't know 98	

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
127	When (Name) had diarrhea, was he/she given less than usual to eat, about the same amount, more than usual, or nothing to eat? **(If less, Probe: Was he/she given much less than usual or somewhat less.)**	Much less.....1 Somewhat less .....2 About the same .....3 More .....4 Stopped food.....5 Had never given food.....6 Don't know.....98	Much less .....1 Somewhat less.....2 About the same.....3 More.....4 Stopped food .....5 Had never given food .....6 Don't know 98	
128	Did you seek advice or teatment for the diarrhea from any health facility of person?	Yes.....1 No .....2 (Go 132) ←	Yes .....1 No.....2 (Go 132) ←	
129	Where did you seek advice or treatment? **(Probe to identify each type of source. If FCHV not mentioned probe specifically)** **(If unable to determine if public or private sector, write the name of the institution and location.)** _____ **(Name of institution and location)** **(Multiple answers possible. Don't read possible answers.)**	**Government Sector** Govt. Hospital/ Clinic .....11 PHC center.....12 Health Post.....13 Sub-health post .....14 PHC outreach.....15 FCHV .....16 Other Govt. (Specify)_____.....196 **Non-Govt. (NGO) Sector** FPAN.....21 UMN.....22 Other NGO (Specify)_____.....296 **Private Medical Sector** Private hospital/ Clinic/Nursing Home .....31 Pharmacy .....32 Other private medical (Specify)_____.....396 **Other Source** Shop.....41 Traditional Practitioner.....42 Other (Specify)___ 496	**Government Sector** Govt. Hospital/ Clinic.....11 PHC center .....12 Health Post .....13 Sub-health post.....14 PHC outreach .....15 FCHV.....16 Other Govt. (Specify)_____.....196 **Non-Govt. (NGO) Sector** FPAN .....21 UMN .....22 Other NGO (Specify)_____.....296 **Private Medical Sector** Private hospital/ Clinic/Nursing Home.....31 Pharmacy.....32 Other private medical (Specify)_____.....396 **Other Source** Shop .....41 Traditional Practitioner .....42 Other (Specify)___.....496	
130	Check Q.No. 129 and write **(✕)** in appropriate box.	Two or more codes circled ☐ → (Go to 132) Only one code circled ☐ → (Go to 132)	Two or more codes circled ☐ → (Go to 132) Only one code circled ☐ → (Go to 132)	
131	Where did you first seek advice or treatment? **(Use codes from Q.No. 129.)**	First place ..... ☐☐	First place..... ☐☐	

132	Was he/she given any of the following to drink at any time since he/she started having diarrhea: a) A fluid made from a special packet called Jeevan Jal/Navajeevan, orestal? **(Show ORS Packet.)** b) Homemade fluid (e.g. starchyliquids, lentil soup, beansoup, salt sugarwater, etc.)?	**Yes No DK** Fluid from ORS Pkt. .....1 2 98 Homemade fluid.....1 2 98	**Yes No DK** Fluid from ORS Pkt. ..... 1 2 98 Homemade fluid. 1 2 98	
133	Was anything else given to treat the diarrhea? If yes, what was given? **(Multiple answers possible. Don't read possible answers.)**	Pill.....1 Syrup.....2 Injection.....3 Home made medicines.....4 Nothing.....5 (Go to 136) ⟵ Other (Specify) _____..96 Don't know.....98	Pill..... 1 Syrup..... 2 Injection ..... 3 Home made medicines .... 4 Nothing ..... 5 (Go to 136) ⟵ Other (Specify) _____. 96 Don't know..... 98	
134	Was zinc given to treat the diarrhea? **(Show Zinc tablet.)**	Yes.....1 No .....2 (Go to 136) ⟵	Yes ..... 1 No..... 2 (Go to 136) ⟵	
135	Have many days was (Name) given zinc?	Days ..... ☐☐ Don't know.....98	Days ..... ☐☐ Don't know..... 98	
136	Has (Name) been ill with a fever at any time in the last 2 weeks?	Yes.....1 No .....2 Don't know.....98	Yes ..... 1 No..... 2 Don't know..... 98	
137	Has (Name) been ill with a cough at any time in the last 2 weeks?	Yes.....1 No .....2 (Go to 140) ⟵ Don't know.....98	Yes ..... 1 No..... 2 (Go to 140) ⟵ Don't know..... 98	
138	When (Name) was ill with a cough, did he/she breath faster than usual with short, rapid breaths or have difficulty breathing?	Yes.....1 No .....2 (Go to 140) ⟵ Don't know.....98	Yes ..... 1 No..... 2 (Go to 140) ⟵ Don't know..... 98	
139	Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?	Chest only..... 1 Nose only..... 2 Both ..... 3 Other (Specify)____ 96 Don't know.....98	Chest only .....1 Nose only .....2 Both.....3 Other (Specify)____.96 Don't know..... 98	
140	Check Q.No. 136 and Q.No. 137 Had fever or cough? **(If either is yes in Q.No. 136 or Q.No. 137, select yes.)**	Yes.....1 No/ Don't Know.....2 ⟵ (Go to 149)	Yes ..... 1 No/ Don't Know ..... 2 ⟵ (Go to 149)	
141	Now I would like to know how much (Name) was given to drink including breast milkwhen the child had a (fever/cough). Was he/she given less than usual to drink, about the same amount, or more than usual to drink? **(If less, Probe: Was he/she given much less than usual to drink or somewhat less?)**	Much less.....1 Somewhat less .....2 About the same .....3 More .....4 Nothing to drink.....5 Don't know.....8	Much less ..... 1 Somewhat less..... 2 About the same..... 3 More..... 4 Nothing to drink ..... 5 Don't know..... 8	

Q.N.	Question	Index Child Name_____	Non-index Child Name_____	Go to
142	When (Name) had a (fever/cough), was he/she given less than usual to eat, about the same amount, more than usual, or nothing to eat? **(If less, Probe: Was he/she given much less than usual to drink or somewhat less?)**	Much less ..... 1 Somewhat less ..... 2 About the same ..... 3 More ..... 4 Stopped food ..... 5 Had never given food ..... 6 Don't know 98	Much less ..... 1 Somewhat less ..... 2 About the same ..... 3 More ..... 4 Stopped food ..... 5 Had never given food ..... 6 Don't know 98	
143	Did you seek advice or treatment for that illness from any source?	Yes ..... 1 No ..... 2 (Go to 146) ⟵	Yes ..... 1 No ..... 2 (Go to146) ⟵	
144	Where did you seek advice or treatment? **(Probe to identify each type of source. If FCHV not mentioned, probe specifically.)** **(If unable to determine if public or private sector, write the name of the institution and location.)** _____ **(Name of institution and location)** **(Multiple answers possible. Don't read possible answers.)**	**Government Sector** Govt. Hospital/ Clinic ..... 11 PHC center ..... 12 Health post ..... 13 Sub-health post ..... 14 PHC outreach ..... 15 FCHV ..... 16 Other Govt. (Speciy)_____ .... 196 **Non-Govt. (NGO) Sector** FPAN ..... 21 Marie Stopes ..... 22 Other NGO (Specify)_____ ..... 296 **Private Medical Sector** Private hospital/ Clinic/Nursing Home ..... 31 Pharmacy ..... 32 Pharmacy with doctor .. 33 Other private medical (Specify)_____ ..... 396 **Other Source** Shop ..... 41 Traditional Practitioner ..... 42 Other (Specify)___ 96	**Government Sector** Govt. Hospital/ Clinic ..... 11 PHC center ..... 12 Health post ..... 13 Sub-health post ..... 14 PHC outreach ..... 15 FCHV ..... 16 Other Govt. (Speciy)_____ ..... 196 **Non-Govt. (NGO) Sector** FPAN ..... 21 Marie Stopes ..... 22 Other NGO (Specify)_____ ..... 296 **Private Medical Sector** Private hospital/ Clinic/Nursing Home ..... 31 Pharmacy ..... 32 Pharmacy with doctor .. 33 Other private medical (Specify)_____ ..... 396 **Other Source** Shop ..... 41 Traditional Practitioner ..... 42 Other (Specify)___ 96	
Instructions: Check Q.No. 144, if 2 or more codes are circled, ask Q.No. 145, otherwise skip to 146.				
145	Where did you first seek advice or treatment? **(Use letter code from Q.No. 144)**	First place ..... ☐☐	First place ..... ☐☐	
146	At any time during the illness, did (Name) take any drugs for the illness (fever/cough)?	Yes ..... 1 No ..... 2 Don't know 98	Yes ..... 1 No ..... 2 Don't know 98	
Instructions: Check Q.No. 136, if yes, ask Q.No. 147, otherwise skip to Q.No. 149.				

147	When (Name) had a fever, was s/he given any anti-malarial drugs?	Yes ..... 1 No..... 2 (Go to 149) ⟵ Don't know 98	Yes ..... 1 No ..... 2 (Go to 149) ⟵ Don't know..... 98	
148	Were these anti-malarial drugs prescribed by a health professional (doctor, nurse, health worker)?	Yes ..... 1 No..... 2 Don't know 98	Yes .....1 No .....2 Don't know.....98	

Section B: Childcare Arrangements

Read aloud: We now have some questions about your child care arrangements. Please only consider the arrangement you make for the care of the index child (Name).

S.N.	Question	Response	Go to
149	Do you usually work at home or outside the home?	Home ..... 1 → 151 Away from home 2	
150	When you work outside the home, do you take (Name) with you?	Always ..... 1 Usually ..... 2 Sometimes ..... 3 Rarely ..... 4 Never 5	
151	On average, how long per day do you usually leave (Name) for both non-work and work activities? **(If response is <1 hour record in minutes.)**	Minutes ..... 1 ☐☐ Hours ..... 2 ☐☐	
152	When you leave your (Name), do you usually leave him/her with someone else or alone?	Someone else ..... 1 Alone ..... 2 → 201	
153	When you leave (Name) with someone, with whom do you leave your child most often?	**Adult (>12 year)** Relative within the household ..... 1 Relative outside the household ..... 2 Non-relative within the household ..... 3 Non-relative outside the household ..... 4 **Child (<12 year)** Relative within the household ..... 5 Relative outside the household ..... 6 Non-relative within the household ..... 7 Non-relative outside the household ..... 8 Other (Specify)_____ 96	
154	What does this person do to care for (Name) when you are not home? **(Multiple answers possible. Don't read possible answers.)**	Feed the child ..... 1 Give baths to the child ..... 2 Play with the child ..... 3 Watch the child ..... 4 Other (Specify)_____ 96	

Module 2: Infant and Young Child Feeding (IYCF) Practices
Section A: Dietary Recall

Respondent PID: ☐☐

Read aloud: Could you please describe everything that (Name) drank and ate yesterday either in the morning, during the day or at night, whether at home or outside the home?

Instructions: For the next set of questions, please ask the appropriate primary caregiver of the child for the 24 hour period (may not be the mother, if the mother was not primarily involved in feeding the child in the last 24 hours).

Ask the 24 hr diet recall for the nearest typical day. First ask about yesterday, if yesterday is an atypical day (feast, festival, sick child, travel, etc.) proceed to ask about the diet from the day before yesterday. If the day before yesterday is again an atypical day, then asks about the diet from yesterday.

As the respondent recalls foods, note the corresponding food on a sheet of paper. Then, circle '1' in the column next to the food group. Some guidelines are below:

- If the food is not listed in any of the food groups below, write the food in the box labeled 'other foods'.
- If foods are used in small amounts for seasoning or as a condiment, do not include.
- If respondent mentions mixed dishes like a porridge, sauce or stew, probe: What ingredients were in that **(mixed dish)**? probe: "anything else?" until respondent says nothing else. And then write each of the key ingredients into the appropriate rows.

Probe for the entire 24 hour period by asking each of the below questions:

a) Think about when (Name) first woke up yesterday. Did (Name) eat anything at that time?
If no, go to part b
If yes: Please tell me everything (Name) ate at that time.
Probe "anything else?" until respondent says nothing else.

b) Did (Name) eat anything in between breakfast and lunch?
If no go to part c.
If yes: Please tell me everything (Name) ate at that time.
Probe "anything else?" until respondent says nothing else.

c) Did (Name) have anything for lunch?
If no go to part d.
If yes: please tell me everything (Name) ate at that time.
Probe "anything else?" until respondent says nothing else.

d) Did (Name) eat anything in between lunch and afternoon snacks?
If no go to part e.
If yes: please tell me everything (Name) ate at that time.
Probe "anything else?" until respondent says nothing else.

e) Did (Name) have anything for snacks?
If no go to part f.
If yes: please tell me everything (Name) ate at that time.
Probe "anything else?" until respondent says nothing else.

f) Did (Name) have anything in between snacks and dinner?
If no go to part g.
If yes: please tell me everything (Name) ate at that time.

Probe "anything else?" until respondent says nothing else.

g) Did (Name) eat anything at night for dinner?
If no go to part h.
If yes: Please tell me everything (Name) ate at that time. Probe: "anything else?"
Probe "anything else?" until respondent says nothing else.
h) Did (Name) eat anything in between night and early morning?
If yes: Please tell me everything (Name) ate at that time. Probe: "anything else?"
Probe "anything else?" until respondent says nothing else.

Once the respondent finishes recalling foods eaten, read each food group where '1' was not circled, ask the following question and circle '1' if respondent says yes, '2' if no and '98' if don't know:

Yesterday/day before yesterday during the day or night did (name) drink/eat any ____

Instructions: You should finish dietary recall for the index child, and then ask the same set of questions for the other child.

S.N.	Question	Index Child **Name: _____**	Non-index Child **Name: _____**	Go to
201	Was yesterday a special day, like a celebration, feast day, fasting, sickness etc. in which (Name) ate special foods or more or less than usual or did not eat because of fasting?	Yes……1 No……2 ↓ 203	Yes……1 No……2 ↓ 203	
202	Was yesterday a special day, like a celebration, feast day, fasting, sickness etc. in which (Name) ate special foods or more or less than usual or did not eat because of fasting?	Yes……1 **(Ask yesterday's diet)** No…….2 **(Ask day before yesterday's diet)**	Yes……1 **(Ask yesterday's diet)** No…….2 **(Ask day before yesterday's diet)**	

Q.N.	Question	Index Child **Name: _____**			Non-index Child **Name: _____**			Go to
203		Yes	No	DK	Yes	No	DK	
1	Plain water	1	2	98	1	2	98	
2	Juice (Fruit juice)/juice drink	1	2	98	1	2	98	
3	Clear broth	1	2	98	1	2	98	
4	Milk (tinned, powdered, or fresh animal milk) If 7 or more times record '7'	1 No. of times..... ☐	2	98	1 No. of times..... ☐	2	98	
5	Commercial baby food/formula, such as Lactogen, Cerealac, Nestum, Champion, etc. If 7 or more times record '7'	No. of times..... ☐			No. of times..... ☐			
6	Tea, coffee, sugar water, coke, sodas or fizzy drinks	1	2	98	1	2	98	
7	Any other liquids (Specify: _____)	1	2	98	1	2	98	
8	Yogurt If 7 or more times record '7'	No. of times..... ☐			No. of times..... ☐			
9	Rice, roti, bread, bun, etc. and any other food made from grain, millet, wheat, maize, barley, etc.	1	2	98	1	2	98	

Q.N.	Question	Index Child Name: _____			Non-index Child Name: _____			Go to
10	Pumpkin, carrots, sweet potatoes that are yellow or orange on the inside	1	2	98	1	2	98	
11	White potatoes, white yams, colocasia any other foods made from roots	1	2	98	1	2	98	
12	Dark green, leafy vegetables like spinach, amaranth leaves, mustard leaves, clocasia leaves	1	2	98	1	2	98	
13	Ripe papaya, mangoes, or apricot	1	2	98	1	2	98	
14	Other fruits or vegetables (e.g. banana, apple, guava, orange, tomato)	1	2	98	1	2	98	
15	Liver, heart, kidneys, lungs or other organ meats	1	2	98	1	2	98	
16	Meats such as pork, buffalo, lamb, goat	1	2	98	1	2	98	
17	Chicken, duck, pigeon or other poultry	1	2	98	1	2	98	
18	Eggs	1	2	98	1	2	98	
19	Fresh or dried fish or shellfish	1	2	98	1	2	98	
20	Beans, peas, lentils, or nuts	1	2	98	1	2	98	
21	Cheese and other milk items except yogurt (paneer, khuwa etc.)	1	2	98	1	2	98	
22	Nuts and seeds, such as peanuts, cashews, walnuts	1	2	98	1	2	98	
23	Fat (oil, butter, ghee)	1	2	98	1	2	98	
24	Instant noodles	1	2	98	1	2	98	
25	Snack foods, such as biscuits, chips or chanachur, candies, chocolates, or other sweets	1	2	98	1	2	98	
26	Breast milk	1	2	98	1	2	98	
96	Other (Specify) _____	1	2	98	1	2	98	
204	How many times did (Name) eat solid or semisolid foods in this 24 hour period not including drinks? **(Ask this question for the same 24 hour period used in 203. Please don't include liquids consumed. Use probing questions so the respondent remembers all the times the child ate; Don't count liquids, soups or broths, small snacks, or a child having one or two bites of someone else's food; this is to know how many times the child ate to be full.)**	Times ..... ☐☐ Don't know..... 98			Times ..... ☐☐ Don't know 98			
205	Did (Name) drink anything from a bottle with a nipple in this 24 your period? **(Ask this question for the same 24 hour period used in 203.)**	Yes..... 1 No. ..... 2 Don't know..... 98			Yes.....1 No.....2 Don't know 98			

Section B: Child Feeding

Instructions: Ask the following questions for both the index child and the non-index child, if available. You should finish asking all questions for the index child, and then ask the same set of questions for the other child.

Read aloud: Now, I would like us to focus on your child's eating and drinking patterns since birth.

Q.N.	Question	Index Child Name: _____	Non-index Child Name: _____	Go to
206	Circle if the child is less than 24 months old. **(Check the age from Q.No. 101.)**	Yes.....1 No.....2	Yes.....1 No.....2	
207	During the first three days of the child's life, was anything fed to (Name) other than breast milk, including anything placed inside the baby's mouth immediately after the birth?	Yes.....1 No.....2 (Go to 209) ⟵ Don't know.....98	Yes.....1 No.....2 (Go to 209) ⟵ Don't know.....98	
208	What was given to the child by you or anyone else, other than breast milk? **(Multiple answers possible. Don't read possible answers.)**	Honey.....1 Plain water.....2 Sugar/Glucose water.....3 Tea/Infusions.....4 Coffee.....5 Milk (other than breast milk).....6 Infant formula.....7 Fruit juice.....8 Gripe water.....9 Other (Specify)_____ 96 Don't know.....98	Honey.....1 Plain water.....2 Sugar/Glucose water.....3 Tea/Infusions.....4 Coffee.....5 Milk (other than breast milk).....6 Infant formula.....7 Fruit juice.....8 Gripe water.....9 Other (Specify)_____ 96 Don't know.....98	
209	Has (Name) ever been breastfed?	Yes.....1 No.....2 (Go to 216) ⟵ Don't know.....98	Yes.....1 No.....2 (Go to 216) ⟵ Don't know.....98	
210	How soon after birth did you put this child to the breast for the first time? **(Only one set of boxes should be filled in: If 24 hours or less, use hours box. If more than 24 hours, use days box.)**	Immediately/Within an hour.....0 Hours..... 1 ☐☐ Days..... 2 ☐☐ Don't know.....98	Immediately/Within an hour.....0 Hours.....1 ☐☐ Days.....2 ☐☐ Don't know.....98	
211	Did you give the child colostrum, which is the "first yellowish milk"?	Yes.....1 No.....2 Don't know.....98	Yes.....1 No.....2 Don't know.....98	
212	Did you face any difficulties when you first started breastfeeding (Name)?	Yes.....1 No.....2 (Go to 216) ⟵ Don't know.....98	Yes.....1 No.....2 (Go to 216) ⟵ Don't know.....98	

213	What kind of concerns or difficulties did you face when you first started breastfeeding (Name)? **(Multiple answers possible. Don't read possible answers.)**	Problems with breast (Pain) .....1 Child did not suck well ....2 Not enough time to feed child .....3 Cracked nipples .....4 Not enough breast milk ....5 Other (Specify)_____ 96 Don't know .....98 (Go to 216) ⟵	Problems with breast (Pain) .....1 Child did not suck well ....2 Not enough time to feed child .....3 Cracked nipples .....4 Not enough breast milk ....5 Other (Specify)_____ 96 Don't know .....98 (Go to 216) ⟵	
214	Did you seek help from anyone to help address those concerns or difficulties?	Yes .....1 No .....2 (Go to 216) ⟵ Don't know 98	Yes .....1 No .....2 (Go to 216) ⟵ Don't know 98	
215	Where and from whom did you seek help, advice, or treatment for these difficulties? **(Multiple answers possible. Don't read possible answers. Probe for all answers; if FCVH is not mentioned, probe specifically.)**	Doctor .....1 Nurse .....2 Health assistant/AHW .....3 MCHW .....4 VHW .....5 FCHV .....6 Traditional birth attendant .....7 Non-government organization .....8 Pharmacy .....9 Health post/sub-health Post .....10 Traditional healer .....11 Spouse .....12 Mother-in-law……13 Other relatives Neighbors/Friends.....14 Mothers' group .....15 Other (Specify)_____ 96 Don't know.....98	Doctor .....1 Nurse .....2 Health assistant/AHW .....3 MCHW .....4 VHW .....5 FCHV .....6 Traditional birth attendant .....7 Non-government organization .....8 Pharmacy .....9 Health post/sub-health Post .....10 Traditional healer .....11 Spouse .....12 Mother-in-law……13 Other relatives Neighbors/Friends .....14 Mothers' group .....15 Other (Specify)_____ 96 Don't know 98	
216	Are you currently facing any problems in feeding solid or semisolid foods to (Name)? **(E.g. Lito, Mashed family food)**	Yes.....1 No .....2 Have not started to feed foods .....3 Don't know/remember 98 (Go to 222) ⟵	Yes .....1 No .....2 Have not started to feed foods .....3 Don't know/remember 98 (Go to 222) ⟵	
217	What problems do you face feeding solid or semisolid foods to the baby, such as child related, family resources, or family/ community traditions or norms? **(Multiple answers possible. Don't read possible answers.)**	Child refuses or spits out food.....1 Child gets sick .....2 Child has poor appetite ....3 Mother does not have time to prepare/feed .....4 Lack of financial resources .....5 Lack of food.....6 Family members discouraged certain food/practices.....7 Other (Specify)_____96	Child refuses or spits out food .....1 Child gets sick .....2 Child has poor appetite ....3 Mother does not have time to prepare/feed .....4 Lack of financial resources .....5 Lack of food .....6 Family members discouraged certain food/practices .....7 Other (Specify)_____96	

218	Have you sought help from anyone to address these problems?	Yes.....1 No.....2 (Go to 222) ←┤ Don't know.....98	Yes .....1 No.....2 (Go to 222) ←┤ Don't know 98	
219	Where and from whom did you seek help, advice, or treatment for these problems? **(Multiple answers possible. Don't read possible answers. If FCHV is not mentioned probe specifically.)**	Doctor .....1 Nurse .....2 Health assistant/AHW .....3 MCHW .....4 VHW .....5 FCHV .....6 Traditional birth attendant .....7 Non-government organization .....8 Pharmacy .....9 Health post/sub-health Post .....10 Traditional healer.....11 Spouse .....12 Mother-in-law…… ....13 Relative/Neighbors/ Friends .....14 Mothers' group .....15 Other (Specify)_____ 96 Don't know.....98	Doctor .....1 Nurse .....2 Health assistant/AHW .....3 MCHW .....4 VHW .....5 FCHV .....6 Traditional birth attendant .....7 Non-government organization .....8 Pharmacy .....9 Health post/sub-health Post.....10 Traditional healer .....11 Spouse .....12 Mother-in-law…….....13 Relative/Neighbors/ Friends.....14 Mothers' group .....15 Other (Specify)_____ 96 Don't know 98	
220	What did they say/suggest that you should do to help address these problems? **(Multiple answers possible. Don't read possible answers.)**	Try the type of food that the baby likes .....1 Give mashed foods .....2 Stop giving liquids.....3 Continue breastfeeding ....4 Stop breastfeeding .....5 Add fat to food (oil, ghee)6 Start with a small quantity and gradually increase .....7 Increase frequency of meals.....8 Try multiple foods .....9 Give fortified flour……..10 Take to health facility ....11 Other (Specify)_____ 96 Don't know.....98	Try the type of food that the baby likes.....1 Give mashed foods .....2 Stop giving liquids .....3 Continue breastfeeding....4 Stop breastfeeding .....5 Add fat to food (oil, ghee)6 Start with a small quantity and gradually increase.....7 Increase frequency of meals .....8 Try multiple foods.....9 Give fortified flour……..10 Take to health facility....11 Other (Specify)_____ 96 Don't know 98	
221	Did they suggest any commercial baby food/formula such as Lactogen, Cerealac, Champion, Nestum?	Yes.....1 No.....2 Don't know.....98	Yes .....1 No.....2 Don't know 98	
222	Is the child still breastfeeding? **(Check Q.No. 209.)**	Yes..... 1 (Go to 225) ←┘ No..... 2 Never breastfed..... .3 (Go to 227) ←┘	Yes .....1 (Go to 225) ←┘ No.....2 Never breastfed ..... .3 (Go to 227) ←┘	
223	At what age did you stop breastfeeding the child?	Month ..... ☐☐	Month..... ☐☐	

Q.N.	Question	Index Child Name: _____	Non-index Child Name: _____	Go to
224	Why did you stop breastfeeding (Name)? **(Multiple answers possible. Don't read possible answers.)**	Problems with breast (Pain) ..... 1 Child did not suck well . 2 Not enough time to feed child ..... 3 Cracked nipples ..... 4 Not enough breast milk ..... 5 Child already grown up. 6 Mother got pregnant ..... 7 New baby born..... 8 Other (Specify)_____96 (Go to 227) ←	Problems with breast (Pain)..... 1 Child did not suck well. 2 Not enough time to feed child..... 3 Cracked nipples ..... 4 Not enough breast milk ..... 5 Child already grown up 6 Mother got pregnant ..... 7 New baby born ..... 8 Other (Specify)_____96 (Go to 227) ←	
225	Was (Name) breastfed during the last 24 hours?	Yes.....1 No .....2 (Go to 227) ← Don't know.....98	Yes .....1 No.....2 (Go to 227) ← Don't know 98	
226	How many times was (Name) breastfed in the last 24 hours? **(Please include only the number of times when the baby was fully breastfed.)**	Times ..... ☐☐ Don't know.....98	Times..... ☐☐ Don't know 98	
227	Did you receive Bal Samrakshan Anudan for (Name), a child protection cash transfer from the VDC?	Yes.....1 No .....2 (Go to 229) ← Don't know.....98	Yes .....1 No.....2 (Go to 229) ← Don't know 98	
228	What did you spend this money on? **(Multiple answers possible. Don't read possible answers.)**	This child's education.....1 This child's healthcare.....2 Food for this child…….....3 Clothes for this child.....4 Education for others.....5 Healthcare for others……6 Food for others.....7 Clothes for others.....8 Housing ……....9 Savings/didn't spend…...10 Other (Specify)_____96 Don't know……..98	This child's education .....1 This child's healthcare.....2 Food for this child…….....3 Clothes for this child .....4 Education for others... .....5 Healthcare for others……6 Food for others .....7 Clothes for others .....8 Housing ……....9 Savings/didn't spend…...10 Other (Specify)_____96 Don't know……..98	
229	Please tell me at what age you started giving the following liquids and/or foods to (Name). **(If mother fed her child any of the following food before the child was 1 month old, this can be noted as "0" months)**			
1	Plain water, other liquid (e.g., honey, broth, juices)	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	
2	Any other kind of milk except breast milk (e.g., tinned, powdered, or fresh animal milk or dairy products such as yogurt)	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	
3	Semi-solid food (e.g. Lito, Jaulo, Khichadi, etc.)	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	

4	Solid food (e.g. Rice, Roti, Vegetable, etc.)	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	
5	Eggs	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	
6	Animal meats (e.g. chicken, duck, goat, lamb, fish)	Months..... ☐☐ Not given yet 95	Months ..... ☐☐ Not given yet 95	
230	How difficult or easy is it for you to feed the child only breast milk and nothing else (not even small amounts of liquid such as honey, water or broth) for the first 6 months?	Very difficult ..... Difficult ..... Somewhat easy/Somewhat difficult ..... Easy ..... Very easy		
231	In this village, do you think it is possible for moms to feed only breast milk and nothing else (not even small amounts of liquid such as honey, water or broth) for the first 6 months?	Not at all possible ..... Somewhat possible ..... Very possible		

Module 3: Household Food Security and Mother's Dietary Diversity
Section A: Household Food Security

Read aloud: Now we would like some information about your household food security. Please consider the past 30 days only.

S.N.	Question	Response	Go to
301	In the past 30 days did you worry that your household would not have enough food?	Yes ..... 1 No ..... 2 →	303
302	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
303	In the past 30 days were you or any household members not able to eat the kinds of foods you preferred because of a lack of resources?	Yes ..... 1 No ..... 2 →	305
304	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
305	In the past 30 days did you or any household member eat just a few kinds of food day after day because of a lack of resources?	Yes ..... 1 No ..... 2 →	307
306	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
307	In the past 30 days did you or any household member eat food that you did not want to eat instead of other foods because of a lack of resources?	Yes ..... 1 No ..... 2 →	309
308	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
309	In the past 30 days did you or any household member eat a smaller meal than you felt you needed because there was not enough food?	Yes ..... 1 No ..... 2 →	311
310	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
311	In the past 30 days did you or any household member eat fewer meals in a day because there was not enough food?	Yes ..... 1 No ..... 2 →	313
312	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
313	In the past 30 days was there ever no food at all in your household because there were no resources?	Yes ..... 1 No ..... 2 →	315
314	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) ..... 2 Often (>10 times) 3	
315	In the past 30 days did you or any household member go to sleep at night hungry because there was not enough food?	Yes ..... 1 No ..... 2 →	317
316	If "Yes", how often did this happen?	Rarely (1-2 times) ..... 1 Sometimes (3-10 times) 2	

S.N.	Question	Response	Go to
		Often (>10 times) 3	
317	In the past 30 days did you or any household member go a whole day without eating anything because there was not enough food?	Yes ..... 1 No ..... 2 →	319
318	If "Yes", how often did this happen?	Rarely (1-2 times)..... 1 Sometimes (3-10 times)..... 2 Often (>10 times) 3	

<u>Instructions</u>: If the answer to all Q.No. 301-318 is 'No', go to Q.No. 320. If ANY of the answers to Q.No.301-318 were yes, 319 must be asked.

319 To meet household food needs in the last 30 days, did your household have to _____? **(Ask one by one)**

	Yes	No	
1. Take a cash loan	1	2	
2. Take an in-kind loan (e.g. groceries)	1	2	
3. Collect wild food	1	2	
4. Consume seed	1	2	
5. Sell assets	1	2	
6. Sell livestock	1	2	
7. Sell land	1	2	
8. Mortgage assets	1	2	
9. Mortgage livestock	1	2	
10. Mortgage land	1	2	
11. Rely primarily on food given by neighbors/relatives	1	2	
12. Get involved in a food for work/cash for work program	1	2	
13. Get support from NGOs	1	2	
96. Other (Specify)_____	1	2	

Section B: Mothers Dietary Recall

Instructions: Ask the 24 hr diet recall for yesterday, if it was a typical day. If not, ask for the day before. If both were atypical days, proceed to ask about the diet from yesterday. For whichever 24 hr period is recalled, probe the respondent to include all food (meals and snacks) consumed during the morning, day, and night, whether at home or outside the home. Start with the first food eaten after waking up and ask about each time of day probing until there is no further food recalled. This dietary recall section should be done exactly like in the children's 24 hour dietary recall in module 2.

S.N.	Question	Response	Go to
320	Was yesterday a special day, like a celebration or feast day or a fast day where you ate special foods or more or less than usual or did not eat because of fasting?	Yes..... 1 No..... 2 →	322
321	Was the day before yesterday a special day, like a celebration or feast day or a fast day where you ate special foods or more or less than usual or did not eat because of fasting?	Yes.....1 **(Ask questions about yesterday)** ↵ No.....2 **(Ask questions about day before yesterday)** ↵	

Read aloud: I would like to now ask you about what you ate and drank yesterday (or the day before if yesterday was unusual)

S.N.	Question	Response		Go to
322	**Food item**	**Yes**	**No**	
1	CEREALS (e.g. Rice, roti, bread, puffed rice, pressed rice, noodles, or any other foods rice, wheat, maize/corn, or other locally available grains)	1	2	
2	VITAMIN A RICH VEGETABLES AND TUBERS (e.g. Pumpkin, carrots, sweet potatoes that are orange and yellow inside)	1	2	
3	WHITE TUBERS AND ROOTS OR OTHER STARCHY FOODS (e.g. Potatoes, white yams, white sweet potato (not orange inside) or other foods made from roots)	1	2	
4	DARK GREEN LEAFY VEGETABLES (e.g. Spinach, amaranth leaves, mustard leaves, pumpkin leaves, yam leaves, etc.)	1	2	
5	OTHER VEGETABLES (e.g. Cauliflower, cabbage, eggplant, green papaya, radish, onion, etc.)	1	2	
6	VITAMIN A RICH FRUITS (e.g. Ripe mangoes, ripe papaya, apricot, jack fruit etc.)	1	2	
7	OTHER FRUITS (e.g. Tomatoes, Bananas, apples, guavas, oranges, other citrus fruits, pineapple, watermelon, grapes, strawberries, plum, peaches etc.)	1	2	
8	MEAT (e.g. Goat, lamb, buffalo, pork, chicken, duck, or other birds, liver, kidney, heart, lungs etc.)	1	2	
9	EGGS (e.g. Eggs of different birds – chicken, duck, etc.)	1	2	
10	FISH (e.g. Big/small fresh or dried fish or shellfish such as prawn, crab etc.)	1	2	
11	BEANS, PEAS, OR LENTILS (e.g. Soybeans, beans, peas, lentils, other pulses)	1	2	
12	MILK AND MILK PRODUCTS (e.g. Milk, cheese, yogurt, or other milk products)	1	2	
13	NUTS AND SEEDS			
14	OILS AND FATS (e.g. Oil, fats, or butter added to food or used for cooking including ghee)	1	2	
15	SWEETS/SNACK FOODS (e.g. Sugar, honey, rock candy, chocolates, biscuits, cold drinks, chips)	1	2	
16	TEA/COFFEE	1	2	
96	Other (Specify) _____	1	2	

Module 4: Empowerment
Section A: Role in Household Decision-making for Production and Income Generation

Instructions: We are interested in the respondent's roles, access to resources and decision-making. Remind the respondents of that from time to time during this module. Complete 401.1, 401.2 and 401.3 for each activity before moving to the next activity.

Read aloud: Now I would like to ask you some questions about your role in decision-making about income-generating activities in your household. There is no right or wrong answer. Please tell me about your most usual situation.

	401	**401.1**	**401.2**	**401.3**
S.N.	Activities	Did you (singular) participate in _____ in the past 12 months?	How much input did you have in making decisions about _____? **(Code list below)**	How much input did you have in decisions on the use of income generated from _____? **(Code list below)**
1	Food crop farming: crops that are grown primarily for household food consumption	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
2	Cash crop farming: crops that are grown primarily for sale in the market	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
3	Livestock raising	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
4	Poultry (e.g. chicken, duck, pigeon)	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
5	Fishing or fishpond culture	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
6	Non-farm economic activities: Small business, self-employment, buy-and-sell	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
7	Wage and salary employment: in-kind or monetary work, both agriculture and other wage work	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
	Code list for 401.2 01 = No input 02 = Input into very few decisions 03 = Input into some decisions 04 = Input into most decisions 05 = Input into all decisions		**Code list for 401.3** 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 07 = Not applicable/Income not generated	

Section B: Access to Capital

Instructions: The purpose of this module is to get an idea about women's access to and control of capital/assets. First answer 402.1 for all the assets listed from 1-16. Then return to the top of the table and then ask 402.2-402.6 for for only the assets which the household has.

Read aloud: Now we have some questions about your household's access to capital/assets and who in the household has ownership of these resources? When we ask about ownership we mean the person who has the final say over that asset.

Read aloud (before 402.3): When we ask about selling, giving away and renting these are different actions. **Selling** an item means to get rid of the asset in exchange for money. To **give something away** means to let someone permanently have the item free of charge. To **mortgage or rent** out means to temporarily allow someone use of the asset in exchange for a payment or service or some other return. For example, one household member may have the ability to let a friend rent the farm equipment, but not be able to make decisions about whether or not to sell that same item.

	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.

Section C: Access to Credit

Instructions: Please read lending sources one by one completing all questions across the row for one source before proceeding to the next row.

403		403.1	403.2	403.3	403.4
Lending Sources		Has anyone in your household taken any loans or borrowed cash/in-kind from _____ in the past 12 months? Yes, cash..... 1 Yes, in-kind ..... 2 Yes, cash and in-kind ..... 3 No.....4 Don't know ..... 5 } 403.4	Who made the decision to borrow from _____? **(Code list below)**	Who makes the decision about what to do with the money/item borrowed from _____? **(Code list below)**	Did you (singular) want to borrow or get a loan from _____in the last 12 months but did not? Yes..... 1 No 2
1.	Non-governmental organization (NGO)	☐	☐☐	☐☐	☐
2.	Informal lender	☐	☐☐	☐☐	☐
3.	Formal lender (direct credit from bank/financial institution)	☐	☐☐	☐☐	☐
4.	Friends or relatives	☐	☐☐	☐☐	☐
5.	Savings and Credit cooperatives/groups	☐	☐☐	☐☐	☐
6.	Women's groups	☐	☐☐	☐☐	☐

Code list for 403.2 and 403.3

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.

Section D: Access to Agriculture/Livestock/Fisheries Extension Worker

Instructions: Please ensure the respondent understands the difference between an agricultural extension worker and a model farmer.

Read aloud: Now I would like to ask you about your access to agricultural/livestock/fisheries personnel. An extension worker is someone providing agricultural inputs, trainings, etc. related to agricultural and can be either a government or NGO worker. A village model farmer is someone who is not a government employee but is generally affiliated with an NGO project, and helps the community by demonstrating farming techniques on a model farm. A village model farmer may also facilitate trainings, distribute inputs, etc.

S.N.	Question	Response	Go to
404	Have you (yourself) met with any agricultural/livestock/fisheries extension worker (NGO or government) in the past 12 months?	Yes .....1 No .....2 →	407
405	How many times have you met with any agricultural/livestock/fisheries extension worker (NGO or government) in the past 12 months?	Number of visits..... ☐☐	
406	What was the sex of the agricultural/ livestock/fisheries extension worker(s) (NGO or government) with whom you last met?	Male .....1 Female.....2 Both male and female 3	
407	Have you (yourself) met with any village model farmer in the past 12 months?	Yes .....1 No .....2 →	410
408	How many times did you meet with any village model farmer in the past 12 months?	Number of visits..... ☐☐	
409	What was the sex of the village model farmer(s) with whom you last met?	Male .....1 Female.....2 Both male and female 3	

Section E: Individual Leadership and Influence

S.N.	Question	Response	Go to
410	Do you feel comfortable speaking up in public to _____?		
410.1	Help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?	No, not at all comfortable ..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty ..... 3 Yes, mostly comfortable ..... 4 Yes, very comfortable 5	
410.2	Ensure proper payment of wages for public works or other similar programs?	No, not at all comfortable ..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty ..... 3 Yes, mostly comfortable ..... 4 Yes, very comfortable 5	
410.3	Protest the misbehavior of authorities or elected officials?	No, not at all comfortable ..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty ..... 3 Yes, mostly comfortable ..... 4 Yes, very comfortable 5	

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)_____

Section F: Decision-Making

Instructions: Please ensure that the respondent understand these decision making concept by repeating definitions, explaining, and giving example as often as needed. Also, if the household does not take part in the mentioned activity, then write '95' and skip to next activity.

Read aloud: Now I would like some information about decision making in your household. Please remember that when we ask who has the ability to make a decision about something it is the person who has the very important/primary say and not just someone involved in discussions about that topic. We are interested in knowing who has the key role in making decisions.

	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 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
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

Section G: Time Allocation

Read aloud: We are also interested in knowing about how you allocate your time for both work and leisure activities.

S.N.	Question	Response	Go to
413	Was yesterday a typical day?	Yes .....1 → No 2	416
414	Was the day before a typical day?	Yes .....1 → No 2	416
415	If neither yesterday nor the day before were typical days, then why?	Public holiday.....1 Sick.....2 Sick child.....3 Travel or away from home .....4 Visitors .....5 Strike/Bandha.....6 Other (Specify).....96	

Instructions: If yesterday was a typical day ask the respondent about yesterday. If yesterday was atypical, but the day before typical, please ask the respondent to consider the day before's activities. If both days were atypical (answer for both 413 and 414 is "No"), then please ask the respondent to consider yesterday's activities.

Please probe and account for activities by 30 minute time slots to get correct time allocation. Fill the log sheet (blank sheet) with the activities **right from the time the respondent woke-up yesterday morning to the time the respondent went to sleep at night.** First, use a blank sheet of paper to note what was done all day (24 hours including morning, day or night). Add up the number of minutes for each category and then make sure the columns each add up. All activities should add up to a total of 24 hours.

Once you have added up all of the columns, if you do not reach 24 hours or 1440 minutes, please probe until you can fill in the missing minutes.

Read aloud: Please describe all the time you gave to work and leisure activities you engaged in, since the time you woke up yesterday (or day before, where applicable). Please include time for traveling and commuting as part of the time for a given activity.

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 (watching T.V./listening to radio/reading/roaming around/playing/talking on phone)	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
10	Social and religious activities	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
96	Other (Specify) _____	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
	Total Time	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐

S.N.	Question	Response	Go to
417	Regarding the amount of sleep you got last night, was that less than average, average, or more than average?	Less than average..... 1 Average..... 2 More than average 3	
418	How satisfied are you with your available time for leisure activities like visiting neighbors, watching T.V., listening to the radio, seeing movies or participating in sports?	Very satisfied..... 1 Somewhat satisfied ..... 2 Neither satisfied nor unsatisfied..... 3 To some extent unsatisfied ..... 4 Very unsatisfied..... 5 Other (Specify)_____..... 96	

Module 5: Information Access

Instructions: For each source of information (501), first ask regarding "health", followed by "nutrition", and finally "agriculture and home gardening". Complete 501.1, 501.2 and 501.3 before proceeding to the next source of information.

Read aloud: Now we have some questions regarding sources of information. In the last 30 days, please indicate if you have you heard/seen any messages about _____ in any of the following:

S.N.	501	501.1		501.2		501.3	
		Health		Nutrition		Agriculture and Home Gardening	
	Source of information	Yes	No	Yes	No	Yes	No
1.	Newspaper/magazine	1	2	1	2	1	2
2.	Radio/FM	1	2	1	2	1	2
3.	Television	1	2	1	2	1	2
4.	Brochure, leaflet, poster, banner	1	2	1	2	1	2
5.	Billboards	1	2	1	2	1	2
6.	Flipchart	1	2	1	2	1	2
7.	Counseling card	1	2	1	2	1	2
8.	Movie theatre/cinema	1	2	1	2	1	2
9.	Loudspeakers	1	2	1	2	1	2
10.	Community or village gatherings	1	2	1	2	1	2
11.	Church or religious meetings	1	2	1	2	1	2
12.	Mothers' groups	1	2	1	2	1	2
13.	Street drama	1	2	1	2	1	2
14.	Health facility (Hospital, Clinic, Post)	1	2	1	2	1	2
15.	FCHV	1	2	1	2	1	2
16.	Village model farmer	1	2	1	2	1	2

S.N.	Question	Response	Go to
502	Which sources of media do you prefer to receive health and nutrition related messages from? **(Multiple answers possible. Don't read possible answers.)**	Newspaper/magazine ..... 1 Radio/FM ..... 2 Television ..... 3 Brochure, leaflet, poster, banner ..... 4 Billboard ..... 5 Flipchart ..... 6 Counseling card ..... 7 Movie theatre/cinema ..... 8 Loudspeaker ..... 9 Community or village gatherings ..... 10 Church or religious meetings ..... 11 Mothers'groups ..... 12 Street drama ..... 13 Health facility (Hospital, Clinic, Post) ..... 14 FCHV ..... 15 Village model farmer ..... 16 Other (Specify) _____ 96	

Module 6: Maternal Health
Section A: Antenatal Care

Instructions: Here we are interested in the last pregnancy, which resulted in a live birth. This may be different from the mother being pregnant with the index or non-index child. Please ask the mother the name of the child from her last pregnancy in which the child was born, regardless of whether the child is still alive, before asking the questions below. Also please record this child's PID; if the child from the last pregnancy is no longer alive record '91' as the PID and how long the child survived.

Read aloud: Now, I would like some information about your last pregnancy, (including services received before and after delivery).These questions refer to when you were pregnant with (Name).

600.1 PID of child from last pregnancy: ☐☐ **(If '91' record child survival before proceeding to Q.No. 601)**

600.2 No. of days of child survived: ☐☐☐ **days**

S.N.	Question	Response	Go to
601	When you were pregnant with (Name), did you receive antenatal services or counseling?	Yes ..... 1 No ..... 2 → 609	
602	From whom did you receive antenatal services or counseling for your pregnancy with (Name)? **(Multiple answers possible. Don't read possible answers. Probe to get all health personnel consulted. If FCHV is not mentioned, probe specifically.)**	**Health Personnel** Doctor ..... 1 Staff nurse ..... 2 Health assistant/AHW ..... 3 MCH worker ..... 4 Village health worker (VHW) ..... 5 **Other Person** FCHV ..... 6 Trained TBA ..... 7 Untrained TBA ..... 8 Mothers' groups ..... 9 Other (Specify) _____ .. 96	
603	From where did you receive antenatal care/counseling for your pregnancy with (Name)? **Probe to identify types of sources.** **If unable to determine public or private write the name of the health institute and location.** _____ Name of health institute and location **(Multiple answers possible. Don't read possible answers.)**	**Government Sector** Government hospital ..... 11 PHC center ..... 12 Health post ..... 13 Sub-health post ..... 14 PHC out reach ..... 15 Other (Specify)_____196 **Home** Your home ..... 21 Other home ..... 22 **Non-government source** FPAN ..... 31 Marie stops ..... 32 ADRA ..... 33 UMN ..... 34 Other NGO (Specify) _____396 **Private Medical Sector** Private hospital/Clinic/ Nursing home ..... 41 Other private (Specify) _____ 496	

S.N.	Question	Response	Go to
		Other (Specify) _____ ..96	

S.N.	Question	Response	Go to
604	From whom did you receive antenatal services/counseling for the first time when pregnant with (Name)? **(Probe to get health personnel consulted.)**	**Health Personnel** Doctor....1 Staff nurse....2 Health assistant/AHW....3 MCH worker....4 Village health worker (VHW)....5 **Other Person** FCHV....6 Trained TBA....7 Untrained TBA....8 Mother's groups....9 Other (Specify) _____ ..96	
605	How many months pregnant were you when you first received antenatal services from a health worker during pregnancy with (Name)?	Month .... ☐ N/A – Didn't receive service……...0 Don'tknow....98	→ 609
606	During pregnancy with (Name), how many times did you consult any health worker for antenatal services (check-ups)? **(Check antenatal card to confirm.)**	Times .... ☐☐ Don't know....98	
607	Do you have an antenatal card for your pregnancy with (Name)?	Yes, seen it....1 Yes, but unable to see it……2 No, lost it....3 No, kept at the institution....4 No, threw it away....5 No, didn't receive the card……6 Other (Specify) _____ ..96	→ 609
608	(Look at the antenatal card and record the dates of each TT injection listed on the card during pregnancy with (Name)? **(Write down according to card.)**	**Day Month Year** 1.... ☐☐☐☐☐☐☐☐ 2.... ☐☐☐☐☐☐☐☐	
609	How many times did you have a TT injection during the pregnancy of (Name)?	Times .... ☐	
610	When you were pregnant with (Name), did you eat less than usual, about the same amount as usual, or more than usual?	Less than usual....1 Same as usual....2 More than as usual....3 Don't know....98	
611	For how many total days did you fast during your pregnancy with (Name)? **(Write '00' if never.)**	Number of Days .... ☐☐	
612	During your pregnancy with (Name) did you take any iron or folic acid tablets? **(Show tablets.)**	Yes....1 No....2	→ 614
613	During your entire pregnancy with (Name), for how many days did you taken iron/folic tablets?	Days.... ☐☐☐ Don't know....998	
614	During your pregnancy with (Name) did you have	Yes....1	

	more trouble than usual seeing at night or when there is little light?	No ..... 2 Don't know 98	
615	During your pregnancy with (Name) did you take any deworming tablets?	Yes ..... 1 No ..... 2 Don't know 98	

S.N.	Question	Response		Go to
Instructions: Check Q.No. 601 if circle to code '2' do not ask Q.No. 616 and skip to Q.No. 617.				
616	During any antenatal services with (Name), were you counseled on _____?	616.1 Yes = 1 No = 2 Don't know=8 Go to next	616.2 Who did you receive the counselingfrom? **(If not applicable, use 97)** **(Up to 3; rank order of importance to mother)** **1st 2nd 3rd**	
	1. Healthy eating for pregnant women	☐	☐☐ ☐☐ ☐ ☐	
	2. Breastfeeding within 1 hour of birth	☐	☐☐ ☐☐ ☐ ☐	
	3. Exclusively breastfeeding infants until they are 6 month old	☐	☐☐ ☐☐ ☐ ☐	
	4. Feeding infants and young children, other than advice relating to breastfeeding, such as when to start complementary foods, what kinds of foods to give infants and young children	☐	☐☐ ☐☐ ☐ ☐	
	5. The need for pregnant women to get sufficient rest during their pregnancy	☐	☐☐ ☐☐ ☐ ☐	
	Health Personnel 01 = Doctor 02 = Staff Nurse/ANM 03 = Health Assistant/AHW 04 = MCH Worker 05 = VHW	**Other Person** 06 = FCHV 07 = Trained TBA 08 = Untrained TBA 09 = Mother's Groups 96 = Other (Specify) _____		

S.N.	Question	Response	Go to
617	During your last pregnancy did you sleep under a mosquito net during the summer/rainy season?	Yes ..... 1 No ..... 2 Don't know 98	
618	How difficult or easy was it for you take care of yourself during your last pregnancy? **(E.g. Eat well, go for antenatal check up, follow health personnel's advice, get rest.)**	Very difficult ..... 1 Difficult ..... 2 Somewhat difficult/Somewhat easy ..... 3 Easy ..... 4 Very easy 5	
619	In this village, do you think it is possible for pregnant women to take care of their health during pregnancy? **(E.g. Eat well, go for antenatal check up, follow health personnel's advice, get rest)**	Not at all possible ..... 1 Somewhat possible ..... 2 Very possible 3	

Section B: Delivery and Postnatal Care

S.N.	Question	Response	Go to
620	Please show me any official record of (Name)'s birth weight. **(Look at the recorded birth weight, especially from institutional deliveries and record.)**	Kg. ..... ☐ . ☐ No record seen..... 95	
621	When (Name) was born, was he/she very big, bigger then average, average, smaller than average, or very small?	Very big..... 1 Bigger than average..... 2 Average ..... 3 Smaller than average ..... 4 Very small ..... 5 Don't know 98	
622	Who assisted you with the delivery of (Name)? **(Multiple answers possible. Don't read possible answers. Probe for the type(s) of person(s) and record all mentioned. If FCHV is not mentioned probe again. If respondent says no one assisted, probe to determine whether any adult was present at the delivery.)**	**Health Personnel** Doctor..... 1 Nurse/Midwife ..... 2 Health Asst./AHW ..... 3 MCHW..... 4 VHW ..... 5 **Other Person** FCHV ..... 6 Trained TBA ..... 7 Un-trained TBA..... 8 Mothers' group member..... 9 Relative/Friends/Neighor ..... 10 Other (Specify)_____ ...96	
623	Where did you give birth to (Name)? **(If unable to determine public or private write the name of the institution and location.)** _____ **(Name of institute and location)**	**Government Sector** Government Hospital ..... 11 PHC Center ..... 12 Health Post ..... 13 Sub-health Post..... 14 PHC out reach ..... 15 Other government (Specify)_____196 **Home** Own home ..... 21 Others home ..... 22 Outdoors (jungle, field) ..... 23 In transit ..... 24 **Non-government** FPAN..... 31 ADRA ..... 32 UNM ..... 33 Other NGO (Specify) _____396 **Private Medical Sector** Pvt. Hospital/Clinic/Nursing Home.... 41 Other private (Specify)_____496 Other (Specify) _____ .. 96	625 625
624	Did you receive a cash incentive for transportation from the facility after the delivery of (Name)?	Yes ..... 1 No..... 2 Don't know 98	626

S.N.	Question	Response	Go to
625	Why did you not deliver (Name) at a health facility, hospital, or private clinic? **(Multiple answers possible. Don't read possible answers.)**	Cost too much.....1 Facility not open.....2 Too far/no transportation.....3 Don't trust facility/poor quality of service….4 No female provider at facility.....5 Husband/family did not allow .....6 Security concerns .....7 Not necessary .....8 Not customary .....9 Child born before reaching the facility..10 Other (Specify) _____ 96	
626	After (Name) was born, how long did it take before any health worker, checked on the status of your health? **(If less than 1 day record in hours, if more than 7 days, record in weeks. If less than 1 hour, write '00'.)**	Hours.....1 ☐☐ Days..... 2 ☐☐ Weeks.....3 ☐☐ Don't know .....98 Nobody came/examined 96	
627	After (Name) was born, how long did it take before any health worker, checked on the status of child's health? **(If less than 1 day record in hours, if more than 7 days, record in weeks. If less than 1 hour, write '00'.)**	Hours.....1 ☐☐ Days..... 2 ☐☐ Weeks.....3 ☐☐ Don't know .....98 Nobody came/examined 96	
628	How many times did you have a PNC checkup by health workers during the first 7 days after delivery of (Name)?	Times..... ☐☐	
629	At the time of delivery or after the delivery did you receive a visit from the FCHV?	Yes .....1 No.....2 Don't know FCHV.....3 Don't know/remember 98	635
630	How many days after delivery did the FCHV **first** visit? **(Write "00" if the same day.)**	Days..... ☐☐ Don't know/remember 98	
631	Did the FCHV also make a **second** visit over the following days and weeks?	Yes .....1 No.....2 Don't know/remember 98	635
632	How many days after delivery did she make a **second** visit?	Days..... ☐☐ Don't know/remember 98	
633	Did the FCHV make a **third** visit over the following days and weeks?	Yes .....1 No.....2 Don't know/remember 98	635
634	How many days after delivery did she make the **third** visit?	Days..... ☐☐ Don't know/remember 98	
635	In the first 6 weeks after delivery of your last child, did you receive a vitamin A capsule? **(Show Vitamin A Capsules.)**	Yes .....1 No.....2 Don't know 98	

S.N.	Question	Response	Go to
636	When you gave birth to (Name), did anyone help or counsel you about breastfeeding in the first hour of birth?	Yes ..... 1 No ..... 2 Don't know ..... 98 Child didn't survive 94	641
637	Who helped or counseled you with breastfeeding in the first hour of (Name)'s birth? **(Multiple answers possible. Don't read possible answers.)**	**Health Personnel** Doctor ..... 1 Nurse/Midwife ..... 2 Health Asst./AHW ..... 3 MCHW ..... 4 VHW ..... 5 **Other Person** FCHV ..... 6 Trained TBA ..... 7 Un-trained TBA ..... 8 Mothers' group member ..... 9 Relative/Friends/Neighbor ..... 10 Other (Specify)_____ 96	
638	How did they help or counsel you with breastfeeding? Did they show you, assist you, or give you information?	Counseled about breastfeeding ..... 1 Demonstrated ways to breastfed properly ..... 2 Both ..... 3 Other (Specify)_____ . 96	
639	Did they assist you with or show you how to position (Name) for breastfeeding? **(Please probe to exclude if only information was given/discussed and not shown/ demonstrated.)**	Yes ..... 1 No ..... 2 Don't know 98	
640	Did they assist you with or show you how to attach (Name) to the breast? **(Please probe to exclude if only information was given/discussed and not shown/ demonstrated.)**	Yes ..... 1 No ..... 2 Don't know 98	
641	After you delivered (Name) did you take any iron or folic acid tablets? **(Show tablets.)**	Yes ..... 1 No ..... 2 Don't know 98	643
642	After you delivered (Name), for how many days did you take the iron/folic tablets?	Days..... ☐☐ Don't know 98	
643	How many times in the last six months were you visited at home by a health worker/FCHV? **(Write "00" if no health worker/FCHV visited.)**	Number of times..... ☐☐	

Section C: Tobacco and Alcohol

Read aloud: Now I have some questions about your use of tobacco and your products.

S.N.	Question	Response	Go to
644	Do you smoke cigarettes?	Yes ..... 1 No ..... 2 →	646
645.1	How often do you usually smoke cigarettes?	Regularly (4-7 days per week) ..... 1 Often (more than once a week) ..... 2 Sometimes (more than once a month) .. 3 Rarely (less than once a month) 4	
645.2	How many cigarettes do you usually smoke on days that you smoke?	Number of cigarettes ..... ☐☐	
646	Do you use tobacco?	Yes ..... 1 No ..... 2 →	648
647.1	How often do you usually use tobacco, e.g. chew tobacco, smoke houka or smoke from a pipe?	Regularly (4-7 days per week) ..... 1 Often (more than once a week) ..... 2 Sometimes (more than once a month) .. 3 Rarely (less than once a month) 4	
647.2	How many times do you usually use tobacco on days that you use tobacco?	Number of times ..... ☐☐	
648	Do you drink alcohol?	Yes ..... 1 No ..... 2 →	650
649	How often do you drink alcohol?	Regularly (4-7 days per week) ..... 1 Often (more than once a week) ..... 2 Sometimes (more than once a month) .. 3 Rarely (less than once a month) 4	

Section D: Family Planning

Read aloud: Now I would like to ask you some question about reproduction and your spacing and timing of pregnancies.

S.N.	Question	Response	Go to
650	How old are you?	Completed age..... ☐☐	
651	How many times over the course of your life have you become pregnant? **(Note: Please include all pregnancies with an outcome (not current pregnancy) regardless of whether she carried the baby to full term or whether the baby is alive or dead.)**	No. of times..... ☐☐	
652	How old were you when you first became pregnant?	Completed age in years ..... ☐☐	
653	Are you currently pregnant?	Yes ..... 1 No..... 2 Don't know/Not sure..... 98	655
654	How many months pregnant are you?	Completed months..... ☐☐	→ 658
655	Are you currently doing something or using any method to delay or avoid getting pregnant?	Yes ..... 1 No..... 2	→ 658
656	Which methods are you currently using? **(Multiple answers possible. Don't read possible answers.)**	Female Sterilization..... 1 Male Sterilization ..... 2 IUD..... 3 Injectables (e.g. Depoprovera, sangani) 4 Implants..... 5 Pill ..... 6 Condom ..... 7 Female Condom ..... 8 Lactation Amenorrhea Method..... 9 Diaphragm..... 10 Foam Jelly ..... 11 Rhythm Method..... 12 Withdrawal ..... 13 Other (Specify)_____ 96	
657	When did you start continuously using ____ as a method of preventing pregnancy?	**Method 1:** Month .....1 ☐☐ Year..... 2 ☐☐☐☐ Don't know ..... 98 **Method 2:** Month .....1 ☐☐ Year..... 2 ☐☐☐☐ Don't know 98	
658	Have you ever been counseled by any health related professional (including FCHV) about healthy spacing and timing of pregnancy, meaning at what age and how often a woman should get pregnant?	Yes ..... 1 No..... 2	→ 663

S.N.	Question	Response	Go to
659	Who gave you this advice/counseling on healthy spacing and timing of pregnancies? **(Multiple answers possible. Don't read possible answers.)**	**Health Personnel** Doctor ..... 1 Nurse/Midwife ..... 2 Health Asst./AHW ..... 3 MCHW ..... 4 VHW ..... 5 **Other Person** FCHV ..... 6 Trained TBA ..... 7 Un-trained TBA ..... 8 Mothers' group member ..... 9 Other (Specify)_____ 96	
660	When did you receive the counseling? **(Multiple answers possible. Don't read possible answers.)**	Antenatal care visit ..... 1 Postnatal visit ..... 2 Routine visit to clinic ..... 3 FCHV visit ..... 4 Other (Specify)_____ 96	
661	When was the last time you received family planning counseling from an FCHV?	Month ..... 1 ☐☐ Year ..... 2 ☐☐☐☐ Not applicable/never received family planning counseling from FCHV 0	
662	When you received counseling about healthy spacing and timing of pregnancy, did the health related professional (including FCHV) tell you _____:		
	1. For the health of the mother and the baby, it is best to wait at least 24 months (2 years) between each pregnancy.	Yes ..... 1 No 2	
	2. Consider using a family planning method of your choice without interruption for the 24 months (2 years) between pregnancies.	Yes ..... 1 No 2	
	3. It is best for a woman to wait until 20 years of age before trying to become pregnant	Yes ..... 1 No 2	
663	In your opinion, do you think it is possible for women in this village to wait at least 24 months/2years between the end of one pregnancy and the beginning of the next?	Not at all possible ..... 1 Somewhat possible ..... 2 Very possible 3	

Module 7: Infant and Young Child Feeding (IYCF) Knowledge, Attitudes and Perceptions

Read aloud: Now I would like some information regarding your knowledge, attitudes and perceptions on infant and young child feeding.

Instructions: If the respondent indicates that they don't know at what age a child can have a certain food, please probe by reminding the respondent that it is just their best idea. Record in months; if the mother says <1 month of age write in weeks.

S.N.	Question	Response	Go to
701	In your opinion, at what age should a young child be given the following foods? How old should the child be?		
1	Water or other clear liquids such as honey, broth, juices	Months.....1 ☐☐ Weeks..... 2 ☐	
2	Milk or other than breast milk (e.g. tinned, powdered, or fresh animal milk or dairy products, such as yogurt)	Months.....1 ☐☐ Weeks..... 2 ☐	
3	Semi-solid foods (e.g. Lito, Jaulo, Khichadi)	Months.....1 ☐☐ Weeks..... 2 ☐	
4	Solid foods (e.g. Rice, Vegetable, Roti)	Months.....1 ☐☐ Weeks..... 2 ☐	
5	Eggs	Months.....1 ☐☐ Weeks..... 2 ☐	
6	Animal meats (e.g. chicken, duck, goat, lamb, buffalo, wild boar, pig, fish)	Months.....1 ☐☐ Weeks..... 2 ☐	
702	What should a mother do with the "first yellowish milk" or colostrum?	Throw it away.....1 Give it to her baby.....2 Other (Specify) _____ .....96 Don't know..... 98	
703	If a mother thinks she does not have enough breast milk, what should she do? **(Multiple answers possible. Don't read possible answers.)**	Breastfeed more often/frequently.....1 Breastfeed the child on demand .....2 Give other liquids/foods .....3 After emptying one breast, switch to the other.....4 Feed animal milk to the child .....5 Mother needs to drink more water/ liquid .....6 Mother needs to eat more food.....7 Mother needs to eat more nutritious foods.....8 Stop breastfeeding .....9 Other (Specify)_____ .96 Don't know.....98	

S.N.	Question	Response	Go to
704	What are some reasons why a young baby should be exclusively breastfed for the first 6 months? **(Multiple answers possible. Don't read possible answers.)**	Protects baby from illness ..... 1 Helps baby grow better ..... 2 Breast milk contains everything a baby needs for the first 6 months ..... 3 Mother less likely to get pregnant ..... 4 Delays return of mother's monthly bleeding ..... 5 Breast milk is clean, safe, convenient ..... 6 Breast milk is affordable ..... 7 Reduces health care costs ..... 8 No reason ..... 9 Other (Specify) _____ ..... 96 Don't know 98	
705	Why do you think children get malnourished? **(Multiple answers possible. Don't read possible answers.)** **(Explain malnutrition and be sure to include not technical terms for stunting, wasting, etc.)**	Don't eat enough food when provided ..... 1 Don't eat frequently enough ..... 2 Illnesses (diarrhea, infection, etc.) ..... 3 Complementary foods not introduced at 6 months of age ..... 4 Child is not assisted with feeding ..... 5 Food too thin ..... 6 Lack of diverse foods ..... 7 Insufficient quantity of food provided ..... 8 Not given enough breast milk…….. ..... 9 Not given enough animal source foods ..... 10 Poor hygiene and sanitation ..... 11 General poverty ..... 12 Witchcraft ..... 13 Other (Specify)_____ 96	
706	What should you do in relation to feeding for your child to recover from illnesses? **(Multiple answers possible. Don't read possible answers.)**	Feed an extra meal daily ..... 1 ORS ..... 2 Feed less food than usual ..... 3 Feed as much food as usual ..... 4 Feed more food than usual ..... 5 Feed different types of foods ..... 6 Give less liquids than usual ..... 7 Give as much liquid as usual ..... 8 Give more liquids than usual ..... 9 Give different types of liquid than usual ..... 10 Increase frequency of breastfeeding ..... 11 Stop breastfeeding ..... 12 Give safe drinking/treated water ..... 13 Give carrot juice or rice scum ..... 14 Give Zinc tablets ..... 15 Continue breastfeeding ..... 16 Give syrups ..... 17 Give traditional medicine ..... 18 Go to health facility ..... 19 Other (Specify)_____ ..... 96 Don't know 98	708
707	For how long should you feed an extra meal daily?	Number of days ..... ☐☐	

708	Now, I am going to read out some information about feeding a baby. Please tell me if you have EVER heard this information. We are not asking whether you have put this information into practice but we want to know if you have heard this and if so, from which source.				
		Yes	**No**	**Source of Information (Code list below) (Up to 3; rank order of most important source)** 1^{st} 2^{nd} 3^{rd}	
1	Putting a baby to the breast immediately after birth.	1	2	☐☐ ☐☐ ☐☐	
2	Not putting anything into the child's mouth before breast milk or colostrums.	1	2	☐☐ ☐☐ ☐☐	
3	Feeding only breast milk up to six months of age.	1	2	☐☐ ☐☐ ☐☐	
4	Not giving the child any water, other liquids or other foods up to six months of age.	1	2	☐☐ ☐☐ ☐☐	
5	Feeding mashed family food at 6 months.	1	2	☐☐ ☐☐ ☐☐	
6	Feeding eggs, fish, meat(any animal source foods) to children older than 6 months.	1	2	☐☐ ☐☐ ☐☐	
7	Washing hands with water and soap before feeding the child.	1	2	☐☐ ☐☐ ☐☐	
8	How to feed a child when he/she is sick.	1	2	☐☐ ☐☐ ☐☐	
	Code list for 707 01 = Doctor 02 = Nurse 03 = Health Assistant/ AHW 04 = ANM 05 = MCHW 06 = VHW 07 = FCHV 08 = TBA 09 = Mother's group 10 = NGO 11 = Pharmacy 12 = Communication Medium (Radio, T.V.) 13 = Newspaper, leaflet, poster 14 = Spouse 15 = Mother in law 16 = Other relative 17 = Friend/Neighbour 96 = Other (Specify)_____				
709	In your opinion, how difficult or easy would it be to feed a child semisolid or solid foods, i.e. complementary foods, at 6 months of age?	Very difficult.....1 Difficult.....2 Somewhat easy/Somewhat difficult.....3 Easy.....4 Very easy.....5			
710	In your opinion, in this village, do you think it is possible for moms to feed their children semisolid or solid foods, i.e. complementary foods, at 6 months of age?	Not all possible.....1 Somewhat possible.....2 Very possible.....3			

Module 8: Water, Sanitation and Hygiene
Section A: Water

S.N.	Question	Response	Go to
801	What is the main source of drinking water for members of your household?	**Piped Water** Piped in to dwelling ..... 11 Piped to yard/plot ..... 12 Public tap/standpipe ..... 13 Tube Well or Borehole ..... 21 **Dug Well** Protected well ..... 31 Unprotected well ..... 32 **Water from Spring** Protected spring ..... 41 Unprotected spring ..... 42 Rain Water ..... 51 Tanker truck ..... 61 Surface Water (river/dam/lake/pond/ stream/canal/irrigation channels) ..... 71 Stone tap/dhara ..... 81 Bottled water ..... 91 Other (Specify) _____ 96	→ 803
802	How long does it take to go to the drinking water source, get water, and come back? **(Confirm this includes time to go fetch water and return.)**	Number of minutes ..... ☐☐ Within HH Compound 0	
803	Do you use the main drinking water source all year or only part of the year?	Only in the dry season ..... 1 Only in the rainy season ..... 2 All year round 3	
804	Who usually goes to this source to fetch the water for your household?	Adult woman from the household ..... 1 Adult male from the household ..... 2 Female child from the household (<15yrs) ..... 3 Male child from the household (<15yrs) ..... 4 Other (Specify) _____ .96	
805	Do you treat your water before drinking it to make it safe?	Yes ..... 1 No 2	→ 809
806	How do you usually treat your water before drinking it to make it safe? **(Multiple answers possible. Don't read possible answers.)**	Let it stand and settle/sedimentation... 1 Strain it through cloth ..... 2 Boil it ..... 3 Add bleach/chlorine ..... 4 Use a water filter (ceramic, sand, and composite) ..... 5 Solar disinfection (Sodis method) ..... 6 Other (Specify) _____ 96	
807	Who usually drinks the treated water?	Adults only ..... 1 Children only ..... 2 All family members 3	
808	How often do children of this household drink treated water?	All the time ..... 1 Most of the time 2	

S.N.	Question	Response	Go to
		Sometimes ..... 3 Never 4	

Section B: Sanitation

S.N.	Question	Response	Go to
809	Do your household members usually use a toilet facility?	Yes ..... 1 No 2	
810	Do you have a toilet facility in the household?	Yes ..... 1 No 2	
811	Do you have a shared toilet facility in your village?	Yes ..... 1 No 2	
812	Where do young children (under 5 years) in your household usually go for defecation? **(Multiple answers possible. Don't read possible answers. If there are multiple children in the household with very different ages.)**	Own toilet ..... 1 Neighbor's toilet ..... 2 Outdoor near the house ..... 3 Open field ..... 4 River/pool ..... 5 Bush/Jungle ..... 6 Diaper ..... 7 Other (Specify)_____ .. 96	814
813	What do you usually do to dispose of a young child's (<5 years) stools?	Drop in the toilet ..... 1 Rinse/wash away in open area ..... 2 Rinse/wash away in drainage system ... 3 Use for compost (cross-check with observation) ..... 4 Throw in the yard/compound ..... 5 Bury it ..... 6 Nothing 7	

Section C: Hygiene

S.N.	Question	Response	Go to
814	Where do you dispose of household waste? **(Multiple answers possible. Don't read possible answers.)**	Garbage Pit ..... 1 In the kitchen garden ..... 2 Thrown out indiscriminately ..... 3 On the street ..... 4 Open space ..... 5 Composting ..... 6 Other (Specify)_____ 96	
815	What are some ways to protect a child from getting worms? **(Multiple answers possible. Don't read possible answers.)**	Wash the child's hands ..... 1 Wash own hands before preparing food ..... 2 Wash own hands before feeding child ..... 3 Wash fruits and vegetables ..... 4 Cut nails ..... 5 Children should wear pants ..... 6 Children should wear sandals ..... 7 Give children treated water ..... 8 Give child sweets/chocolate ..... 9 Give deworming tablets ..... 10 Other (Specify)_____ ..... 96 Don't know 98	
816	Could you please show me where household members most often wash their hands? **(Check and observe location.)**	Inside/near indoor toilet ..... 1 Inside/near kitchen/cooking place ..... 2 Indoors elsewhere ..... 3 Outdoors in the yard/compound ..... 4 Outdoors out of the yard/compouond ..... 5 No specific place/various places ..... 6 Don't want to show/NA ..... 7 →	819
817	(Check if at the area identified for hand washing water is accessible easily.)	Yes ..... 1 No 2	
818	(Check if at the area identified for hand washing there is soap/ash available.)	Yes, soap ..... 1 Yes, ash ..... 2 Both ..... 3 Nothing 4	
819	Would you show me exactly what you do when you usually wash your hands? **(Try to get her to go to the hand washing spot so you can observe the actual practice.)**	Yes ..... 1 No ..... 2 →	821
820	(Record all the steps the mother shows you that she does to wash her hands.) **(Please circle all that apply.)**	Uses running water ..... 1 Uses clean water including from a pot ..... 2 Uses soap/ash ..... 3 Rubs hands together only once ..... 4 Rubs hands together at least 3 times ..... 5 Washes both hands ..... 6 Dries hands hygenically, by air or by using a clean cloth 7	822

821	Could you please explain the steps you follow to wash your hands? **(Please circle all that apply.)**	Uses running water ..... 1 Uses clean water including from a pot.. 2 Uses soap/ash ..... 3 Rubs hands together only once ..... 4 Rubs both hands together at least 3 times ..... 5 Washes both hands ..... 6 Dries hands hygenically, by air or by using a clean cloth 7		
822	Do you have soap? If yes, could you please show it to me?	Yes, soap seen ..... 1 Yes, but soap not seen ..... 2 No ..... 3 →		824
823	What did you use soap for yesterday? **(Multiple answers possible. Don't read possible answers.)**	Washing clothes ..... 1 Washing own body ..... 2 Washing child's body/bottom ..... 3 Wahsing hands after defecating ..... 4 Washing hands after cleaning child ..... 5 Washing hands before feeding a child.. 6 Washing hands before cooking ..... 7 Washing hands before eating ..... 8 Washing hands after eating ..... 9 Washing child's hands before eating .. 10 Washing child's hands after eating ..... 11 Didn't use soap yesterday ..... 12 Other (Specify)_____ ... 96		
824	When do you usually wash your hands? **(Ask the mother about her daily activities and record all the responses. Do not read the list.)**	**824.1** Yes ..... 1 824.2 → Not Mentioned..... 2	**824.2** **How often do you wash your hands _____ ?** Every time = 1 Most of the times = 2 Sometimes = 3 Rarely = 4	
	1. After defecation	☐	☐	
	2. After cleaning a young child's bottom	☐	☐	
	3. Before cooking/preparing food	☐	☐	
	4. Before eating	☐	☐	
	5. Before feeding children	☐	☐	
	6. After cooking/eating	☐	☐	
	7. After feeding children	☐	☐	
	8. After cleaning the house/compound	☐	☐	
	9. After disposing garbage	☐	☐	
	10. Before picking up the child	☐	☐	

Time of interview completed: Hours ☐☐ Minutes ☐☐

Module 9: Anthropometry and Hemoglobin

Section A: Mother's Weight, Height, and Hemoglobin Measurements

901. Mother's PID ☐☐

902. Name: _____

903. Date of birth: ☐☐ ☐☐ ☐☐☐☐
MM DD YY

904. Age: ☐☐ (Write the completed age)

905. Weight: ☐☐.☐ (k.g.)

906. Height: ☐☐☐.☐ c.m. (1st reading)
☐☐.☐ c.m. (2nd reading)

907. MUAC: ☐☐.☐ c.m.(1st reading)
☐☐.☐ c.m. (2nd reading)

908. Hemoglobin: ☐☐.☐ g/dl

909. Altitude (Meter): ☐☐☐☐

S.N.	Question	Response	Go to
910	Are you currently pregnant? **(Please conform with Q. 653)**	Yes.....1 No .....2 Don't know.....98	→ 912
911	Are you currently postpartum? **(Delivered a baby within the past weeks.)**	Yes.....1 No 2	
912	(Result of Anthropometric measurement)	Measured .....1 Refused .....2 Other (Specify) _____96	
913	(Result of Hemoglobin test)	Measured .....1 Refused .....2 Other (Specify) _____96	

Section B: Children's Anthropometric Measurements

Instructions: Please collect weight and height information for all children 0-59 months in the household. If the child is <24 months measure the length; otherwise measure the height. For MUAC, collect for all household children 6-59 months.

					Weight and height of children 0-59 months			MUAC of children 6-59 months		Measured length/ height	Result for measurement
PID	Name	(Copy information from Q.No. 101) Date of Birth DD MM YY	Age in complete d months	Sex Male= 1 Female=2	Weight (Kg.)	Height (First reading) (c.m.)	Height (Second reading) (c.m.)	MUAC (First reading) (c.m.)	MUAC (Second reading) (c.m.)	Length=1 Height=2	Measured=1 Refused=2 Not present=3 Other (Specify) _________96
		__/___/___									
		__/___/___									
		__/___/___									
		__/___/___									
		__/___/___									
		__/___/___									
		__/___/___									

Section C: Children's Hemoglobin Measurements (index child and non-index child)

Instructions: Please collect this information only for the index and non-index children and only those aged 6-59 months.

Hemoglobin:

Date	Month	Year
☐☐	☐☐	2069

Child's PID	Name	Hemoglobin measurement (g/dl)	Result Measured=1 Refused=2 Not present=3 Other (Specify)_____96
☐☐	_____	☐☐.☐	☐
☐☐	_____	☐☐.☐	☐

Respondent PID No.: ☐☐

Module 10: Grandmother's Perspective on Maternal and Child Health and Nutrition

Respondent: Grandmother of the Index Child

S.N.	Question	Response	Go to
1001	When a woman is pregnant, should she eat less than usual, about the same amount as usual, or more than usual?	Less than usual ..... 1 Same as usual ..... 2 More than as usual..... 3	
1002	What are the main things a pregnant woman should do for a safe and healthy pregnancy and delivery? **(Multiple responses allowed.)**	Consult health workers……..……1 Take vitamin and minerals……2 Tetanus injections……..3 Deliver in a hospital/clinic……4 Eat more foods…….……5 Eat nutritious foods ..... 6 Rest more……..7 Other (Specify) _____ 96	
1003	How long after birth should a baby start breastfeeding?	Immediately..... 1 Within 1 hr ..... 2 More than 1 hr but less than 24 hrs ..... 3 1 day later..... 4 2 days or more later..... 5 Baby should not be breastfed 6	
1004	What should a mother do with the "first yellowish milk" or colostrums?	Throw it away ..... 1 Give it to her baby..... 2 Other (Specify) _____ 96	
1005	When do you believe that you can start giving a young child the following foods? How many months old should the child be?		
	1. Water and other clear liquids (e.g. honey, broth, juices)	Months ..... 1 ☐☐ Weeks..... 2 ☐	
	2. Any other milk except breast milk (e.g. tinned, powdered, or fresh animal milk or dairy products such as yogurt)	Months ..... 1 ☐☐ Weeks..... 2 ☐	
	3. Semi-solid foods (e.g. lito, jaulo, khichadi)	Months ..... 1 ☐☐ Weeks..... 2 ☐	
	4. Solid foods (e.g. rice, vegetable, roti)	Months ..... 1 ☐☐ Weeks..... 2 ☐	
	5. Eggs	Months ..... 1 ☐☐ Weeks..... 2 ☐	
	6. Meat and meat product (e.g. chicken, duck, goat, lamb, buffalo, wild boar, pig, fish)	Months ..... 1 ☐☐ Weeks..... 2 ☐	
1006	Do you agree with the following statements? **(Read choices one by one)**		
	1. For the health of the mother and the baby, it is best to wait at least 24 months/2 years between each pregnancy.	Yes ..... 1 No..... 2	
	2. It is best for a woman to wait until 20 years of age before trying to become pregnant.	Yes ..... 1 No..... 2	

Appendix 4: Questionnaire for Male Respondent

Household No.:☐☐☐☐☐

Suaahara Baseline Survey
Save the Children/IFPRI/New ERA - 2012

Questionnaire for Male Respondent

Informed Consent Form

Namaste! My name is……. I am here from New ERA, a Nepali research organization based in Kathmandu. Together with the International Food Policy Research Institute (IFPRI), Save the Children (SCI), and other organizations, we are collecting data for a research study**.** The information will be used to set up health, nutrition and agriculture/income generation programs in certain communities of Nepal. Your household has been chosen by a random selection process. You are one of over 4,000 households included in this survey and we are also interviewing Female Community Health Volunteers (FCHVs) and other community leaders at the ward level.

During this study, I will ask you questions related to diverse topics including household membership; social assistance; agricultural practices; socio-economic status; and empowerment. We will also need to make some observations of the house and surrounding area and test the iodine content of your household's salt.

We are inviting you to be a participant in this study. We value your opinion and there are no wrong answers to the questions we will be asking in the interview. We will use approximately 2:00 hours of your time to collect all the information. There will be no risk as a result of your participating in the study. Your participation in this research is completely voluntary. You are free to withdraw your consent and discontinue participation in this study at any time.

The information given by you will be strictly treated as confidential and will be used only for the study. Your responses will not be linked with your name/address and will be kept separately in a locked room and will be destroyed once all the data has been collected and analyzed. Finally, if we choose to take any pictures of the survey process, these photos will only be taken with your permission and will be only used for study purposes and your name or address will not be identified with the photo at any point.

Your participation will be highly appreciated. The answers you give will be used for planning health and nutrition related programs and services.

Are you willing to participate in the study?

1. Yes 2. No

Signature of the interviewer: _____ Date: ____/_____/2069

Signature of the witness: _____

Operational Definition of the Study Participant:

Mother: A woman having at least one living child 0-59 completed months of age who was randomly selected as the index-child.

Index child: A child 0-59 completed months of age chosen through random sampling.

Non-Index child: A child 0-23 completed months of age who has the same birth mother and resides in the same household as the index child, but is not a twin/triplet/etc. of the index child.

Male Respondent: Spouse of the sample mother; if not available, another adult male who is responsible for making major household economic decisions.

Grandmother: Mother-in-law of the sample mother/woman; if not available, mother of the sample mother/woman.

Indicators

District (name and number)_____ .....

VDC (name and number)_____ .....

Ward (number)_____ .....

Village/Tole (name)_____..

Cluster (number).....

Region: Mountain = 1, Hill = 2, *Terai* = 3 .....

Household head (name) _____

Respondent (name and PID) _____

Religion of Household Head:.....
Hinduism = 01, Buddhism = 02, Islam = 03, Christianity = 04, Other (Specify)_____ 96

Caste of household head _____(Code list in manual) .....

Interview Visits

	1	2	3	Final Visit
Date	_____/_____/2069 DD MM YY	_____/_____/2069 DD MM YY	_____/_____/2069 DD MM YY	Day Month Year 2 0 6 9
Interviewer's Name	_____	_____	_____	Interviewers code number
Result*				Result*
Next Visit: Date	_____	_____		Total number of Visits
Time	_____	_____		

*Result Codes:
01. Completed
02. Not at home at time of visit
03. Postponed
04. Refused
05. Interview is partially completed
96. Other (Specify) _____

Language of interview** _____

Native language of respondent** _____

Translator (Used =1, Partially used = 2, Not used = 3) .....

** Language Code:Nepali = 01; Bhojpuri = 02, Maithali = 03, Tharu = 04, Tamang = 05, Newari = 06, Mager = 07
Abadhi = 08; Limbu = 9, Other (Specify) _____ = 10

Supervisor	QC	Office Editor	Data Entry
Name: _____	Name: _____		
Date: _____/_____/2069 DD MM YY	Date: _____/_____/2069 DD MM YY		

Table of Contents

Interview start time: **Hour** ☐☐ **Minute** ☐☐ PID No. ☐☐

Module 1: Household Roster

Instructions: Read the definition of the household aloud and make sure the respondent understands that only household members as defined for this survey are included. Complete the list of names first, and then complete 103-105 for each person before asking for the next person. For 106-111 only fill for defined age group of each question. Probe at the end by repeating this survey's definition of household to make sure all have been included and no one extra. For combined income, please ensure it is not double counted. For example if more than one person works on the farm and it is not possible to get income for each individual by that activity, please enter the income from farming under the person who works primarily on the farm and do not include this amount again for any other person who worked on the farm to help make this income. The primary occupation is the activity on which the household member spends most of his/her time. The secondary source is an additional activity/occupation. For example, if a person spends most of the time on salary wage employment that would be primary. But if s/he also looks after the farm or manages the farm or looks after some business, in addition to his/her salaried employment, that would be his/her secondary activity. It could be possible that someone earns more from his/her secondary occupation then his/her primary occupation.

Read aloud: Now we would like information on all persons who usually live in your household. Please tell me the names and surnames of all usual members of your household, starting with the household head.

Member Line Number (Note: Tick all the children <5 yrs. of age and circle the index child with red ink and non-index child with green ink)	**Name**	**Relations** What is the relationship of __ to the household head? **(Code list below)**	**Age** How old is ____? (Completed years for adults and exact date of birth for children <5 years)		**Sex** Is __ male or female? Male = 1 Female=2	**MARITAL STATUS** *(Only for members 10 years and above)* What is __'s present marital status? **(Code list below)**	**SCHOOL** (*Only for members >=**3 years***)		**OCCUPATION** (*Only for members >= **6 years and above***)				**BIOLOGICALPARENTS** (*Only for **children<5 years***)	
			Year (>5 yrs.)	DD/ MM/ YY (<5 yrs.)			Is _____ currently attending school? Yes = 1 No = 2	What is the highest grade/level ____ has completed? **(Code list below)**	What is _____'s main type of occupation? **(Code list below)**	What is the total gross income earned per month from the main occupation? **(Monthly average including cash and in kind)**	What is the secondary type of occupation? **(Code list below)**	What is the total gross income earned per month from the secondary occupation? **(Monthly average including cash and in kind)**	Who is the mother of (name)? **(Write PID from Q.101)** Dead = 91 Alive, not in household=92 Unknown =98	Who is the father of (name)? **(Write PID from Q.101)** Dead = 91 Alive, not in household=92 Unknown=98
101	**102**	**103**	**104a**	**104b**	**105**	**106**	**107**	**108**	**109**	**109a**	**109b**	**109c**	**110**	**111**
1				/ /						Rs. _____		Rs. _____		
2				/ /						Rs. _____		Rs. _____		
3				/ /						Rs. _____		Rs. _____		
4				/ /						Rs. _____		Rs. _____		
5				/ /						Rs. _____		Rs. _____		
6				/ /						Rs. _____		Rs. _____		
7				/ /						Rs. _____		Rs. _____		

Code list for 103
01 = Household head
02 = Spouse
03 = Son/Daughter
04 = Son-in-law/daughter-in-law
05 = Grandon/Granddaughter
06 = Father/Mother
07 = Father-in-law/mother-in-law
08 = Brother/Sister
09 = Brother-in-law/Sister-in-law
10 = Uncle/Aunt
11 = Nephew/Niece
12 = Grandfather/Grandmother
13 = Other relative
14 = Fostered/ Adopted child
15 = Co-wife
16 = Not related
17 = Not related but household employee

Code list for 106:
01 = Never marrid
02 = Currently married
03 = Widowed
04 = Divorced
05 = Separated

Code list for108
0 = Started school, but not competed grade 1
1-10 = Class 1-10 completd
11 = Complete class 12/ Certificate
12 = Bachelors
13 = Master
14 = Ph.D.
15 = Non-formal education
16 = Technical/ Vocational
94 = Pre-primary
98 = Does not know
99 = Never attended school

Code list for109-109b
0 = Doesn't have secondary job
01 = Agriculture/Livestock/Poultry/ Aquaculture
02 = Wage employment
03 = Salaried worker
04 = Self-employment/business
05 = Piece worker
06 = Trader/Echange of goods
07 = Non-earning occupation (e.g., housewife/FCHV)
08 = Student
09= Retired
10= Too sick or physically challenged
11 = Not working but looking for work
12 = Not working and not looking work
96 = Other (Specify) _____

Module 2: Household Economics
Section A: Socioeconomic Status

Read aloud: Now we have some questions about your housing and assets. Please be reassured that we will not share this information with anyone as it will be treated as confidential.

S.N.	Question	Response	Go to
201	Does your household (i.e., you or members of your household) own the house you live in, use it for free, or rent it?	Own the house .....1 → 203 Rental property .....2 Free/provided housing .....3 → 203 Other (Specify) _____96	
202	How much rent is your household charged for your housing? How often?	(Amount in Nepalese Rupees) ☐☐☐☐☐☐ Daily .....1 Weekly.....2 Bi-weekly.....3 Monthly .....4 Bi-Monthly .....5 Annually .....6 Other (Specify) _____96	
203	How many bedrooms does your house have? **(Please also include any bedrooms outside the main dwelling.)**	Number of Bedrooms .....☐☐	
204	Does your household have electricity?	Yes.....1 No 2	
205	What is your household's main source of energy for lighting?	Kerosene/paraffin/ gas/oil lamp.....1 Candles .....2 Electricity.....3 Diesel.....4 Open fire.....5 Torch.....6 Solar panel .....7 Other (Specify) _____96	
206	What is your main source of energy for cooking?	Electricity.....1 Liquefied propane gas.....2 Natural gas.....3 Biogas .....4 Firewood.....5 Kerosene .....6 Charcoal/coal/lignite.....7 Dust/Straw .....8 Animal Dung .....9 Dried leaves/straw/shrub.....10 Agricultural crop.....11 Other (Specify) _____96	

Instructions: Read each asset one by one. Ifthehousehold does nothaveanyofthatasset, please record '00'. Please do not count any devices more than one time even if this device has multiple funcitions (e.g., television also used as radio).

Read aloud: Now I would like to ask you some information regarding specific assets you may own in your household.

	207	207.1
	Asset	How many _____ does your household own?
1	Stove/Gas burner	☐☐
2	Refrigerator	☐☐
3	Bed with frame	☐☐
4	Sofa	☐☐
5	Armoire/Cupboard/Cabinet	☐☐
6	Table/chair	☐☐
7	Electric Fan	☐☐
8	Radio	☐☐
9	Audio cassette/CD player	☐☐
10	Television	☐☐
11	DVD player	☐☐
12	Wall clock/watch	☐☐
13	Handloom for weaving	☐☐
14	Sewing machine	☐☐
15	Bicycle	☐☐
16	Cycle rickshaw	☐☐
17	Van (tricycle van)	☐☐
18	Boat/Canoe	☐☐
19	Motorcycle/Scooter	☐☐
20	Mobile Phone	☐☐
21	Landline Phone	☐☐
22	Computer	☐☐
23	Small agricultural tools - (Ex: Saw/Hammer/Hoe/Spade/Axe/ Shovel/Sickle/Harrower/Rake)	☐☐
24	Fishing net	☐☐
25	Solar energy panel	☐☐
26	Electricity Generator	☐☐
27	Reaper/Harvester	☐☐
28	Harrower/weeding machine	☐☐
29	Machine sprayer (e.g. fertilizer, chemical, pesticide)	☐☐
30	Wheelbarrow	☐☐
31	Bullock cart/Horse cart	☐☐
32	Push cart	☐☐

33	Tractor	☐☐
34	Power Tiller/ Small tractor (with steering)	☐☐
35	Trolley/Trailer	☐☐
36	Thresher	☐☐
37	Fodder cutting machine	☐☐
38	Swing basket	☐☐
39	Hand tube well/Rower pump	☐☐
40	Manual wooden thresher/Treadle pump (for irrigation)	☐☐
41	Low lift pump (LLP) for irrigation (Machine pumping from surface water)	☐☐
42	Shallow tube well/Diesel motor pump	☐☐
43	Deep tube well/Electric motor pump	☐☐
44	Spraying machine for water	☐☐
45	Carpentry equipment	☐☐
46	Pottery wheel	☐☐
47	Blacksmith tools	☐☐
48	Spinning wheel	☐☐
49	Manual wooden thresher/Treadle pump (for food processing)	☐☐
50	Manual flour mill	☐☐
51	Value of savings (bank saving, cash at home, etc.)	Rs. _____
96	Other (Specify) _____	☐☐

Section B: Remittances

Instructions: Use PIDs 81-89 for remitters who have migrated but were household members at one point. Use PIDs 91-99 for remitters who were never household members.

Remittances In

S.N.	Question	Response	Go to
208	During the past 12 months, have you or any household member received any money from any person not living in your household at the time of sending?	Yes ..... 1 No ..... 2 →	210

	209	209.1	209.2	209.3	209.4	209.5
S. No.	Sender PID	What is the relationship of the remitter to the household head? **(Code list below)**	Where did the remitter live when sending the money? In Nepal=1 Outside Nepal=2	In the past 12 months how much in total remittance has the household received from _____?	Which expenditure, savings, and investment activity would have been **CUT** had the remittance from this source not been received? **(Up to 3 answers; code list below)** **1st 2nd 3rd**	Did the person who sent the money put any condition on items the money was to be spent on? Yes = 1 No = 2
1	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
2	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
3	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
4	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
5	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
6	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
7	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
8	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
9	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐
10	☐☐	☐☐	☐	Rs. _____	☐☐ ☐☐ ☐☐	☐☐

Code list for 209.1

01 = Household Head
02 = Spouse
03 = Son/Daughter
04 = Son-in-law/daughter-in-law
05 = Grandon/Granddauther
06 = Father/Mother
07 = Father-in-law/mother-in-law
08 = Brother/Sister
09 = Brother-in-law/Sister-in-law
10 = Uncle/Aunt
11 = Nephew/Niece
12 = Grandfather/Grandmother
13 = Other relative
14 = Fostered/ Adopted child
15 = Co-wife
16 = Not related
17 = Not related but household employee
98 = Does not know

Code list for 209.4

01 = Savings
02 = Education
03 = Health (Hospital/Doctor/Medicine)
04 = Consumption (food, clothes)
05 = Build/renovate house
06 = Purchase land
07 = Purchase transpiration (bike, car, etc.)
08 = Purchase consumer durables
09 = Investment in agriculture or business
10 = Purchase of gold and other jewelry
11 = Livestock purchase
12 = Pay off loan/debt
13 = Social ritual
14 = No Effect
96 = Other (Specify) _____

Remittances Out

S.No.	Question	Response	Go to
210	During the past 12 months, did you or any member of your household send money to someone who did not live in your household at the time of sending?	Yes .....1 No .....2 →	212

	211	211.1	211.2	211.3
S.No.	Recipient PID	What is the relationship of the recipient to the household head? **(Code list below)**	Where did the remitter live when the remittance was sent? In Nepal=1 Outside Nepal=2	In the past 12 months, how much in total remittances has the household sent out to ____?
1	☐☐	☐☐	☐	Rs. _____
2	☐☐	☐☐	☐	Rs. _____
3	☐☐	☐☐	☐	Rs. _____
4	☐☐	☐☐	☐	Rs. _____
5	☐☐	☐☐	☐	Rs. _____
6	☐☐	☐☐	☐	Rs. _____
7	☐☐	☐☐	☐	Rs. _____
8	☐☐	☐☐	☐	Rs. _____
9	☐☐	☐☐	☐	Rs. _____
10	☐☐	☐☐	☐	Rs. _____

Code list for 211.1

01 = Household Head
02 = Spouse
03 = Son/Daughter
04 = Son-in-law/daughter-in-law
05 = Grandon/Granddauther
06 = Father/Mother
07 = Father-in-law/mother-in-law
08 = Brother/Sister
09 = Brother-in-law/Sister-in-law
10 = Uncle/Aunt
11 = Nephew/Niece
12 = Grandfather/Grandmother
13 = Other relative
14 = Fostered/ Adopted child
15 = Co-wife
16 = Not related
17 = Not related but household employee
98 = Does not know

Section C: Economic Events

Instructions: The recall period for this module is 12 months; please remind the respondent as necessary.

Read aloud: Sometimes unexpected events happen that can have an impact on a household's standard of living. These can be positive or negative events. In the past 12 months has any event happened that might have had an effect on your household positively or negatively? I will now ask you about different types of such events, one by one. Please tell me only about events from the last 12 months.

	212	212.1	212.2	212.3	212.4			212.5
S.N.	Economic Event	In the past 12 months, was your household affected by _____? Yes = 1 No = 2 → **Go to next event**	How many months ago did this occur for the last time? **(Number of months; If lessthan one month write '00')**	What was the impact of this on the household's economic situation? No effect = 1 → **Go to next event** Small negative effect = 2 Large negative effect = 3 Small positive effect = 4 → **Go to next event** Large positive effect = 5 → **Go to next event**	Which strategy did the household select to face this event? **(Multiple answers allowed; Up to 3)** **1st**	**2nd**	**3rd**	Did the household economically recover? Yes = 1 No = 2
1.	New regular job for any household member	☐	☐☐	☐				
2.	New or increased remittances	☐	☐☐	☐				
3.	Inheritance	☐	☐☐	☐				
4.	Large gift/lottery winnings	☐	☐☐	☐				
5.	Receipt of dowry	☐	☐☐	☐				
6.	Gain from business activities	☐	☐☐	☐				
7	Profits from agriculture related activities (e.g. bumper harvest, more income due to better prices)	☐	☐☐	☐				

8.	Scholarship (stipend for child's education)	☐	☐☐	☐				
9.	Assistance from NGOs	☐	☐☐	☐				
10.	Death of an income earning household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
11.	Death of another household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
12.	Accident/injury of any household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
13.	Short term illness (<3 months) of any household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
14.	Chronic/long term illness (> 3 months) of income earning household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
15.	Chronic/long term illness (>3 months) of another household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
16.	Loss of employment of any household member	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
17.	Business failure	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
18.	Damage to house/dwelling or any productive assets (e.g. theft, fire, landslide, heavy rains)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
19.	Loss of crop (e.g. flooding, drought)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
20.	Loss of crop (e.g. plant disease, insects, animals)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
21.	Loss of storage crop (e.g. damage, theft)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
22.	Loss of cattle/large livestock (e.g. theft/death/disease)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐

23.	Loss of small livestock/poultry/aquaculture (e.g. theft/death/disease)	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
24.	Conflict, dispute, legal problems	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
25.	Civil conflict/war/political unrest	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
26.	Marriage including giving dowry	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
27.	Divorce	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
28.	New birth	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
29.	Other 1 (Specify)_____	☐	☐☐	☐	☐☐	☐☐	☐☐	☐
30.	Other 2 (Specify)_____	☐	☐☐	☐	☐☐	☐☐	☐☐	☐

Code list for 212.4

01 = Did not do anything
02 = Sold land
03 = Mortgaged/leased land
04 = Sold productive assets
05 = Mortgaged/leased productive assets
06 = Sold consumption assets
07 = Mortgaged/leased consumption assets
08 = Borrowed from NGO or other organization
09 = Borrowed from money lender
10 = Reduced food consumption
11 = Consumed lower quality food
12 = Moved to lower cost housing
13 = Removed children from school
14 = Migrated to find temporary work
15 = Migrated to find permanent work
16 = Engaged in other/additional/different revenue-generating activities
17 = Additional household members forced to work
18 = Received help from family or others
96 = Other (Specify) _____

Module 3: Social Assistance

Read aloud: I am now going to ask you if, in the last 12 months, any member of your household received any type of assistance/aid, whether the assistance/aid is still being received, and who provides the assistance/aid.

S.No.	301 Item Categories	301.1 In the last 12 months has any member in yourhousehold received_____? Yes ……1 No ……..2 → **Go to next item**	301.2 What is/was the source of this assistance? **(Up to 3, rank order of importance)** **(Code list below)** **1st 2nd 3rd**
1	Monthly/regular food rations	☐	☐☐☐☐☐☐
2	One time/sporadic/periodic food assistance	☐	☐☐☐☐☐☐
3	Specialized foods for individuals (e.g. children, sick people, pregnant or lactating women)	☐	☐☐☐☐☐☐
4	School feeding program (take home or in school)	☐	☐☐☐☐☐☐
5	Cash transfer other than Bal Samrakshan/Anudan	☐	☐☐☐☐☐☐
6	Water purification (e.g., filters, chlorine)	☐	☐☐☐☐☐☐
7	Seeds	☐	☐☐☐☐☐☐
8	Fertilizer (e.g., chemical, organic)	☐	☐☐☐☐☐☐
9	Agricultural tools	☐	☐☐☐☐☐☐
10	Agricultural inputs other than seeds, fertilizer or agricultural tools	☐	☐☐☐☐☐☐
11	Animals (e.g. livestock/poultry/fish)	☐	☐☐☐☐☐☐
12	Inputs for care of animals (e.g. fodder, medicine, shelter)	☐	☐☐☐☐☐☐
13	Mosquito nets	☐	☐☐☐☐☐☐
14	Medicine other than mass distribution	☐	☐☐☐☐☐☐
15	Housing	☐	☐☐☐☐☐☐
16	Clothes/shoes	☐	☐☐☐☐☐☐
17	Vocational training	☐	☐☐☐☐☐☐
18	Food for work programs	☐	☐☐☐☐☐☐
19	Cash for work programs	☐	☐☐☐☐☐☐
20	Educational assistance/Scholarship for study or training	☐	☐☐☐☐☐☐
21	Workman's compensation	☐	☐☐☐☐☐☐
96	Other (Specify)_____	☐	☐☐☐☐☐☐

Code list for 301.2

01 = Government
02 = NGO/INGO
03 = Community group
04 = Self help group
05 = Religious institution
06 = Business community
07 = Political party
08 = Relative
09 = Mothers' group
10 = Non-household member
96 = Other (Specify)_____

Module 4: Agricultural Practices and Use of Land
Section A: Land Use

Instructions: Probe for and list all the land under 401.2 first. Then complete questions 401.3-401.9 for each piece of land before proceeding to the next piece of land.

Read aloud: Now, we would like information on your household's ownership and use of land. For this section please consider the last agricultural season.

S.N.	Question	Response	Go to
401	Does any member of your household own, rent, or use land?	Yes .....1 No .....2 →	402

401.1	401.2	401.3				401.4	401.5	401.6		401.7		401.8	401.9
Plot Code	Where is the land? At homestead.....1 Same village/ward within VDC.....2 Another ward within VDC.....3 Ward outside the VDC.....4 Outside the district 5 Outside Nepal.....6 Other (Specify)_____96	What is the size of the land? Bigha.....1 Ropani.....2 Other (specify) _____..96				What is the ownership status of this land by you or your household member? Owns with title deed.....1 Owns witout title deed.....2 Adiya in/Share cropping .....3 Rented/Leased in.....4 Mortgaged in .....5 Borrowed in.....6 Allocated by some authority .....7 Family (other than HH member) property.....8	What is currently the main use of the land? Flower Garden .....1 Cultivated Crops .....2 Home garden.....3 Orchard/ Tea Garden.....4 Used for Livestock .....5 Pasture/ meadow .....6 Pond/Lake .....7 Fallow .....8 Rented/Leased out.....9 Gave it free of cost .....10 Adiya out .....11 Mortgaged out.....12 Virgin/never used land....13 Only use for HH living...14 Other (Specify)_____. 96	Who decides what to do on the land? **(Up to 2; Rank in order of importance in decision making)** Non household member 95		Who works on the land? **(Up to 2; Rank order of working most to least)** **(Ask only for codes 1-6 in Q.No. 401.5)** Non household member.....95		What is the **main** water source for the land? River/Stream .....1 Well/Pond .....2 Dam/Canal .....3 Rain.....4 Rain harvesting.....5 Deep Tubewell/ borehole .....6 Shallow Tubewell...7 Other (Specify)___96 **(Ask only for codes 1-6 in Q.No. 401.5)**	During the last agricultural season, was the land irrigated by rain or otherwise at least once? Yes, formal irrigation only..1 Yes, rainfed only irrigation..2 Both..... .....3 Neither .....4 **(Ask only for codes 1-6 in Q.No. 401.5)**
		Unit	Bigha/ Ropani	Kattha/ Aana	Dhur/ Paisa			PID	PID	PID	PID		
1.		☐	☐☐	☐☐	☐☐								
2.		☐	☐☐	☐☐	☐☐								
3.		☐	☐☐	☐☐	☐☐								
4.		☐	☐☐	☐☐	☐☐								
5.		☐	☐☐	☐☐	☐☐								

Section B: Field Crop Production and Sale

Instructions: Please ensure the respondent understands that the two agricultural season are rainy/summer season and winter season. Also, "improved seed varieties" include open pollination, hybrid, or high yielding. Probe for and list all the field crops under 402.2 first, and then fill the information for each field crop grown by completing 402.3-402.14 for one crop before proceeding to the next crop.

Read aloud: Now we would like to ask you a few questions about production and selling of field crops. Please think of the last two completed agricultural seasons including the rainy/summer season and the winter season.

S.N.	Question	Response	Go to
402	In the last 2 completed agricultural seasons (rainy/summer and winter), did the household plant (whether harvested or not) any field crops? (Only ask the questions below for land which the household is cultivating themselves, not for land which has been rented out, mortgaged out, etc.)	Yes.....1 No.....2 →	403

	402.1	402.2	402.3	402.4	402.5	402.6	402.7		402.8	402.9		402.10		402.11		402.12	402.13		402.14	
S. No.	Crop Code	List all the field crops planted during the last 2 agricultural seasons (rainy and winter)? Crop Name	What type of seed was primarily used on the land during production of ____? Purchased/obtained improved varieties..... 1 Own supply improved varieties..... 2 Purchased/obtained local varieties ..... 3 Own supply local varieties..... 4 Dont know 98	Was any fertilizer used on the land during production of _____? Organic fertilizer .....1 Chemical fertilizer .....2 Both .....3 None 4	Did you lose any of the__ to pest, drought, etc. before harvesting? All/Almost all ..... 1 More than half ..... 2 Half ..... 3 Less than half ..... 4 None/Almost None..... 5	During which month(s) did you harvest ____? **(Code list below; separate months with a comma)**	How much ____ did you produce ? **(Code list below)**		Did you lose any of the ____ to pest, drought, etc. during post-harvest including storage losses? All/Almost all..... More than half..... Half ..... Less than half ..... None/ Almost none	Who was in charge of deciding what to do with the foods produced? **(Up to 2; rank order of importance)** Non household member....95		How much of the harvested __ was eaten by household members? All……...94 **(Go to next crop)** Haven't started consuming yet .....95 **(Code list below)**		How much of the harvested ____ was sold? Not yet sold ....95 **(Go to 402.14)** **(Code list below)**		What was the income from the sale of ___? Don't know ..... 98 **(Nepalese Rupees)**	Who makes decisions about the money from the sale of___ ? **(Up to 2; rank order of importance)** Non household member....95		How much of the harvested ____ was stored/ preserved? Not stored...95 **(Code list below)**	
							Qty.	Unit		PID	PID	Qty.	Unit	Qty.	Unit		PID	PID	Qty.	Unit
1	☐☐		☐☐	☐	☐			☐☐	☐	☐☐	☐☐		☐☐		☐☐	Rs. _____	☐☐	☐☐		☐☐
2	☐☐		☐☐	☐	☐			☐☐	☐	☐☐	☐☐		☐☐		☐☐	Rs. _____	☐☐	☐☐		☐☐
3	☐☐		☐☐	☐	☐			☐☐	☐	☐☐	☐☐		☐☐		☐☐	Rs. _____	☐☐	☐☐		☐☐
4	☐☐		☐☐	☐	☐			☐☐	☐	☐☐	☐☐		☐☐		☐☐	Rs. _____	☐☐	☐☐		☐☐
5	☐☐		☐☐	☐	☐			☐☐	☐	☐☐	☐☐		☐☐		☐☐	Rs. _____	☐☐	☐☐		☐☐

Code list for 402.1

01 = Rice	05 = Finger millet	10 = Lentil	15 = Cotton	20 = Sweet potatoes
02 = Wheat	06 = Buckwheat	11 = Peas	16 = Sunflower	21 = Potatoes
03 = Maize	07 = Barley	12 = Chickpeas	17 = Tobacco	22 = Oil seeds
04 = Sorghum	08 = Groundnut	13 = Beans	18 = Tea	96 = Other
	09 = Soybeans	14 = Sugarcane	19 = Coffee	(Specify) _____

Code list for 402.6

01 = Mid-April-Mid-May	05 = Mid-August-Mid-Sept.	09 = Mid-Dec-Mid-Jan
02 = Mid-May-Mid-June	06 = Mid-Sept.-Mid-Oct.	10 = Mid-January-Mid-Feb.
03 = Mid-June-Mid-July	07 = Mid-Oct.-Mid-Nov.	11 = Mid-February-Mid-March
04 = Mid-July-Mid-August	08 = Mid-Nov-Mid-Dec.	12 = Mid-March-Mid-Aug

Code list for 402.7, 402.10, 204.11 and 204.14

01= Mana	05= Quintile
02= Pathi	06= K.G.
03= Muri	96= Other (Specify) _____
04= Doko	

Instructions: List all the vegetables and fruits under 403.2 first, and then answer 403.3-403.11for each fruit/vegetable before proceeding to the next one.

Read aloud: Now we would like some information about production and selling of fruits and vegetables your household produced. Please think of the last 12 months.

S.N.	Question	Response	Go to
403	In the last 12 months, did your household grow any vegetables or fruits?	Yes ..... 1 No..... 2	→ 404

	403.1	403.2	403.3		403.4		403.5	403.6		403.7	403.8		403.9	403.10		403.11	
S.No.	Fruits/ Vegetables **(Code list below)**	List all the vegetables and fruits grown during the last 12 months, whether or not they were harvested.	What quantity of _____ did you harvest during the last12 months? **(Code list below)**		Who was in charge of deciding what to do with the foods produced? **(Up to 2; rank order of importance)** Non houshold member 95		Did you lose any of the ____ to pest, drought, etc. post harvest? **(Please indicate the total losses)** Almost all .....1 More than half ...2 Half.....3 Less than half ....4 None/ Almost none 5	How much of the ____ was eaten by the household? Not eaten...95 ↓ **(Go to 403.8)** **(Code list below)**		Which household members ate the _____? 1=Everyone in the household 2=Men 3=Women 4=Children <2 years 5=Children 2-5 years 6=Children >5 years **(Multiple answers possible)**	How much of the ____ was sold? Consumed all… 94 ↓ **(Go to next crop)** Haven't started consuming yet ..... 95 ↓ **(Go to 403.11)** **(Code list below)**		What was the income from the sale of _____in the last 12 months? Don't know 98	Who was in charge of the money from the sale of _____? **(Up to 2; rank order of importance)** Non-household member .. 95		How much of the harvested ____ was stored/ preserved (e.g. jam/ pickle/ fermented)? Not stored 95 **(Code list below)**	
			Qty.	Unit	PID	PID		Qty.	Unit		Qty.	Unit		PID	PID	Qty.	Unit
1	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
2	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
3	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
4	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
5	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
6	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
7	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
8	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
9	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐
10	☐☐			☐☐	☐☐	☐☐	☐		☐☐			☐☐	Rs. _____	☐☐	☐☐		☐☐

Code list for 403.1

01 = Cabbage	08 = Onion	15 = Green Beans	22 = Mango	29 = Peach
02 = Carrots	09 = Capsicum/Bell pepper	16 = Garlic	23 = Lemon/Lime	30 = Plum
03 = Cucumber	10 = Pumpkin/Zuchini	17 = Ginger	24 = Orange/Tangerine	31 = Berries
04 = Chili	11 = Cauliflower	18 = Tomato	25 = Papaya	32 = Pineapple
05 = Eggplant	12 = Bottle gourd	19 = Avocado	26 = Melon	96 = Other (Specify)_____
06 = Green leaves	13 = Sponge gourd	20 = Banana	27 = Lychee	
07 = Okra/Lady Finger	14 = Bitter gourd	21 = Guava	28 = Apple	

Code list for 403.3, 403.6, 403.8 and 403.11

01= Mana	05= Quintile
02= Pathi	06= K.G.
03= Muri	96= Other (Specify) _____
04= Doko	

Section C: Animal Ownership

Instructions: First answer 404.3 by reading each animal name one by one. Then complete questions 404.4-404.8 for each animal owned before proceeding to the next animal.

S.N.	Question	Response	Go to
404	During the last 12 months, did anyone in the household own any livestock, poultry, fish, etc?	Yes.....1 No.....2	→ 406

404.1	404.2	404.3	404.4	404.5		404.6	404.7	404.8	
Animal/ Poultry Code	Animal/Poultry Name	How many _____ has your household owned in the last 12 months? **(If none write '00')** ↓ **(Go to next animal)**	How many _____ does your household currently own? **(If none write '00')** ↓ **(Go to next 404.6)**	Who usally takes/took care of the animals? **(Up to 2; rank order of who takes care the most)** Non household member 95		How many ___ did you sell in the last 12 months? Haven't sold any...00 ↓ **(Go to next animal)**	How much did your household receive for the sale of these ___ in the last 12 months? Don't know.....98	Who was in charge of the money from the sale of _____? **(Up to 2; rank order of importance)** Non household member.....95	
				PID	PID			PID	PID
1	Beehives	☐☐	☐☐	☐☐	☐☐				
2	Cattle/buffalo/oxen/cow/yak	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
3	Goat	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
4	Guinea fowl/Pigeons/Duck/ Hen/ Poultry	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
5	Sheep	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
6	Donkey/Mule	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
7	Horse	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
8	Pig	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
8	Rabbit	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐
9	Fish pond/Aquaculture	☐☐	☐☐	☐☐	☐☐		Rs. _____	☐☐	☐☐
96	Other (Specify)_____	☐☐	☐☐	☐☐	☐☐	☐☐	Rs. _____	☐☐	☐☐

Section D: Animal Products

Instructions: First answer 405.2 by reading the product list one by one. Then complete questions 405.3-405.8 for each product produced before proceeding to the next product. Please ask about the animal product for only the last 12 months.

Read aloud: Now we would like some information on your household's production and selling of animal products. Please only consider the previous 12 months.

405	405.1	405.2	405.3		405.4	405.5	405.6		405.7		405.8
Product code	Product name:	Did you produce any ___ during the last 12 months? Yes = 1 No = 2 **(Goto next product)**	How much ___ did you produce? **(Code list below)** Qty.	Unit	Did your household sell any of the ___ produced ? Yes = 1 No→2 405.7	How much in total did your household receive for the sale of these ___ ? Don't know = 98	Who was in charge of the money from the sale of ___ ? **(Uo to 2; rank order of importance)** Non household member.....95 1st PID	2nd PID	How much of the ___ was eaten by the household? (Not eaten ....00) **(Go to next product)** Qty.	Unit	Which household members ate the ___ ? 1=Everyone in the household 2=Men 3=Women 4=Children <2 years 5=Children 2-5 years 6=Children >5 years **(Multiple answers possible)**
1	Animal meat/offal	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐
2	Poultry meat/offal	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐
3	Milk (including that produced for milk products)	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐
4	Eggs	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐
5	Honey	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐
6	Leather/Wool	☐			☐	Rs. _____	☐☐	☐☐			
7	Other (Specify)___	☐			☐	Rs. _____	☐☐	☐☐			☐☐☐☐

Section E: Practices and Inputs

Instructions: First answer 406.2 by reading the inputs one by one. Then complete questions 406.3-406.8 for each input owned by the household before proceeding to the next one.

Read aloud: Please tell me about any agricultural inputs your household bought or acquired during the last two agriculture seasons.

406	406.1	406.2	406.3	406.4	406.5	406.6
Input code	Input name:	Did your household use any ____ during the last two agricultural seasons? Yes.....1 No.....2 ↓ (**Go to next input)**	How did you acquire the ____? Saved from last harvest/ own ..... 1 Provided free ..... 2 **(Go to next input)** Bought ..... 3 Rented..... 4 Other (Specify)_____96 **(Multiple Answers Possible)**	How much did you spend on the ____? Dont Know.....98	Did you use any loans to buy the ____? Yes.....1 No.....2 ↓ **(Go to next input)**	Who provided the loans for ____? Bank ..... 1 Money lender ..... 2 Government scheme..... 3 NGO/INGO ..... 4 Friend/family ..... 5 Community group ..... 6 Private business person ..... 7 Religious Organization ..... 8 Other (Specify)_____ 96
1.	Improved seed varieties (e.g. high yielding, hybrid seeds, etc.)	☐	☐ ☐ ☐	Rs. _____	☐	☐
2.	Local seed varieties	☐	☐ ☐ ☐	Rs. _____	☐	☐
3.	Seedlings/Saplings	☐	☐ ☐ ☐	Rs. _____	☐	☐
4.	Pesticides	☐	☐ ☐ ☐	Rs. _____	☐	☐
5.	Herbicides	☐	☐ ☐ ☐	Rs. _____	☐	☐
6.	Fertilizer (e.g., chemical, organic)	☐	☐ ☐ ☐	Rs. _____	☐	☐
7.	Hand tools (e.g., ax, sickle)	☐	☐ ☐ ☐	Rs. _____	☐	☐
8.	Mechanized tools (e.g., thresher, harvester)	☐	☐ ☐ ☐	Rs. _____	☐	☐
9.	Plough	☐	☐ ☐ ☐	Rs. _____	☐	☐
10.	Animal feed	☐	☐ ☐ ☐	Rs. _____	☐	☐
11.	Animal drugs/vacines	☐	☐ ☐ ☐	Rs. _____	☐	☐
96.	Other (Specify)_____	☐	☐ ☐ ☐	Rs. _____	☐	☐

Section F: Agricultureand Livestock Related Training

Instructions: Read each training topic one by one.

S.N.	Question	Response	Go to
407	Have you or anyone else from your household ever received any training on agriculture, poultry or livestock related work?	Yes..... 1 No..... 2 Don't know..... 98	501

407	407.1	407.2	407.3	407.4	
Training topic code	Agriculture and Livestock Training	Did you or anyone else from your household ever receive training on_____? Yes .....01 No.....02 Don't know.....98 (**Go to next training**)	Who provided the training ? **(Up to 2)** **(Code list below)**	When was the last time you received training on_____? Year	Month
1.	Field crop selection or rotation	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
2.	Improved seeds or crop varieties	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
3.	Pest management	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
4.	Soil improvement	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
5.	Home gardening	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
6.	Poultry	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
7.	Livestock	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐
96.	Other (Specify)_____	☐☐	☐☐ ☐☐	☐☐☐☐	☐☐

Code list for 407.3

01 = Government
02 = NGO
03 = AAMA/HKI/HFP/VMF trainer
04 = Religious groups
05 = Business groups
06= Community organizations
07 = Family members/friends
96 = Other (Specify)_____

Code list for 407.4

01 = Mid-April-Mid-May
02 = Mid-May-Mid-June
03 = Mid-June-Mid-July
04 = Mid-July-Mid-August
05 = Mid-August-Mid-Sept.
06 = Mid-Sept.-Mid-Oct.
07 = Mid-Oct.-Mid-Nov.
08 = Mid-Nov-Mid-Dec.
09 = Mid-Dec-Mid-Jan
10 = Mid-January-Mid-Feb.
11 = Mid-February-Mid-March
12 = Mid-March-Mid-Aug

Module 5: Empowerment

Section A: Role in Household Decision-making for Production and Income Generation

Instructions: We are interested in the respondent's roles, access to resources and decision-making. Remind the respondents of that from time to time during this module. Complete 501.1, 501.2 and 501.3 for each activity before moving to the next activity.

Read aloud: Now I would like to ask you some questions about your role in decision-making about income-generating activities in your household. There is no right or wrong answer. Please tell me about your most usual situation.

	501	**501.1**	**501.2**	**501.3**
S.N.	Activities	Did you (singular) participate in _____ in the past 12 months?	How much input did you have in making decisions about _____? **(Code list below)**	How much input did you have in decisions on the use of income generated from _____? **(Code list below)**
1	Food crop farming: crops that are grown primarily for household food consumption	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
2	Cash crop farming: crops that are grown primarily for sale in the market	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
3	Livestock raising	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
4	Poultry (e.g. chicken, duck, pigeon)	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
5	Fishing or fishpond culture	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
6	Non-farm economic activities: Small business, self-employment, buy-and-sell	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
7	Wage and salary employment: in-kind or monetary work, both agriculture and other wage work	Yes.....1 No.....2 **Go to next activity** ←	☐☐	☐☐
	Code list for 401.2 01 = No input 02 = Input into very few decisions 03 = Input into some decisions 04 = Input into most decisions 05 = Input into all decisions	**Code list for 401.3** 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 07 = Not applicable/Income not generated		

Section B: Access to Capital

Instructions: The purpose of this module is to get an idea about men's access to and control of capital/assets. First answer 502.1 for all the assets listed 1-13. Then return to the top of the table and for the first instance in which 402.1 was answered as yes proceed to ask the remaining questions across the row (502.2-502.6) for that item before going to the next item to ask 502.2-502.6.

Read aloud: Now we have some questions about your household's access to capital/assets and who in the household has ownership of these resources? When we ask about ownership we mean the person who has the final say over that asset.

Read aloud (before 502.3): When we ask about selling, giving away and renting these are different actions. **Selling** an item means to get rid of the asset in exchange for money. To **give something away** means to let someone permanently have the item free of charge. To **mortgage or rent** out means to temporarily allow someone use of the asset in exchange for a payment or service or some other return. For example, one household member may have the ability to let a friend rent the farm equipment, but not be able to make decisions about whether or not to sell that same item.

	502	502.1	502.2	502.3	502.4	502.5	502.6
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, turkeys, 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)	☐	☐☐	☐☐	☐☐	☐☐	☐☐
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 (ex: bicycle, motorcycle, car, rickshaw, horse cart)	☐	☐☐	☐☐	☐☐	☐☐	☐☐

Code list for 502.2, 502.3, 502.4, 502.5 and 502.6

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.

Section C: Access to Credit

Instructions: Please read lending sources one by one completing all questions across the row for one source before proceeding to the next row.

503		503.1	503.2	503.3	503.4
Lending Sources		Has anyone in your household taken any loans or borrowed cash/in-kind from _____ in the past 12 months? Yes, cash..... 1 Yes, in-kind ..... 2 Yes, cash and in-kind ..... 3 No.....4 Don't know ..... 5 } 503.4	Who (usually) made the decision to borrow from _____? **(Code list below)**	Who (usually) makes the decision about what to do with the money/item borrowed from _____? **(Code list below)**	Did you (singular) want to borrow or get a loan from _____in the last 12 months but did not? Yes.....1 No 2
7.	Non-governmental organization (NGO)	☐	☐☐	☐☐	☐
8.	Informal lender	☐	☐☐	☐☐	☐
9.	Formal lender (direct credit from bank/financial institution)	☐	☐☐	☐☐	☐
10.	Friends or relatives	☐	☐☐	☐☐	☐
11.	Savings and Credit cooperatives/groups	☐	☐☐	☐☐	☐
12.	Women's groups	☐	☐☐	☐☐	☐

Code list for 503.2 and 503.3

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.

Section D: Access to Agriculture/Livestock/Fisheries Personnel

Instructions: Please ensure the respondent understands the difference between an agricultural extension worker and a model farmer.

Read aloud: Now I would like to ask you about your access to agricultural/livestock/fisheries personnel. An extension worker is someone providing agricultural inputs, trainings, etc. related to agricultural and can be either a government or NGO worker. A village model farmer is someone who is not a government employee but is generally affiliated with an NGO project, and helps the community by demonstrating farming techniques on a model farm. A village model farmer may also facilitate trainings, distribute inputs, etc.

S.N.	Question	Response	Go to
504	Have you (yourself) met with any agricultural/livestock/fisheries extension worker (NGO or government)in the past 12 months?	Yes .....1 No .....2 →	507
505	How many times have met you with any agricultural/livestock/fisheriesextension worker (NGO or government) in the past 12 months?	Number of visits..... ☐☐	
506	What was the sex of the agricultural/ livestock/fisheries extension worker(s) (NGO or government)with whom you last met?	Male .....1 Female.....2 Both male and female 3	
507	Have you (yourself) met with any village model farmer in the past 12 months?	Yes .....1 No .....2 →	510
508	How many times did you meet with any village model farmer in the past 12 months?	Number of visits..... ☐☐	
509	What was the sex of the village model farmer(s) with whom you last met?	Male .....1 Female.....2 Both male and female 3	

Section E: Individual Leadership and Influence

S.N.	Question	Response	Go to
510	Do you feel comfortable speaking up in public to _____?		
510.1	Help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?	No, not at all comfortable..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty..... 3 Yes, mostly comfortable..... 4 Yes, very comfortable 5	
510.2	Ensure proper payment of wages for public works or other similar programs?	No, not at all comfortable..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty..... 3 Yes, mostly comfortable..... 4 Yes, very comfortable 5	
510.3	Protest the misbehavior of authorities or elected officials?	No, not at all comfortable..... 1 Yes, but with a great deal of difficulty ..... 2 Yes, but with a little difficulty..... 3 Yes, mostly comfortable..... 4 Yes, very comfortable 5	

511		511.1	511.2	511.3	511.4
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 .....3 511.4 ← **(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)**
11.	Agricultural/livestock/fisheries producer group (including marketing groups)	☐	☐	☐☐	☐☐
12.	Water users' group	☐	☐	☐☐	☐☐
13.	Land/forest users' groups	☐	☐	☐☐	☐☐
14.	Credit or microfinance group	☐	☐	☐☐	☐☐
15.	Mutual help or insurance group (including burial societies)	☐	☐	☐☐	☐☐
16.	Trade and business association	☐	☐	☐☐	☐☐
17.	Civic group (improving community) or charitable group (helping others)	☐	☐	☐☐	☐☐
18.	Religious group	☐	☐	☐☐	☐☐
19.	Mother's group	☐	☐	☐☐	☐☐
20.	Other women's group (only if it does not fit into one of the other categories)	☐	☐	☐☐	☐☐
96	Other (Specify) _____	☐	☐	☐☐	☐☐

Code list for 511.3

1 = No input
2 = Input into very few decisions
3 = Input into some decisions
4 = Input into most decisions
5 = Input into all decisions
6 = Decision not made

Code list for 511.4

1 = Not interested
2 = No time
3 = Unable to raise entrance fees
4 = Unable to raise reoccurring fees
5 = Group meeting location not convenient
6 = Family dispute/not allowed to join
7 = Not allowed because of sex
96 = Other (Specify)_____

Section F: Decision-Making

Instructions: Please ensure that the respondent understand these decision making concept by repeating definitions, explaining, and giving example as often as needed. Also, if the household does not take part in the mentioned activity, then write '98' and skip to next activity.

Read aloud: Now I would like some information about decision making in your household. Please remember that when we ask who has the ability to make a decision about something it is the person who has the very important/primary say and not just someone involved in discussions about that topic. We are interested in knowing who has the key role in making decisions.

	512	512.1	512.2	512.3	512.4	512.5
				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 each statement.		
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	☐☐	☐☐	☐☐	☐☐	☐☐
2.	Taking crops to the 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	☐☐	☐☐	☐☐	☐☐	☐☐

Code list for 512.1

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 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
95 = Decision not made

Code list for 512.2

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

Code list for 512.3, 512.4 and 512.5

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

Section G: Time Allocation

Read aloud: We are also interested in knowing about how you allocate your time for both work and leisure activities.

S.N.	Question	Response	Go to
513	Was yesterday a typical day?	Yes.....1 No .....2 →	516
514	Was the day before a typical day?	Yes.....1 No 2	516
515	If neither yesterday nor the day before were typical days, then why?	Public holiday.....1 Sick.....2 Sick child.....3 → Travel or away from home.....4 Visitors .....5 Strike/Bandha .....6 Other (specify).....96	

Instructions: If yesterday was a typical day ask the respondent about yesterday. If yesterday was atypical, but the day before typical, please ask the respondent to consider the day before's activities. If both days were atypical (answer for both 413 and 414 is "No"), then please ask the respondent to consider yesterday's activities.

Please probe and account for activities by 30 minute time slots to get correct time allocation. Fill the log sheet (blank sheet) with the activities **right from the time the respondent woke-up yesterday morning to the time the respondent went to sleep at night.** First, use a blank sheet of paper to note what was done all day (24 hours including morning, day or night). Add up the number of minutes for each category and then make sure the columns each add up. All activities should add up to a total of 24 hours.

Once you have added up all of the columns, if you do not reach 24 hours or 1440 minutes, please probe until you can fill in the missing minutes.

Read aloud: Please describe all the time you gave to work and leisure activities you engaged in, since the time you woke up yesterday (or day before, where applicable). Please include time for traveling and commuting as part of the time for a given activity.

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	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐

S.N.	Question	Response	Go to
517	Regarding the amount of sleep you got last night, was that less than average, average, or more than average?	Less than average.....1 Average.....2 More than average 3	
518	How satisfied are you with your available time for leisure activities like visiting neighbors, watching T.V., listening to the radio, seeing movies or participating in sports?	Very satisfied.....1 Somewhat satisfied .....2 Neither satisfied nor unsatisfied .....3 To some extent unsatisfied .....4 Very unsatisfied.....5 Other (Specify)_____.....96	

Module 6: Observations

Instructions: For these questions please record only your observations and not answers given by the respondents. Also, do not read aloud any of the questions in italics and parentheses. Only for the salt test and water treatment question should you read the question.

S.N.	Question	Response	Go to
601	*(Does the household have a separate kitchen?)* **(Observation)**	Yes ..... 1 No ..... 2 Could not observe 3	
602	*(What is the main material of the floor?)* **(Observation)**	**Natural Floor** Earth/Sand ..... 1 Dung ..... 2 **Rudimentary Floor** Wood Planks ..... 3 Palm/Bamboo ..... 4 **Finished Floor** Parquet or Polished Wood ..... 5 Vinyl or Asphalt Strips ..... 6 Ceramic Tiles ..... 7 Cement ..... 8 Carpet ..... 9 Other (Specify)_____ 96	
603	*(What is the main material of the exterior/outer wall?)* **(Observation)**	**Natural Walls** No Walls ..... 1 Cane/Palm/Trunks ..... 2 Mud/Sand ..... 3 **Rudimentary Walls** Bamboo with Mud ..... 4 Stone with Mud ..... 5 Plywood ..... 6 Cardboard ..... 7 Reused Wood ..... 8 **Finished Walls** Cement ..... 9 Stone with Lime/Cement ..... 10 Bricks ..... 11 Cement Blocks ..... 12 Wood Planks/Shingles ..... 13 Other (Specify)_____ 96	
604	*(What is the main material of the roof?)* **(Observation)**	**Natural Roofing** No Roof ..... 1 Thatch/Palm Leaf ..... 2 **Rudimentary Roofing** Rustic Mat ..... 3 Palm/Bamboo ..... 4 Wood Planks ..... 5 Cardboard ..... 6 **Finished Roofing** Galvanized Sheet ..... 7 Wood ..... 8 Calamine/Cement Fiber ..... 9 Ceramic Tiles ..... 10 Cement ..... 11 Roofing Shingles ..... 12 Other (Specify)_____ 96	

S.N.	Question	Response	Go to
605	*(Is the drinking water pot covered?)* **(Observation)**	Yes ..... 1 No..... 2 N/A – Do not store water..... 3 Could not observe..... 4	
606	*(Is there a toilet?)* **(Observation)**	Yes ..... 1 No..... 2 Could not observe..... 3	609 609
607	*(What kind of toilet facility does the household have?)* **(Observation)**	**Flush or Pour Flush Toilet** Flush to piped sewer system. ..... 1 Flush to septic tank..... 2 Flush to pit latrine..... 3 Flush to somewhere else..... 4 Flush, don't know where..... 5 **Pit Latrine** Ventilated improved pit latrine..... 6 Pit latrine with slab..... ..... 7 Pit latrine without slab/Open pit..... ..... 8 Composting toilet..... ..... 9 Bucket toilet ..... 10 No facility/bush/field..... ..... 11 Other (Specify) _____..... 96	
608	*(How clean is the toilet?)* **(Observation)**	Dirty..... ..... 1 Not very clean..... ..... 2 Clean..... 3	
609	*(Is there human feces in the house, compound or right outside the compound?)* **(Observation)**	Yes, in the house..... ..... 1 Yes, near the compound……..... 2 No..... 3	
610	*(Is there animal feces (livestock, poultry, pets etc.) around the house or in the compound?)* **(Observation)**	Yes, in the house..... ..... 1 Yes, near the compound……..... 2 No..... 3	
611	*(Are there animals inside the house/in the same building where people cook and eat?)* **(Observation)**	Yes ..... 1 No..... 2	
612	*(Is there rubbish in the house or compound?)* **(Observation)** **(Please include only open garbage, rotting garbage NOT dry leaves and twigs.)**	Yes ..... 1 No..... 2	
613	Please show me what is used in your household for water treatment. **(Observation)** **(Multiple answers possible. Don't read possible answers.)**	Let it stand and settle/sedimentation..... 1 Strain it through cloth..... 2 Boil it ..... 3 Add bleach/chlorine..... 4 Use a water filter (ceramic, sand, and composite)..... 5 Solar disinfection (Sodis method)..... 6 Do not treat water..... 7 Could not observe..... 8 Other (Specify) _____..... 96	
614	Please show me a sample of the salt used in your household for human consumption. **(Test the salt.)**	No iodization..... 1 <15 PPM iodized..... 2 >15 PPM iodized..... 3 Salt not tested (Specify)_____ 4	

Time of interview completed:

Hour ☐☐

Minute ☐☐

Thank for your valuable time.

Appendix 5: WEAI 5DE Construction

Domain	Indicator/Qnn	Survey questions		Answers	Aggregation cut-off	Weight
Production	Input into productive decisions (401.1; 401.2) (412.1; 412.2)	(1) Did you (singular) participate in _____ in the past 12 months?; (2) If yes, how much input did you have in making decisions about _____?	food crop farming	(1) yes; no (2) no input; input into very few decisions; input into some decisions; input into most decisions; input into all decisions	Adequate if some input into decisions, makes the decisions, or feels should could make the decisions if wanted, in at least two domains	1/10
			cash crop farming			
			livestock raising			
			poultry			
			fishing or fishpond aquaculture			
		(1) Who normally takes the decision regarding _____?; (2) To what extent can you make decisions regarding ____ if you want(ed) to?	agricultural production	(1) self; spouse; self and spouse; etc. (2) not at all; to a small extent; to some extent; to a large extent		
			taking crops to the market			
			livestock raising			
	Autonomy in production (412.3; 412.4; 412.5)	(1) Regarding ___ I do what I do partly because I will get in trouble if I do differently. (2) Regarding _____ I do what I do so others don't think poorly of me. (3) Regarding _____ I do what I do because I personally think it is the right thing to do.	agricultural production	(1-3) strongly disagree; disagree; somewhat agree/disagree; agree; strongly agree	Adequate if does not strongly disagree that a coerced reason for decision in at least one of: agricultural production, taking crops to the market, and livestock raising	1/10
			taking crops to the market			
			livestock raising			
Resources	Ownership of assets (402.1; 402.2)	(1) Does anyone in your household currently have any _____? (2) Who would you say owns most of the _____?	agricultural land	(1) yes; no (2) self; spouse; self and spouse; etc.	Adequate if solely or jointly owns at least two small assets (non-mechanized farming equipment or small consumer durables) OR one large asset (all the other); also inadequate if household has no assets	1/15
			land not used for agriculture			
			large livestock			
			small livestock			
			fish pond or fishing equipment			
			farm equipment (non-mechanized)			
			farm equipment (mechanized)			
			non-farm business equipment			
			house (and other structures)			
			large consumer durables			
			small consumer durables			
			mobile phone			
			transportation			
	Right to purchase, sale, or transfer agricultural assets (402.3; 402.4; 402.5; 402.6)	(1) Who can decide whether to sell _____ most of the time? (2) Who can decide to mortgage or rent out _____most of the time? (3) Who contributes most to decisions regarding a new purchase of _____?	agricultural land	(1-3) self; spouse; self and spouse; etc.	Adequate if has at least one joint right over at least one household agricultural asset (or two if small assets); also inadequate if household has no assets	1/15
			large livestock			
			small livestock			
			fish pond or fishing equipment			
			farm equipment (non-mechanized)			
			farm equipment (mechanized)			
	Access to and decisions on credit (403.1; 403.2;	(1) Has anyone in your household taken any loans or borrowed cash/in-kind from _____ in the past 12 months? (2) Who made the decision to borrow from _____? (3) Who	non-governmental organization	(1) yes, cash; yes, in-kind; yes, cash and in-kind; no; don't know (2-3) self;-spouse; self and spouse; etc.	Adequate if has at least one source of credit and makes at least one decision solely or jointly for at least one type of household credit; also inadequate if	1/15
			informal lender			
			formal lender			
			friends or relatives			

Domain	Indicator/Qnn	Survey questions		Answers	Aggregation cut-off	Weight
	403.3)	makes the decision about what to do with the money/item borrowed from _____?	savings and credit cooperatives/groups		household has no credit	
			women's groups			
Income	Control over use of income (401.3)	(1) (If yes to 401.1), How much input did you have in decisions on the use of income generated from _____?	food crop farming	(1) no input; input into very few decisions; input into some decisions; input into most decisions; input into all decisions; decision not made; not applicable	Adequate if has at least some input into decisions about income generated or feels she can make decisions in at least one household income/ expenditure domain as long as it is not only minor household expenditures	1/5
			cash crop farming			
			livestock raising			
			poultry			
			fishing or fishpond aquaculture			
			non-farm activity			
			wage and salary employment			
		(1) Who normally takes the decision regarding _____?; (2) To what extent can you make decisions regarding ____ if you want(ed) to?	your own (singular) wage or salary employment	(1) self; spouse; self and spouse; etc. (2) not at all; to a small extent; to some extent; to a large extent		
			major household expenditures			
			minor household expenditures			
Leadership	Group membership (411.1; 411.2)	(1) Is there a _____ in your community?; (2) Are you a member/active member of any _____?	agricultural/livestock/fisheries producer group	(1) yes; no (2) yes member; yes active member; no	Adequate if participates in at least one group	1/10
			water users' group			
			land/forest users' groups			
			credit or microfinance group			
			mutual help or insurance group			
			trade and business association			
			civic group or charitable group			
			religious group			
			mother's group			
			other women's group			
			other			
	Speaking in public (410.1; 410.2; 410.3)	(1) Do you feel comfortable speaking up in public to _____?	help decide on infrastructure to be built in your community?	(1) No, not at all comfortable; yes but with a great deal of difficulty; yes but with a little difficulty; yes mostly comfortable; yes very comfortable	Adequate if comfortable to any degree speaking in public in at least one context	1/10
			ensure proper payment of wages for public works or other similar programs?			
			protest the misbehaviour of authorities or elected officials?			
Time	Workload (416)	(1) Please describe all the time you gave to work and leisure activities you engaged in, since the time you woke up yesterday (or day before, where applicable). Please include time for travelling and commuting as part of the time for a given activity.	sleeping and resting		Adequate if works no more than 10.5 hours a day; the following are included as work: employed for others; work as self employed; farming/livestock/fishing; and domestic work	1/10
			personal care			
			school			
			work as employed for others			
			work as self employed			
			farming/livestock/fishing			
			domestic work			
			care for children, adults, elderly			
			leisure			
			social and religious activities			
			other (Specify) _____			
	Leisure (418)	(1) How satisfied are you with your available time for leisure activities like visiting neighbours, watching T.V., listening to the radio, seeing movies or participating in sports?		(1) Very satisfied; somewhat satisfied; neither satisfied nor unsatisfied; to some extent unsatisfied; very unsatisfied	Adequate if doesn't express any dissatisfaction with amount of leisure time	1/10