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Balancing the Scales: Examining relationships between Maternal Agency and Child Nutrition in Differing Developing World Contexts

Alison C. Roberts

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A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Science in Interdisciplinary Studies from
The College of William and Mary

by

Alison Roberts

Accepted for _____Honors_____

_____(Honors)_____

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Professor Scott Ickes, Director

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Alison Roberts

The College of William and Mary

Abstract – This paper examines the relationship between maternal agency and child nutritional outcomes through a series of statistical analyses using data from developing countries. Malnutrition remains a major global disease burden and with increasing political attention surrounding the issue, it is necessary to understand the underlying factors contributing to it. One of these may be poor maternal care practices due to low maternal agency. The literature on maternal agency is conflicted about the nature of the relationship between maternal agency and child nutrition, and if there is a relationship at all. By comparing results from a 12-country study, a study in one district in rural Uganda, and the methodologies and data used in the two we are able to identify strong relationships in larger studies while simultaneously recognizing disparate and more specific relationships in more specific contexts. Our results point to a need for standardization in the field as well as a prioritization of future research tailored to unique socioeconomic contexts in developing countries.

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Next to my family and friends, many of whom have constituted my William and Mary family. My parents have never done anything but support me and encourage me– which includes the encouragement to get a few more hours of sleep every night. I owe all of my successes to them and everything they have done for me over the years. To Abhi Goyal, thank you for what I can only characterize as undying support and incredible responsiveness to messages complaining about Stata. Thank you to Melanie, Taylor, Emily, Karthik, Matt, Natalie, Arie, and Ariel for your words of encouragement and late night chats about maternal agency and life. Your friendship has taught me as much as this work and motivated me through it. And finally to Emily, Laura, Steph, and Maia for all the long hours spent in Adair. Your company made it so much better.

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Introduction

According to the WHO, malnutrition represents 10% of the global disease burden and is a factor in one third of child deaths worldwide (1). Even for children who do not face obvious morbidity due to malnutrition, research continues to show a strong link between child malnutrition and long-term cognitive and economic losses (2). Stunting – or low height for age (height for age Z score < -2.00) – has been associated with cognitive losses and losses in earnings, both of which are essential to building human and economic capital in developing countries (2, WHO MGRS). Due to increasing evidence that better nutrition is long associated with economic gains, recent initiatives like the Scaling Up Nutrition (SUN) Movement have built momentum around nutrition as an issue of development (3). As these programs grow it is important to determine how to best combat malnutrition. A recent study found no association between increases in GDP and better nutrition across 36 countries using data from 1990 to 2011 (4). To truly understand the barriers to good nutrition experts and policy makers explore factors that could be preventing optimal child nutrition worldwide.

Research on important social obstacles to proper child nutrition may be able to answer this question and inform more sensitive programs. While poverty has long been associated with malnutrition, scholars argue that conventional income-based measures of poverty may not capture all of the constraints faced by people around the world, especially women (5, 6). Mothers, and women by extension, are of special concern because infant and young child feeding practices have been identified as one of the major factors in child malnutrition (7). Amartya Sen put forward the idea of a capability as "the opportunity to achieve valuable combinations of

human functionings – what a person is able to do or be" (6). While Sen connects this idea to broader conceptualizations of freedom, in the case of maternal and child nutrition this concept can be attached to what a woman is able to do to care for her child given both the resources around her and her own efficacy (6). Others have capitalized on the idea of capabilities to identify important or universal ones, building a methodology around studying the capabilities of women as they relate to child health (5).

A growing literature is operationalizing the capabilities concept for the study of nutrition as it relates to maternal autonomy. Autonomy, used somewhat interchangeably with empowerment, "refers to a woman's ability to have control or influence over choices that affect herself and her family within her own particular context" (8). Using cross-sectional survey data from multiple sources, the literature examines how variables which proxy for autonomy interact with a variety of child health outcomes (8, 9, 10). We will focus in this paper on nutritional outcomes – including infant and young child feeding practices (IYCF), stunting, wasting (low weight for height Z score or WHZ < -2.00), and underweight (low weight for age Z score or WAZ < -2.00) (11). This literature targets associations between these child nutritional indicators and autonomy or capability indicators for mothers. Autonomy and capability indicators vary across studies, with some focusing on women's status within the household or their relationships with men and others using survey data to determine mental capabilities or autonomy (9, 12, 13).

Generally, the field shows promising but conflicted results. Studies in India, a major contributor to the burden of malnutrition worldwide, have found significant associations between maternal agency and child nutrition (15). However, smaller regional studies in Kenya and Nicaragua have not found a significant relationship (13, 16).[1] While the literature on maternal

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[1] It does bear noting that Nicaragua saw positive associations, they were just not significant. This is generally true throughout the literature suggesting that there may be some association but that its strength is questionable in

agency and child nutrition is promising theoretically – and somewhat empirically – it remains conflicted. This is due in large part to vast differences in samples, theoretical interpretations, and methods of analysis. Some articles engage in large multi-country samples and find significant results across multiple indicators and models (9, 17). In contrast, smaller studies usually find less significance, such as two studies in Kenya and Nicaragua (13, 16). Yet other relatively small-scale studies, like two Jordan and Ghana respectively, do find significant results (18, 19).

Besides different sample areas or sample sizes, there is also a split in method of analysis within the literature about whether or not to use composite measures of autonomy (4). Because a woman's capabilities are multifaceted and related, some papers combine agency variables that measure similar capabilities using principle component analysis to create single variables (9, 10). For example, all measures of autonomy related to healthcare may be combined into one index (10). This approach could potentially create indicators that measure an aspect of empowerment without overloading the model and has been used in both multi-country and single country studies (9, 10). Different uses of factor analysis as well as the question of whether to use it or not currently divide the literature on maternal agency.

Comparison is also limited by differing dependent variables across studies. The main outcomes relating to child nutritional status can be divided into two groups – infant and young child feeding (IYCF) practices and anthropometric measures (11, 20). The three major anthropometric measures of importance are stunting, wasting, and underweight (11).[2] A child is considered abnormal – meaning they are stunted, wasted, or underweight – if they are two

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smaller areas. The Kenya study also saw significant relationships in children 3-10 years of age. Most studies focus on children 0-2 years old.

[2] Stunting, as discussed above, is low height for a child's age and indicates chronic malnutrition likely leading to developmental delays and consequences. Wasting is low weight for height, which is indicative of severe malnutrition often requiring medical intervention. Underweight is low weight for age and is a more conventional measure of malnutrition but its consequences are less clear.

standard deviations below the value considered normal based on extensive WHO study (11). The WHO also recommends study of eight key indicators for acceptable IYCF practices (19).[3] These eight measures are all feeding behaviors that are recommended by childcare professionals and the WHO to promote good nutrition. Which of these indicators is the independent variable also differ across papers, with some focusing on infant and young child feeding practices while others focus on anthropometric measures (4). Using different indicators of child feeding and anthropometry can help distinguish how maternal agency affects child nutrition, and areas that are potentially more fertile for intervention. However, the ability to compare significant and non-significant results across papers is weakened because few papers examine both anthropometric and IYCF indicators (4).

Independent autonomy variables differ as well. The study in Jordan mentioned above considered women to have high autonomy and power if she was the head of her household and examined the health of children whose mothers headed their household versus those who didn't (12). The study in Ghana used the Women's Agricultural Empowerment Index created by USAID's Feed the Future (FtF) and measured in areas in which FtF operates (18). Meanwhile multi-country studies made use of uniform Demographic and Health Surveys (DHS) data collected using the same questionnaire and sampling techniques in multiple countries (9, 17). Finally, the studies mentioned earlier which showed less significant results used their own questionnaires tailored from DHS or previously generated autonomy frameworks that were tailored to be culturally relevant to study areas (13, 16). Different indicators limit opportunities for comparison among studies as well as for formal definition of empowerment, creating a divide in the literature and room for further research (4).

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[3] The eight indicators are described below in our methods section of Chapter 1

The limitations of the autonomy and child nutrition literature mainly lie in the wide variety of methods and the gaps still remaining in them (4). The extremely wide variety of indicators, from uniform but large-scale data such as Demographic and Health Surveys (DHS) to smaller more culturally tailored datasets, allows study of many questions but only weak comparison between them as few studies examine both or break down information (8, 9, 10, 11, 12, 13, 14). One study that did break results down into separate samples found a generally strong correlation across multiple countries, suggesting that more systematic study at different levels could be beneficial to discovering exactly how the link between maternal autonomy and child nutrition varies across different areas of the world (17).

This paper hopes to use a more inclusive measure of both autonomy and capabilities, referred to as agency. We conceptualize agency as a combination of the capabilities a woman has to be, the decision making power she is able to exert to control over choices, and the basic personal assets she has to do so (4, 6). In this way, the concept of agency can encompasses the concept of capabilities and the varying concepts of autonomy to survey a greater number of indicators and outcomes. The theoretical framework for our study is shown below in Figure 1. Like other articles we will include capabilities and autonomy while also including economic and relevant context as controls or covariates (10, 16). By building a more inclusive concept of agency, we hope to better understand the relationship between maternal agency and child nutrition across the developing world and how it can be used to improve child nutrition.

Figure 1. Women's Empowerment Framework
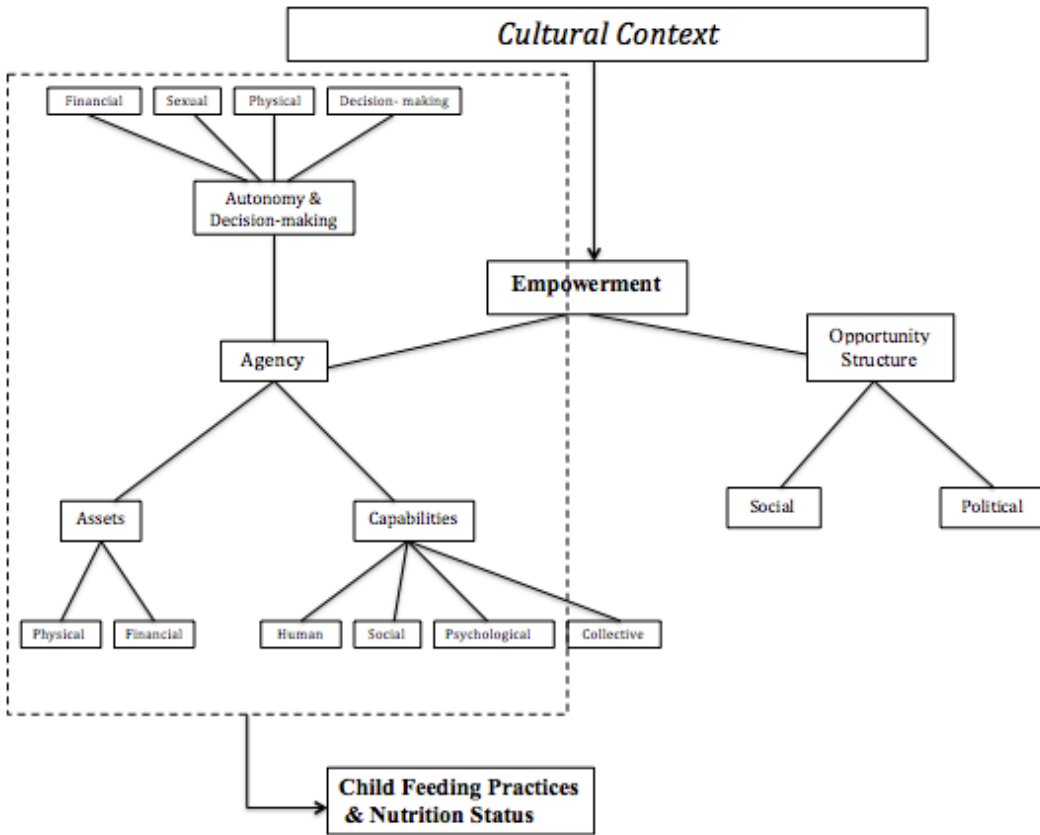
Much of the agency literature operationalizes autonomy or capabilities without a strong theoretical backing for how agency and child nutrition interact. There is a well-established link between care practices and child nutrition, and maternal agency is thought to modify maternal care (4). Long term, these feeding practices influence a child's nutritional status. Poor care practices may be the result of some combination of poor capacity, autonomy, or assets that limit a mother's ability to take care of her child as she would desire. Each of the domains of agency, and their more specific constructs, have unique relationships with child nutrition based on how they affect feeding practices (Table 1). Generally, autonomy affects nutrition through the decisions women make, assets affect the choices open to women, and capabilities affect a women's intrinsic motivation for adopting health behaviors (Figure 2).

Figure 2. Relationship between agency and feeding indicators
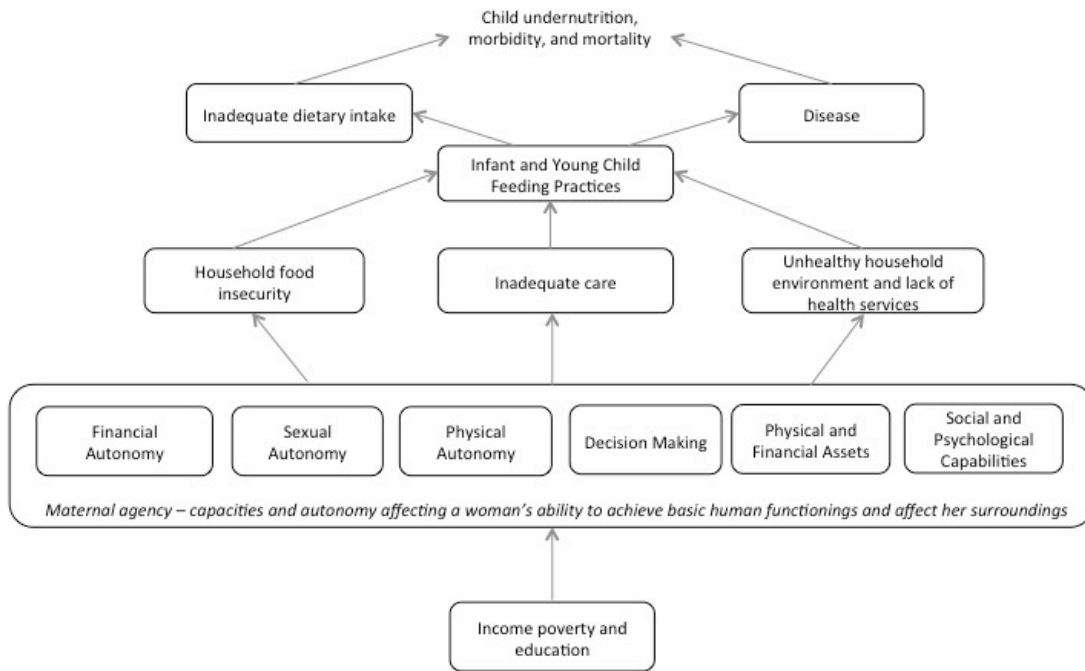
Autonomy, as defined above as a women's ability to affect the world around her, is operationalized in this study in 4 constructs. The first is physical autonomy, operationalized as a woman's ability to travel. We hypothesize that a woman's freedom to travel relates to her ability to care for her child if she is away from the home. Thus there is likely to be a negative relationship between the two. Next is sexual autonomy, the ability of a woman to decide whether or not she or her partner use contraception. Contraceptive use can allow a woman to better space her children's births, which allows better care for the youngest child during their most critical period of growth (4). Decision-making regarding money use represents financial autonomy, which gives women the power to use household resources to buy food or other commodities, such as ORS, which can improve their child's health. Finally, decision-making autonomy is represented in this analysis as decision-making regarding seeking healthcare. This is included due to its significance across the literature and our hypothesis that a woman able to seek

healthcare for her children will prevent them from becoming malnourished due to underlying

illness. Thus we hypothesize autonomy to have a variety of important affects on child nutrition.

Table 1. Definitions and operationalization of maternal agency constructs and their relationships with child care practices

Domain	Agency Construct and Definition	Variable	Potential Behaviors Affected	Expected Impact on Nutrition
Assets	Physical	Mother is Underweight	Feeding practices suboptimal due to food insecurity	Negative Direct, A mother lacking proper health will be less able to feed her children and will have less food to do so
Capabilities	Social	Access to Media	Improved access to social capital and improve motivation	Indirect Positive, greater ability to provide care in resource constrained setting
Capabilities	Psychological	Attitudes toward Wife Beating	Improved motivation and basic capabilities	Indirect Positive, greater ability to provide care in resource constrained setting
Autonomy	Physical	Travel	Mother entrusts childcare with others	Direct Negative, breastfeeding practices and others must be done
Autonomy	Financial	Decision Regarding Money	Household purchases can be devoted to commodities (i.e. food, medicine) that can improve child nutrition	Direct Positive, Children receive better nutrition and medical care
Autonomy	Decision-Making	Decision Regarding Health	Visits to health facilities if child is ill;	Positive Indirect, Visits to health center prevent nutritional losses due to illness
Autonomy	Sexual	Decision Regarding Contraception Use	Better birth spacing and control over births	Indirect positive, birth spacing allows continued breastfeeding and more resources to be devoted to children during 1000 days
Assets	Financial	Employed	Women is more able to make her own decisions about assets; Women is away from home more often	Indirect Mixed, decision making should be positive but time away from home may affect care
Culture	Control	Gender	-	-
Opportunity Structure	Control	Any Education	-	-
Opportunity Structure	Control	Wealth	-	-

Assets are more closely related to opportunity than other agency variables, but still hypothesized to enable positive feeding practices (21). The two constructs of assets used in this analysis are physical and financial. Physical assets are represented by a woman's weight status. If a mother is underweight she is less likely to have food for her children and due to her own health concerns less likely to feed them well. Financial assets are represented by employment. Financial assets better allow a woman to buy the food and commodities necessary to care for her children, thereby improving their nutrition. Assets enable women to exercise their autonomy in ways that can improve their children's nutrition.

Capabilities are less directly related to child care practices but can still have important implications for child feeding and thus anthropometry long term. The two capability constructs studied in this paper are social and psychological capabilities. Social capabilities are operationalized as access to media. We hypothesize greater access to media connects a woman to those around her and can also provide positive messages about child care and how it is valued in a society. Women who have this social capability will be more likely to engage in positive feeding practices due to their own self-determination and intrinsic motivation. Self-determination and motivation are viewed as major drivers of positive health behaviors in psychology (22 psych article). This connection has been used as a theoretical basis for analyses of agency before (23 agency article pointing to it) Psychological capabilities are defined as a woman's belief that wife beating is ever justified. If a women believes wife beating is justified, she will have less intrinsic motivation due to lower self worth and this will negatively impact her care practices. Figure 1 summarizes the connections between agency and child nutritional status narrated above. It is within this theory of autonomy, assets, and capabilities that this paper conducts an analysis of

women's empowerment and child nutrition.

This thesis will attempt to fill gaps in the maternal agency literature by studying multiple aspects of agency on both a large multi-country scale and smaller national and regional scales. It will first discuss results from a 12-country study using DHS data to explore different facets of agency across regions and age groups. Next a complementary study in rural Bundibugyo, Uganda will consider the same question but is able to explore agency in a more culturally appropriate way as well as examine the link between social support, agency, and child nutrition that is theorized in the literature. Finally, the replication of the first analysis with Uganda DHS data will allow comparison between different methods of studying empowerment and hopefully point towards priorities for future study and application.

Chapter 1: Relationships between Maternal Agency and IYCF and Anthropometric Child Nutrition Indicators in National Survey Data for 12 Developing Countries

METHODS

Sample Selection

In order to obtain a globally representative sample we selected 12 countries from 4 developing world regions for this study. Based on WHO classification of countries and methodology from other studies or world regions were: Southeast Asia, Latin America and the Caribbean, Africa, and South Asia (9). Each region included 3 countries that had the highest

burden of malnutrition in the area as well as available Demographic and Health Survey data from the last 8 years. Selecting high burden countries ensured a more balanced sample and provided a set of countries with a wide array of development issues and priorities. Southeast Asian Countries included Cambodia, Indonesia, and Timor Leste. The Latin America and Caribbean countries included Guyana, Haiti, and Honduras. African countries selected were Ethiopia, Nigeria, and the Democratic Republic of Congo. And finally, South Asian countries included Nepal, Bangladesh, and India. While the WHO and previous studies have not made a distinction between South Asian Countries and Southeast Asian Countries, doing so allowed us to select countries, like Indonesia and Cambodia, which have not previously been included in studies but represent unique cultural and development contexts relevant to child nutrition worldwide (9).

Following country selection, we compiled a dataset using DHS Recode V data from all 12 countries using the child recode from the latest year available. The child recode from DHS assigns each child of a woman interviewed a unique subject ID, which attaches their mother's survey responses to data on their physical health (20). Children, and thus their mothers, were included in the analysis if they lived with their mother, were still alive at the time of the survey, were the first-born child, and were age 0-24 months. Using only data on the first-born child ensures that different cases are not directly associated. The final selection criterion was the presence of data on infant and young child feeding (IYCF) practices in the DHS survey, except in Indonesia where data was not collected on IYCF practices.

Indicator Creation

This study focuses on two sets of outcomes of interest – IYCF practices and anthropometric measures – in order to make it comparable to larger portions of the literature. As discussed above, most studies focus on a specific set of child health indicators and thus

comparison of the effect of maternal agency on nutritional outcomes is difficult (4). We created

all indicators using the DHS survey data available. IYCF indicators were composed of the eight

core indicators recommended by the WHO for studying IYCF and calculated based on the most

recent WHO guidelines (19).

Four indicators relate to breastfeeding – immediate initiation of breastfeeding, exclusive

breastfeeding for the first six months of life, continued breastfeeding at 1 year, and timely

introduction of complementary foods at 6 to 8 months. The other four indicators were related to

dietary adequacy – whether children are fed the minimum number of times per day, fed for or

more food groups per day, fed an iron rich diet, or fed a diet defined as meeting the minimum

acceptable criteria. Feeding was classified based on a child's reported age and what foods

mothers reported giving them the previous day. As a result, sample sizes vary across IYCF

indicators based on the number of children in each age group within the sample. Exclusive

breastfeeding only includes children 0 to 6 months. Continued breastfeeding at 1 year includes

children 12-15 months. Introduction of complementary foods only included 12 to 15 months.

Immediate initiation of breastfeeding included all children in the sample. All other indicators

included all children 6 to 23 months. These indicators were all created based on a WHO on how

to measure and calculate and define core IYCF practices (WHO 2010). The eight indicators

selected were the 8 core indicators recommended by the WHO.

Anthropometric variables – in this case stunting, wasting, and underweight – were all

calculated from available DHS data as per WHO Multicentre Growth Reference Study (MGRS)

guidelines (11). The WHO calculated DHS data on weight for age, weight for length, and height

for age for DHS based on this extensive research and are included in downloadable datasets (20).

The data was presented in DHS datasets as standard deviations from the population norm times

100. By dividing by 100, we were able to classify any child more than 2 standard deviations below the norm as stunted, wasted, or underweight. Underweight corresponds with low weight for age. Wasting corresponds with low weight for length. Stunting corresponds with low height for age and is related to cognitive and earnings losses due to malnutrition (2,3). The prevalence of stunting is often used as an indicator of overall development (3). With IYCF indicators, our anthropometric variables make up at set of 11 independent variables analyzed for association with maternal autonomy.

Due to the lack of standardized methodology across papers studying women's empowerment as it relates to child nutrition it was necessary to make decisions about how to conceptualize agency variables and use them in our analyses. The methodology for how we selected our basic indicators is described above and in Table 1. While there is a continuing debate within the literature about whether joint decision making should be measured as the same level of agency as autonomous decision making we consider joint decision making to be the same as autonomous decision making in our study (4). All indicators were created using DHS survey data with responses coming from a single question within the data, except for the domestic violence indicator which was created from multiple indicator to proxy the question "Is domestic violence ever justified?" Questions were selected based on previous use and use throughout the literature (4, 24, 25). While many studies create composite indicators using PCA, we did not feel it was appropriate to do so given our data's binary nature and the potentially non-random nature of DHS cluster sampling. Both of these factors could invalidate PCA based on the methods underlying statistical assumptions (26). Had we used PCA, variables would have been combined into components within each of the three components of agency. Ultimately we

employed the 8 indicators listed above to measure maternal agency and its relationship with child nutritional status and IYCF practices.

<u>Model Building</u>

We built a logistic regression model using the IYCF and anthropometric variables above as dependent variables and autonomy variables as independent variables. Control variables were introduced based on relevance to our overall empowerment framework. To control for known cultural factors in our sample we included child gender as a control, which has been suggested in other work (27). Our major socioeconomic control was whether or not the mother and child were in the lowest 40 percent of the DHS created wealth index, which has been used in similar analyses (10). Our final control was whether or not woman had any education, due to its demonstrated importance in child care (7). Wealth and education acted as a proxy for a woman's opportunity structure and child gender as a proxy for cultural context.

Models were run as both multivariate and univariate regressions. The univariate regressions are a misnomer as they contained control variables but only one agency indicator acting as the independent variable. Multivariate models included all agency variables as well as controls. The individual regressions were meant to examine the relationship between each indicators and child health, since this has rarely been done across so many indicators on a multi-country scale. However, we recognize that agency variables are likely not unrelated – though their level of correlation was low suggesting each indicator did capture a different aspect of agency – and used the pooled model to control for SES as well as high agency in other areas.

Travel was eventually dropped from the model due to extremely low response rates to travel questions across the 12-country data, which decreased the sample size too much to justify its inclusion in our models. Models were run using data from all 12 countries, with data

disaggregated by world region (4, 16). Results are reported as odds ratios with confidence

intervals and levels of significance (p <0.05 is considered significant). Coefficients for control

variables are included in tables to allow comparison of other domains of empowerment with

agency variables.

RESULTS

<u>Demographic characteristics and descriptive outcomes</u>

Table 2 shows the distribution of feeding and agency indicators over the entire sample. A

very high percentage of women responded that they were involved in decision-making regarding

contraception (92. 2%), though generally other agency variables were more balanced between 1

and 0. A smaller percentage of the population experienced agency in the categories of maternal

underweight (24.5%) and involvement in decision-making regarding money (21.6%). Travel is

included to show the relatively small sample of women with information on travel. Where as the

full sample is 42677, only 7798 women had data on travel and while this was within 2000

respondents of other agency variables, due to distribution it resulted in a prohibitively low

sample size in the models.

Of the age categories included in the initial regressions we see a relatively good balance

among the five groups and large enough sample sizes to justify stratification for IYCF variables

such as introduction of complementary foods, which only includes children five to eight months

of age. In terms of IYCF indicators themselves, mothers most commonly met the criteria

exclusive breastfeeding for 6 months most often (64.4%) and the criteria minimum acceptable

diet least often (15.7). Of the three anthropometric variables the stunting was most prevalent

(34.2%) but underweight was not much less prevalent (30.2%). Wasting (19.4%) was least

prevalent, which is logical as it is the most severe condition (11).

Table 2. Demographic characteristics, maternal agency indicators, feeding practices, and nutrition status of study participants [1].

	Percent	N
Age (n=42677)		
0 to 5 months	22.6	9652
6 to 8 months	14.7	6269
9 to 11 months	12.8	5448
12 to 15 months	18.0	7661
16 to 23 months	32.0	13648
Gender (n=42677)		
Male	51.4	21926
Female	48.6	20751
Maternal Education (n=42677)		
None	36.0	15362
Some primary/Complete primary	28.3	12075
Some secondary	35.7	15239
Maternal Agency Indicators [2]		
Maternal Underweight	24.5	10424
Access to Media	57.9	24719
Believe wife beating is justified	49.3	21052
Involved in decision making regarding use of own money	21.6	9213
Involved in decision making regarding contraception	92.2	14288
Travelled away from home 2 or more times in last 12 months	20.5	7798
Involved in decision making regarding healthcare	63.0	42677
Employed	41.2	17587
IYCF Feeding Indicators [3]	Percent	
Early initiation of breastfeeding	41.8	17841
Exclusive breastfeeding to six months	64.4	6218
Fed minimum meal frequency	50.9	14049

Fed minimum dietary diversity	30.8	9935
Fed iron-rich or iron-fortified foods	27.2	8864
Fed minimum acceptable diet	15.7	5018
Anthropometric Data among children 0 to 23 months (n=36411) [4]		
Underweight (Weight-for-age Z-score <-2)	30.2	10998
Stunted (Length-for-age Z-score <-2)	34.2	12448
Wasted (Weight-for-length Z-score <-2)	19.4	7047

[1] Sample includes all last born children living with their mothers with complete anthropometric and infant feeding data, except in Indonesia where all children with complete IYCF data were included, n=42677.
[2] Some sample sizes varied dependent on the questions asked in specific countries due to cultural sensitivities regarding contraception use and wife domestic violence.
[3] Sample size varies dependent on the age restrictions of feeding indicators.
[4] Anthropometric analyses exclude children from Indonesia where this data was not collected.

Table 3 shows these same variables over each of the 12 countries, and among more granular regional data there is much more variance in population means and the percentage of individuals meeting feeding requirements or expressing agency. In Africa, 91.8 – 96.3% of children are still breastfed at 1 year compared to 61.8 – 82.6% in Latin America and the Caribbean. Feeding indicators also differ from the other regions in Africa, where Ethiopia has very low feeding indicators (4.6% of children are fed four or more food groups per day) as do the Democratic Republic of the Congo and Nigeria. In Ethiopia all breastfeeding indicators are met in more that 50% of the sample, and more than 40% in the other African countries while less than 15% of children being fed a minimally acceptable diet.

Table 3. Proportion of households meeting Infant and Young Child Feeding Practices by country [1]

	Breastfed within one hour of delivery (%) (N=42,677)		Exclusively breastfed among children 0 to 5 months (%) (N=9,652)		Continued breastfeeding at one year among children 12 to 15 months (%) (N=7,661)		Timely introduction of complementary foods among children 6 to 8 months (%) (N=6269)		Fed minimum number of times per day among children 6 to 23 months (%) (N=33,025)		Fed four or more food groups among children 6 to 23 months (%) (N=33,025)		Fed iron rich foods or iron fortified products among children 6 to 23 months (%) (N=33,025)		Fed minimum acceptable diet among children 6 to 23 months (%) (N=33,025)	
	Pct.	SE	Pct.	SE	Pct.	SE	Pct.	SE	Pct.	SE	Pct.	SE	Pct.	SE	Pct.	SE
Southeast Asia																
Cambodia	66.0	1.2	86.1	2.0	84.3	2.2	88.5	2.1	70.8	1.5	35.7	1.4	73.7	1.3	21.0	1.2
Indonesia	40.5	0.6	42.5	1.2	79.9	1.2	89.5	1.0	53.0	0.8	59.4	0.7	63.7	0.7	27.6	0.7
Timor-Leste	81.7	0.8	58.8	2.1	72.0	2.0	89.4	1.7	54.7	1.2	30.5	1.0	32.1	1.0	13.0	0.8
Latin America/Caribbean																
Guyana	66.2	2.1	44.3	5.2	61.8	5.5	82.1	4.3	35.1	2.6	61.0	2.4	61.5	2.4	19.3	2.0
Haiti	43.7	1.1	44.4	2.2	82.6	1.9	91.8	1.8	36.4	1.4	35.4	1.2	29.6	1.2	12.6	0.9
Honduras	77.6	0.8	42.6	2.5	72.9	1.8	90.5	1.3	61.2	1.0	59.9	0.9	22.6	0.8	35.3	1.0
Africa																
Democratic Republic of Congo	45.8	1.4	59.5	3.1	91.8	1.7	85.8	2.6	29.5	1.6	28.4	1.5	41.5	1.6	6.7	0.8
Ethiopia	53.2	0.8	75.0	1.3	96.3	0.7	61.7	2.1	49.6	1.0	4.6	0.4	5.6	0.4	3.6	0.4
Niger	46.7	1.2	78.5	1.9	95.3	1.2	70.7	2.9	43.9	1.5	31.3	1.3	12.0	1.1	12.7	1.0
South Asia																
Bangladesh	43.5	1.1	62.1	2.3	94.1	1.4	80.6	2.2	82.5	1.0	42.7	1.2	47.6	1.2	37.9	1.2
India	23.0	0.3	73.7	0.7	89.5	0.6	67.4	0.9	45.1	0.5	15.6	0.3	11.6	0.3	8.8	0.2
Nepal	45.1	1.6	80.5	2.7	94.0	1.9	63.0	4.2	79.3	1.7	29.1	1.7	17.6	1.4	23.8	1.6

[1] Sample includes women all 12 countries with complete IYCF and anthropometric data. Sample size may vary depending on age restrictions of feeding indicators.

Table 4. Proportion of households meeting maternal agency indicators by country [1]

	Maternal Underweight [2] (n=42607) (n=42608 in regional analyses)		Believe wife beating is justified (n=42677)		Travelled away from home (n=42677) (n=7798 in regional calcs)		Employed (n=42677)	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Southeast Asia (n=10,324)	*24.3*	*0.7*	*52.5*	*0.5*	*22.5*	*1.1*	*45.8*	*0.5*
Cambodia	20.2	1.1	51.1	1.3	22.5	1.1	76.7	1.1
Indonesia	N/A	N/A	37.0	0.6	N/A	N/A	41.5	0.6
Timor Leste	26.6	0.9	91.0	0.6	N/A	N/A	38.6	1.0
Latin America/Caribbean (n=5,612)	*7.5*	*0.4*	*24.4*	*0.6*	*14.2*	*0.7*	*44.8*	*0.7*
Guyana	10.6	1.4	20.1	1.8	20.3	1.8	26.5	2.0
Haiti	12.4	0.7	30.8	1.0	12.8	0.7	61.8	1.1
Honduras	3.8	0.3	20.9	0.7	N/A	N/A	36.6	0.9
Africa (n=6,725)	*19.6*	*0.5*	*75.9*	*0.5*	*14.6*	*0.7*	*54.0*	*0.6*
Democratic Republic of Congo	16.8	1.1	78.3	1.2	12.6	1.0	76.8	1.2
Ethiopia	22.4	0.7	77.1	0.7	N/A	N/A	50.8	0.8
Niger	15.1	0.9	71.6	1.1	16.1	0.9	44.8	1.2
South Asia (n=20,016)	*38.6*	*0.4*	*45.7*	*0.4*	*52.5*	*1.6*	*33.5*	*0.3*
Bangladesh	33.5	1.0	31.8	1.0	N/A	N/A	22.8	0.9
India	40.1	0.4	49.9	0.4	N/A	N/A	33.1	0.4
Nepal	21.5	1.4	1.0	0.3	52.5	1.6	65.7	1.6
Overall	24.5	0.2	49.3	0.2	20.5	0.5	41.2	0.2

[1] Sample includes women all 12 countries with complete IYCF and anthropometric data. Sample size may vary depending on cultural sensitivity of certain survey questions.

[2] Maternal and child anthropometric data was not collected in Indonesia. However, mothers with IYCF data are included in the analysis of all other agency indicators.

N/A Question was not included in country survey and was therefore not available for analysis

(Table 3 cont'd)

	Access to media (n=42677)		Involved in decisions regarding use of own money (n=42677)		Involved in decisions regarding use of contraception (n=15504)		Involved in decisions regarding healthcare (n=42677)	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Southeast Asia (n=10,324)	*69.2*	*0.5*	*25.9*	*0.4*	*94.4*	*0.3*	*85.5*	*0.2*
Cambodia	61.6	1.3	54.8	1.3	89.7	1.2	87.3	0.4
Indonesia	81.4	0.5	27.7	0.6	95.0	0.3	84.8	0.3
Timor Leste	44.0	1.0	5.3	0.4	95.2	0.9	85.7	0.4
Latin America/Caribbean (n=5,612)	*84.2*	*0.5*	*33.1*	*0.6*	*92.1*	*0.5*	*63.1*	*0.3*
Guyana	87.5	1.5	17.2	1.7	84.7	2.5	75.6	0.9
Haiti	67.6	1.0	51.3	1.1	93.3	1.1	59.4	0.5
Honduras	94.6	0.4	23.8	0.8	92.6	0.6	64.3	0.5
Africa (n=6,725)	*31.1*	*0.6*	*28.5*	*0.6*	*86.4*	*0.9*	*46.4*	*0.3*
Democratic Republic of Congo	37.3	1.4	38.1	1.4	83.9	2.1	42.1	0.6
Ethiopia	23.7	0.7	26.2	0.7	92.8	0.9	65.7	0.5
Niger	43.6	1.2	26.7	1.1	73.3	2.5	24.9	0.5
South Asia (n=20,016)	*53.7*	*0.4*	*13.8*	*0.2*	*91.5*	*0.4*	*62.3*	*2.0*
Bangladesh	55.1	1.1	14.6	0.8	N/A	N/A	60.2	0.6
India	53.6	0.4	13.8	0.3	91.8	0.4	63.0	0.2
Nepal	54.1	1.6	13.1	1.1	86.0	2.0	58.2	0.7

Table 4 presents demographic percentages for agency indicators across the four regions. Beliefs about the acceptability of wife beating are significantly higher in Africa than any other region. More than 70% of women in all three African countries believe wife beating may be justified in one or more situations. Similarly, access to media is much higher in Latin America and the Caribbean than any other region. Also within Africa, 78.3% of women in the Democratic Republic of Congo are employed. Other indicators are more uniform across regions and countries. However, in general there is enough variation in decision making related to healthcare and money to encourage robust results.

Univariate and Multivariate Regression Results

In univariate and multivariate regression models that included all indicators, most predictor variables significantly influences the odds of IYCF practices and anthropometric outcomes. In the individual regressions this level of significance was even higher, demonstrating that our agency variables do attenuate individual affects slightly but overall capture different dimensions of empowerment. Figure 3 presents the results of multivariate models, a table containing all region multivariate results can be found in the appendix. Access to media, maternal underweight, and decision-making regarding health were highly significant in the individual all region regressions shown in Figure 3 and Table A1. Indicators showing less significance included participation in decisions on the use of contraception, which could be due to the high overall rates of involvement with contraceptive decisions. Given the low levels of other agency indicators, this could be a problem with the DHS question or social norms surrounding the issue.

Significance across multiple agency and IYCF indicators shows a strong link between maternal agency and child health, though the directions of these relationships are not constant. All region regressions in Figure 3 show that multiple indicators of agency decrease the odds that children will be breastfed exclusively for 6 months and that they will still be breastfed at one year. However, these same indicators also make children more likely to be fed an adequate diet. In pooled regressions, access to media makes a child 0.62 times (CI: 0.45, 0.86, p <0.01) as likely to be breastfed exclusively while making a child 1.93 (CI: 1.70, 2.19, p<0.001) times more likely to be fed a minimum acceptable diet.

The relationship between agency indicators and child health outcomes begin to change as results are disaggregated to regional levels. Comparisons between Figures 3-7 below show substantive and statistical significance levels varying across regions. Southeast Asia followed the same general patterns as the all region regressions. Access to media and maternal underweight remained important predictors of most feeding practices, but attitudes towards domestic violence rivaled them for significance in the Southeast Asian sample. Breastfeeding indicators were impacted negatively by empowerment as shown by the association of immediate initiation of breastfeeding to access to media (OR: 0.75, CI: 0.65, 0.87, p<0.001) and decision-making regarding health with exclusive breastfeeding (OR: 0.61, CI: 0.42, 0.89, p<0.05). Odds of meeting non-breastfeeding related indicators generally increased. For example access to media increased odds of being fed four plus food groups (OR: 1.40, CI: 1.21, 1.62, p<0.001) and being med a minimum acceptable diet (OR: 1.44, CI: 1.18, 1.75, p<0.001).

The Latin America and the Caribbean (LAC) region shows more disparate patterns from the all region regressions, and less significance overall. Media is much less significant and maternal underweight is only a significant predictor of increased odds of immediate initiation of

breastfeeding (OR: 1.95, CI: 1.38, 2.75, p < 0.001). The most significant predictor of

recommended child feeding practices in the LAC countries is wealth, a control variable. In LAC

certain indicators – immediate initiation of breastfeeding, minimum number of meals per day,

and minimum adequate diet – seem to be affected by changes in agency more than other feeding

indicators which are not significantly associated with any agency variables.

Results from the African region in particular were vastly different from the All Region

results. Figure 6 shows the large confidence intervals, most of which are straddling 1 making

results insignificant, for the African region. Still in Africa decision-making regarding health,

media, and employment showed significant results in some categories. In cases of statistical

significance, the substantive coefficients were often larger than those in the pooled models. For

example, there is a strong relationship between access to media and the minimum acceptable diet

(OR: 6.26, CI: 3.64, 10.74, p<0.001), employment and an iron rich diet (OR: 2.47, CI: 1.62,

3.76, p<0.001), and attitudes towards wife-beating and exclusive breastfeeding (OR: 2.80, CI:

1.41, 5.57, p<0.01). Our control variables – child gender, maternal education, and wealth – were

only associated with decreased odds of stunting, being fed four or more food groups, and being

fed iron rich foods. Their lack of significance over the models suggests that these controls may

not be properly capturing the opportunity structure in the African countries in the sample.

Overall, the variances in results within the African countries show that the All Region results

may not be representative of smaller samples.

The South Asian sample was the largest sample (N=20,566) thus creating the concern

that it could be driving the All Region results. However, the South Asian regressions results were

not quite as in line with the all region results as the South East Asian sample. Maternal

underweight was only a significant predictor of decreased odds of timely introduction of

complementary foods (OR: 0.77, CI: 0.66, 0.91, p<0.01). Media significantly predicted increased

odds of feeding a child four or more food groups per day (OR: 1.69, CI: 1.42, 2.01, p<0.001),

iron rich foods (OR: 1.36, CI: 1.13, 1.64, p<0.01), and a minimum acceptable diet (OR: 1.42, CI:

1.15, 1.77, p<0.01). Overall, employment had much stronger associations with feeding practices

in the South Asian region. It was only associated with continued breastfeeding, timely

introduction of complementary foods, or feeding four or more food groups. However,

employment greatly increased the odds of exclusive breastfeeding (OR: 4.48, CI: 2.39, 8.38,

p<0.001). Wealth and education were significant predictors across the majority of indicators,

indicating that the woman's opportunity structure was better represented by these variables in

South Asia. While the South Asian model followed some of the all region trends, Figure 5 shows

that these trends were weaker overall despite the large sample size.

Figure 3. Associations between agency indicators and infant and young child feeding (IYCF) practices across 12 countries
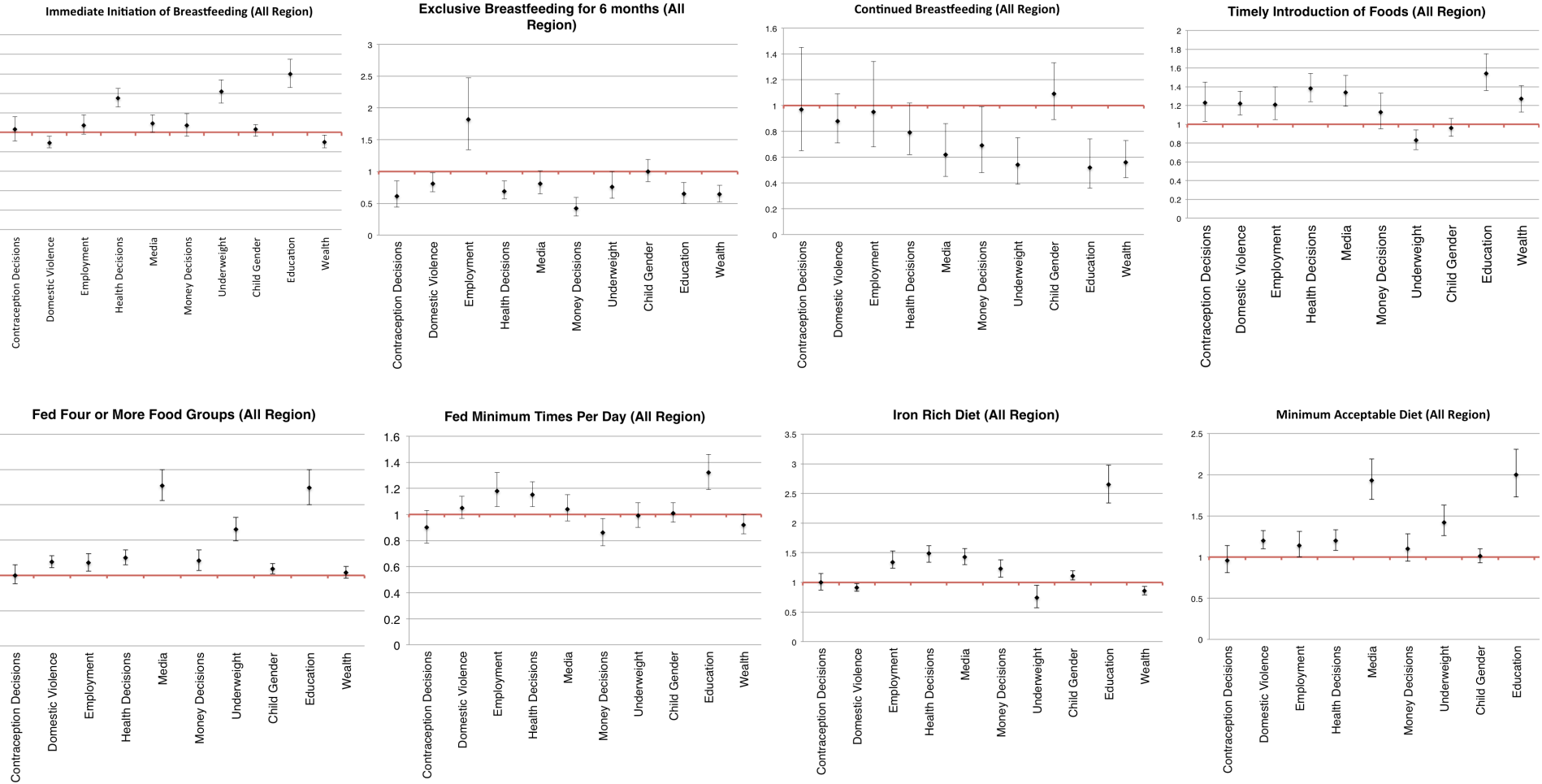
Figure 4. Associations between agency indicators and infant and young child feeding (IYCF) practices in Southeast Asian Countries
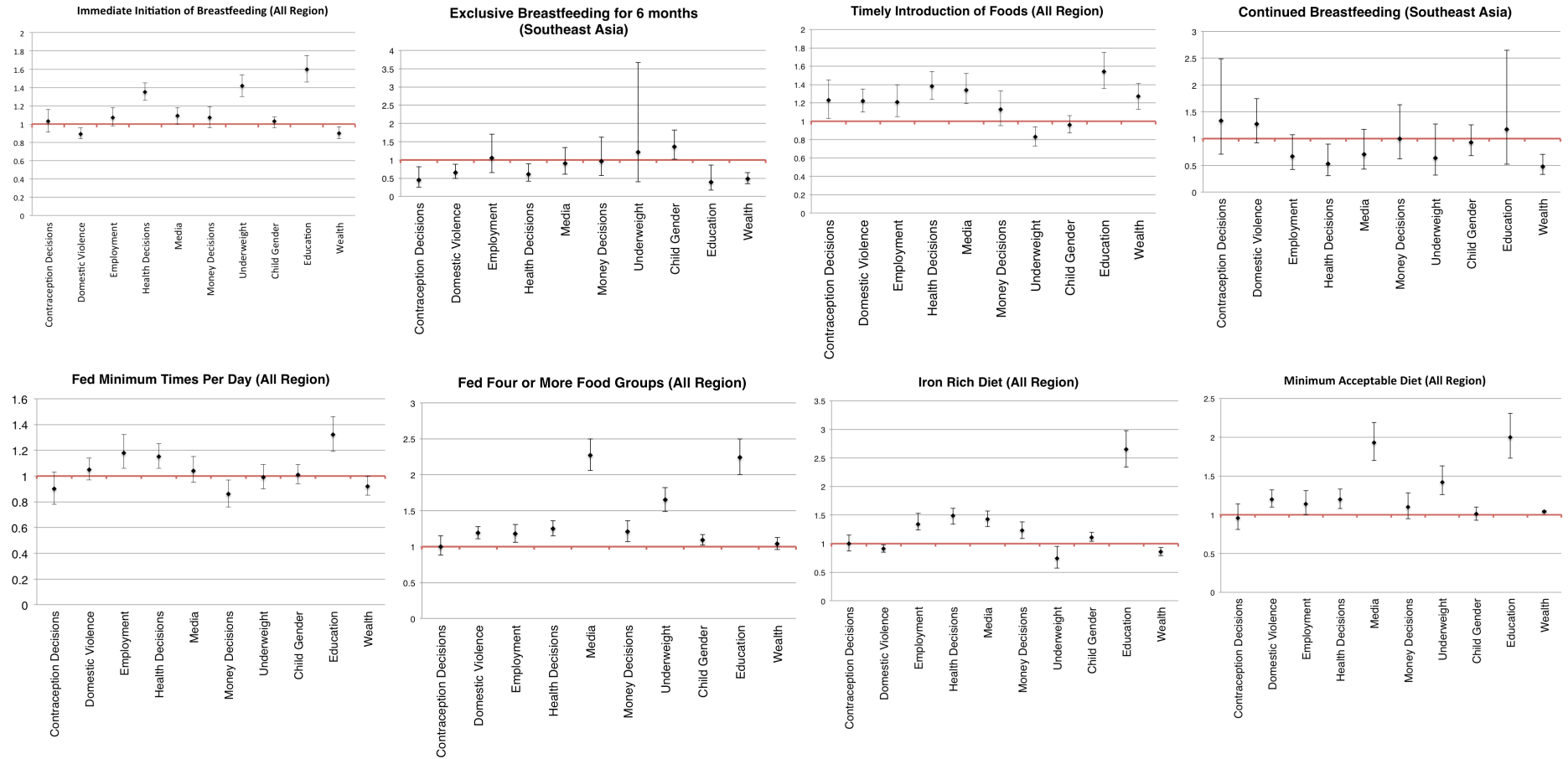
Figure 5. Associations between agency indicators and infant and young child feeding (IYCF) practices in Latin American and Carribbean Countries
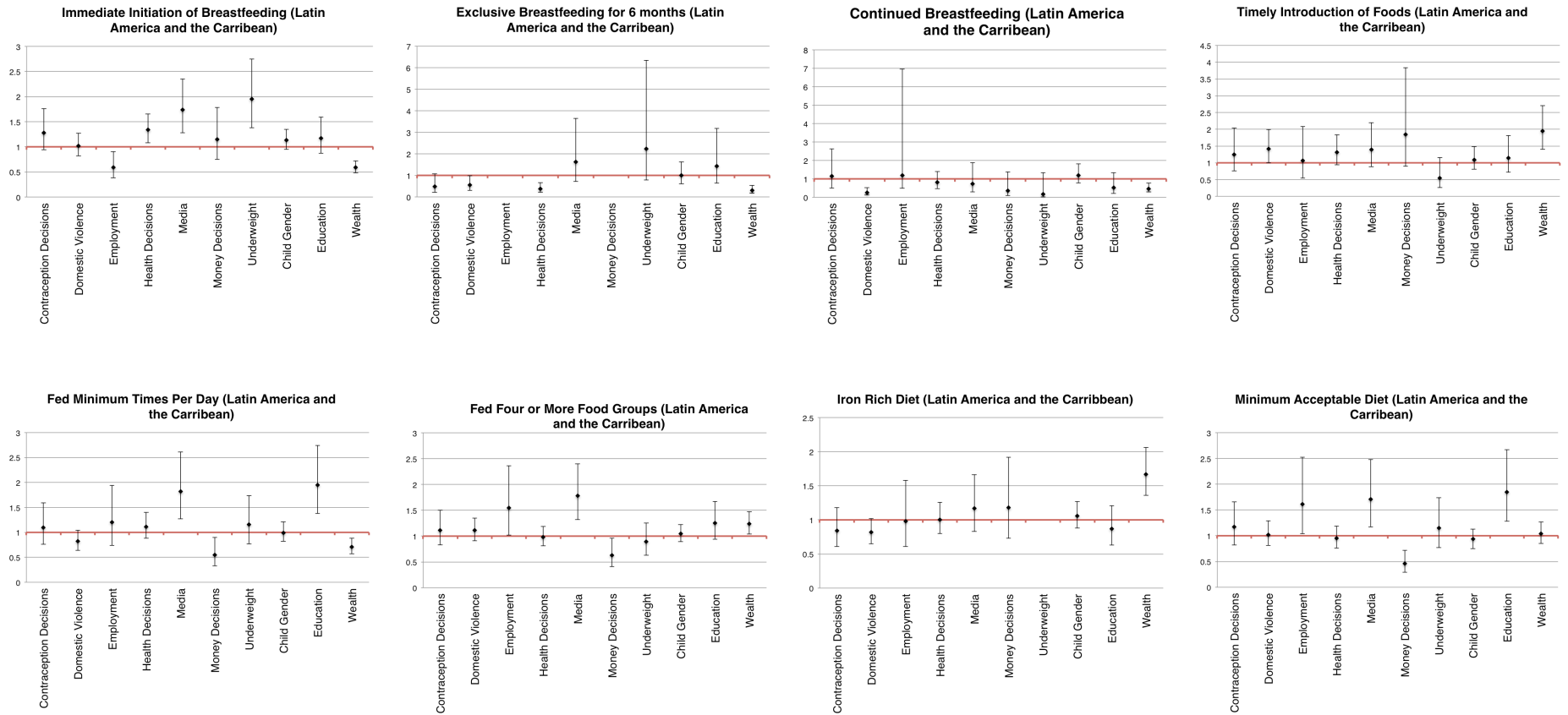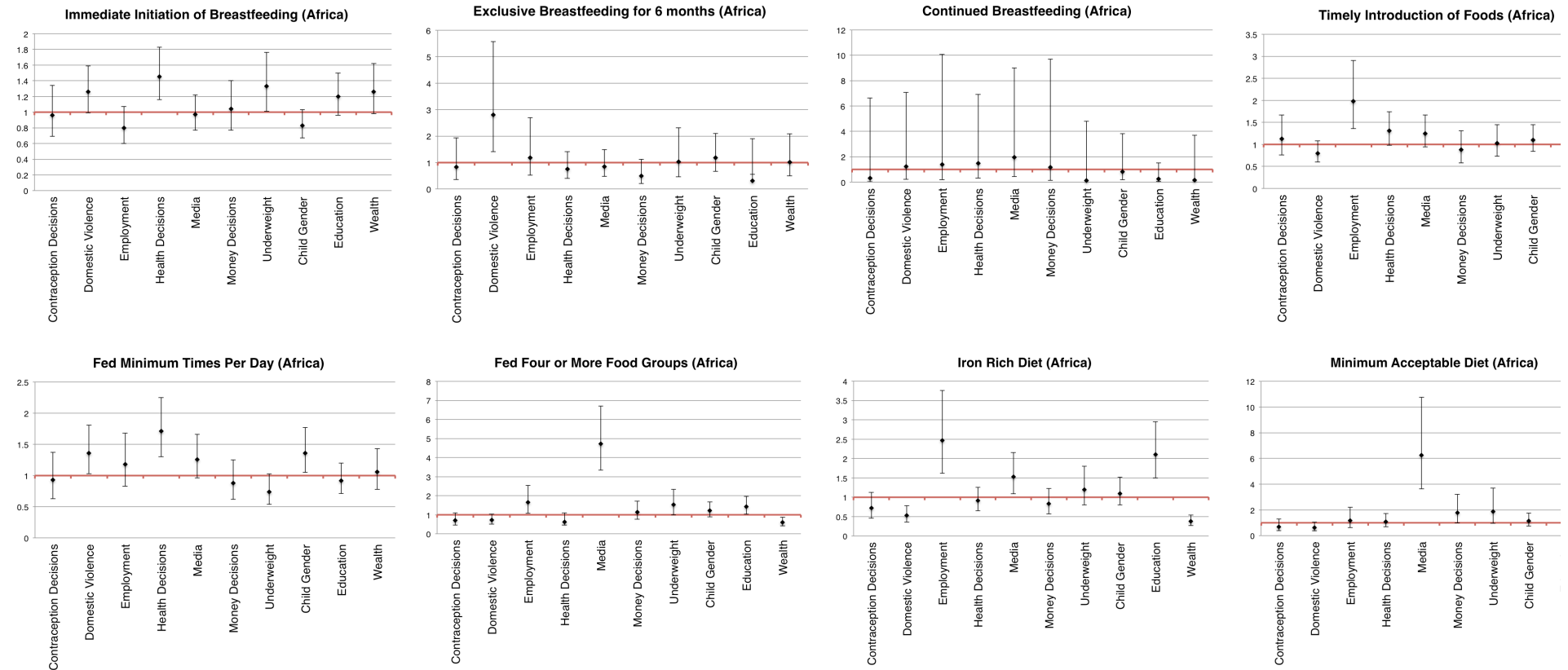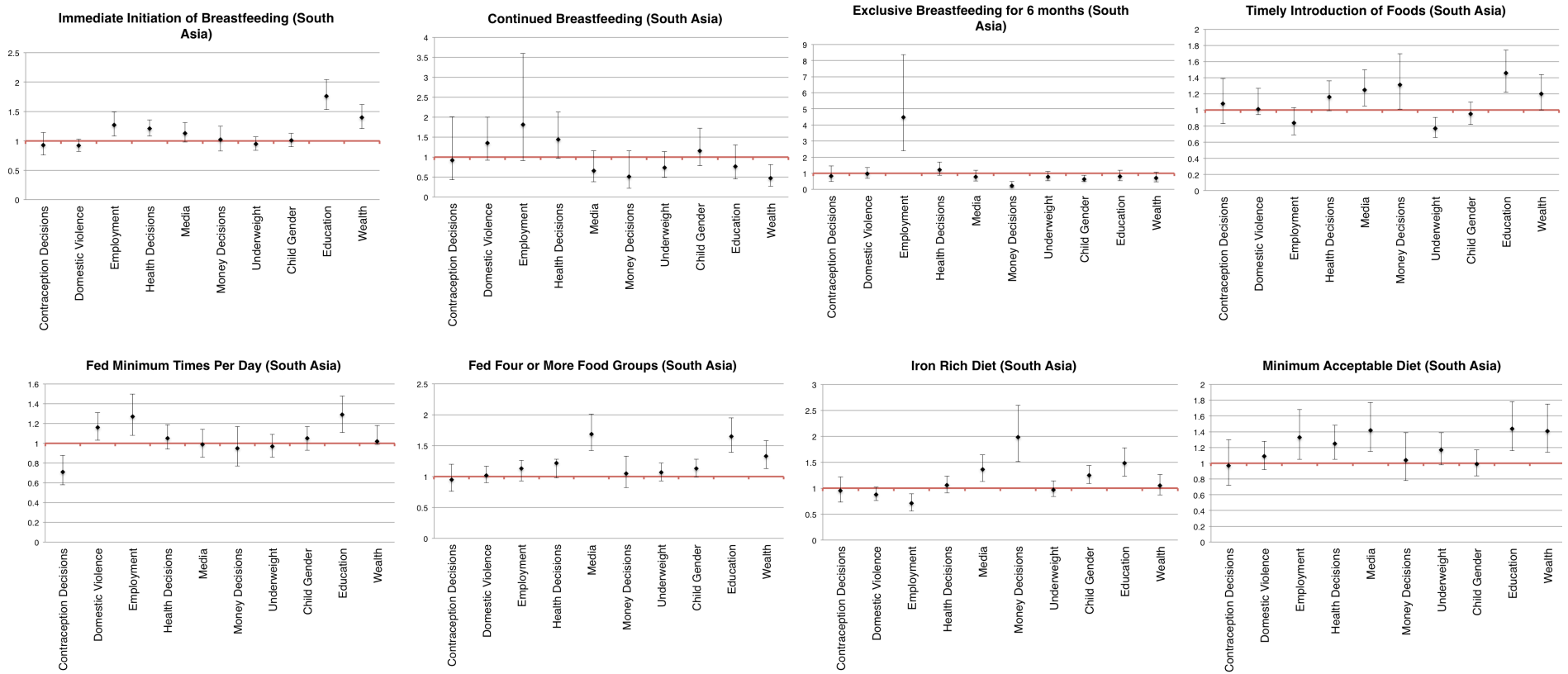

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Figure 6. Associations between agency indicators and infant and young child feeding (IYCF) practices in African Countries

Figure 7. Associations between agency indicators and infant and young child feeding (IYCF) practices in South Asian Countries

Anthropometric variables showed similar trends, with both greater significance in individual regressions and significance across regions. Generally, Figures 8-12 and Table A2 show greater significance in general across regions, but different affects for stunting versus wasting and underweight. All indicators show a high level of significance ($p<0.01$ or $p<0.001$), except decision-making power related to contraception for the all region analyses. Maternal underweight and access to media remain significant ($p<0.001$) across the three anthropometric indicators. These indicators also have substantive effects with maternal weight having especially strong effects on wasting (OR: 0.46, CI:0.44, 0.50, $p<0.001$) and underweight (OR:0.46 CI: 0.44, 0.49, $p<0.001$). But maternal underweight still had a relatively large effect on stunting (OR: 0.70, CI: 0.66, 0.73, $p<0.001$) at about the same magnitude that access to media had on stunting (OR: 0.76, CI: 0.72, 0.80, $p<0.001$) and underweight (OR: 0.73, CI: 0.68, 0.77, $p<0.001$). Decision-making regarding health did not have as strong a relationship with anthropometric measures as feeding indicators. It was not significantly related to stunting, and only lightly related to wasting (OR: 0.87, CI: 0.81, 0.93, $p<0.001$) and underweight (OR: 0.93, CI: 0.88, 0.98, $p<0.01$). It also should be noting that maternal employment was significantly associated with greater odds of children being stunted, wasted, or underweight. Overall, agency indicators continued to show strong but inconsistent relationships with child health outcomes when looking at anthropometric variables.

Anthropometric variables also varied by region. Southeast Asia did not mirror as perfectly results for anthropometric indicators. While the South Asian and All Region results were similar for stunting, there was generally low significance across indicators for wasting and underweight. Significant coefficients were also generally closer to 1. In LAC countries, more

agency variables were related to wasting and underweight than stunting in regressions of anthropometric dependent variables. However, wealth was strongly associated with a decrease in the risk of stunting (OR: 0.32, CI: 0.28, 0.36, p<0.001) and underweight (OR: 0.50, CI: 0.42, 0.59, p<0.001). Education was significant across stunting (OR: 0.64, CI: 0.54, 0.76, p<0.001), wasting (OR: 0.31, CI: 0.22, 0.43, p<0.001), and underweight (OR: O.46, CI: 0.37, 0.57, p<0.001).

Despite generally weak systematic association between IYCF practices and agency in Africa, there seemed to be relatively strong association between agency and stunting with 5 of 7 agency indicators significantly associated with the likelihood of stunting. All that were significantly associated decreased the odds of stunting, except for underweight, which increased the odds of stunting 1.23 times (CI: 1.03, 1.46, p<0.01). Wasting showed the least association with indicators, only being significantly associated with decisions regarding contraception (OR: 0.59, CI: 0.42, 0.83, p<0.001) and maternal underweight (OR: 0.55, CI: 0.42, 0.72, p<0.001). Two of the In South Asia association was strong for stunting and underweight, but some empowerment variables increased the risk of stunting including decisions making regarding contraception use (OR: 1.13, CI: 1.02, 1.25, p<0.01) and employment (OR: 1.12, CI: 1.04, 1.20, p<0.01).

Figure 8. Associations between maternal agency and anthropometric indicators across all regions
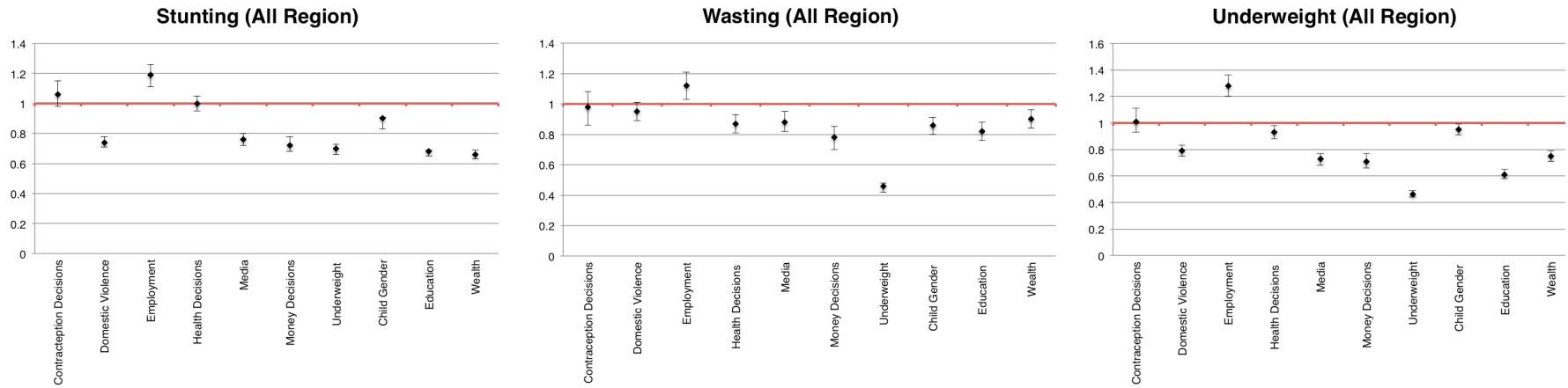

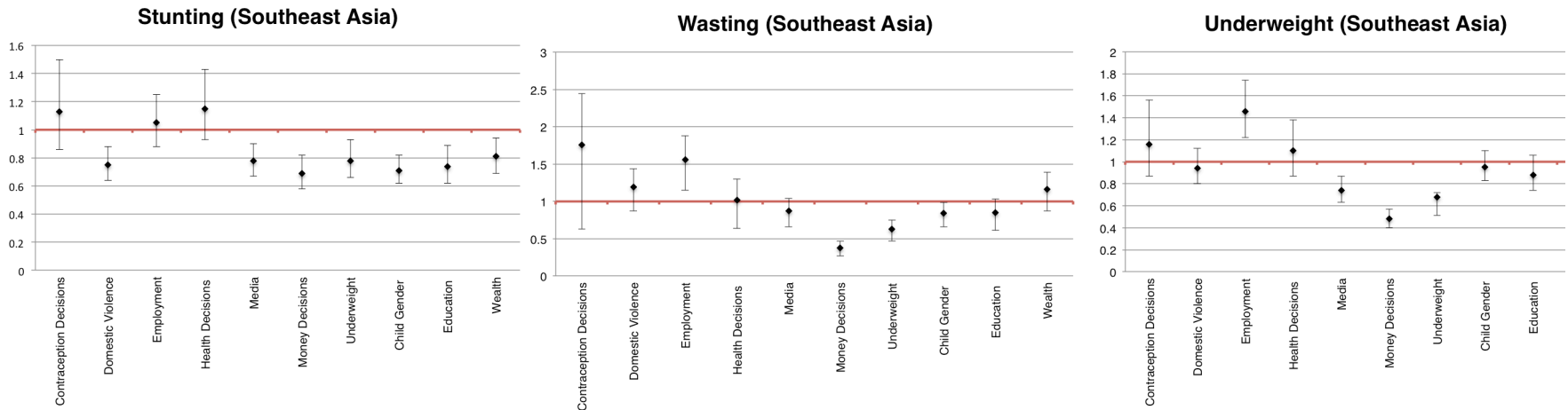Figure 9. Associations between maternal agency and anthropometric indicators in Southeast Asia

Figure 10. Associations between maternal agency and anthropometric indicators in Latin America and the Caribbean
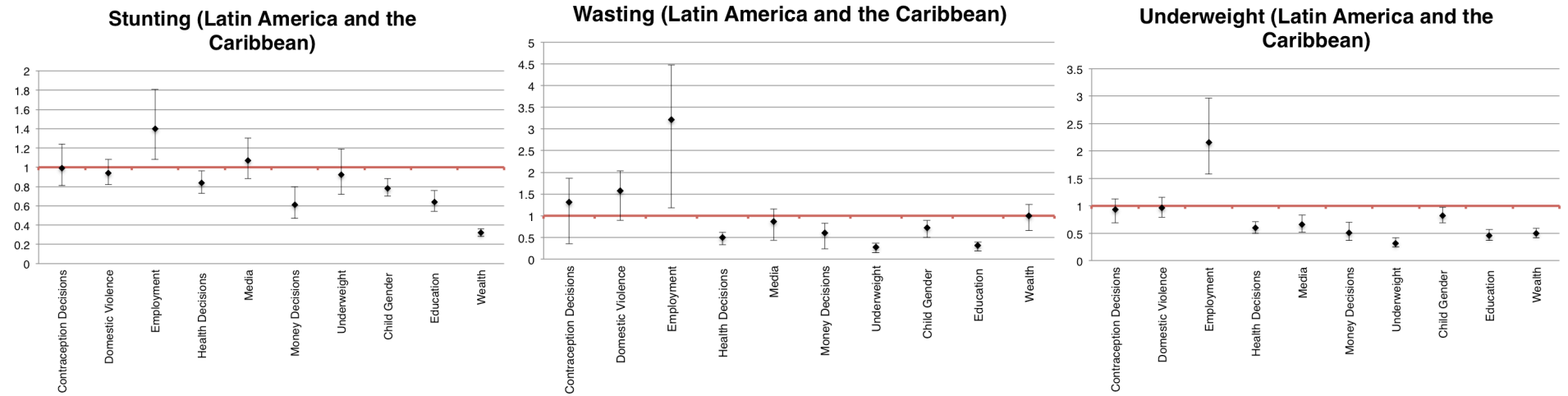

Figure 11. Associations between maternal agency and anthropometric indicators in Africa
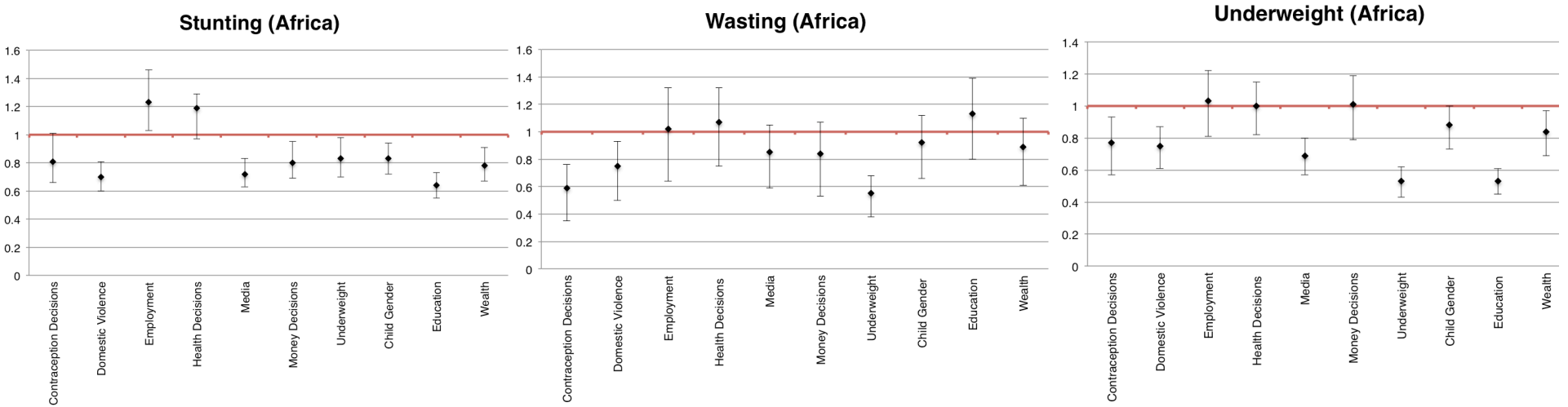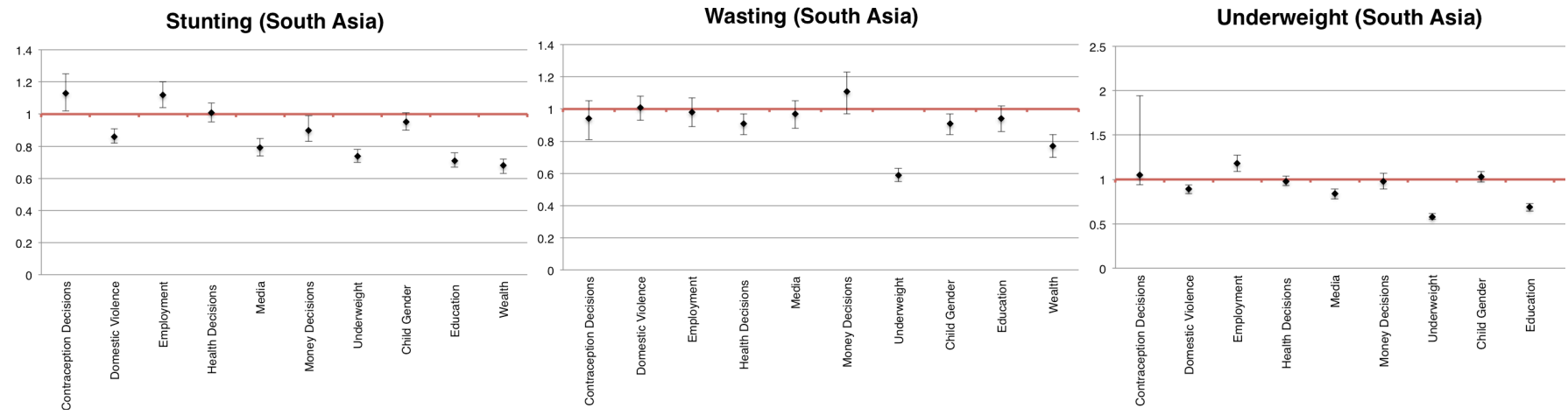
Figure 12. Associations between maternal agency and anthropometric indicators in South Asia

In general, our results indicate that there is a relationship between maternal agency and child nutritional status but that it may not be practical to study this relationship globally. Segmenting our sample into regions already shows large differences in which indicators are significant and how significant they are. Significance was severely attenuated for most indicators when models shifted from pooled to regional. However, there was still significance for some indicators within each region, suggesting that there is a relationship between agency and child nutrition meriting further study. This relationship appears to be context specific, and potentially counterintuitive.

Many breastfeeding indicators were less likely to be met if a woman had greater agency, and in Southeast Asia education was even significantly associated with lower odds of exclusive breastfeeding (OR: 0.39, CI: 0.17, 0.86, $p<0.05$). This is a common finding in the literature, and these finding indicate we are somewhat in line with the rest of the literature (4). In general, feeding practices were associated with agency in the expected direction, increased agency led to better feeding practices. However, maternal employment was also significantly associated with greater odds of stunting in all regression results except those for Southeast Asia. This is less easily explained by theory or literature, but could be do to an overall trade off between maternal time and child health in developing countries. Mothers who work may be less able to care for their children when they are very young, which could lead to growth deficits and stunting later in life. Finally, it should also be noted at the pseudo r-squared values for our models were low, suggesting that while there may be significant relationships between agency and nutritional status there seem to be other significant relationships which must be taken into account.

In terms of individual regions, Southeast Asia and South Asia generally had the strongest associations between feeding practices with agency indicators, whereas Africa had the weakest and LAC's association was also low. The combination of greater significance in the case of wasting, a more severe health condition, and wealth could point to a greater influence of poverty and resource constraints on child health and maternal agency in LAC countries. In the African region, our sample countries are generally resource poor and their low reported adequate diet consumption. These statistics suggest that the general opportunity structure within these countries could be limiting attainment of adequate feeding practices. In the case of stunting, strength of association was more significant across regions. This may result from the long-term affects of a weak maternal agency. Mothers in Africa may not have access to knowledge and services necessary for optimal feeding practices, but increased agency may help them prevent stunting as it is the result of feeding practices over the first two years of a child's life (11). Variance in economic opportunity and culture could be creating the variance we see between regions in our results.

Future research should focus not on providing stronger evidence that there is a relationship between maternal agency and child nutrition status, but determining what role agency plays specifically. This work could be focused on how levels of agency that may differ by context, and how improvements in agency can improve health. Our results point to a very different relationship between wealth and agency in different areas of the world. It is possible that in extremely low resource settings and relatively high resource settings agency is less of a factor – leading to relatively low significance in Africa and Latin America. Small area studies which ask the same questions as large-N studies will also help to allow comparability of methods

throughout the literature which can determine what kind of indicators and study design will provide the richest information and results.

Chapter 2: An Investigation of Agency, Social Support, and Psychological Well-Being in Bundibugyo Uganda

INTRODUCTION

In order to take a closer look at how agency and child health are related we surveyed 204 women in Bundibugyo, Uganda in Summer 2015 about their level of agency, social support, and psychological well being. Bundibugyo is a district in Western Uganda, which borders the Democratic Republic of Congo. The district is one of the poorest in Uganda and has faced conflict from roving militias as well as an Ebola outbreak in 2007 (28). The district is relatively isolated from the rest of Uganda due to its location behind the Rwenzori Mountains, though an infrastructure project funded by the Chinese government has very recently improved access to the area. One of the few organizations in the area, Serge (previously known as World Harvest Mission) operates near Nyahuka town center within the district and funds programs at the Nyahuka health center. For this study, Ugandan staff who run a Serge nutrition program at the health center were employed and trained to give a survey focusing on three domains of agency: decision-making, social support, and psychological well-being.

Social support has been theorized as a key aspect of women's agency that has been less frequently studied (4). Social support was significant in providing better child health outcomes in Nicaragua, even when agency indicators were not significant (13). Additionally, social network strength has also been associated with improved child nutrition (29). We acknowledge the importance of social support through the recognition of collective capacities in Figure 1. Yet DHS data does not provide adequate information on the level of support women feel they have. While they ask women a variety of questions about their own ability to make decisions, it is outside the scope of the survey to ask about the level of support women receive from those around them. Furthermore, while we try to capture psychological capabilities through attitudes toward domestic violence, this proxy leaves other aspects of psychological wellbeing understudied. Creating and conducting our own survey in Bundibugyo Uganda allows us to build on and compare results to DHS data, while also learning about the relationship between agency and child health in an extremely resource poor setting where improving access is difficult.

METHODS

Survey Methodology and Structure

The survey for this study was based on responses to a series of focus groups held in Summer 2014 to qualitatively learn about women's health concerns in Bundibugyo. Women who participated in the Nyahuka Health Center nutrition program – where they received micronutrient paste for their children, children were routinely weighed, and mothers attended health classes – were eligible for participation in focus groups. Using information collected in Summer 2014, a team returned to conduct a quantitative survey on maternal agency in Bundibugyo. Survey questions were broken down into 5 domains, with an accompanying set of demographic

questions. The first two domains consisted of a household roster and questions on IYCF practices. Questions on child feeding and breastfeeding practices where based on those asked in DHS surveys.

In order to administer the survey, we trained enumerators who spoke the local language (Lubwesi) and worked with them to conduct the first 30 interviews. This training and oversight lasted about a week, while the two William and Mary researchers were in country. The enumerators, shadowed by a Ugandan with a graduate degree in public health and a US student working with Serge, conducted the rest of the interviews over the course of summer 2015. The student was primarily involved with data management and basic oversight. Our sample came entirely from Bundibugyo district and can best be described as a village convenience sample. The enumerator teams, both during initial interviews and throughout the summer, visited small villages throughout Bundibugyo. Multiple women were sampled from each village on a given day and lived at most a few minutes walk from each other. Criteria for inclusion included a woman having a child under 3 and present and that woman being the mother. The youngest child was the subject of our anthropometric measurements and questions about breastfeeding practices.

The remaining three domains focused on aspects of overall empowerment with domain 3 focusing on social support, domain 4 focusing on psychological wellbeing, and domain 5 on decision-making and agency. Questions on social support included those focused marital status as well as whether or not the woman felt she had someone to talk to about her problems and their involvement in groups outside the home – such as religious or community organizations. Women were asked to express the level to which they agreed or disagreed with a series of statements about the level of the support they received on a scale of 1 to 5. Similarly, to assess a women's level of psychological women were asked to rate their satisfaction with their life, health, family,

and other relevant possessions of value on a 4 points scale. Finally, to assess a woman's decision-making power and agency we again used a 5-point likert scale. Survey questions and materials can be found in the supplementary materials.

While questions did not replicate DHS questions, they complement and build on the specificity of those questions. While DHS questions focus on who is involved in making decisions, our survey questions were able to more thoroughly examine perceptions about the process of decision-making, and thus a woman's perceived ability to be and act (4,6). By asking to what degree women believed in they had control over decisions related to household finance as well as health we hope to examine actual perceptions of agency, versus proxies for it. We focused on these indicators due to their widespread applicability in the literature. The additions of measures for social support and psychological support strengthen our model, as these domains are not as widely studied in the nascent empowerment literature (4, 27).

<u>Indicator Creation</u>

We chose ICYF, anthropometric, and agency indicators for this analysis to allow some comparison the Chapter 1 analysis, though not all variables were included. Based on the data we collected on food and breastfeeding practices, we did not include immediate initiation of breastfeeding or presence of iron rich foods in the diet as dependent variables in our analysis. However, the other 6 core feeding indicators were included as well as stunting, wasting, and underweight. Children were measured in the field as we conducted interviews with their mothers. The agency variables used in this analysis are also related to those in the Chapter 1 study. While our questions were more in depth, variables chosen for this analysis were chosen based on their similarity to chapter 1 agency indicators.

Our agency variables were decision making regarding health, belief that domestic violence was appropriate, a woman's comfort with how her husband spends money, her participation in the final decision on how to use money, and maternal BMI. We were able to create a scale for decision-making in health as a composite of our questions on health in domain 5. This differed from the dummy variable used in our chapter 1 analysis. While we used DHS variables to create a variable measuring the amount of women who thought domestic violence was ever acceptable, we asked women in Bundibugyo if they believed it was ever acceptable and did not need to make a composite variable. The distinction between our variable measuring a woman's participation in monetary decisions versus her comfort with them allows us to examine the importance of agency versus the perceptions of agency within our population. While the two household finance variables appear similar in description they are not highly correlated (corr= -0.24) and thus suitable for inclusion in the same analysis. Maternal BMI was included to once again represent the assets domain of agency and measured exactly as in DHS.

Model Creation

All five agency indicators were included in models with each dependent IYCF practice or anthropometric indicator. Univariate regressions were not preformed due to their relative redundancy in chapter 1. Continued breastfeeding was eliminated as a dependent variable because every woman surveyed continued to breastfeed her child at 12 months. Continued breastfeeding is generally well practiced in Uganda, so this finding does not necessarily indicate a problem in sampling (24). Acceptability of domestic violence also had to be eliminated from the model in which exclusive breastfeeding for 6 months was the dependent variable because all women who exclusively breastfed believed domestic violence was acceptable. This was likely

due to the small sample size (N=57) of women for whom we collected data on exclusive breastfeeding.

Our controls varied from the Chapter 1 study because of Bundibugyo's unique context. In order to avoid over specifying the model – due to our lower number of observations – we limited controls to those we knew varied significantly and importantly in Bundibugyo. In Bundibugyo, the vast majority of women are married and fairly poor. Socioeconomic controls like education and business ownership were relatively uniform across the population. However, because most (82.3%) residents of Bundibugyo are farmers, production of a cash crop can significantly improve the livelihoods of a family. We thus used whether or not a family produced cash crops as our socioeconomic control.

Because we sampled multiple houses in the same village, and in some cases within the same 100 meters, women in the same village were likely to not be truly independent samples for social support and agency. As a result, we chose to use both classic logistic regression and regression with random effects. We believe that women living in a tight knit village, such as a smaller one where most families are related, will likely show same levels of social support. Examination of the proportion of women relatively well supported showed that support did vary significantly by village. If there is a relationship between social support and empowerment, geographical proximity could further shape our outcomes. Therefore we chose to incorporate a random effects model with village as the panel variable to avoid these effects (30). The number of women interviewed in a village ranged from 1 to 19. For the purpose of comparison of model suitability, we still conducted logistic regressions on the data as well – though these are not reported in the results and acted as a baseline.

We utilized random effects regressions in three separate models. In our first models, we did not add any variables to the logistic model. We only accounted for random effects across village clusters. Results form the random effects model are shown instead of the logistic model. With the first model acting as a baseline we then introduced social support and psychological wellbeing into the model. The first model served as a direct comparison to our 12-country models, which did not include any analysis on social support or psychological wellbeing. If social support has a major influence on maternal agency and potentially care practices, as some literature suggests, we would expect a significant relationship between social support and feeding practices or anthropometry (13, 29). The same is true for psychological wellbeing, though this hypothesis is based more in information from the 2014 focus groups and significance of the abuse variable in the multi-country study.

RESULTS

Demographics

Overall, the sample was less balanced than the 12-country sample due to its smaller size (N=204). However, important dependent variables including stunting and minimum meal frequency were well balanced, thereby allowing for variation in the sample used in regressions. Variables of note that did not vary much across Bundibugyo women included belief that domestic abuse was ever ok as well as wasting and introduction of complementary foods.

Regression Results

Results from the first regression were largely non-significant, except in the case of maternal BMI. Maternal BMI is a significant predictor of both wasting (OR: 0.79, CI: 0.67, 0.95, p<0.05) and underweight (OR: 0.88, CI: 0.78, 0.99, p<0.05). Greater maternal involvement in

decision-making regarding health is borderline significant in decreasing odds of wasting as well.
In general, odds ratios are in the expected direction despite no significant associations for
stunting and one significant for wasting or underweight, as shown in Table 5. When social
support is added to the model we see that maternal BMI remains significantly associated with
underweight (OR: 0.88, CI: 0.79, 0.99, p<0.05), but not with wasting. Instead social support
becomes significantly associated with a decrease in the likelihood of being underweight (OR:
0.79, CI: 0.66, 0.94, p<0.05). These results are reported in Table 6. Adding psychological
support to the model conversely does not have an effect, as seen in table 7. Underweight also
loses its significance in the psychological well being model.

Table 5. Random Effects Adjusted Odds Ratios for Anthropometric and Agency Variables (Multivariate Model)

	Stunted	Wasted	Underweight
Decision Making-Regarding Health	0.76 (0.51, 1.13)	0.58 (0.32, 1.04)°	0.93 (0.61, 1.42)
Comfort with Husband's Spending	0.94 (0.76, 1.19)	1.13 (0.80, 1.60)	1.17 (0.91, 1.51)
Participation in Final Call Regarding Money	0.77 (0.31, 1.93)	1.10 (0.25, 4.87)	0.89 (0.31, 2.55)
Belief that Abuse is Ok	1.25 (0.38, 4.09)	0.36 (0.07, 1.86)	1.93 (0.45, 8.27)
Maternal BMI	0.94 (0.85, 1.04)	0.79 (0.67, 0.95)*	0.88 (0.78, 0.99)*
Family Grows Cash Crop	1.04 (0.522, 2.08)	1.32 (0.50, 3.48)	1.23 (0.57, 2.66)
Sample Size (Group Number)	162 (33)	162 (33)	162 (33)

* Results significant, p<0.05
° Results border on significant, p <0.10

Table 6. Random Effects Adjusted Odds Ratios for Anthropometric, Agency Variables, and Social Support (Multivariate Model)

	Stunted	Wasted	Underweight
Decision Making-Regarding Health	0.78 (0.52, 1.16)	0.59 (0.32, 1.09)°	0.95 (0.63, 1.46)
Comfort with Husband's Spending	0.91 (0.71, 1.17)	1.10 (0.77, 1.57)	1.12 (0.86, 1.46)
Participation in Final Call Regarding Money	0.78 (0.31, 1.97)	1.12 (0.25, 4.99)	0.89 (0.32, 2.50)
Belief that Abuse is Ok	1.30 (0.39, 4.30)	0.37 (0.07, 1.94)	2.12 (0.50, 8.88)
Social Support	0.94 (0.85, 1.04)	0.79 (0.66, 0.94)*	0.95 (0.81, 1.10)
Maternal BMI	0.97 (0.84, 1.12)	0.99 (0.80, 1.21)	0.88 (0.79, 0.99)*
Family Grows Cash Crops	1.06 (0.51, 2.18)	1.28 (0.45, 3.61)	1.30 (0.60, 2.80)
Sample Size (Group Numbers)	158 (33)	158 (33)	158 (33)

Table 6. Random Effects Adjusted Odds Ratios for Anthropometric, Agency Variables, and Psychological Well Being (Multivariate Model)

	Stunted	Wasted	Underweight
Decision Making-Regarding Health	0.73 (0.49, 1.10)	0.63 (0.34, 1.14)	0.95 (0.62, 1.45)
Comfort with Husband's Spending	0.95 (0.74, 1.22)	1.18 (0.80, 1.75)	1.16 (0.89, 1.53)
Participation in Final Call Regarding Money	0.85 (0.33, 2.17)	1.42 (0.30, 6.78)	1.00 (0.35, 2.91)
Belief that Abuse is Ok	1.15 (0.32, 4.06)	0.44 (0.08, 6.77)	2.65 (0.60, 11.62)
Maternal BMI	0.93 (0.84, 1.03)	0.79 (0.66, 0.95)*	0.89 (0.79, 1.00)
Psychological Well-Being	1.03 (0.91, 1.17)	0.93 (0.77, 1.12)	0.90 (0.79, 1.03)
Family Grows Cash Crop	0.96 (0.47, 1.93)	1.43 (0.51, 3.99)	1.32 (0.62, 2.80)
Sample Size (Group Number)	158 (33)	158 (33)	158 (33)

For IYCF models, the only initial significance was between decision-making regarding health and the introduction of complementary foods (OR: 1.78, CI: 1.03, 3.08, p<0.05). All other variables remained insignificant and did not approach significance, as shown in Table 8. Once social support was added to the model it modulated the effect of decision-making (OR: 1.78, CI: 0.96, 3.32, p>0.05) but became significantly associated with greater likelihood of dietary diversity (OR: 1.37, CI: 1.08, 1.74, p<0.05) and lower likelihood of exclusive breastfeeding (OR: 0.63, CI: 0.42, 0.97, p<0.05). Social support also verged on increasing significance of minimum meal frequency and being fed a minimum acceptable diet, as shown in Table 9. Adding psychological wellbeing to the model did not have the same effect and decision-making regarding health retained became slightly more strongly associated with introduction of complementary foods (OR: 1.91, CI: 1.06, 3.45, p<0.05). Full results are presented below in Tables 8, 9, and 10.

Table 8. Random Effects Adjusted Odds Ratios for IYCF and Agency Variables (Multivariate Model)

	Exclusive Breastfeeding	Complementary Food Intro	Minimum Dietary Diversity	Minimum Meal Frequency	Minimum Acceptable Diet
Decision Making-Regarding Health	0.90 (0.39, 2.05)	1.78 (1.03, 3.08)*	1.01 (0.61, 1.70)	1.06 (0.68, 1.65)	1.12 (0.62, 2.01)
Comfort with Husband's Spending	1.40 (0.84, 2.33)	0.72 (0.50, 1.04)°	0.83 (0.59, 1.16)	0.92 (0.71, 1.20)	0.89 (0.61, 1.30)
Participation in Final Call Regarding Money	0.27 (0.02, 3.09)	3.84 (0.46, 32.50)	0.88 (0.26, 2.96)	0.66 (0.23, 1.90)	0.74 (0.16, 3.42)
Belief that Abuse is Ok	(ommitted)	(ommitted)	2.21 (0.34, 14.51)	1.17 (0.28, 4.99)	1.19 (0.18, 7.86)
Maternal BMI	1.02 (0.81, 1.28)	1.07 (0.91, 1.24)	1.11 (0.97, 1.27)	0.99 (0.88, 1.11)	1.02 (0.87, 1.18)
Family Grows Cash Crop	1.25 (0.19, 8.19)	1.07 (0.41, 2.81)	0.65 (0.23, 1.84)	1.72 (0.80, 3.71)	0.95 (0.30, 2.96)
Sample Size (Groups)	44 (19)	162 (33)	162 (33)	116 (30)	125 (31)

Table 9. Random Effects Adjusted Odds Ratios for IYCF and Agency Variables with Social Support Included (Multivariate Model)

	Exclusive Breastfeeding	Complementary Food Intro	Minimum Dietary Diversity	Minimum Meal Frequency	Minimum Acceptable Diet
Decision Making-Regarding Health	0.93 (0.38, 2.29)	1.78 (0.96, 3.32)°	1.00 (0.58, 1.71)	0.95 (0.60, 1.51)	1.03 (0.55, 1.92)
Comfort with Husband's Spending	1.43 (0.68, 3.02)	0.68 (0.45, 1.02)°	0.98 (0.68, 1.42)	1.00 (0.75, 1.32)	0.99 (0.66, 1.52)
Participation in Final Call on Household Money Use	0.50(0.3, 9.58)	3.10 (0.35, 27.49)	0.70 (0.19, 2.56)	0.61 (0.21, 1.81)	0.57 (0.10, 3.12)
Belief that Abuse is Ok	(ommitted)	1.18 (0.18, 7.88)	2.38 (0.33, 17.40)	1.05 (0.24, 4.60)	1.08 (0.14, 8.16)
Maternal BMI	0.82 (0.57, 1.17)	1.13 (0.95, 1.35)	1.14 (0.99, 1.33)	1.00 (0.89, 1.13)	1.03 (0.88, 1.22)
Social Support	0.63 (0.42, 0.97)*	1.15 (0.93, 1.42)	1.37 (1.08, 1.74)*	1.18 (0.99, 1.40)°	1.36 (0.99, 1.85)°
Cash Crop Production	2.32 (0.23, 23.30)	0.84 (0.29, 2.44)	0.47 (0.15, 1.46)	1.34 (0.68, 3.12)	0.80 (0.08, 8.50)
Sample Size (Groups)	43 (19)	158 (33)	158 (33)	113 (30)	122 (31)

Table 10. Random Effects Adjusted Odds Ratios for IYCF and Agency Variables with Psychological Well-Being Included (Multivariate Model)

	Exclusive Breastfeeding	Complementary Food Intro	Minimum Dietary Diversity	Minimum Meal Frequency	Minimum Acceptable Diet
Decision Making-Regarding Health	0.84 (0.37, 1.94)	1.91 (1.06, 3.45)*	0.99 (0.59, 1.66)	1.02 (0.65, 1.60)	1.09 (0.61, 1.95)
Comfort with Husband's Spending	1.31 (0.76, 2.26)	0.75 (0.51, 1.10)	0.82 (0.58, 1.17)	0.95 (0.72, 1.25)	0.84 (0.58, 1.22)
Participation in Final Call Regarding Money	0.34 (0.03,3.97)	3.72 (0.43, 32.32)	0.87 (0.26, 2.95)	0.67 (0.23, 1.95)	0.69 (0.15, 3.06)
Belief that Abuse is Ok	(ommitted)	1.00 (0.15, 6.59)	2.37 (0.33, 16.95)	0.93 (0.20, 4.32)	1.86 (0.27, 12.77)
Maternal BMI	1.02 (0.81, 1.29)	1.07 (0.91, 1.25)	1.11 (0.97, 1.27)	0.98(0.87, 1.10)	1.02 (0.88, 1.19)
Psychological Well-Being	0.86 (0.64, 1.15)	1.08 (0.91, 1.28)	0.98 (0.82, 1.17)	1.07 (0.92, 1.24)	0.88 (0.73, 1.07)
Famly Grows Cash Crop	1.57 (0.22, 11.01)	1.01(0.38, 2.65)	0.65 (0.23, 1.84)	1.63 (0.74, 3.57)	1.00 (0.33, 3.03)
Psuedo R-squared	43 (18)	158 (33)	158 (33)	114 (30)	123 (31)

Analysis and Discussion of Regression Results

Overall, the results of the smaller Bundibugyo study continue the trend of decreasing significance among smaller samples. This could be due to the small sample size, issues with the survey methodology, or because in the context of Bundibugyo there is a different relationship between maternal agency and child nutrition. In extremely resource poor settings, like Bundibugyo and the villages we sampled, it is possible that a lack of agency is not the primary factor preventing women from following recommended feeding practices for their children. This would further explain why effects are so strong in South and Southeast Asia, where there is a slightly better and more accessible opportunity structure for women and their families and yet still such a large burden of malnutrition, as discussed in chapter 1.

However, the significance of social support is an important finding and one supported by previous study (13, 29). Given the lack of resources in Bundibugyo, social support may mediate women's agency or provide them with the expertise of others who can help them care for their children. While social support did not show significance across all indicators it did trend that way, indicating that is has the strongest relationship with our outcomes of interest of any independent variable. Social support is not captured in the DHS, preventing us from comparing social support's effect in larger datasets. However, the results for the significance of social support here are promising. While there were no significant associations with psychological well being, the ability to examine relationships between woman's mental and social capabilities indicates the importance of smaller and more culturally tailored studies.

In order to determine which of these potential factors has led to the lack of significance for most of our individual agency variables, more study is needed. Direct comparison between

our survey and the DHS survey is necessary to understand why these differences are observed. While our survey had more depth, it is not directly comparable to DHS surveys for other areas of Uganda or areas of the world. We also did not include questions on access to media – which was one of the most significant indicators in our dataset and has been shown to be significant in other studies in Uganda (31). More in depth questions on a woman's access to media sources could also elucidate how exactly media interacts with maternal agency and how health programs worldwide can capitalize on media access.

Finally, though the results from our Bundibugyo study contradict results from the 12-country analysis it bears noting that the non-significant results are part of a broader trend of decreasing significance in smaller samples. The move from an African regional sample from a multi-country sample decreased significance across all empowerment and nutritional indicators. Smaller N studies in other countries, such as Nicaragua and Kenya, have similarly showed little significance (13, 16). This could indicate that the relationship between maternal agency and child nutrition is weak, and thus only apparent in larger datasets. Alternatively, differing conceptions of empowerment may be masking the true significance of the relationship. More scholarship related to how indicators are chosen and applied, as well as more small studies in different settings – both rural and urban – are necessary to move research in this field forward.

Chapter 3: Comparison of Indicators and Results Across Scales using Uganda DHS Data

While our multi-country analysis and Bundibugyo study tell different stories, data on the relationship between agency and feeding practices and Uganda as a whole could act as a link between those two stories. If the relationship between agency and child nutrition is attenuated at the country level in Uganda, as well as the district level, our data may simply reflect the greater Ugandan context versus a major discordance in the theory of agency and nutrition. In this Chapter, we will examine the relationship between agency and nutrition in Uganda and compare means for indicators for similar variables across our datasets and the most recent DHS dataset in Uganda.

METHODS

While the most recent DHS recode for Uganda is DHS VI, instead of the DHS V data used for our multi country study, we were able to create the same indicators due to the similarities in the V and VI recodes. The same code in STATA was used to create variables for agency and feeding indicators. While minute changes were made to accommodate any reorganization of variables, the methods are still the same as those in Chapter 1. To analyze these variables we once again employed logistic regression, but in this case stratified repressions were not necessary or possible based on sample size.

The Uganda DHS data also provided the opportunity for a comparison of the agency indicators used. In order to compare the indicators used in the DHS data to our own indicators we focused on indicators relating to attitudes towards domestic violence, involvement in

decision-making regarding health, and participation in decisions about money use. These were the three indicators present across both datasets, as we did not collect information on media or contraception use. Measurement of maternal BMI is already standardized so it was not included in this comparison. Employment was not used in the Chapter 2 regressions, as it did not vary significantly because many women reported being small farmers. However, employment along with marital status and maternal education were included in comparisons because these are all important social variables which can determine if the population of Bundibugyo differs systematically from the larger Ugandan population.

We compared the averages from three sources: whole of Uganda data from DHS, Bundibugyo data from DHS, and Bundibugyo data from our survey. DHS data is collected in geographic clusters, the locations of which are available for download. Using GIS and other spatial data sources we were able to identify the two clusters sampled in Bundibugyo district. Unfortunately one of these clusters did not have any data, making the DHS Bundibugyo sample very small. However, it is still used here for rudimentary comparison between similar indicators to see if different indicators could be measuring similar aspects of empowerment.

RESULTS

Regressions using data from Uganda showed little significance, and even less than the African region data found in Chapter 1. Table 11 shows the full range of results using the same 7 agency indicators and 8 IYCF indicators from Chapter 1. Only decisions regarding money use, attitudes towards wife beating, and maternal underweight showed any relationship with IYCF variables. Decisions regarding use of money decreased the odds of continued breastfeeding (OR: 0.053, CI: 0.004, 0.69, p<0.05) but the association was so small that it is not very substantively

significant. Attitudes toward wife beating substantively decreased the odds of being fed iron rich foods (OR: 0.68, CI: 0.48, 0.96, p<0.05). And maternal underweight significantly decreased odds of being fed the minimum adequate diet (OR: 0.18, CI: 0.05, 0.69, p<0.05).

Table 11. Adjusted logistic regression coefficients (Odds ratios) of predictive power of combined maternal agency model on Infant and Young Child Feeding Practices[1]

	Breastfed within one hour of delivery (n=42,677)	Exclusively breastfed among children 0 to 5 months (n=9,652)	Continued breastfeeding at one year among children 12 to 15 months (n=7,661)	Timely introduction of complementary foods among children 6 to 8 months (n=6,269)	Fed minimum number of times per day among children 6 to 23 months (n=32,903)	Fed four or more food groups among children 6 to 23 months (n=33,025)	Fed iron rich foods or iron fortified products among children 6 to 23 months (n=33,025)	Fed minim acceptable among child to 23 mon (n=33,02
Mother is not Underweight (underweight is referent)	0.94 (0.35, 2.55)	(Omitted)	(Omitted)	1.87 (0.54, 6.50)	0.98 (0.33, 2.91)	0.54 (0.15, 1.89)	2.02 (0.62, 6.54)	0.18 (0.05, 0.
Access to Media (no access is referent)	0.90 (0.56, 1.43)	2.05 (0.36, 11.74)	4.67 (0.32, 67.48)	0.90 (0.43, 1.87)	1.58 (0.92, 2.72)	1.66 (0.78, 3.54)	1.37 (0.83, 2.26)	2.29 (0.60, 8.
Attitudes toward wife beating (never justified is referent)	1.10 (0.80, 1.52)	0.34 (0.12, 1.01)	5.53 (0.97, 31.58)	0.90 (0.56, 1.46)	1.02 (0.70, 1.49)	0.93 (0.60, 1.43)	0.68 (0.48, 0.96)*	1.29 (0.64, 2.
Decision regarding use of her money (no involvement is referent)	1.08 (0.74, 1.59)	0.96 (0.26, 3.46)	0.053 (0.004, 0.69)*	0.77 (0.42, 1.40)	0.75 (0.48, 1.18)	1.11 (0.66, 1.87)	1.38 (0.91, 2.07)	1.10 (0.48, 2.
Decision regarding health (no involvement is referent)	0.79 (0.57, 1.10)	0.57 (0.19, 1.71)	1.76 (0.36, 8.64)	1.53 (0.94, 2.48)	1.01 (0.63, 1.49)	0.71 (0.46, 1.09)	0.95 (0.67, 1.35)	0.75 (0.37, 1.
Decision Regarding Contraception Use (no involvement is referent)	0.81 (0.50, 1.31)	0.057 (0.0007, 4.50)	2.00 (0.24, 16.34)	0.63 (0.27, 1.44)	0.68 (0.40, 1.17)	1.11 (0.57, 2.20)	0.84 (0.51, 1.39)	0.45 (0.19, 1.
Employed (unemployed in last 12 months is referent)	0.60 (0.38, 0.93)	1.14 (0.30, 4.34)	1.86 (0.096, 35.87)	1.57 (0.82, 3.01)	1.95 (1.15, 3.30)	1.11 (0.60, 2.04)	0.77 (0.48, 1.22)	1.44 (0.51, 4.
Gender (female child is referent)	0.87 (0.63, 1.19)	0.48 (0.16, 1.46)	1.85 (0.39, 8.87)	1.03 (0.64, 1.65)	1.05 (0.73, 1.53)	0.69 (0.45, 1.06)	0.67 (0.48, 0.93)	0.94 (0.47, 1.
Any Education (no maternal education is referent)	1.16 (0.64, 2.13)	0.34 (0.023, 4.97)	2.95 (0.30, 29.05)	0.95 (0.37, 2.48)	1.86 (0.90, 3.85)	2.68 (0.81, 8.84)	1.24 (0.66, 2.34)	1.26 (0.28, 5.
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	1.95 (1.36, 2.77)	0.37 (0.081, 1.71)	0.065 (0.0044, 0.96)*	0.95 (0.55, 1.63)	0.82 (0.54, 1.24)	1.71 (1.01, 2.88)	0.68 (0.47, 0.99)*	1.12 (0.51, 2.

In the case of anthropometric variables, there was also little association. The only variable significantly associated with stunting was child gender (OR: 0.60, CI: 0.41, 0.88, p<0.01). Both employment (OR: 0.21, CI: 0.10, 0.95, p <0.05) and maternal underweight (OR: 0.14, CI: 0.05, 0.36, p<0.001) are associated with wasting. There are no significant assocaitins with underweight. Odds ratios were also not always in the predicted direction, decision-making regarding money use non-significantly increased the odds (OR: 1.58, CI: 0.53, 4. 71, p>0.05).

Table 12. Adjusted logistic regression coefficients (Odds ratios) of predictive power of combined maternal agency model on Anthropometric Measures of Nutritional Status[1]

	Stunted	Wasted	Underweight
Mother is not Underweight (underweight is referent)	1.33 (0.62, 2.88)	0.14 (0.05, 0.36)***	0.48 (0.20, 1.12)
Access to Media (no access is referent)	1.46 (0.84, 2.55)	0.82 (0.26, 2.54)	0.68 (0.33, 1.39)
Attitudes toward wife beating (never justified is referent)	0.71 (0.48, 1.04)	1.46 (0.64, 3.35)	0.67 (0.38, 1.18)
Decision regarding use of her money (no involvement is referent)	1.02 (0.66, 1.59)	1.58 (0.53, 4.71)	1.15 (0.60, 2.23)
Decision regarding health (no involvement is referent)	0.75 (0.51, 1.11)	1.00 (0.42, 2.39)	1.05 (0.59, 1.86)
Decision Regarding Contraception Use (no involvement is referent)	1.01 (0.55, 1.87)	1.58 (0.33, 7.66)	1.69 (0.62, 4.64)
Employed (unemployed in last 12 months is referent	1.77 (0.99, 3.17)	0.31 (0.10, 0.95)*	0.88 (0.40, 1.92)
Gender (female child is referent)	0.60 (0.41, 0.88)**	1.48 (0.65, 3.40)	1.00 (0.58, 1.73)
Any Education (no maternal education is referent)	0.77 (0.39, 1.51)	0.55 (0.15, 2.01)	0.67 (0.28, 1.62)
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.94 (0.62, 1.43)	0.60 (0.24, 1.49)	0.80 (0.45, 1.47)

Table 13 shows the comparison in agency variable means for all of Uganda and the two Bundibugyo samples with sample sizes for each group. The proportion of women believing abuse is acceptable is especially high in Bundibugyo (0.88) but the proportion of women employed is extremely high (0.99). The proportion involved in decision making regarding health is roughly the same for the Bundibugyo DHS sample (0.36) and our Bundibugyo data (0.32), but both of these are less than the whole of Uganda proportion (0.56). Proportions of women involved in decision making regarding money are low across all three samples, but lowest in our

Bundibugyo sample (0.19). Demographic variables such as marriage and some education were very similar across all three samples.

Table 13. Population means for key Agency Indicators and Controls in Uganda and Bundibugyo

	Uganda (DHS) N=6899		Bundibugyo (DHS) N=25		Bundibugyo (Summer 2015) N=204	
	P	SE	P	SE	P	SE
Proportion believing abuse is acceptable	0.58	0.005	0.64	0.098	0.88	0.024
Proportion involved in decision making regarding health	0.56	0.006	0.36	0.098	0.32	0.033
Proportion involved in final call regarding husbands money	0.39	0.0059	0.28	0.092	0.19	0.028
Proportion employed	0.79	0.0048	0.32	0.095	0.99	0.005
Proportion with some education	0.82	0.0047	0.88	0.066	0.81	0.027
Proportion married	0.87	0.0034	0.84	0.075	0.88	0.023

Analysis and Discussion of Results

Decreased significance of maternal agency variables in Uganda supports our hypothesis that there is a decrease in significance as sample size and scale of analysis decreases. These results also indicate that insignificant results in our Bundibugyo study may be a result decreased significance due to the Ugandan cultural context. More research, likely qualitative in nature, would be needed to confirm this. From our results we are able to show that the trend of lower significance in smaller analyses throughout the literature (13, 16). Overall, the pattern of lower significance at smaller levels of analysis holds in the Uganda data.

The remaining question for this analysis is whether or not the results from Chapter 1 and Chapter 2 are comparable given that different surveys were used. We cannot know whether or not results capture similar aspects of empowerment given different indicators, but we can see by comparing their population means that the proportions of indicators aiming at capturing similar aspects of agency are comparable across studies. This is an important first step to understanding how different datasets relate to each other, and for determining whether or not questions are well

understood by respondents in developing countries. Further statistical tests, such as difference of means, and surveys in small regions which use both questions tailored to the region and DHS survey replicates could confirm that similar indicators capture similar results. However, we would need a larger Bundibugyo DHS sample to make any firm conclusions in this study. Our results suggest that DHS and tailored questionnaires can capture similar information, allowing comparison of significance across studies and recognition of the pattern of decreased significance with decreased sample size.

As a result of both the pattern of decreased significance in smaller samples and the seemingly insignificant differences between population mean values for some indicators it appears there is a difference in the relationship between agency and nutritional outcomes across sample sizes. In large samples, where patterns are more likely to emerge, the relationship between agency and empowerment is more readily visible. This may be because the substantive magnitude of this relationship is not large. However, in smaller samples agency may not be as strongly related to child health outcomes. The overall structure of the society also determines the strength of the relationship, as agency is more likely to be an important explanatory variable in settings like South Asia where the surrounding opportunity structure is better and low agency may prevent women from accessing it (29). Overall, more context dependent research with further elucidate these relationships as the literature grows.

Discussion

The findings of this thesis mirror patterns already apparent in the literature on agency, autonomy, capabilities, and empowerment and can further illuminate why these patterns exist. Overall, the attenuation in significance from our large 12-country sample to our smaller Bunidbugyo sample makes statistical and intuitive sense. A woman's agency and overall empowerment are likely to be specific to her context, which varies hugely across the developing world, even across small regions (16). At larger scales, such as multi-country or regional studies, greater significance may exist as an aggregation of many varying relationships at smaller scales. Thus small-scale studies with more culturally tailored questions can illustrate better define the exact nature of the agency to nutrition relationship in a given context. Study at both levels, and standardization and comparison across the two are key to solidifying our understandings of the importance of maternal empowerment and utilizing it to improve nutrition worldwide.

Larger multi-country studies provide interesting results that can further be studied at smaller scales. In our 12-country study we found results similar to those in other studies, which showed that likelihood of optimal breastfeeding practices might be decreased by agency, but feeding practices generally seem to have a positive association with agency (4, 9, 17). Knowledge of these counterintuitive relationships can drive future research questions while also improving our understanding of choices women must make and how they ultimately make them. Based on our large sample size there is a question of whether or not our results are so strong due to the large sample or due to an actual relationship. This seems unlikely based on the widespread and very strong significance ($p<0.001$) of much of our results. Additionally, if trends of

significance in larger studies were not due to any real relationship we would not expect to find the strong associations in any small scale studies, which is not the case (15, 18, 19). Measures of maternal agency have also been found to relate to other child health outcomes, suggesting a definite relationship of some kind (31). Large-N multi-country studies have provided a strong basis for a basic understanding of how agency can be related to child nutrition.

Smaller region studies can compliment larger studies and allow a more concentrated and in depth look at this relationship, such as our study in Bundibugyo does. While we only found a significant relationship between decision-making regarding health and introduction of complementary foods to children at the proper age, trends towards significance in decision-making and comfort with a husband's decisions on the use of money indicate potential for further study of this aspect of agency specifically. In the resource constrained conditions of Bundibugyo, social support showed the most significance. This finding indicates that strengthening social networks in the area could translate to better nutritional outcomes due to care practices and that they may be of special importance in certain socioeconomic settings (13, 28). Resource constraints could also be preventing women who have high agency from accessing care or healthy foods, suggesting a need for more research into the relationship between opportunity structure and agency. Smaller studies allow researchers to better understand the context in which they or an organization is working in and how it affects women and their agency.

In order to move the literature on agency forward, small-scale studies and large-scale studies should work to standardize methods and begin to consistently employ the most theoretically and empirically successful methods available. While Sen argues against a universal list of human capabilities, because of differing cultural and regional contexts, using current scholarship to

create a universal list of possible indicators could be beneficial (9). If researchers had a standard for how to measure aspects of agency they would be able to choose the most culturally relevant indicators. Additionally, smaller-scale studies may benefit from using OLS instead of logistic regression, as a study in Ghana that found more significance than those in Kenya and Nicaragua used this method (13, 16, 19). Standardizing methods and agreeing on best practices in the agency literature will help researchers uncover more about how significant this relationship is to overall child health as well as new important and interesting relationships between the two.

While the importance of maternal autonomy in preventing child malnutrition is still not clear, the body of existent literature suggests that there is some relationship of note that those trying to improve nutrition around the globe should pay attention to. Nutrition programs have already begun to integrate the concept of women's empowerment into their programs (31). Current research suggests that this is likely necessary, but surveying women in areas of program implementation is key to understand the most important associations between agency and child nutrition in small regions (4, 13, 16). This can also inform creation of new metrics for evaluation and study of agency based (19). While the exact relationship between agency and child nutrition is not settled, their association is of enough importance to incentivize future research in this area to inform policy making and implementation.

This thesis and the current literature provide direction for future research to improve the research on agency and child nutrition. First, despite Sen's objections, a universal list of agency indicators is necessary to act as a toolkit for researchers (6). This list could operationalize the work of others in defining all potential aspects of agency (5). Researchers could then choose relevant agency indicators based on the location of their study, as many researchers have done in the past, without any kind of conceptual framework linking them to the rest of the literature (19,

29). Additionally, better data availability and improved access to rural areas can allow comparison of different datasets at even more granular scales than our chapter 3 analysis. DHS presents data in geographic clusters, allowing small area estimates of empowerment that could be compared and contrasted to existent small area studies, like our Bundibugyo study or the Rendille Kenya study (16). This could illuminate the level of variation between levels of empowerment within a country and improve our understanding of how granular a study of agency needs to be in order to understand how maternal agency relates to child health. Overall, harmonization of the agency literature and cooperation with other literatures can improve our understandings of the importance of maternal agency, how it can be improved, and how increased agency can improve child nutrition.

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Table.A1 Adjusted logistic regression coefficients (Odds ratios) of predictive power of combined maternal ageny model on Infant and Young Child Feeding Practices[1]

	Breastfed within one hour of delivery (n=42,677)	Exclusively breastfed among children 0 to 5 months (n=9,652)	Continued breastfeeding at one year among children 12 to 15 months (n=7,661)	Timely introduction of complementary foods among children 6 to 8 months (n=6,269)	Fed minimum number of times per day among children 6 to 23 months (n=32,903)	Fed four or more food groups among children 6 to 23 months (n=33,025)	Fed iron rich foods or iron fortified products among children 6 to 23 months (n=33,025)	Fed m... accept... among ch... 23 m... (n=3...
All Region								
Mother is not Underweight (underweight is referent)	1.42 (1.30, 1.54)***	0.76 (0.58, 1.00)	0.54 (0.39, 0.75)***	0.83 (0.73, 0.94)**	0.99 (0.90, 1.09)	1.65 (1.49, 1.82)***	0.74 (0.57, 0.95)*	1.42 (1.26
Access to Media (no access is referent)	1.09 (1.00, 1.18)*	0.81 (0.65, 1.01)	0.62 (0.45, 0.86)**	1.34 (1.19, 1.52)***	1.04 (0.95, 1.15)	1.27 (2.06, 2.50)***	1.43 (1.30, 1.57)***	1.93 (1.70
Attitudes toward wife beating (never justified is referent)	0.89 (0.84, 0.96)**	0.81 (0.68, 0.98)*	0.88 (0.71, 1.09)	1.22 (1.10, 1.35)***	1.05 (0.97, 1.14)	1.19 (1.11, 1.28)***	0.91 (0.85, 0.98)*	1.20 (1.10
Decision regarding use of her money (no involvement is referent)	1.07 (0.96, 1.19)	0.42 (0.30, 0.59)***	0.69 (0.48, 0.99)*	1.13 (0.95, 1.33)	0.86 (0.76, 0.97)*	1.21 (1.07, 1.36)**	1.23 (1.09, 1.38)***	1.10 (0.95
Decision regarding health (no involvement is referent)	1.35 (1.26, 1.45)***	0.69 (0.57, 0.85)***	0.79 (0.62, 1.02)	1.38 (1.24, 1.54)***	1.15 (1.06, 1.25)**	1.25 (1.15, 1.36)***	1.49 (1.34, 1.62)***	1.20 (1.08
Decision Regarding Contraception Use (no involvement is referent)	1.03 (0.91, 1.16)	0.61 (0.44, 0.85)**	0.97 (0.65, 1.45)	1.23 (1.03, 1.45)**	0.90 (0.78, 1.03)	1.00 (0.88, 1.15)***	1.00 (0.87, 1.15)	0.96 (0.81
Employed (unemployed in last 12 months is referent	1.07 (0.98, 1.18)	1.82 (1.34, 2.47)***	0.95 (0.68, 1.34)	1.21 (1.05, 1.40)**	1.18 (1.06, 1.32)**	1.18 (1.06, 1.31)***	1.34 (1.24, 1.53)***	1.14 (1.00
Gender (female child is referent)	1.03 (0.96, 1.08)	0.10 (0.84, 1.19)	1.09 (0.89, 1.33)	0.96 (0.87, 1.06 (	1.01 (0.94, 1.09)	1.09 (1.02, 1.17)**	1.11 (1.04, 1.20)***	1.01 (0.93
Any Education (no maternal education is referent)	1.60 (1.46, 1.75)***	0.65 (0.50, 0.83)**	0.52 (0.36, 0.74)***	1.54 (1.36, 1.75)***	1.32 (1.19, 1.46)***	2.24 (2.00, 2.50)***	2.65 (2.34, 2.98)***	2.00 (1.73
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.90 (0.84, 0.97)**	0.64 (0.52, 0.78)***	0.56 (0.44, 0.73)***	1.27 (1.13, 1.41)***	0.92 (0.85, 1.00)	1.04 (0.96, 1.13)	0.86 (0.79, 0.93)***	1.04 (1.03
Southeat Asia								
Mother is not Underweight (underweight is referent)	0.41 (0.31, 0.54)***	1.21 (0.40, 3.67)	0.64 (0.32, 1.27)	0.51 (0.29, 0.88)*	0.59 (0.44, 0.80)**	1.08 (0.83, 1.41)	(omitted)	0.76 (0.56
Access to Media (no access is referent)	0.75 (0.65, 0.87)***	0.91 (0.61, 1.34)	0.71 (0.43, 1.17)	1.05 (0.82, 1.34)	0.82 (0.69, 0.98)*	1.80 (1.55, 2.10)***	1.40 (1.21, 1.62)***	1.44 (1.18
Attitudes toward wife beating (never justified is referent)	0.74 (0.66, 0.83)***	0.66 (0.49, 0.88)**	1.27 (0.92, 1.75)	1.39 (1.15, 1.69)**	0.99 (0.87, 1.13)	1.33 (1.19, 1.49)***	1.30 (1.16, 1.45)***	1.26 (1.10
Decision regarding use of her money (no involvement is referent)	0.83 (0.70, 0.98)*	0.96 (0.57, 1.63)	1.00 (0.62, 1.63)	0.68 (0.48, 0.95)*	0.99 (0.81, 1.20)	1.16 (0.97, 1.37)	1.22 (1.03, 1.45)*	1.12 (0.91
Decision regarding health (no	1.09 (0.94, 1.27)	0.61 (0.42, 0.89)*	0.53 (0.31, 0.90)*	1.52 (1.21, 1.93)***	0.98 (0.82, 1.17)	1.10 (0.94, 1.28)	1.16 (1.00, 1.35)	1.02 (0.85

involvement is referent)

Decision Regarding Contraception Use (no involvement is referent)	1.30 (1.02, 1.64)	0.45 (0.25, 0.82)**	1.33 (0.71, 2.49)	1.44 (1.02, 2.04)*	1.08 (0.82, 1.43)	104 (0.82, 1.32)	0.97 (0.77, 1.22)	0.90 (0.68
Employed (unemployed in last 12 months is referent	1.12 (0.96, 1.32)	1.05 (0.65, 1.70)	0.67 (0.42, 1.07)	1.91 (1.40, 2.60)***	1.04 (0.86, 1.25)	1.12 (0.96, 1.32)	1.35 (1.16, 1.59)***	1.10 (0.90
Gender (female child is referent)	0.99 (0.89, 1.10)	1.36 (1.02, 1.82)*	0.93 (0.68, 1.26)	0.83 (0.69, 1.00)	0.89 (0.79, 1.02)	1.01 (0.91, 1.13)	1.03 (0.93, 1.15)	1.00 (0.88
Any Education (no maternal education is referent)	0.48 (0.36, 0.63)***	0.39 (0.17, 0.86)*	1.17 (0.52, 2.65)	1.37 (0.92, 2.04)	0.93 (0.69, 1.26)	1.89 (1.42, 2.52)***	1.67 (1.29, 2.15)***	2.23 (1.47
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.97 (0.86, 1.09)	0.48 (0.35, 0.65)***	0.48 (0.33, 0.71)***	1.62 (1.32, 1.98)***	1.03 (0.89, 1.18)	1.55 (1.37, 1.75)***	1.02 (0.91, 1.15)	1.43 (1.23

Latin America and Carribean

Mother is not Underweight (underweight is referent)	1.95 (1.38, 2.75)***	2.23 (0.78, 6.34)	0.16 (0.02, 1.34)	0.54 (0.26, 1.15)	1.16 (0.77, 1.74)	0.89 (0.63, 1.25)	(omitted)	1.15 (0.77
Access to Media (no access is referent)	1.74 (1.28, 2.35)***	1.62 (0.72, 3.65)	0.74 (0.29, 1.88)	1.39 (0.88, 2.20)	1.82 (1.27, 2.61)**	1.78 (1.32, 2.40)***	1.17 (0.83, 1.66)	1.71 (1.17
Attitudes toward wife beating (never justified is referent)	1.02 (0.82, 1.27)	0.55 (0.30, 0.99)*	0.25 (0.12, 0.53)***	1.42 (1.00, 1.99)*	0.82 (0.64, 1.04)	1.11 (0.91, 1.35)	0.82 (0.65, 1.02)	1.02 (0.81
Decision regarding use of her money (no involvement is referent)	1.15 (0.75, 1.78)	(omitted)	0.36 (0.094, 1.37)	1.85 (0.90, 3.83)	0.55 (0.33, 0.90)**	0.63 (0.41, 0.96)*	1.18 (0.73, 1.92)	0.46 (0.29
Decision regarding health (no involvement is referent)	1.34 (1.08, 1.65)**	0.38 (0.22, 0.66)**	0.81 (0.47, 1.39)	1.31 (0.94, 1.83)	1.11 (0.88, 1.40)	0.98 (0.81, 1.19)	1.00 (0.80, 1.26)	0.95 (0.76
Decision Regarding Contraception Use (no involvement is referent)	1.28 (0.94, 1.76)	0.48 (0.21, 1.07)	1.15 (0.50, 2.62)	1.25 (0.76, 2.04)	1.10 (0.76, 1.59)	1.11 (0.83, 1.50)	0.84 (0.61, 1.18)	1.17 (0.82
Employed (unemployed in last 12 months is referent	0.59 (0.38, 0.90)**	(omitted)	1.18 (0.49, 6.95)	1.06 (1.54, 2.08)	1.20 (0.74, 1.94)	1.55 (1.02, 2.36)*	0.98 (0.61, 1.58)	1.61 (1.04
Gender (female child is referent)	1.13 (0.95, 1.35)	1.00 (0.61, 1.63)	1.19 (0.78, 1.82)	1.09 (0.81, 1.48)	0.99 (0.82, 1.21)	1.05 (0.89, 1.22)	1.06 (0.88, 1.27)	1.94 (0.78
Any Education (no maternal education is referent)	1.17 (0.87, 1.59)	1.43 (0.64, 3.17)	0.53 (0.21, 1.33)	1.14 (0.72, 1.81)	1.95 (1.38, 2.74)***	1.25 (0.94, 1.67)	0.87 (0.63, 1.21)	1.85 (1.28
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.59 (0.48, 0.72)***	0.30 (0.17, 0.53)***	0.47 (0.29, 0.78)**	1.95 (1.40, 2.70)***	0.71 (0.57, 0.88)**	1.24 (1.04, 148)*	1.67 (1.36, 2.06)***	1.04 (0.85

Africa

Mother is not Underweight (underweight is referent)	1.33 (1.01, 1.76)*	1.03 (0.46, 2.31)	0.14 (0.00, 4.79)	1.03 (0.73, 1.45)	0.74 (0.54, 1.03)	1.52 (0.99, 2.34)	1.20 (0.80, 1.80)	1.88 (0.96
Access to Media (no access is referent)	0.97 (0.77, 1.22)	0.85 (0.48, 1.49)	1.96 (0.43, 8.99)	1.25 (0.94, 1.67)	1.26 (0.96, 1.66)	4.73 (3.34, 6.71)***	1.53 (1.09, 2.15)**	6.26 (3.64
Attitudes toward wife beating (never justified is referent)	1.26 (0.99, 1.59)	2.80 (1.41, 5.57)**	1.22 (0.21, 7.07)	0.80 (0.60, 1.08)	1.36 (1.03, 1.81)*	0.72 (0.51, 1.03)	0.53 (0.36, 0.78)**	0.63 (0.38
Decision regarding use of her money (no involvement is referent)	1.04 (0.77, 1.40)	0.49 (0.21, 1.13)	1.16 (0.14, 9.70)	0.88 (0.58, 1.31)	0.88 (0.62, 1.25)	1.14 (0.76, 1.71)	0.83 (0.57, 1.23)	1.77 (0.98

Decision regarding health (no involvement is referent)	1.45 (1.16,1.83)**	0.75 (0.40, 1.42)	1.49 (0.32, 6.92)	1.31 (0.98, 1.74)	1.71 (1.30, 2.25)***	0.63 (0.46, 1.09)**	0.91 (0.65, 1.26)	1.08 (0.69
Decision Regarding Contraception Use (no involvement is referent)	0.96 (0.69, 1.34)	0.83 (0.36, 1.94)	0.30 (0.014, 6.63)	1.13 (0.76, 1.67)	0.93 (0.63, 1.37)	0.71 (0.46, 1.09)	0.72 (0.46, 1.13)	0.70 (0.39
Employed (unemployed in last 12 months is referent	0.80 (0.60, 1.07)	1.19 (0.52, 2.69)	1.40 (0.19, 10.07)	1.98 (1.36, 2.90)***	1.18 (0.83, 1.68)	1.65 (1.08, 2.53)*	2.47 (1.62, 3.76)***	1.17 (0.62
Gender (female child is referent)	0.83 (0.67, 1.03)	1.19 (0.67, 2.10)	0.83 (0.18, 3.81)	1.10 (0.84, 1.45)	1.36 (1.05, 1.77)*	1.22 (0.89, 1.67)	1.10 (0.80, 1.52)	1.13 (0.74
Any Education (no maternal education is referent)	1.20 (0.96, 1.50)	0.32 (0.56, 1.90)	0.26 (0.045, 1.50)	1.04 (0.78, 1.37)	0.92 (0.71, 1.20)	1.42 (1.03, 1.96)*	2.10 (1.50, 2.95)***	1.81 (1.14
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	1.26 (0.98, 1.62)	1.02 (0.50, 2.08)	0.17 (0.0078, 3.68)	1.19 (0.87, 1.63)	1.06 (0.78, 1.43)	0.61 (0.42, 0.88)**	0.38 (0.27, 0.54)***	0.65 (0.38
South Asia								
Mother is not Underweight (underweight is referent)	0.95 (0.84, 1.07)	0.77 (0.53, 1.11)	0.74 (0.49, 1.14)	0.77 (0.66, 0.91)**	0.97 (0.86, 1.09)	1.07 (0.93, 1.22)	0.97 (0.84, 1.14)	1.17 (0.98
Access to Media (no access is referent)	1.13 (0.98, 1.31)	0.78 (0.52, 1.19)	0.66 (0.38, 1.16)	1.25 (1.05, 1.50)*	0.99 (0.86, 1.14)	1.69 (1.42, 2.01)***	1.36 (1.13, 1.64)**	1.42 (1.15
Attitudes toward wife beating (never justified is referent)	0.92 (0.82, 1.03)	0.97 (0.69, 1.36)	1.35 (0.92, 2.00)	1.01 (0.94, 1.27)	1.16 (1.03, 1.31)*	1.02 (0.90, 1.17)	0.88 (0.76, 1.02)	1.09 (0.92
Decision regarding use of her money (no involvement is referent)	1.02 (0.83, 1.25)	0.23 (0.11, 0.49)***	0.51 (0.22, 1.16)	1.31 (1.01, 1.70)*	0.95 (0.77, 1.17)	1.05 (0.82, 1.33)	1.98 (1.51, 2.60)***	1.04 (0.78
Decision regarding health (no involvement is referent)	1.21 (1.08, 1.36)**	1.21 (0.87, 1.70)	1.44 (0.97, 2.13)	1.16 (0.99, 1.36)	1.05 (0.94, 1.19)	1.22 (0.98, 1.28)	1.06 (0.91, 1.23)	1.25 (1.05
Decision Regarding Contraception Use (no involvement is referent)	0.93 (0.76, 1.14)	0.83 (0.48, 1.45)	0.92 (0.43, 2.01)	1.08 (0.83, 1.39)	0.71 (0.58, 0.88)**	0.95 (0.76, 1.20)	0.95 (0.73, 1.22)	0.97 (0.72
Employed (unemployed in last 12 months is referent	1.27 (1.08, 1.49)**	4.48 (2.39, 8.38)***	1.81 (0.91, 3.60)	0.84 (0.69, 1.03)	1.27 (1.08, 1.50)**	1.13 (0.93, 1.26)	0.71 (0.56, 0.89)**	1.33 (1.05
Gender (female child is referent)	1.01 (0.90, 1.13)	0.63 (0.48, 0.88)**	1.16 (0.78, 1.73)	0.95 (0.82, 1.10)	1.05 (0.93, 1.17)	1.13 (0.99, 1.28)	1.25 (1.09, 1.44)**	0.99 (0.84
Any Education (no maternal education is referent)	1.76 (1.53, 2.04)***	0.81 (0.54, 1.20)	0.77 (0.45, 1.30)	1.46 (1.22, 1.74)***	1.29 (1.11, 1.48)***	1.65 (1.39, 1.95)***	1.48 (1.23, 1.78)***	1.44 (1.16
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	1.40 (1.21, 1.62)***	0.71 (0.47, 1.08)	0.47 (0.27, 0.81)**	1.20 (1.00, 1.44)*	1.02 (0.99, 1.18)	1.33 (1.13, 1.58)**	1.05 (0.87, 1.26)	1.41 (1.14

[1] Regression models controlled for child age, gender, no maternal education, and houshold income being in the lowest 40 percent of the wealth index

* result was significant, p<0.05

** result was significant, p<0.01

*** result was significant, p<0.001

* In Bangladesh, Ethiopia, Honduras, Timor-Liste, India, and Indonesia data was not collected regarding travel away from home. Consequently, they are not included in these results.

Table A2. Adjusted logistic regression coefficients (Odds ratios) of predictive power of combined maternal agency model on Anthropometric Measures of Nutritional Status[1]

	Stunted	Wasted	Underweight
All Region			
Mother is not Underweight (underweight is referent)	0.70 (0.66, 0.73)***	0.46 (0.44, 0.50)***	0.46 (0.44, 0.49)***
Access to Media (no access is referent)	0.76 (0.72, 0.70)***	0.88 (0.81, 0.94)***	0.73 (0.68, 0.77)***
Attitudes toward wife beating (never justified is referent)	0.74 (0.71, 0.78)***	0.95 (0.89, 1.01)	0.79 (0.75, 0.83)***
Decision regarding use of her money (no involvement is referent)	0.72 (0.68, 0.78)***	0.78 (0.71, 0.86)***	0.71 (0.66, 0.77)***
Decision regarding health (no involvement is referent)	1.00 (0.95, 1.05)	0.87 (0.81, 0.93)***	0.93 (0.88, 0.98)**
Decision Regarding Contraception Use (no involvement is referent)	1.06 (0.98, 1.15)	0.98 (0.88, 1.10)	1.01 (0.93, 1.11)
Employed (unemployed in last 12 months is referent	1.19 (1.11, 1.26)***	1.12 (1.03, 1.21)**	1.28 (1.20, 1.36)***
Gender (female child is referent)	0.90 (0.83, 0.91)***	0.86 (0.81, 0.92)***	0.95 (0.91, 0.99)*
Any Education (no maternal education is referent)	0.68 (0.65, 0.69***	0.82 (0.76, 0.88)***	0.61 (0.58, 0.65)***
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.66 (0.63, 0.69)***	0.90 (0.84, 0.96)**	0.75 (0.71, 0.79)***
Southeast Asia			
Mother is not Underweight (underweight is referent)	0.78 (0.66, 0.93)**	0.63 (0.51, 0.79)***	0.68 (0.51, 0.72)***
Access to Media (no access is referent)	0.78 (0.67, 0.92)**	0.87 (0.70, 1.08)	0.74 (0.63, 0.87)***
Attitudes toward wife beating (never justified is referent)	0.75 (0.64, 0.88)***	1.19 (0.94, 1.51)	0.94 (0.80, 1.12)
Decision regarding use of her money (no involvement is referent)	0.69 (0.58, 0.82)***	0.38 (0.29, 0.49)	0.48 (0.40, 0.57)***
Decision regarding health (no involvement is referent)	1.15 (0.93, 1.43)	1.02 (0.74, 1.40)	1.10 (0.87, 1.38)
Decision Regarding Contraception Use (no involvement is referent)	1.13 (0.86, 1.50)	1.76 (1.08, 2.89)**	1.16 (0.87, 1.56)
Employed (unemployed in last 12 months is referent	1.05 (0.88, 1.25)	1.56 (1.24, 1.97)***	1.46 (1.22, 1.74)
Gender (female child is referent)	0.71 (0.62, 0.82)***	0.84 (0.69, 1.02)	0.95 (0.83, 1.10)
Any Education (no maternal education is referent)	0.74 (0.62, 0.89)**	0.85 (0.67, 1.09)	0.88 (0.74, 1.06)
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.81 (0.69, 0.94)**	1.16 (0.93, 1.45)	0.87 (0.75, 1.03)
Latin America and Caribbean			
Mother is not Underweight (underweight is referent)	0.92 (0.72, 1.19)	0.28 (0.19, 0.41)***	0.32 (0.25, 0.42)*(**
Access to Media (no access is referent)	1.07 (0.88, 1.30)	0.87 (0.58, 1.31)	0.66 (0.52, 0.83)***
Attitudes toward wife beating (never justified is referent)	0.94 (0.82, 1.08)	1.57 (1.10, 2.25)**	0.96 (0.79, 1.16)
Decision regarding use of her money (no involvement is referent)	0.61 (0.47, 0.80)***	0.60 (0.37, 0.97)**	0.51 (0.37, 0.70)***
Decision regarding health (no involvement is referent)	0.84 (0.73, 0.96)**	0.50 (0.38, 0.67)***	0.60 (0.50, 0.71)***
Decision Regarding Contraception Use (no involvement is referent)	0.99 (0.81, 1.24)	1.31 (0.76, 2.27)	0.93 (0.69, 1.23)
Employed (unemployed in last 12 months is referent	1.40 (1.08, 1.81)**	3.22 (1.97, 5.26)***	2.16 (1.58, 2.96)***
Gender (female child is referent)	0.78 (0.70, 0.88)***	0.72 (0.55, 0.94)**	0.82 (0.69, 0.97)**
Any Education (no maternal education is referent)	0.64 (0.54, 0.76)***	0.31 (0.22, 0.43)***	0.46 (0.37, 0.57)***
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.32 (0.28, 0.36)***	1.00 (0.74, 1.34)	0.50 (0.42, 0.59)***
Africa			
Mother is not Underweight (underweight is referent)	0.83 (0.70, 0.98)**	0.55 (0.42, 0.72)***	0.53 (0.44, 0.63)***
Access to Media (no access is referent)	0.72 (0.63, 0.83)***	0.85 (0.65, 1.11)	0.69 (0.58, 0.81)***
Attitudes toward wife beating (never justified is referent)	0.70 (0.60, 0.81)***	0.75 (0.57, 1.00)	0.75 (0.63, 0.89)**
Decision regarding use of her money (no involvement is referent)	0.80 (0.69, 0.95)**	0.84 (0.61, 1.15)	1.01 (0.83, 1.23)
Decision regarding health (no involvement is referent)	1.19 (0.97, 1.29)	1.07 (0.82, 1.39)	1.00 (0.85, 1.18)

Decision Regarding Contraception Use (no involvement is referent)	0.81 (0.66, 1.01)	0.59 (0.42, 0.83)**	0.77 (0.61, 0.97)
Employed (unemployed in last 12 months is referent	1.23 (1.03, 1.46)**	1.02 (0.72, 1.40)	1.03 (0.84, 1.25)
Gender (female child is referent)	0.83 (0.72, 0.94)**	0.92 (0.72, 1.18)	0.88 (0.76, 1.03)
Any Education (no maternal education is referent)	0.64 (0.55, 0.73)***	1.13 (0.87, 1.46)	0.53 (0.45, 0.61)***
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.78 (0.67, 0.91)**	0.89 (0.68, 1.17)	0.84 (0.71, 0.99)**

South Asia

Mother is not Underweight (underweight is referent)	0.74 (0.70, 0.78)***	0.59 (0.55, 0.63)***	0.58 (0.54, 0.61)***
Access to Media (no access is referent)	0.79 (0.74, 0.85)***	0.97 (0.89, 1.06)	0.84 (0.79, 0.90)***
Attitudes toward wife beating (never justified is referent)	0.86 (0.82, 0.91)***	1.01 (0.94, 1.09)	0.89 (0.84, 0.94)***
Decision regarding use of her money (no involvement is referent)	0.90 (0.83, 0.99)**	1.11 (0.99, 1.25)	0.98 (0.89, 1.07)
Decision regarding health (no involvement is referent)	1.01 (0.95, 1.07)	0.91 (0.85, 0.98)	0.98 (0.92, 1.03)
Decision Regarding Contraception Use (no involvement is referent)	1.13 (1.02, 1.25)**	0.94 (0.83, 1.07)	1.05 (9.94, 1.16)
Employed (unemployed in last 12 months is referent	1.12 (1.04, 1.20)**	0.98 (0.89, 1.07)	1.18 (1.09, 1.27)***
Gender (female child is referent)	0.95 (0.90, 1.01)	0.91 (0.85, 0.98)**	1.03 (0.97, 1.09)
Any Education (no maternal education is referent)	0.71 (0.67, 0.76)***	0.94 (0.86, 1.02)	0.69 (0.65, 0.74)***
Upper sixtieth percentile for wealth (poorest 40 percent is referent)	0.68 (0.63, 0.72)***	0.77 (0.70, 0.84)***	0.64 (0.60, 0.68)***

[1] Regression models controlled for child age, gender, no maternal education, and household income being in the lowest 40 percent of the wealth index

* Result was significant, p<0.05

** Result was significant, p<0.01

*** Result was significant, p<0.001

* In Bangladesh, Ethiopia, Honduras, Timor-Liste, India, and Indonesia data was not collected regarding travel away from home. Consequently, they are not included in these results.

Figure A1. Sample Questions on Social Support from Maternal Capacities Questionnaire used in Study of Maternal Agency in Bundibugyo, Uganda

Domain 3 – Social Support

"I am now going to ask you some questions about how the people involved in your day to day life support you as you care for your children."

	Question	Response Code	Response
s1	Are you currently married or living together with a man as married	0=No 1= Yes 98=N/A	
s2	If no, were you ever married or living together with a man as if married?	0=No 1=Yes 98=N/A	
s3	What is your marital status now: are you widowed, divorced, or separated?	1=Widowed 2=Divorced 3=Seperated 98=N/A	
s4	Is your (husband/partner) living with you now or is he staying elsewhere?	0=Elsewhere 1=Living together	
s5	Does your (husband/partner) have other wives or does he live with other women as if married?	0=No 1=Yes	

Figure A2. Sample Questions on Social Support from Maternal Capacities Questionnaire used in Study of Maternal Agency in Bundibugyo, Uganda

Domain 4: Psychological Wellbeing

"Now we will ask about how satisfied you are with different aspects of your life."

"In general, how satisfied are you with..."		Very satisfied	Fairly Satisfied	Not very satisfied	Not at all satisfied	Response (98 = DK
P1a	Life overall	1	2	3	4	
P1b	Food	1	2	3	4	
P1c	Housing	1	2	3	4	
P1d	Income	1	2	3	4	

Figure A3. Sample Questions on Decision-making and Agency from Maternal Capacities Questionnaire used in Study of Maternal Agency in Bundibugyo, Uganda

Domain 5: Decision-making/Agency

"Now, we're going to talk about how you make decisions and who helps you make them. Like before, I will give you a statement and you will tell me how much you agree or disagree."

	"To what extent do you agree with the following statements?"	Disagree Strongly		Neutral		Agree Strongly	Response
a1a	If my husband and I disagree about how to spend money for our household, my opinion is respected	1	2	3	4	5	
a1b	If my husband and I disagree about how to spend money in our household, he will make the final decision	1	2	3	4	5	
a1c	I wish that I could use more of the money that we have in our household on food for my children	1	2	3	4	5	
a1d	I feel uncomfortable with the way that my husband spends money	1	2	3	4	5	