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What dimensions of women's empowerment in agriculture matter for nutrition in Ghana?

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ABSTRACT

This paper investigates linkages between women's empowerment in agriculture and the nutritional status of women and children using 2012 baseline data from the Feed the Future population-based survey in northern Ghana. Using a new survey-based index, the women's Empowerment in Agriculture Index, we conduct individual-level analyses of nutrition-related indicators including exclusive breastfeeding, children's dietary diversity score, minimum dietary diversity and minimum acceptable diet, children's height-for-age, weight-for-height, and weight-for-age *z*-scores, and women's dietary diversity score and body mass index. Results suggest that women's empowerment is more strongly associated with the quality of infant and young child feeding practices and only weakly associated with child nutrition status. Women's empowerment in credit decisions is positively and significantly correlated with women's dietary diversity, but not body mass index. This suggests that improved nutritional status is not necessarily correlated with empowerment across all domains, and that these domains may have different impacts on nutrition.

Introduction

Gender equality and women's empowerment is an important development priority, as highlighted by its inclusion in the Millenium Development Goals (MDGs). Whether one adopts "instrumentalist" views, or recognizes the intrinsic value of women's empowerment, the important role of gender equality in goals related to reducing poverty, eradicating hunger, and improving food security must be acknowledged. Policy interventions that improve women's status and reduce gender inequalities are expected to improve women's and children's well-being, owing to women's important role in childcare and household food preparation in many societies. Smith et al. (2003) find that women with higher status relative to men have greater control over household resources, fewer time constraints, better access to information and health services, and better mental health, self-confidence, and higher self-esteem. Women with greater status have better nutritional status, are better cared for themselves, and provide higher quality care to their children. In many societies, women also play an important role in agriculture, although this role has tended to be unrecognized or incorrectly measured. Although the biological processes underlying optimal nutrition are relatively well understood, knowledge regarding which dimensions of women's empowerment matter for good nutrition is limited, both because empowerment is culture- and context-specific and because of the difficulty of measuring empowerment. This lack of knowledge constrains the set of policy options that can be used to empower women and improve nutrition.

Approaches used to measure the relationship between women's empowerment and nutrition include using: nationally-representative data on women's status and malnutrition (Smith et al., 2003); proxy measures of bargaining power such as income, assets, and education (Thomas, 1994); and direct measures of empowerment such as mobility, decisionmaking, and attitudes toward verbal and physical abuse (Bhagowalia et al., 2012). With few exceptions (Sraboni et al., 2014; Malapit et al., forthcoming), most analyses have concentrated on women's decisionmaking within the household or on their reproductive roles, neglecting empowerment in productive domains. Few studies measure women's empowerment in agricultural production as a pathway to improved nutrition, despite the explicit targeting of women in many programs (Ruel and Alderman, 2013).

This paper investigates linkages between women's empowerment in agriculture and the nutritional status of women and children using 2012 baseline data from the Feed the Future Initiative's

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population-based survey in northern Ghana. We use the survey-based Women's Empowerment in Agriculture Index (WEAI) (Alkire et al., 2013), which directly assesses women's empowerment across five domains in agriculture, namely, agricultural production, access to and control over productive resources, control over the use of income, leadership in the community, and time allocation. The women's empowerment score reflects the extent to which women are empowered in these domains. Comparing women's and men's empowerment scores enables us to assess the inequality between the achievements of women relative to the men in their households.

We focus on the women's empowerment score to assess the extent to which women's empowerment in agriculture is linked with the adoption of infant and young child feeding (IYCF) practices and nutrition outcomes for women and children. We also use the components of the women's empowerment score to identify how specific domains and indicators are associated with nutrition. For households where both male and female decisionmakers are present (also referred to as dual-adult households), we use information about the empowerment gap between men and women to examine relationships between intrahousehold inequality and nutrition.

We conduct individual-level analyses of nutrition outcomes including exclusive breastfeeding of children under 6 months; children's dietary diversity score, minimum dietary diversity and minimum acceptable diet for children 6–23 months; children's height-for-age *z*-scores (HAZ), weight-for-height *z*-scores (WHZ), and weight-for-age *z*-scores (WAZ); and women's dietary diversity score and body mass index (BMI). Overall, our findings suggest that different domains of empowerment may have different impacts on nutrition, consistent with other findings in the empowerment literature (Kabeer, 1999; Sraboni et al., 2014; Malapit et al., forthcoming).

Table 1
The domains, indicators, and weights in the Women's Empowerment in Agriculture Index.

Domain	Indicator	Definition of indicator	Weight
1. Production	1.1 Input in productive decisions	Sole or joint decisionmaking over food and cash-crop farming, livestock, and fisheries	1/10
	1.2 Autonomy in production	Autonomy in agricultural production reflects the extent to which the respondent's motivation for decisionmaking reflects own values rather than a desire to please others or avoid harm	1/10
2. Resources	2.1 Ownership of assets	Sole or joint ownership of major household assets	1/15
	2.2 Purchase, sale, or transfer of assets	Whether respondent participates in decision to buy, sell, or transfer assets	1/15
	2.3 Access to and decisions about credit	Access to and participation in decisionmaking concerning credit	1/15
3. Income	3.1 Control over use of income	Sole or joint control over income and expenditures	1/5
4. Leadership	4.1 Group member	Whether respondent is an active member in at least one economic or social group	1/10
	4.2 Speaking in public	Whether the respondent is comfortable speaking in public concerning issues relevant to oneself or one's community	1/10
5. Time	5.1 Workload	Allocation of time to productive and domestic tasks	1/10
	5.2 Leisure	Satisfaction with time for leisure activities	1/10

Source: Alkire et al. (2013).

Overview of the Women's Empowerment in Agriculture Index

WEAI is a new survey-based tool designed to measure the empowerment, agency, and inclusion of women in agriculture using data collected by interviewing men and women within the same households. Initially designed as a monitoring and evaluation tool for Feed the Future, the index can also be used to assess the general state of empowerment and gender parity in agriculture and identify the key areas where empowerment gaps exist (Alkire et al., 2013).

WEAI is an aggregate index reported at the program level and is composed of two subindexes: the five domains of empowerment (5DE) and the gender parity index (GPI). The 5DE assesses the degree to which women are empowered in five domains, which include (1) agricultural production decisions, (2) access to and decisionmaking power over productive resources, (3) control over use of income, (4) leadership roles within the community, and (5) time allocation. The 5DE is constructed from individual-level empowerment scores, which reflects each person's achievements in the five domains as measured by 10 indicators with their corresponding weights (Table 1). Each indicator measures whether an individual has surpassed a given threshold, or has adequate achievement, with respect to each indicator. A woman is defined as empowered if she has adequate achievements in four out of the five domains or has achieved adequacy in 80% or more of the weighted indicators.

Unlike other women's empowerment measures based on interviews of a sole female respondent, WEAI uses survey data from the self-identified primary male and female adult decisionmakers, aged 18 and over, in the same household. Relative empowerment is captured in GPI, which reflects women's achievements in the five domains relative to the men in their households. Households are classified as having gender parity if either the woman is empowered (her empowerment score is 80% or higher) or her score is greater than or equal to the empowerment score of the male decisionmaker in her household.

All of these indexes have values ranging from 0 to 1, where higher values reflect greater empowerment. The overall WEAI is a weighted average of 5DE and GPI, with weights 0.9 and 0.1, respectively. While the overall WEAI is useful as a headline indicator, similar to how poverty indexes are used to track overall trends in poverty, the WEAI is also decomposable, which allows us to disaggregate the 5DE achievements by domain and by indicator to see which specific areas contribute the most to both women's and men's disempowerment. More details about the methodology, piloting, and validation of WEAI are available in Alkire et al., (2013).

Country context

Ghana is a lower-middle-income country in West Africa that has experienced relatively high rates of economic growth and poverty reduction in the past two decades, although poverty reduction has been much slower in the north (World Bank, 2013, 9). Children's nutritional status has improved in recent years, though the stunting prevalence remains high at 23% (Ghana Statistical Service, 2011). Ghana also lags on key MDGs, such as maternal and infant mortality and access to improved sanitation methods, with large disparities in access to key health and education services between north and south and between income quintiles (World Bank, 2013, i).

Women and girls are active in Ghana's agricultural sector. Females accounted for 49% of the economically-active population in 2010, of which agriculture employed 49.3% (FAO, 2011). As in other areas of West Africa, men and women within the same household cultivate separate plots, and women traditionally cultivate food crops and men, cash crops, although these distinctions are neither clear-cut nor immutable (Doss, 2002). Despite women's high degree of involvement in agriculture, data from a nationally-representative survey indicate that most agricultural parcels (85%) are owned exclusively by the individual male, 9.8% by the individual female, and only 3.5% jointly (Deere et al., 2012). Ghana's "separation of property regime" within marriage also does not recognize wives' contributions to the formation of marital property (Deere et al., 2012). Laar and Aryeetey (2015) also point out that women may be vulnerable to food insecurity owing to their lower empowerment status, unequal intrahousehold food distribution, and the willingness of women to forego meals in favor of children during times of scarcity. In some ethnic groups, women eat only after men are served, and in some Ghanaian communities, nutrient-rich animal source foods are largely served to male household members (Colecraft et al., 2006).

Data, empirical specification and variables

Data

This paper uses the 2012 baseline survey that is statistically representative of the Feed the Future's zone of influence (ZoI) in northern Ghana, which included districts in the northern, upper west, and upper east regions, and areas in the Brong Ahafo region above the eighth parallel (Fig. 1). The survey uses a two-stage sampling methodology, where 230 enumeration areas were selected from all the enumeration areas within the ZoI based on Ghana 2010 Census data in the first stage, and then households were randomly sampled from among those listed in each selected enumeration area in the second stage (METSS-Ghana, 2012).

About 75% of the survey sample of 4410 households were in rural areas, totaling 3317 households. We restrict our analysis to rural households to avoid the potential misclassification of women as "disempowered" if they are not engaged in agriculture. We further exclude 248 rural households without a female adult decision-maker, and another 35 households that were not administered the WEAI module. Households with incomplete WEAI indicators were excluded, because all 10 indicators are needed to calculate the WEAI. A probit regression suggests that households are more likely to have missing female WEAI scores if they have fewer literate members, more teenage females, or reside in the poorer Northern region. Only 1783 households have complete WEAI indicators for the female decisionmakers, of which 1513 households have at least one co-resident female household member aged 15–49, and 1027 households have at least one co-resident child under five years old. Our final estimation sample consists of 2027 women aged 15–49 and 1437 children under five years old. The number of observations for specific regressions vary because some households have multiple women aged 15–49 and/or children under five, or have missing data on some variables. Actual estimation samples are presented in the relevant tables.

Within our sample, 18.4% of households were female headed. Compared with the national averages reported in the 2008 Ghana Demographic and Health Survey (GDHS), the female respondents in our sample are older and have lower rates of literacy. About half our female respondents are under 30, and only 11% were literate. In contrast, 56% of females in the 2008 GDHS are under 30, and about half of rural women can read and write (Ghana Statistical Service, 2009).

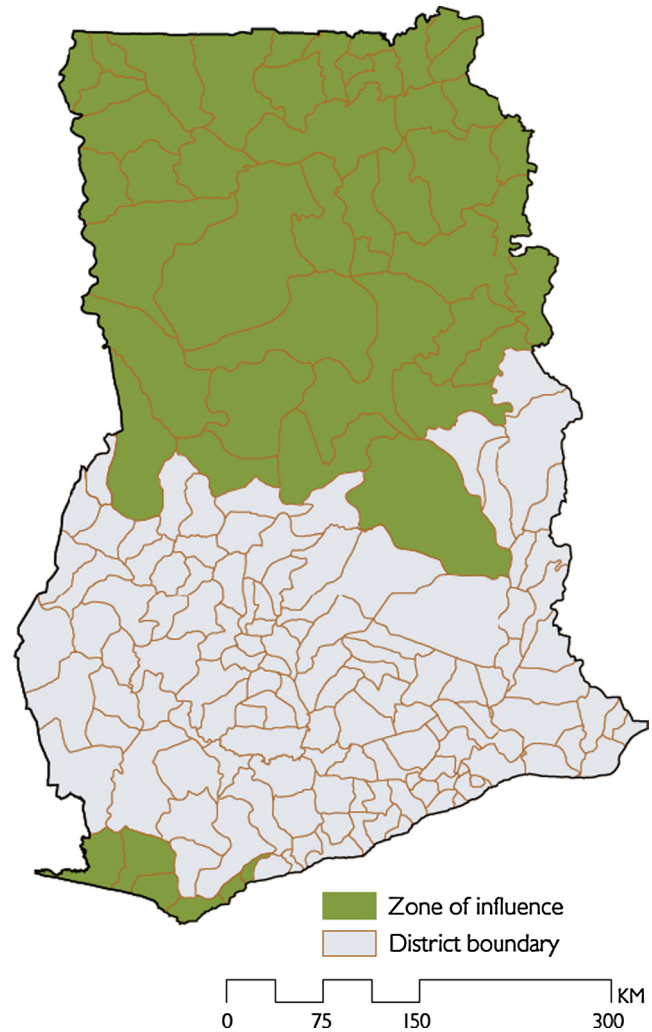

Fig. 1. Feed the Future zone of influence in Ghana. Source: Malapit et al. (2014). The Feed the Future zone of influence includes the Brong Ahafo, Northern, Upper East, and Upper West regions of Ghana.

Empirical specification

UNICEF's conceptual framework (1990) identifies care, household food security, and a healthy environment as the three underlying factors that determine nutrient intake and health of children and their survival, growth and development. Engle et al. (1997, p. 3) expansion of the UNICEF framework highlights the importance of resources needed by the caregiver and specific care practices, including education, knowledge and beliefs, physical health and nutritional status, mental health and self-confidence, autonomy and control of resources, reasonable workload and availability of time, and family and community social support. We hypothesize that empowered women are better able to command the resources needed to provide care, such as the adoption of infant and young child feeding practices (IYCF) leading to optimal nutritional status, measured by children's HAZ, WAZ, and WAZ. To analyze the relationship between individual nutrition outcomes ($\boldsymbol{O}$), and women's empowerment, we estimate the following equation using ordinary least squares:

$$\boldsymbol{O} = a_0 + a_1 \text{ empowerment} + \boldsymbol{a_2 I} + \boldsymbol{a_3 H} + \varepsilon, \quad (1)$$

where I is a vector of individual characteristics; $\boldsymbol{H}$ is a vector of household characteristics; a_i, $\boldsymbol{a_2}$, and $\boldsymbol{a_3}$ are the parameters to be estimated; and ε is an error term. Our key coefficient of interest is

a_1, which captures how women's empowerment is correlated with the nutrition outcome, controlling for a set of observable individual and household characteristics. We expect that women's empowerment is positively correlated with the adoption of IYCF practices and appropriate diets for women, and negatively correlated with malnutrition. Although empowerment itself may be influenced by the woman's own characteristics as well as her household's characteristics, because suitable instruments are not available, we use ordinary least squares and interpret the estimated relationships as associative rather than causal.

Pooling boys and girls in the equation for child-level nutritional outcomes assumes that women's empowerment influences IYCF for boys and girls and their nutritional status in the same way. To test whether the coefficient a_1 differs for boys and girls, or whether women's empowerment has a differential impact on children by sex, we include a dummy variable for the sex of the child (=1 if girl child) and also interact this dummy variable with the empowerment variable. The resulting equation to be estimated for child-level nutrition outcomes ($\boldsymbol{O_C}$) is given by

$$\boldsymbol{O_C} = b_0 + b_1 \text{ empowerment} + b_2 \text{ girl} + b_3(\text{empowerment} \times \text{girl}) + \boldsymbol{b_4 I} + \boldsymbol{b_5 H} + v, \quad (2)$$

where b_i, $\boldsymbol{b_4}$, and $\boldsymbol{b_5}$ are the parameters to be estimated and v is an error term. For boys, the relationship between women's empowerment and the nutrition outcome is given by b_1. For girls, the impact of empowerment is the sum of the coefficient of the empowerment variable and the coefficient of the interaction term with the girl child dummy ($b_1 + b_3$). Eq. (2) also nests the test of the differential impact of empowerment on girls, which is represented by the coefficient on the interaction term, represented by b_3. If b_3 is significantly different from zero, then this suggests that women's empowerment has differential effects on boys and girls. We estimate equation (1) for women's nutrition outcomes, and equation (2) for children's nutrition outcomes.

Nutrition outcome variables

Information about IYCF practices is based on responses of mothers and caretakers of children under two years old in reference to the preceding 24 h. Summary statistics for these indicators are presented in Table 2.

Quality of infant and young child feeding practices

Indicators for quality of IYCF include:

Exclusive breast-feeding (for children 0–6 months): A child aged zero to six months is defined as exclusively breast-fed if he or she did not consume any other liquids or foods other than breast milk in the preceding 24 h. The World Health Organization (WHO) recommends exclusively breast-feeding infants during the child's first six months of life to achieve optimal growth, development, and health. Of children in the relevant age group, 60% were exclusively breast-fed at the time of the survey (Table 2).

Dietary diversity score (children aged 6–23 months): The number of food groups consumed in the last 24 h out of seven food groups which include (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products; (4) flesh foods; (5) eggs; (6) vitamin-A-rich fruits and vegetables; and (7) other fruits and vegetables (WHO, 2010).

Minimum diet diversity (children aged 6–23 months): Defined as consuming at least four food groups out of the seven food groups if breast-fed and out of six food groups (excluding dairy products) if not breast-fed, in the last 24 h.

Minimum acceptable diet (children aged 6–23 months): Defined as having achieved the minimum diet diversity and minimum meal frequency for solid, semisolid, and soft foods in the last 24 h. Minimum meal frequency is defined as consuming at least two feedings for breast-fed children aged 6–8 months, at least three feedings for breast-fed children aged 9–23 months, and at least four feedings for non-breast-fed children aged 6–23 months, of which at least two feedings must be milk feeds (WHO, 2008).

Children in our estimation sample had a diet diversity score of 2.62 (out of 7.00), but only 31% satisfied the minimum diversity criterion of eating at least four out of seven food groups, and 15% consumed the minimum acceptable diet (Table 2). These results are much lower compared with the national averages of 46% and 31% of children receiving the minimum diet diversity and minimum acceptable diet, respectively (Ghana Statistical Service, 2011), reflecting the higher rates of poverty and less diverse production portfolios in the northern region. On average, girls are more likely to be exclusively breast-fed and consume better-quality diets than boys, although these differences are not statistically significant.

Child anthropometry

The child nutrition outcomes are based on anthropometric z-scores for children under five, calculated using the 2006 WHO Child Growth Standards (WHO Multicentre Growth Reference Study Group, 2006). These standardized indicators are useful for assessing the degree to which the physiological needs for growth and development are met during the crucial period of early childhood.

HAZ: A child is defined as stunted if his or her height-for-age measurement is two or more standard deviations below the median of the reference group.

WHZ: A child is defined as wasted if his or her weight-for-height measurement is two or more standard deviations below the median of the reference group.

WAZ: A child is defined as underweight if his or her weight-for-age measurement is two standard deviations below the median of the reference group.

The prevalence of undernutrition for children under five in our sample is higher than in the rest of the country, again reflecting higher poverty rates. The 2011 Ghana Multiple Indicator Cluster Survey reports that 23% of children are stunted, 6% are wasted, and 13% are underweight (Ghana Statistical Service, 2011). In contrast, our sample shows that 41% of children are stunted, 11% are wasted, and 20 are underweight (Table 2). Overall, there are no significant differences in the prevalence of stunting, wasting, and underweight between boys and girls.

Women's dietary diversity and anthropometry

For women of reproductive age (15–49 years old), we use the following nutrition indicators:

Dietary diversity score: Defined as the number of food groups consumed based on 24-h recall, namely: (1) starchy staples, (2) green leafy vegetables, (3) other vitamin-A-rich fruits and vegetables, (4) other fruits and vegetables, (5) organ meat, (6) meat and fish, (7) eggs, (8) legumes and nuts, and (9) milk and milk products (Kennedy et al., 2011).

BMI: Defined as the ratio of weight (in kilograms) to the square of height (in meters). A woman is considered underweight or thin if her BMI is less than 18.50 kg/m^2 (WHO, 1995). Our estimation sample excludes pregnant women.

Table 2
Summary statistics.

Variable	Observations	Mean	Standard error	Minimum	Maximum
Child outcomes and characteristics					
Infant and young child feeding practices					
Breast-fed exclusively, 0–6 months	147	0.60	0.05	0	1
Boys	85	0.58	0.06	0	1
Girls	62	0.62	0.07	0	1
Number of food groups consumed (out of 7), 6–23 months	402	2.62	0.11	0	7
Boys	189	2.55	0.16	0	7
Girls	213	2.68	0.15	0	7
Consumed minimum diet diversity (⩾4 food groups), 6–23 months	402	0.31	0.03	0	1
Boys	189	0.27	0.04	0	1
Girls	213	0.35	0.04	0	1
Consumed minimum acceptable diet, 6–23 months	402	0.15	0.02	0	1
Boys	189	0.12	0.03	0	1
Girls	213	0.17	0.04	0	1
Child anthropometry, 0–59 months					
Height-for-age z-score (HAZ)	1394	−1.52	0.10	−5.94	6
Boys	696	−1.58	0.11	−5.94	5.99
Girls	698	−1.46	0.15	−5.91	6
Weight-for-height z-score (WHZ)	1339	−0.17	0.07	−4.97	4.98
Boys	670	−0.09	0.09	−4.97	4.98
Girls	669	−0.25	0.09	−4.97	4.98
Weight-for-age z-score (WAZ)	1437	−0.90	0.09	−5.98	4.98
Boys	722	−0.87	0.10	−5.98	4.98
Girls	715	−0.93	0.11	−5.72	4.98
Stunting (HAZ < -2SD)	1394	0.41	0.03	0	1
Boys	696	0.43	0.03	0	1
Girls	698	0.39	0.03	0	1
Wasting (WHZ < -2 SD)	1339	0.11	0.01	0	1
Boys	670	0.11	0.02	0	1
Girls	669	0.11	0.02	0	1
Underweight (WAZ < -2SD)	1437	0.20	0.02	0	1
Boys	722	0.20	0.02	0	1
Girls	715	0.21	0.03	0	1
Child characteristics					
Girl	1437	0.52	0.01	0	1
Age in months	1437	29.53	0.48	0	59
Mother's age in years	1437	29.72	0.34	15	49
Mother's height (centimeters)	1437	159.18	0.44	107.2	193.4
Mother can read and write	1437	0.09	0.01	0	1
Women's outcomes and characteristics					
Number of food groups consumed (out of 9)	2027	3.85	0.07	0	9
Body mass index (BMI)	1800	21.56	0.13	12.2	34.8
Underweight (BMI < 18.5)	1800	0.13	0.01	0	1
Age in years	2027	29.91	0.32	15	49
Can read and write	2027	0.16	0.02	0	1
Women's empowerment indicators					
Female empowerment score, = 1 if empowered	1500	0.70	0.01	0	1
Average number of credit decisions	1500	0.47	0.03	0	2
Total number of agricultural production decisions	1500	3.49	0.12	0	9
Gender parity gap	1124	0.20	0.01	0	1
Household characteristics					
Household head can read and write	1500	0.18	0.02	0	1
Dual-adult household	1500	0.74	0.02	0	1
Age of household head	1500	42.74	0.47	18	100
Household size	1500	6.33	0.13	1	35
Dependency ratio	1500	1.20	0.03	0	7
Per capita expenditure quintile 1	1500	0.19	0.02	0	1
Per capita expenditure quintile 2	1500	0.22	0.02	0	1
Per capita expenditure quintile 3	1500	0.22	0.01	0	1
Per capita expenditure quintile 4	1500	0.20	0.02	0	1
Per capita expenditure quintile 5	1500	0.18	0.02	0	1
Brong Ahafo region	1500	0.15	0.03	0	1
Northern region	1500	0.50	0.04	0	1
Upper east region	1500	0.19	0.04	0	1
Upper west region	1500	0.17	0.04	0	1

Note: Statistics adjusted for sample design. Households may have multiple women and/or children under five, which accounts for the differences between the numbers of households and individuals in our analysis. Household level characteristics include all households with nonmissing variables, counting each household only once. The child outcomes are not significantly different for boys and girls. Per capita expenditure quintile and region dummies do not sum to 1 due to rounding.

The women in our sample consume close to four food groups (out of nine) on average and have a mean BMI of 21.5 (Table 2), which falls within the normal range (18.5–25.0). Similar to the child indicators, the prevalence of women's undernutrition in our

sample is higher compared to the rest of Ghana. The 2008 GDHS reports that at the national level, 9% of women ages 15–49 are considered thin (Ghana Statistical Service, 2009), compared to 13% in our sample (Table 2).

Key independent variables

We explore alternative indicators of women's empowerment. First, we use the female respondent's individual-level empowerment score, which is the weighted average of the 10 indicators. Next, using the WEAI diagnostics, we identify the areas of greatest disempowerment to identify the key domains, and the indicators within each domain, on which to focus our analysis. We rank domains first, and then rank indicators within the domains, rather than ranking the indicators directly because indicators within domains are inter-related and interventions aimed at improving one indicator is also likely to influence the other indicators in the domain. We then investigate how improvements in women's empowerment in these specific areas translate to improvements in nutrition outcomes.

Fig. 2 shows that the *resources* and *production* domains have the highest contributions to women's disempowerment in northern Ghana. Despite women's heavy involvement in agriculture, they have limited control over resources and limited decisionmaking power over agricultural activities. Fig. 3 shows that *access to and decisions about credit* is the key indicator that contributes the most to disempowerment in the resource domain while *input into productive decisions* is the most important indicator in the production domain. For further analysis, we use the underlying data used to construct these two indicators to represent empowerment in these domains. For the credit indicator, we use the average number of credit decisions where the female respondent has some input, because a household that takes loans from multiple sources versus a single source is not necessarily more empowered in terms of access to resources. For input into production decisions, we use the total number of agricultural activities where the female respondent has some input into decisions or feels she can make decisions, assuming that input into decisions over more types of agricultural activities implies greater empowerment in production. Last, for dual-headed households, we use the gender parity gap component of GPI to test whether differences between the empowerment levels of men and women within households are associated with nutrition practices and outcomes.

We explore four alternative specifications.

Model 1—empowerment score: the empowerment score of the female respondent, equal to the weighted average of achievements in the 10 indicators if the respondent is disempowered and equal to 1 if the individual is empowered. We use censored empowerment scores for consistency with the construction of the WEAI and other Alkire-Foster indices.

Model 2—(resource domain) average number of credit decisions: the number of credit decisions (who made the decision to borrow, and who made the decision about what to do with the money/item borrowed) with input from the female respondent, averaged across lending sources. This is assumed to be zero if the respondent's household did not borrow from any source in the past year.

Model 3—(production domain) total number of agricultural decisions: the total number of agricultural activities where the female respondent has some input into decisions or feels she can make decisions.

Model 4—gender parity gap: the difference in the male and female empowerment scores, equal to zero if the woman is empowered or if her empowerment score is greater than or equal to that of the male in her household.

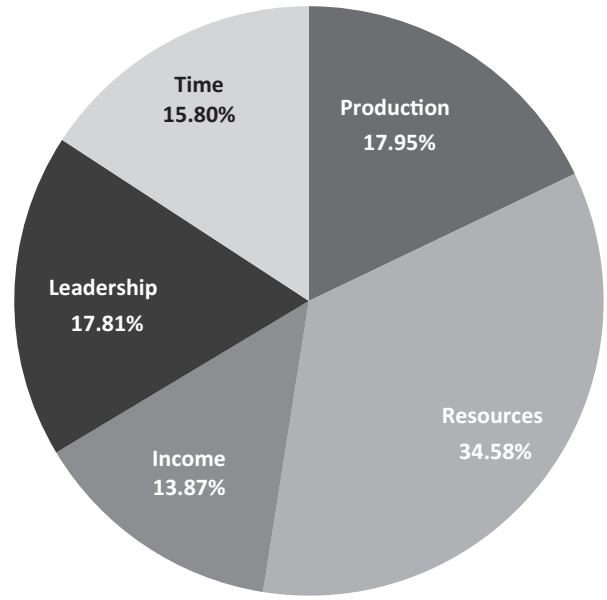

Fig. 2. Contribution of each of the five domains to women's disempowerment, northern Ghana. Source: Authors' calculations using the 2012 Feed the Future Ghana survey (METSS-Ghana, 2012).

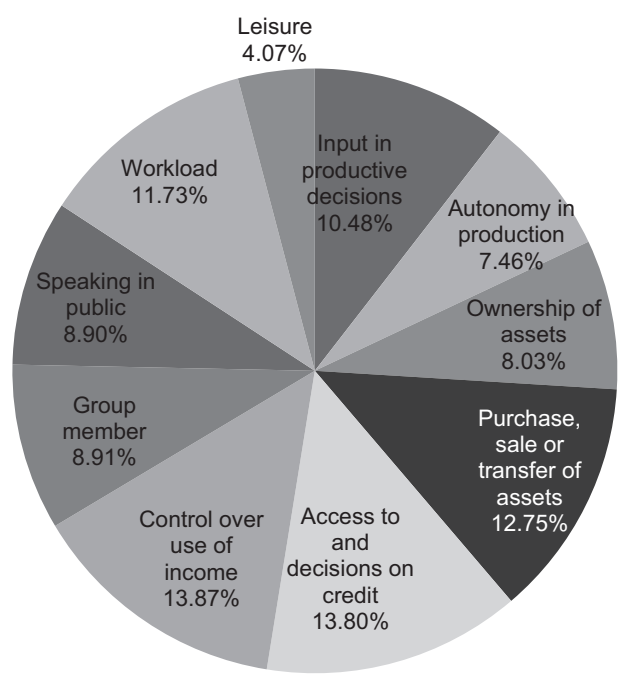

Fig. 3. Contribution of each of the 10 indicators to women's disempowerment, northern Ghana. Source: Authors' calculations using the 2012 Feed the Future Ghana survey (METSS-Ghana, 2012).

The first three empowerment measures (models 1–3) are increasing in empowerment, so higher numbers imply greater empowerment. A larger gender parity gap (model 4) indicates greater inequality between men and women in the household.

Control variables

All models include control variables such as household characteristics (age and age squared of the household head, household size, dependency ratio, per capita expenditure quintiles, and region dummies) and, if applicable, child characteristics (age and age

squared, sex, and mother's age, height, and literacy) and woman characteristics (age and age squared, literacy). Summary statistics are presented in Table 2. Unlike in Sraboni et al. (2014) in Bangladesh, the Ghana survey did not collect data with which to instrument the women's empowerment variables, which are arguably endogenous. All regressions in this paper were estimated with ordinary least squares, and thus should be interpreted as associative rather than causal.

Results

The results for IYCF practices, children's nutrition outcomes, and women's nutrition outcomes are summarized in Tables 3–5, respectively.

The regressions on IYCF practices reported in Table 3 are based on a smaller sample of children ages 0–6 months and 6–23 months. None of the empowerment measures are significant for boys, whereas a strong association between women's empowerment and IYCF practices is found for girls. The empowerment score, number of credit decisions, and gender parity gap are not significantly associated with the likelihood of exclusively breast-feeding either boys or girls. However, the significant and positive correlation for the production decisions indicator suggests that girls are 9% more likely to be exclusively breast-fed in households where the female decisionmaker is more involved in production decisions.

As for children's diet quality outcomes, results show that none of the four empowerment indicators appears to be important for boys. For girls, credit decisionmaking is associated with a higher dietary diversity score, and a higher likelihood that girls consume a minimum acceptable diet. However, the empowerment score and the number of production decisions are significant and *negatively* correlated with girls' diet diversity score and minimum diet diversity, and greater equality in the household (a lower gender parity gap) is significantly associated with *less diverse* diets for girls. Note that the coefficients of the girl-interaction terms with

Table 3
Results summary: Infant and young child feeding practices.

Key variable	Exclusively breast-fed 0–6 months (1)	Dietary diversity score 6–23 months (2)	Minimum diet diversity 6–23 months (3)	Minimum acceptable diet 6–23 months (4)
Model 1: Empowerment score				
(1.a) Empowerment score	−0.005	0.745	−0.084	−0.105
	(0.238)	(0.631)	(0.158)	(0.131)
(1.b) Empowerment score × Girl	0.103	−1.702**	−0.257	−0.066
	(0.359)	(0.817)	(0.245)	(0.170)
(1.c) Girl	0.011	1.208**	0.218	0.090
	(0.269)	(0.608)	(0.184)	(0.121)
Effect of empowerment on girls: (1.a) + (1.b)	0.098	−0.957*	−0.341*	−0.172
p-value of *F*-test: (1.a) + (1.b) = 0	0.716	0.073	0.053	0.163
N	147	402	402	402
R2	0.3198	0.1842	0.1806	0.1033
Model 2: Resource domain				
(2.a) Average number of credit decisions	−0.092	0.091	−0.007	0.012
	(0.063)	(0.180)	(0.045)	(0.032)
(2.b) Average number of credit decisions × Girl	0.046	0.277	0.077	0.061
	(0.094)	(0.235)	(0.067)	(0.046)
(2.c) Girl	0.051	−0.036	0.018	0.025
	(0.096)	(0.220)	(0.053)	(0.039)
Effect of empowerment on girls: (2.a) + (2.b)	−0.046	0.368*	0.071	0.074*
p-value of *F*-test: (2.a) + (2.b) = 0	0.512	0.057	0.181	0.075
N	147	402	402	402
R2	0.3321	0.1849	0.1728	0.1078
Model 3: Production domain				
(3.a) Number of agricultural production decisions	0.017	0.037	−0.008	−0.014
	(0.021)	(0.050)	(0.014)	(0.010)
(3.b) Number of agricultural production decisions × Girl	0.071**	−0.156**	−0.022	0.004
	(0.029)	(0.067)	(0.017)	(0.014)
(3.c) Girl	−0.240*	0.563*	0.115	0.030
	(0.141)	(0.307)	(0.080)	(0.065)
Effect of empowerment on girls: (3.a) + (3.b)	0.088***	−0.119***	−0.030**	−0.009
p-value of *F*-test: (3.a) + (3.b) = 0	0.001	0.009	0.012	0.399
N	147	402	402	402
R2	0.3908	0.1911	0.1825	0.1026
Model 4: Gender parity				
(4.a) Gender parity gap	−0.127	−0.929	−0.107	−0.075
	(0.294)	(0.811)	(0.198)	(0.148)
(4.b) Gender parity gap × Girl	−0.073	2.513**	0.662**	0.262
	(0.515)	(1.033)	(0.294)	(0.190)
(4.c) Girl	0.050	−0.509	−0.115	−0.034
	(0.144)	(0.315)	(0.082)	(0.058)
Effect of empowerment on girls: (4.a) + (4.b)	−0.200	1.584**	0.554***	0.187
p-value of *F*-test: (4.a) + (4.b) = 0	0.619	0.011	0.005	0.175
N	115	311	311	311
R2	0.3395	0.2270	0.2123	0.1250

Note: Robust standard errors are in parentheses.
* $p < .1$.
** $p < .05$.
*** $p < .01$.

Table 4
Results summary: Children's anthropometric *z*-scores, children ages 0–59 months.

Key variable	Height for age (1)	Weight for height (2)	Weight for age (3)
Model 1: Empowerment score			
(1.a) Empowerment score	0.709	−0.234	0.107
	(0.472)	(0.372)	(0.353)
(1.b) Empowerment score × Girl	−1.086	−0.040	−0.863
	(0.940)	(0.491)	(0.644)
(1.c) Girl	0.904	−0.129	0.541
	(0.608)	(0.336)	(0.418)
Effect of empowerment on girls: (1.a) + (1.b)	−0.378	−0.274	−0.755*
p-value of *F*-test: (1.a) + (1.b) = 0	0.562	0.354	0.066
N	1,394	1,339	1,437
R2	0.1053	0.0502	0.0672
Model 2: Resource domain			
(2.a) Average number of credit decisions	0.184	0.122	0.031
	(0.116)	(0.086)	(0.080)
(2.b) Average number of credit decisions × Girl	−0.313	0.048	−0.055
	(0.206)	(0.119)	(0.125)
(2.c) Girl	0.307*	−0.168	−0.022
	(0.168)	(0.120)	(0.108)
Effect of empowerment on girls: (2.a) + (2.b)	−0.129	0.170*	−0.024
p-value of *F*-test: (2.a) + (2.b) = 0	0.466	0.056	0.829
N	1394	1339	1437
R2	0.1057	0.0545	0.0608
Model 3: Production domain			
(3.a) Number of agricultural production decisions	−0.003	0.019	−0.016
	(0.036)	(0.029)	(0.028)
(3.b) Number of agricultural production decisions × Girl	0.006	−0.018	−0.001
	(0.051)	(0.034)	(0.033)
(3.c) Girl	0.144	−0.090	−0.044
	(0.270)	(0.174)	(0.169)
Effect of empowerment on girls: (3.a) + (3.b)	0.003	0.001	−0.017
p-value of *F*-test: (3.a) + (3.b) = 0	0.937	0.973	0.551
N	1,394	1,339	1,437
R2	0.1016	0.0495	0.0614
Model 4: Gender parity			
(4.a) Gender parity gap	−1.027*	−0.045	−0.616
	(0.550)	(0.423)	(0.389)
(4.b) Gender parity gap × Girl	1.211	−0.245	1.053
	(0.952)	(0.559)	(0.699)
(4.c) Girl	−0.140	−0.160	−0.379*
	(0.309)	(0.188)	(0.226)
Effect of empowerment on girls: (4.a) + (4.b)	0.184	−0.290	0.437
p-value of *F*-test: (4.a) + (4.b) = 0	0.789	0.426	0.327
N	1095	1058	1122
R2	0.0884	0.0725	0.0866

Note: Robust standard errors are in parentheses.
* $p < .1$.

Table 5
Results summary: Women's dietary diversity score and body mass index, women ages 15–49 years.

Key variable	Diet diversity score (1)	Body mass index (2)
Model 1: Empowerment score		
Empowerment score	0.454*	0.269
	(0.272)	(0.390)
N	2027	1800
R2	0.1157	0.0623
Model 2: Resource domain		
Average number of credit decisions	0.250***	−0.023
	(0.067)	(0.100)
N	2027	1800
R2	0.1295	0.0620
Model 3: Production domain		
Number of agricultural production decisions	−0.018	−0.003
	(0.014)	(0.033)
N	2027	1800
R2	0.1128	0.0620
Model 4: Gender parity		
Gender parity gap	−0.290	0.146
	(0.292)	(0.478)
N	1547	1385
R2	0.1144	0.0597

Note: Robust standard errors are in parentheses.
* $p < .1$.
*** $p < .01$.

the empowerment score and number of production decisions are significant, which suggests that these indicators have a differential impact on boys' and girls' diet diversity score.

The negative relationships between empowerment indicators and diet quality imply that girls in households where the principal female is more empowered in agriculture are more likely to consume less diverse diets. A qualitative study by Davis et al. (2003) on complementary infant feeding practices in Ghana provides a possible explanation for this counter-intuitive result. Mothers of well-nourished infants in Kumasi, Ghana considered porridge the main complementary food and believed that giving infants a wide variety of foods was unhealthy (Davis et al., 2003). However, if children rejected the porridge or had poor appetite due to illness, mothers would offer different foods to get the child to eat. Thus, malnourished (underweight) children were fed a wider variety of food, while well-nourished children typically received fewer types of food. In our sample, underweight girls on average consume more food groups (2.8 vs. 2.7 food groups) and are more likely to have the minimum diet diversity (46% vs. 34%) and minimum acceptable diet (26% vs. 17%) compared with well-nourished girls. However, the sample is small, and none of these differences are statistically significant.

Overall, women's empowerment is only weakly associated with children's nutrition outcomes (Table 4). None of the women's empowerment measures in models 1 through 3 are significantly correlated with boys' nutritional status, but greater equality within the household (model 4) favors boys' HAZ. This suggests that a narrowing of the gender parity gap by 10% points is associated with a 0.10 increase in boys' HAZ. For girls, the estimated relationships between nutrition and empowerment have opposite signs for the empowerment score and the credit decisionmaking indicator. The empowerment score is *negative* and significantly correlated with WAZ, which implies that girls residing in more empowered households are more likely to experience nutrition deficiencies, contrary to our expectations. For example, a 0.10 increase in the empowerment score implies a 0.08 decline in girls' WAZ. Note, however, that the coefficient of the girl-interaction term with the empowerment score is insignificant, so we cannot reject the null hypothesis that women's empowerment affects boys and girls equally.

In contrast, the association between girls' WHZ and women's average number of credit decisions is positive and significant. In households where women make credit decisions, there may be more scope for smoothing consumption, which could minimize the incidence of acute food shortages or severe disease that results in substantial weight loss. These estimates suggest that an additional credit decision made by the primary female decisionmaker increases girls' WHZ by 0.17. In the WHZ and WAZ regressions, the interaction terms between the girl child dummy and the average number of credit decisions and aggregate empowerment, respectively, are insignificant, indicating that we cannot reject the null hypothesis that these empowerment measures affect boys and girls equally.

Last, our findings suggest that women's aggregate empowerment and participation in credit decisions is positively and

significantly correlated with women's dietary diversity score but do not appear to be correlated with BMI (Table 5). Women's participation in production decisionmaking as well as the relative empowerment between men and women within households, is not significantly associated with inputs into women's nutritional status or her nutritional status itself. Our findings on diet diversity suggest that individuals who have greater decisionmaking power in the household receive a larger share of the benefits from household resources, including nutritious food. However, consuming a balanced diet by itself does not guarantee nutritional well-being (Gillespie, 2013), which could explain why empowerment might improve diet quality but not BMI. A woman's dietary intake interacts with her own health status, so factors relating to disease could potentially negate the impact of higher diet diversity on nutritional status. Also, both women's dietary intake and health status are themselves driven by other underlying household and community-level factors and processes, such as food security, access to health services, water and sanitation, and other feeding practices (UNICEF, 1990; Gillespie, 2013). Empowered women also may be exerting greater work effort in agricultural activities and therefore have higher caloric requirements that are not necessarily met by consuming a more diverse diet.

Full results are available in the appendix. In general, there are no significant correlations between the sex of the child and nutrition outcomes, consistent with the lack of evidence on gender bias in nutritional status outside South Asia (Haddad et al., 1996). The only model where we find a significant overall effect of empowerment on girls is in the dietary diversity equation that uses the empowerment score as the measure of empowerment. This is consistent with the summary statistics that indicate insignificant differences in the average nutrition outcomes of girls and boys. Literate mothers are also more likely to have children with higher WHZs. Mothers who can read and write may be more likely to participate in income-generating activities, enabling them to smooth consumption and avoid acute food shortages. Literate women are also more likely to consume more diverse diets but do not necessarily have higher BMI. Rather, the literacy of the household head is positively associated with women's BMI and children's WAZ, which is indicative of an income effect.

Conclusion

Formulating appropriate interventions and policies to improve maternal and child nutrition requires being sensitive to culture and context. Even if biological processes underlying optimal nutrition are well understood, whether a woman is empowered may determine whether she can command the resources needed to adopt recommended IYCF practices and take care of her own nutrition. Using the WEAI, we found that the domains of empowerment that are significant for women and children's diet and nutrition outcomes did not always overlap. This implies that improved nutrition is not necessarily correlated with being empowered across all empowerment domains and that different domains may have different impacts on nutrition, consistent with the empowerment literature (Kabeer, 1999; Sraboni et al., 2014; Malapit et al., forthcoming).

This overall finding should not be surprising, because gender norms are culture- and context-specific. Our work on the WEAI in different countries finds that different domains and indicators of women's empowerment are important in different settings. In Bangladesh, while overall empowerment contributes to improved household food security, leadership in the community and control of resources are the most promising areas for policy intervention, specifically increasing the number of groups in which women actively participate and increasing women's control of assets (Sraboni et al., 2014). In Nepal, engagement in the community, control over income, reduced workload, and the overall empowerment score are positively associated with better maternal nutrition, while control over income is associated with better HAZ and a lower gender parity gap improves children's diets and long-term nutritional status. Women's empowerment also has greater potential to improve nutrition outcomes in households with less diverse production (Malapit et al., forthcoming).

In our northern Ghana sample, women's empowerment is strongly associated with the quality of IYCF *practices* and only weakly associated with child nutrition status. Participation in credit decisions improves women's dietary diversity but does not reduce the likelihood of being underweight, suggesting that diet quality may not necessarily translate to improved nutrition status, owing to the influence of other factors such as disease that contribute to poor absorption of nutrients. Greater empowerment may also entail greater work effort, which might increase caloric requirements and dampen improvements in BMI through more diverse diets. The extent to which diverse diets result in improved nutrition outcomes depends on other underlying household and community-level processes, such as food security, access to health services, water and sanitation, and childcare capacity and feeding practices (UNICEF, 1990; Gillespie, 2013). Our results also suggest that expanding women's access to credit and participation in credit decisions is associated with improved outcomes for both women and girls. Our unexpected findings on the impact of empowerment measures on girls' dietary diversity may point to a role for behavior change communication (BCC) in improving dietary quality. Appropriate BCC messages could teach caregivers that diverse diets are important for a child's general health, and not only for those who are ill.

The differences in findings across the three countries for which we have analyzed relationships between the WEAI and various indicators of food and nutrition security suggest that policies designed to empower women and improve nutritional status need to be based on understanding which specific domains of women's empowerment matter for particular outcomes in a specific context. WEAI data are now available for 18 countries in the Feed the Future initiative, and are increasingly being collected by other countries and organizations. Identifying areas where empowerment gaps are greatest, and examining how these correlate with indicators of maternal and child nutrition, may be an important first step toward evidence-based and culture- and context-sensitive policies and programs. Closing these empowerment gaps can then be an explicit target for food policy to empower women and improve maternal and child nutrition.

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Appendix. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.foodpol.2015.02.003.

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