IFPRI Discussion Paper 01486

December 2015

How Does Women's Time in Reproductive Work and Agriculture Affect Maternal and Child Nutrition?

Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal

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ABSTRACT

There are concerns that increasing women's engagement in agriculture could have a negative effect on nutrition because it limits the time available for nutrition-improving reproductive work. However, very few empirical studies have been able to analyze whether these concerns are well-founded. This paper examines whether an increase in women's time in agriculture adversely affects maternal and child nutrition, and whether the lack of women's time in reproductive work leads to poorer nutrition. Using data from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal, we find that on the whole, in poor households, reductions in women's reproductive work time are detrimental to nutrition, especially for children. In contrast, women's and children's nutrition in nonpoor households is less sensitive to reductions in time on reproductive work. Working long hours in agriculture reduces women's dietary diversity score in Ghana and nonpoor women's in Mozambique. However, for poor women and children in Mozambique, and children in Nepal, working in agriculture in fact increases dietary diversity. This suggests that agriculture as a source of food and income is particularly important for the poor. Our results illustrate that women's time allocation and nutrition responses to agricultural interventions are likely to vary according to socioeconomic status and local context.

Keywords: time use, gender, agriculture, nutrition, poverty

JEL codes: Q1, I1

ACKNOWLEDGMENTS

This work was undertaken as part of the CGIAR Research Programs on Agriculture for Nutrition and Health (A4NH) and Policies, Institutions, and Markets (PIM). Funding support for this study was provided by A4NH and the United States Agency for International Development (USAID) under Feed the Future, the US government's global hunger and food security initiative, through its partnership with the International Food Policy Research Institute (IFPRI) on the Women's Empowerment in Agriculture Index, USAID Grant Number: EEM-G-00-04-00013-00. We are grateful to Agnes Quisumbing, Suneetha Kadiyala, Deborah Johnston, Sara Stevano, Indira Hirway, Victoria Vernon, and participants at the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH) seminar and the Population Association of American (PAA), International Association for Feminist Economics (IAFFE), and International Association for Time Use Research (IATUR) for helpful comments and suggestions. The contents are the responsibility of the authors and do not necessarily reflect the views of CGIAR, A4NH, PIM, USAID, or the US government. This paper has not gone through IFPRI's standard peer-review procedure. The opinions expressed here belong to the authors, and do not necessarily reflect those of A4NH, PIM, IFPRI, or CGIAR.

1. INTRODUCTION

Researchers have paid increasing attention to the links between agriculture and nutrition to identify the conditions in which agricultural and nonagricultural programs could improve nutrition. Kadiyala and others (2014) outlined six pathways through which agriculture and nutrition are connected. Two of the six pathways specifically address the potential effects of women's time use on nutrition.

One of the agriculture-nutrition pathways proposes that increasing women's engagement in agriculture can negatively impact child nutrition by reducing women's time for nutrition-enhancing activities (Headey, Chiu, and Kadiyala 2012; Kadiyala et al. 2014). A range of practices contribute to the underlying determinants of nutrition—care, diets, and health (UNICEF 1990). These practices include food preparation; feeding; breastfeeding; child hygiene; collecting clean water and cooking fuel; good hygiene and sanitation practices; and accessing health services, such as antenatal care, regular health checkups, child vaccinations, health and nutrition information, and government food and nutrition programs (Glick 2002; Smith et al. 2003; Bhalotra 2010; Rani and Rao 1995; Lamontagne, Engle, and Zeitlin 1998). Given social norms dictating that women provide the bulk of reproductive work,[1] women under a time constraint may carry out such practices with reduced frequency or reduced quality, or forego them altogether.

In some circumstances, other members of the household may substitute in these activities, but the quality of their care could be worse than maternal care, especially when the child is an infant or the caregiver an older child (Glick 2002; Headey, Chiu, and Kadiyala 2012; Engle, Menon, and Haddad 1999). This suggests that sufficient time spent on reproductive work is important, but that other factors, like knowledge and access to assets, may mediate the effects of this time on nutrition.

However, achieving access to knowledge or assets often requires time. Maternal time, shifted from reproductive work to agricultural or other productive work, can increase access to food and income. This may especially benefit nutrition if women control the earnings from their own work or if working increases their decisionmaking power, given evidence that women are more likely to spend earnings on nutrition-enhancing purchases (Gillespie, Harris, and Kadiyala 2012; Smith et al. 2003; Malapit and Quisumbing 2015). Whether maternal time is more beneficial for nutrition in productive or reproductive work is also contingent on the care needs of children, which vary by age (Lamontagne, Engle, and Zeitlin 1998).

The second agriculture-nutrition pathway that relies on women's time use suggests that women's employment in agriculture requires them to intensify work effort, lengthen working hours, and increase their overall work burden in productive and reproductive activities combined (Kadiyala et al. 2014). Agricultural activities that require long working hours are likely to have a negative effect on women's nutritional status (Higgins and Alderman 1997; Headey, Chiu, and Kadiyala 2012) and are especially risky during pregnancy (Rao et al. 2003).

However, there is little evidence to corroborate the conditions under which an increase in women's time in agriculture and a reduction in time in reproductive work influence child and maternal nutrition, most likely because datasets containing both maternal and child nutrition and women's time use are scarce (Kadiyala et al. 2014; Headey, Chiu, and Kadiyala 2012).

This study aims to examine, theoretically and empirically, whether the lack of women's time in reproductive work leads to poorer maternal and child nutrition, and whether an increase in women's time in agriculture, or productive work, has a detrimental effect on maternal and child nutrition. The paper makes a theoretical contribution by developing a framework to establish how agricultural investments impact women's time and nutrition. By doing so, we identify two additional agriculture-nutrition pathways by which agricultural investments can impact nutrition. The paper also makes an empirical contribution by studying the evidence on the effect of women's time allocation on their dietary diversity score, minimum acceptable diet, children's dietary diversity score, minimum dietary diversity, and

[1] *Reproductive work* refers to traditionally unremunerated work for the household's benefit, including cooking, cleaning, care activities, domestic chores, shopping, and getting services.

minimum meal frequency in different country contexts, namely Bangladesh, Cambodia, Ghana, Mozambique, and Nepal.

Our analysis disaggregates the impact of women's time on maternal and child nutrition by poverty category, with poor households defined as those belonging to the poorest asset quintile. Poor households not only represent low socioeconomic status, but they also lack access to or ownership of time-saving assets.

2. THEORETICAL FRAMEWORK ON AGRICULTURE, TIME USE, AND NUTRITION

We develop the theoretical framework on agriculture, time use, and nutrition based on Singh, Squire, and Strauss's (1986) agricultural household model by introducing women's time in domestic work and a nutrition production function. The advantage of the agricultural household model is that it recognizes the role of households as both producers and consumers of agricultural produce, and it can easily incorporate women's time and nutrition. Given that many agricultural projects involve public capital investments in agriculture and rural infrastructure, we examine the impact of public capital investments on women's time allocation and nutrition.

We assume that the household is composed of a mother, a father, and a child, but the father's labor supply is inelastic and unresponsive to price changes. The household maximizes a welfare function that allocates the mother's time between farm work (f), leisure (l), and nutrition-improving domestic work (t). The latter involves activities such as cooking, caring, domestic work, or accessing health care. Hence, the mother faces a time constraint as follows:

$$f + l + t = T, \tag{1}$$

where T is the mother's total time available net of self-care such as sleeping and eating.

We assume that prices and wages are exogenously given. The household produces only one crop, and we exclude the possibility of child labor. Total farm labor (L), which is the sum of the mother's time in farm work (f) and that of hired labor, and capital (K) are used to produce an agricultural crop following the production function

$$Q = Q\,(L, K). \tag{2}$$

The production function exhibits diminishing marginal productivity to labor and capital, $Q_{LL} < 0$, $Q_{KK} < 0$. We assume that the level of capital is fixed and exogenous. The justification for the exogeneity of capital is that agricultural and rural infrastructure projects, rather than a decision within the household itself, often determine the household's level of and access to capital.

Nutritional status (N), denoted by a nutrition production function, is generated by the household consumption of agricultural staples (X_a), mother's time in domestic work (t), and level of capital (K). Capital increases the marginal product of nutrition because it includes time-saving technology, such as access to electricity, piped water, or transportation:[2]

$$N = N\,(X_a, t, K), \tag{3}$$

where the marginal product of each input is positive, and $N_{xx} < 0$, $N_{tt} < 0$, and $N_{KK} < 0$. We assume that capital can reduce the mother's time in domestic work, and therefore the mother's time and capital are substitutes ($N_{tK} < 0$). However, we also assume that consumption of agricultural crops does not impact women's time, and hence $N_{tx} = 0$.[3]

The household maximizes the following welfare function, which consists of utility derived from mother's leisure time (l) and the household nutritional status (N), which are additively separable, as shown below:

$$W = U(l) + N(X_a, t, K), \tag{4}$$

[2] Kevane and Wydick (2001) made a similar assumption that farm capital increases the productivity of home production.

[3] If agricultural crops increase, we might expect the mother's cooking time to increase (making them complements), but this could be canceled out by the mother's decision to allocate less time to cooking because with more food, she doesn't have to cook as much (making them substitutes).

where the marginal utility of each argument is positive, and $U_{ll} < 0$.

The budget constraint, similar to the formulation by Singh and others (1986), is given as follows:

$$p_a (Q - X_a) = w(L - f). \tag{5}$$

The household produces its crop at a level Q, and $(Q - X_a)$ is the agricultural surplus that it can sell in the market at price p_a. The term $(L - f)$ is hired labor if $(L - f) > 0$, and it is the mother's time spent in wage work outside her farm if $(L - f) < 0$, and w is the market wage. It is assumed that the mother's labor and hired labor are perfect substitutes, and that the wage rate the mother can receive by engaging in wage work is the same as the hired laborers' wage.

By substituting the production function (2) and time constraint (1) into the budget constraint (5), we can rewrite equation (5) as

$$p_a X_a + w (t + l) = p_a Q (L, K) + w (T - L). \tag{6}$$

The terms on the left-hand side are costs to the household, while the terms on the right-hand side are considered full income (Singh, Squire, and Strauss 1986).

By substituting the nutrition function into the welfare function, the household maximizes the welfare function subject to (6). Following the agricultural household model, we first maximize agricultural profits by differentiating the Lagrangian equation with respect to total farm labor L. This results in the household's producing agricultural outputs until the marginal product of labor is equal to its wage rate. As noted by Singh and others (1986), total farm labor demand (L) is a function of the wage rate and p_a, and is determined independent of the welfare function. This means that production decisions are made first, and consumption decisions are made subsequently. Once the level of agricultural output Q^* is chosen, full income can be derived by substituting L^* and Q^* into the right-hand side of (6). Given the full income, the household can maximize welfare by differentiating the Lagrangian equation with respect to t, l, and X_a. Once optimal time in reproductive work d^* and leisure l^* is identified, the mother's time in own-farm labor (f) is calculated from equation (1). If the total farm labor L^* is greater than f^*, then the household will hire labor, and if it is less, the mother will engage in wage work.

We examine the effect of an exogenous increase in capital (K) on the mother's time allocation and nutrition because it increases the productivities of agriculture and nutrition. The comparative statistics are derived by totally differentiating the first-order conditions. Doing so gives the following Hessian determinant:[4]

$$|H| = P_a Q_{LL}\{ w^2 N_{xx} (U_{ll} + N_{tt}) + P_a^2 U_{ll} N_{tt} \} < 0. \tag{7}$$

Using Cramer's rule, the effect of capital on women's domestic time is given by

$$dt/dK = (1/ |H|) P_a Q_{LL}\{ w U_{ll} P_a N_{xx} Q_K - N_{tK} (w^2 N_{xx} + P_a^2 U_{ll})\}. \tag{8}$$

We cannot sign expression (8) without making further assumptions. Capital investments such as better access to piped water and sources of fuel or electricity can reduce women's time in domestic work, which is the second term of (8) that begins with N_{tk}. We refer to the effect of capital investment on reducing domestic work as the "reproductive time displacement effect." The investments can also increase agricultural productivity and output, and hence full income, which we refer to as the "agricultural productivity effect." An increase in production and income allows the mother to spend more time in nutrition-improving domestic work (shown by the first term of [8]). If the capital investments' agricultural productivity effect is large enough to outweigh the reproductive time displacement effect, then capital investments increase domestic work; that is, $dt/dK > 0$. If, on the other hand, the reproductive

[4] Details of the comparative statics are available upon request.

time displacement effect is greater than the agricultural productivity effect, then capital investment reduces the domestic work burden.

In order to examine the effect of a capital increase on women's farm work (f), we have to first assess its impact on leisure. Using Cramer's rule, we find that capital has a positive effect on leisure time, as shown below:

$$dl/dK = (1/|H|)\, P_a\, Q_{LL} \{ w\, N_{xx} (w\, N_{tK} + N_{tt}\, P_a\, Q_K) \} > 0. \quad (9)$$

Capital investments reduce women's total work burden, which is the sum of domestic and agricultural work. This equation also predicts that women in capital-poor households will have less leisure time and be more time constrained than women in nonpoor households.

The effect of an investment on the mother's farm work (f) is derived by differentiating the mother's time constraint (1) with respect to capital:

$$df/dK = - dt/dK - dl/dK. \quad (10)$$

Substituting (8) and (9) into (10), and rearranging gives

$$df/dK = (1/|H|)\, P_a\, Q_{LL} \{ P_a^2 U_{ll}\, N_{tK} - w\, P_a\, Q_K\, N_{xx} (U_{ll} + N_{tt}) \}. \quad (11)$$

The sign of the expression depends on the relative size of the reproductive time displacement effect (the first term in [11]) and the agricultural productivity effect (the second term in [11]). If the productivity effect is larger than the reproductive time displacement effect, then capital investment reduces the mother's farm work: she would spend more time in domestic work. In contrast, if the reproductive time displacement effect is greater than the productivity effect, capital investment increases farm work, and she would spend less time in domestic work. Therefore, the mother shifts her time allocation to the activity that experiences a lower productivity increase, while her overall work burden falls.

Capital investment increases consumption of agricultural crops (X_a) as shown below:

$$dX_a / dK = (1/|H|)\, P_a^2\, Q_{LL}\, U_{ll} \{ N_{tt}\, P_a\, Q_K + w\, N_{tK} \} > 0. \quad (12)$$

There are several ways in which greater capital stocks can impact nutrition. First, higher levels of capital stock raise consumption of agricultural products, which in turn has a positive effect on nutrition through the nutrition production function. Second, more capital increases agricultural production, and hence the household's full income, thereby improving nutrition through an income effect.[5] Third, capital investment raises the marginal productivity of nutrition ($N_K > 0$), which directly affects nutrition. For example, certain investments can improve nutrition without having any implications on women's time. Installing improved sanitation facilities may not affect time, but it directly leads to a better nutritional outcome. Fourth, if the agricultural productivity effect is greater than the reproductive time displacement effect, it can increase the mother's domestic work and reduce her farm work. This in turn has a positive effect on nutrition through the nutrition production function. In contrast, if the reproductive time displacement effect is greater than the agricultural productivity effect, it can reduce the mother's domestic work and increase her farm work, which would worsen nutrition. The net effect of capital investment on nutrition would be positive if the consumption, income, nutrition productivity, and agricultural productivity effects outweigh the reproductive time displacement effect. The relative size of the five effects on nutrition depends on the type of capital investments. Some may have a greater impact on reducing women's domestic time than they do on increasing agricultural output or nutrition.

[5] The comparative statics show that the marginal utility of income declines as a result of capital investment ($d\lambda/dK < 0$), which occurs because of an increase in income.

Table 2.1 summarizes the expected signs of capital investments on women's time allocation and nutrition. We compare the predictions of the theoretical framework with the agriculture-nutrition pathways from Kadiyala and others (2014), shown in the fourth column of Table 2.1.

Table 2.1 Impact of capital investment on women's time and nutrition

Effects	Effect on women's time	Effect on nutrition	Comparison with agriculture-nutrition pathways
Consumption effect ($X_a \uparrow$)	n/a	Positive effect on nutrition through nutrition production function	Pathway 1: Agriculture as a source of food
Income effect	n/a	Positive effect on nutrition because capital increases full income	Pathway 2: Agriculture as a source of income
Nutrition productivity effect	n/a	Direct and positive effect on nutrition	
Agricultural productivity effect > time displacement effect	Domestic work ↑ Farm work ↓ Leisure ↑	Positive effect on nutrition through nutrition production function	
Time displacement effect > agricultural productivity effect	Domestic work ↓ Farm work ↑ Leisure ↑	Negative effect on nutrition through nutrition production function	Pathway 5: Maternal employment in agriculture and in childcare and feeding Pathway 6: Women in agriculture and maternal nutrition and health status

Source: Authors. Agriculture-nutrition pathways in column 4 are from Kadiyala and others (2014).
Note: n/a indicates that there is no explicit effect on women's time.

It should be noted that Kadiyala and colleagues (2014) considered agriculture in a more comprehensive manner, including price changes and input support, while we look only at the effect of an increase in capital stock, and hence the nutrition implications of our model are not complete.[6] Our analysis also includes capital investments that are not directly related to agricultural investments. Therefore, although the results are not directly comparable, it is nevertheless useful to compare them. The first and second pathways in Kadiyala and others (2014) refer to agriculture as a source of food and of income for food and nonfood expenditures. These are similar to the consumption and income effects of capital investment, respectively, in our theoretical framework. The fifth and sixth pathways focus on the detrimental effects of maternal employment in agriculture on child and maternal nutrition, which is similar to our prediction when the time displacement effect exceeds the agricultural productivity effect.

Our theoretical framework identifies two more pathways through which agricultural investments can impact child and maternal nutrition: the direct nutrition productivity effect and the agricultural productivity effect. In particular, the latter effect, namely that investments can actually reduce women's farm work, increase domestic work, and improve nutrition, has not been recognized in the literature so far.

We can see that the impact of capital investment on women's time allocation and nutrition is far from clear-cut. There are several reasons why the predictions are ambiguous. We do not know, a priori, the shape of the utility and nutrition production functions; the relative size of capital investment's income effect, nutrition productivity effect, agricultural productivity effect, and reproductive time displacement effect on women's domestic work; and whether capital and labor are substitutes or complements. The shape of the production functions can be assessed only with empirical evidence.

[6] Kadiyala and others (2014) included two pathways that we do not explore here. These relate to price changes and policy, and intrahousehold allocations. In our theoretical model, it is possible to include other inputs (such as fertilizers, seeds, or pesticides), costs related to accessing markets, and production of multiple crops (Singh, Squire, and Strauss 1986). We can then assess the nutrition impact of price changes of one or more crops; costs of fertilizers, seeds, or pesticides; and improving access to markets.

3. DATA

The study uses 2012 data from the Bangladesh Integrated Household Survey (BIHS); population-based surveys from the US Agency for International Development (USAID) Feed the Future initiative in USAID's zones of influence (ZOIs) in Cambodia, Ghana, and Mozambique; and a baseline survey of a USAID-funded nutrition program called Suaahara in Nepal.[7]

Table 3.1 provides the gross national income per capita of the five countries, which range from the lowest, Mozambique, at $1,140[8] per capita, followed by Nepal. The highest is Ghana, with $3,910 per capita. All are classified by the World Bank as low-income countries, except for Bangladesh and Ghana, which are lower-middle-income countries.

Table 3.1 Gross national income per capita based on purchasing power parity (current international dollars), 2014

	Bangladesh	Cambodia	Ghana	Mozambique	Nepal
2014 gross national income p.c.	3,330	3,100	3,910	1,140	2,420

Source: World Bank (2015).

Survey Design

The datasets collected information on household and individual characteristics, food security, and maternal and child nutrition. For the surveys in Bangladesh, Cambodia, Ghana, and Mozambique, primary female and male household members, usually the household head and spouse, responded to questions about their time use, degree of participation in decisionmaking in key economic activities, and group participation, which are part of the Women's Empowerment in Agriculture Index questionnaire (Alkire et al. 2013). In Nepal, the respondents were mothers of children younger than five, and their husbands, if available (Cunningham et al. 2013).

Two-stage probability sampling methodology identified the enumeration areas (EAs) and then randomly selected the households within the EAs. In Nepal, multistage cluster sampling was used, with the final-stage sampling unit being rural households with children younger than five (Cunningham et al. 2013). A mother and an index child were surveyed in each household, with the index child randomly selected in each household from among the household's children younger than five.

Both time use and nutrition indicators vary throughout the year depending on seasonal fluctuations in labor demand and food security. The period in the year in which survey data were collected is important to note to contextualize these findings. Data collection in all countries overlapped at least partially with a lean season.

Bangladesh data collection occurred between October 26 and November 30, 2011. Data collection coincided with a transition out of a lean period and the beginning of the harvest of the aman rice crop, the major crop for smallholder households. October and November are considered a lean season; preceding the harvest of aman rice in mid-November, agricultural employment is relatively scarce. As the harvest begins, labor demand is high, increasing workloads especially for men (GIEWS and FAO 2015).

Cambodia data collection occurred in September 2012, which is considered the lean season that precedes the main rice harvest in December (Tickner 1996).

In Ghana, data collection, from July 1 to August 17, 2012, coincided with the rainy season and the major farming season in the region. Workloads in this period are particularly high relative to the rest of the year, and the work intensity was thought to have raised the rate of nonresponse. This period also coincided with Ramadan, the Muslim period of mandatory fasting, beginning July 20 and lasting for

[7] Feed the Future data for Haiti, Uganda, and Zambia were analyzed too. However, for Uganda and Zambia, a significant proportion of observations on the time use data exceeded 24 hours in a day or totaled less than 1,000 minutes. For Haiti, more data cleaning is needed before further analysis can be conducted.

[8] All dollar amounts are in international dollars.

about a month. Although children are not required to fast, some families encourage their children to practice fasting. Women's dietary diversity and children's minimum acceptable diet indicators may be affected by household observance of Ramadan (Zereyesus et al. 2013).

In Mozambique, data were collected from February 5 to May 6, 2013, in Manica, Nampula, and Zambezia. When the Feed the Future ZOI was expanded to include three districts in the province of Tete, an additional round of data collection was undertaken from November 22, 2013, to January 3, 2014. Though the two rounds of data collection occurred six months apart, both rounds were primarily conducted during the lean season in the respective region: October–February in southern and central Mozambique, and December–early March in the north (Feed the Future FEEDBACK 2014), corresponding with the rainy and cyclone season.

Nepal data collection occurred from June 13 to October 6, 2012. July to August is considered the lean season in Nepal (WFP 2012), with the start of maize and paddy harvest occurring from September to October (WFP 2013). Food insecurity is expected to be higher during the lean season and attenuate in September, as agricultural workloads rise.

Nonresponse rates are relevant to this study because they could indicate the most time-constrained respondents, those that faced too great a time burden to respond to the survey. In Ghana, nominal sample sizes based on stunting and underweight indicators were adjusted to account for households without children in the age group of 0–59 months and further inflated by 10 percent to adjust for nonresponse. In Mozambique, nonresponse rates were 2.25 percent for male and female adults together (Feed the Future FEEDBACK 2014). Sampling weights corrected for unequal probabilities, noncoverage of the population, and nonresponse.[9]

The sample includes households engaged in either agricultural or nonagricultural activities, or both. The geographic areas cover rural households, except for Ghana and Mozambique, where 20 percent and 15 percent of households are located in urban areas, respectively. In order to assess the impact of time allocation on women's dietary diversity, the sample is restricted to women in the reproductive age of 15 to 49, following standard practice for women's dietary diversity (Arimond et al. 2010).

The BIHS, conducted in 2011–2012, is representative of the rural areas of the seven administrative divisions (Sraboni et al. 2014). It used a two-stage sampling design to first allocate and select 275 primary sampling units (PSUs) among the seven divisions, and select 5,503 households within each PSU (Sraboni et al. 2014). We restrict our analysis to women between the ages of 15 and 49, yielding a sample of 4,248 women.

Cambodia's data were collected for the baseline of the Helping Address Rural Vulnerabilities and Ecosystem Stability (HARVEST) program impact evaluation in the USAID ZOI. The study used a cluster sampling approach to select 1,500 treatment households in 60 village clusters and 600 control households in 24 village clusters. (Vuthy et al. 2013), for a total of 2,100 households interviewed in Pursat, Battambang, Siem Reap, and Kampong Thom provinces. The sample that we work with is 1,494 women, ages 15–49.

In Ghana, the survey interviewed 4,410 households in the four northern regions of Brong Ahafo, Northern, Upper East, and Upper West.[10] It included 2,465 women aged 15–49, with time use information and women's dietary diversity. We focus our analysis on female respondents whose total time recorded per day was less than or equal to 1,440 minutes (that is, 24 hours) and greater than 1,000 minutes. About 30 percent of the sample had a recorded total time of more than 1,440 minutes or less than 1,000 minutes, making the size of our final sample 1,735 women.

In Mozambique, 2,864 households were surveyed, and 1,804 female respondents provided time use and dietary diversity information. Our sample includes 1,741 women between the ages of 15 and 49.

The baseline survey of a USAID Nepal project, Suaahara, was conducted in June–October 2012 and was administered to 4,080 mothers with children younger than five, and their husbands, if available (Cunningham et al. 2013). The areas covered include 16 districts in three agroecological zones—

[9] Nonresponse rates for the BIHS, Nepal Suaahara project, and Feed the Future Cambodia are not yet available, but we hope to include this information in later versions of the study.

[10] USAID's ZOI includes the three regions of Northern, Upper East, and Upper West. Areas above the 8th parallel in Brong Ahafo are included in the survey.

mountains, hills, and Terai. Our sample consists of 4,003 women between the ages of 15 and 49, all of whom were mothers of children younger than five.

Women's Time Use by Sex and Poverty Category

The time use module was administered to respondents using a 24-hour recall period in 15-minute intervals. The surveys ask how the respondent spent the last 24 hours in the following categories: sleeping; eating and drinking; personal care; school; work as employee; work in own business; farming/livestock/fishing; shopping / getting services (including access to health services); weaving, sewing, and textile care; cooking; domestic work (including fetching water and wood); caregiving for children/adults/elderly; traveling and commuting; watching TV / listening to radio / reading; exercising; social activities and hobbies; religious activities; and others. The respondents also indicated whether the activities were primary or secondary activities.

We define reproductive work to be the sum of activities related to cooking, domestic work (including fetching water and firewood), caring for a child or adult, shopping, and getting services. Activities classified as agriculture include farming, fishing, and livestock care, while nonagriculture includes working as employee or owner of a business, and weaving, textile, or sewing work. Productive work is defined as the sum of time in agricultural and nonagricultural work.

The categorization of agricultural activities for Bangladesh deviates from this definition in that even though all farm-related activities (including home gardening) and fishing fall under agriculture, off-farm activities (including off-farm postharvest activities and drying paddy from the harvest) are classified as domestic work. Further, livestock rearing falls under nonagricultural work. These factors explain why Bangladesh's average time recorded for agriculture (4 minutes) is low and the mean time in domestic work is higher than in other countries, as shown in Table 3.2. In Nepal, time spent on cooking and domestic work is combined, and this category also includes weaving and textile care.

Table 3.2 presents the average time men and women spent on productive and reproductive activities as a primary activity in the past 24 hours, with an indication that all of the differences between men's and women's activity times are highly significant (with nonagricultural work in Cambodia the single exception). In all countries but Bangladesh, women's overall work burden (reproductive and productive workload) is greater than men's. The difference in workload is greatest in Nepal, with women working 2.7 hours more than men per day, and least in Bangladesh, where men reported spending about 45 minutes more time working than women per day. In all countries, women spend more time in domestic work, cooking, and caregiving than men, with women spending between 3.2 (Cambodia) and 5 (Bangladesh) more hours per day on reproductive work than men. Men spend more time on agricultural and nonagricultural work, though women spend at least 3 hours in agricultural work in all countries except Bangladesh, due to the categorization explained above.

Because men's time in reproductive work was low, we did not model the effects of men's time on nutrition in this study. However, the possibility of any shifts in gender norms could eventually lead to a greater impact of men's reproductive time on child and maternal nutrition outcomes.

Table 3.3 presents the average time women spend in each activity, disaggregated by poverty category. Because secondary activities were not often recorded, the average time includes only primary activities. Poor households are defined as those that belong to the poorest quintile of that country's asset index. We constructed an asset index using principal component analysis with variables indicating whether the household owns a house or structures, nonagricultural land, large consumer goods, nonfarm business equipment, bike, motorcycle, or car, and has electricity; a flush toilet; and piped, a tube well, or a protected well as the main source of drinking water.[11] Not only are these asset variables a proxy for socioeconomic status, but assets also have implications on women's time because many assets save time.

[11] For Nepal, we exclude the dummy variable for using a tube well or protected well as the main source of drinking water in the calculation of the asset index because 71 percent of households obtain drinking water from piped sources.

Table 3.2 Average time men and women spent in the past 24 hours by activity (in minutes)

Activity	Bangladesh			Cambodia			Ghana			Mozambique			Nepal		
	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test
Total work (reproductive and productive)	566.4	521.5	***	420.6	535.0	***	504.1	580.4	***	352.0	455.8	***	490.5	652.8	***
Reproductive work	162.6	484.4	***	64.6	259.3	***	18.6	283.1	***	28.1	238.3	***	106.4	381.0	***
Domestic work[a]	119.0	273.0	***	41.5	76.8	***	6.5	114.2	***	17.5	95.4	***	53.9	246.3	***
Cooking	1.9	157.5	***	5.9	86.0	***	5.1	126.0	***	3.0	103.0	***	n/a	n/a	
Caregiving	10.7	55.7	***	11.4	80.1	***	2.3	35.0	***	4.1	32.6	***	52.6	134.8	***
Productive work	403.7	37.1	***	356.0	275.7	***	485.4	297.3	***	323.9	217.6	***	384.1	271.7	***
Agriculture	98.7	5.5	***	283.8	195.5	***	383.8	213.4	***	242.3	205.4	***	269.5	251.7	***
Nonagriculture[b]	305.1	31.7	***	72.3	80.2		105.3	87.7	***	81.6	12.16	***	114.6	20.0	***

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** 1 percent significant, ** 5 percent significant, * 10 percent significant. [a] For Nepal, domestic work includes cooking and shopping. For Bangladesh, domestic work includes off-farm agricultural activities. [b] For Bangladesh, nonagricultural work includes livestock raising. n/a indicates that the data were not available.

Table 3.3 Average time women spent in the past 24 hours by activity and poverty (in minutes)

Activity	Bangladesh			Cambodia			Ghana			Mozambique			Nepal		
	Nonpoor	Poor	T-test	Nonpoor	Poor	T-test	Nonpoor	Poor	T-test	Nonpoor	Poor	T-test	Nonpoor	Poor	T-test
Total work (reproductive and productive)	515.8	533.6	***	531.6	546.5		568.4	587.6	*	473.0	442.3	***	649.6	672.4	***
Reproductive work	482.3	490.7		248.5	295.8	***	280.9	282.2		247.9	231.1	**	383.7	366.0	**
Domestic work[a]	268.9	284.4	***	73.7	87.1		111.5	113.8		100.1	93.7		248.2	237.4	**
Cooking	157.9	150.8	**	84.8	90.4	*	126.1	124.1		111.5	93.6	***	n/a	n/a	
Caregiving	54.2	55.4		71.2	110.3	***	33.2	36.2		32.1	38.5		135.5	128.6	
Productive work	33.4	42.9	**	283.0	250.7	**	287.5	305.5		225.1	211.2		265.9	306.5	***
Agriculture	4.6	4.3		191.0	210.9		195.0	273.5	***	210.9	203.5		242.9	302.3	***
Nonagriculture[b]	29.0	36.7	**	92.1	39.8	***	92.5	31.9	***	14.2	7.7		4.2	23.0	***

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** 1 percent significant, ** 5 percent significant, * 10 percent significant. [a] For Nepal, domestic work includes cooking and shopping. For Bangladesh, domestic work includes off-farm agricultural activities. [b] For Bangladesh, nonagricultural work includes livestock raising. n/a indicates that the data were not available.

Women in Nepal have the heaviest work burdens among all five countries, spending about 11 hours a day in total on productive and reproductive work. Women in Mozambique spend the least, at about 7.5 hours. These differences are likely to depend on the technology available and the agricultural season. The poor face greater workloads than the nonpoor in Bangladesh, Ghana, and Nepal because the average time in total reproductive and productive work is much greater for the poor than the nonpoor, and the difference is statistically significant. This confirms the prediction from our theoretical framework that the poor have a greater work burden and have less leisure than the nonpoor.

Since we define poor households as those in the lowest asset quintile, they have a lower capital endowment than nonpoor households. The theoretical framework predicts that if the agricultural productivity effect of a capital investment were to exceed the time displacement effect, then women's domestic work burden would be greater and women would spend less time on farm work. This suggests that poor women would spend more time in agriculture, while the nonpoor would allocate more time to reproductive work. We generally find this holds true. In Ghana and Nepal, poor women spend close to 5 hours in agriculture, while the figures for nonpoor women are 3 hours in Ghana and 4 hours in Nepal. In Bangladesh, poor women spend 284 minutes in domestic work (which includes off-farm agricultural activities) versus 269 minutes for nonpoor women.[12] However, in Cambodia and Mozambique, there is no difference in agricultural work by poverty category.

Women also spend a large portion of their day in reproductive work. In Cambodia and Ghana, women on average allocate close to 5 hours to reproductive work, while in Nepal, the figure is greater than 6 hours. The impact of being poor on women's reproductive time has two competing effects, as suggested by the theoretical framework. On the one hand, it can increase the time for reproductive work or cooking because poor women lack time-saving assets.[13] On the other hand, it can reduce time for reproductive work because women have to spend more time in productive work or agriculture to compensate for the lack of income. In Mozambique and Nepal, nonpoor women spend more time than poor women in reproductive work, and the average time in reproductive work is particularly high for Nepal, 6.4 hours by poor women and 6.1 hours by nonpoor women. The reverse is true in Cambodia, and there is no statistical difference in mean time spent by poverty category in Ghana.

In most countries, there is no difference in caregiving by poverty category, although there is likely to be underreporting of such work, given the low reporting of secondary activities. The difference in average time for cooking is pronounced in Bangladesh, Mozambique, and Nepal (the latter based on domestic work, which includes cooking), with nonpoor women spending more time than poor women. This suggests that poor women may not have enough time to prepare nutritious meals. In Cambodia, cooking time is greater for the poor than the nonpoor, but the difference is significant only at 10 percent. For nonagricultural work, the nonpoor spend more time than the poor in Cambodia and Ghana, but the reverse is true in Bangladesh and Nepal.

Taken together, these results reveal that poor women face heavier workloads in Bangladesh, Ghana, and Nepal, particularly due to their substantial involvement in agricultural activities. Nonpoor women allocate more time for reproductive work than poor women in Mozambique and Nepal. This pattern is particularly pronounced in cooking time in Bangladesh, Mozambique, and Nepal. We explore its influence on child and maternal nutrition in Section 4.

[12] The difference in means is significant at 1 percent.

[13] This is equivalent to when the time displacement effect dominates the agricultural productivity effect. Note that the signs are reversed because being capital poor is the reverse of undergoing a capital increase.

Summary Statistics

Understanding the type of activities in which female respondents were involved in the last 12 months is essential for analyzing time use data (Table 3.4). Most women in Mozambique (97 percent) engaged in cash crop farming in the last 12 months, but only 25 percent participated in food crop farming.[14] In contrast, 67 percent of men were involved in food crop farming, while only 20 percent participated in producing cash crops. In other countries, women were more likely to have been involved in food crop than in cash crop farming. In Nepal, for example, half the women were involved in cash crop farming, while most (91 percent) participated in food crop farming. Almost 90 percent of women engaged in livestock raising in Nepal, which is not surprising given the high percentage of households who owned small or large livestock. This is followed by Cambodia, Bangladesh, and Ghana, at around 50 percent participation for women in raising livestock. In Mozambique, only 24 percent of women tended to livestock, and only 30 percent of households owned small livestock. Women's participation in nonfarm economic work (such as self-employment or small businesses) was highest in Ghana, at close to 40 percent, and most limited in Nepal, at 9 percent.

Table 3.4 Percentage of respondents who engaged in specific activities in the last 12 months

Activity	Bangladesh	Cambodia	Ghana	Mozambique	Nepal
	n = 4,249	*n* = 1,494	*n* = 1731	*n* = 1,741	*n* = 4,003
In the last 12 months, female respondent engaged in					
Agriculture	0.644	0.625	0.811	0.972	0.960
Cash crop farming	0.274	0.436	0.481	0.966	0.519
Food crop farming	0.390	0.610	0.782	0.246	0.905
Livestock raising	0.518	0.576	0.430	0.253	0.876
Wage work	0.288	0.369	0.076	0.137	0.188
Nonfarm economic activities	0.241	0.178	0.396	0.117	0.088
In the last 12 months, male respondent engaged in					
Agriculture	0.732	0.373	0.761	0.678	0.950
Cash crop farming	0.305	0.254	0.489	0.195	0.293
Food crop farming	0.572	0.367	0.894	0.673	0.544
Livestock raising	0.466	0.339	0.566	0.197	0.512
Wage work	0.446	0.234	0.086	0.148	0.284
Nonfarm economic activities	0.410	0.123	0.232	0.146	0.155

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Note: Weights used.

Table 3.5 presents the summary statistics for the five countries.

[14] The Mozambique ZOI includes strong cash crop production, including cotton production in Tete province, cotton and tobacco in the Manica highlands, and mixed cropping / subsistence systems based in Zambezia and Nampula districts (FEWS NET 2014).

Table 3.5 Summary statistics

Characteristic	Bangladesh *n* = 4,249		Cambodia *n* = 1,494		Ghana *n* = 1,731		Mozambique *n* = 1,741		Nepal *n* = 4,003	
	Mean	Stand. errors	Mean	Stand. errors	Mean	Stand. errors	Mean	Stand. errors	Mean	Stand. errors
Women's characteristics										
Women's dietary diversity score (out of 9 food groups)	3.98	1.25	4.57	1.38	3.94	1.61	3.30	1.38	3.80	1.09
Age of respondent	32.69	8.07	36.03	8.21	32.41	7.94	30.84	8.38	26.89	6.10
Respondent can read and write#	0.541	0.498	0.610	0.488	0.114	0.318	0.250	0.433	n/a	
Respondent is pregnant#	0.045	0.207	0.043	0.203	0.102	0.303	n/a		0.060	0.237
Respondent's years of education	3.575	3.563	n/a		n/a		n/a		4.466	4.443
Respondent is lactating#	0.230	0.420	n/a		n/a		n/a		0.782	0.413
Household characteristics										
Age of household head	39.33	10.19	40.98	10.33	39.44	12.10	35.23	10.48	43.57	15.64
Poor#	0.169	0.374	0.199	0.399	0.198	0.398	0.227	0.419	0.205	0.403
Female-headed household#	0.174	0.379	0.109	0.312	0.078	0.268	0.318	0.466	0.336	0.472
Household head can read and write #	0.490	0.500	0.692	0.462	0.224	0.417	0.480	0.500	n/a	
Head of household's years of education	3.418	3.900	n/a		n/a		n/a		4.689	4.987
Household composition										
ln (household size + 0.1)	1.42	0.34	1.62	0.33	1.71	0.49	1.56	0.42	1.66	0.40
Dependency ratio	0.94	0.77	0.28	0.60	1.20	0.87	0.67	1.08	1.34	0.99
Number of boys 0–4	0.26	0.48	0.29	0.52	0.53	0.69	0.53	0.67	0.68	0.62
Number of boys 5–10	0.40	0.59	0.40	0.62	0.72	0.91	0.56	0.73	0.36	0.59
Number of men 11–18	0.35	0.60	0.54	0.75	0.62	0.89	0.47	0.73	0.29	0.59
Number of men 19–59	0.95	0.59	1.30	0.69	1.09	0.70	0.91	0.47	0.86	0.80
Number of men 60+	0.08	0.27	0.07	0.26	0.09	0.29	0.03	0.18	0.20	0.40
Number of girls 0–4	0.26	0.49	0.27	0.49	0.53	0.72	0.53	0.67	0.68	0.69
Number of girls 5–10	0.40	0.60	0.34	0.59	0.64	0.85	0.58	0.71	0.49	0.71
Number of women 11–18	0.35	0.59	0.55	0.76	0.45	0.73	0.41	0.65	0.43	0.71
Number of women 19–59	1.13	0.39	1.33	0.64	1.34	0.69	1.04	0.34	1.49	0.76
Number of women 60+	0.11	0.32	0.15	0.37	0.09	0.31	0.01	0.09	0.21	0.41
Household owns large livestock#	0.417	0.493	0.643	0.479	0.227	0.419	0.073	0.260	0.809	0.393
Household owns small livestock#	0.202	0.401	0.292	0.455	0.608	0.488	0.307	0.461	0.750	0.433
Urban#	n/a		n/a		0.224	0.417	0.153	0.360	n/a	
Household owns agricultural land #	n/a		0.065	0.247	0.873	0.333	0.972	0.164	n/a	
Log of cultivable land	-5.770	4.270	n/a		n/a				n/a	
Log of total land owned with deed (hectares)	n/a		n/a		n/a				-4.030	3.940

Table 3.5 Continued

Children's characteristics	Bangladesh		Cambodia		Ghana		Mozambique		Nepal	
	n = 705		*n* = 292		*n* = 391		*n* = 495		*n* = 1,372	
Minimum acceptable diet^	Mean	Stand. Errors	Mean	Stand. Errors	Mean	Stand. Errors	Mean	Stand. Errors	Mean	Stand. Errors
Boys	0.173	0.379	0.357	0.481	0.114	0.319	0.102	0.303	0.344	0.475
Girls	0.169	0.376	0.348	0.478	0.217	0.413	0.089	0.285	0.380	0.486
All	0.171	0.377	0.353	0.479	0.166	0.370	0.095	0.293	0.362	0.481
Minimum dietary diversity^	*n* = 662		*n* = 292		*n* = 391		*n* = 495		*n* = 1,372	
Boys	0.350	0.478	0.471	0.501	0.275	0.447	0.178	0.383	0.450	0.498
Girls	0.316	0.465	0.439	0.498	0.389	0.489	0.205	0.404	0.464	0.499
All	0.332	0.471	0.455	0.499	0.327	0.470	0.192	0.394	0.457	0.498
Number of food groups consumed (out of 7 food groups)	*n* = 662		*n* = 292		*n* = 391		*n* = 495		*n* = 3,625 (0–5 yrs)	
Boys	3.127	1.576	3.408	1.561	2.549	1.649	2.432	1.340	3.554	1.082
Girls	3.124	1.560	3.232	1.553	2.712	1.886	2.378	1.393	3.558	1.125
All	3.125	1.567	3.321	1.557	2.632	1.773	2.404	1.367	3.556	1.102
Minimum meal frequency^	*n* = 662		*n* = 292		*n* = 391		*n* = 495		*n* = 1,372	
Boys	0.415	0.493	0.712	0.454	0.440	0.498	0.407	0.492	0.731	0.444
Girls	0.466	0.500	0.719	0.451	0.455	0.499	0.371	0.484	0.775	0.418
All	0.441	0.497	0.716	0.452	0.448	0.498	0.388	0.488	0.753	0.431
	n = 705				*n* = 391				*n* = 1,372	
Girl#	0.518	0.500	0.490	0.500	0.506	0.501	0.523	0.500	0.499	0.500
Child's age in months	14.111	4.622	29.286	16.871	13.215	4.554	13.715	4.774	14.345	5.144

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: # = 1, 0 if otherwise. ^= 1 if achieved, 0 otherwise. Weights used. n/a indicates that the data were not available.

Table 3.5 reveals that women in Cambodia have the highest dietary diversity of the countries studied, at 4.6 (out of 9 food groups), while women in Mozambique have the lowest, at 3.3. Women's dietary diversity is close to 4 for Bangladesh and Ghana, and 3.8 for Nepal.

Children in Nepal have the highest dietary diversity, at 3.6 (out of 7 food groups). However, this could be partly attributable to the inclusion of older children (0–5 years old) in the Nepal sample, whereas the other country samples include only younger children, up to 23 months. Children's dietary diversity in Cambodia is 3.3, followed by Bangladesh (3.1) and Ghana (2.6). Children in Mozambique have the least dietary diversity, at 2.4.

More than one-third of children aged 6–23 months in Cambodia and Nepal achieved a minimum acceptable diet, while about 17 percent achieved it in Bangladesh and Ghana. Again, Mozambique has the worst child nutrition by this measure, with only 9.5 percent of children achieving a minimum acceptable diet.

Cambodia and Nepal have the highest percentage of children 6–23 months who achieved minimum dietary diversity, 46 percent, and one-third of children achieved it in Bangladesh and Ghana. In Mozambique, only 19 percent achieved minimum dietary diversity.

Cambodia and Nepal have the highest proportion of children achieving minimum meal frequency (71 and 75 percent, respectively), while on the other end, less than 40 percent of children in Mozambique receive minimum meal frequency. Bangladesh and Ghana are not much better, with about 44 percent of children receiving minimum meal frequency.

4. EMPIRICAL METHODOLOGY

The challenge in examining the impact of women's time use on nutrition is that there could be unobserved characteristics, such as a woman's preference or ability to cook or care for her child, that influence her time allocation and also impact nutrition (Glick 2002). For example, a woman who likes to cook may spend more time cooking, thereby providing her family with more varied meals. Assessing the impact of cooking time on dietary diversity without taking into account the endogeneity of time would overstate the impact of time. Alternatively, a woman who is an efficient cook might be able to produce a diverse meal in less time. This would lead to an underestimation of the impact of time on dietary diversity. Hence, in the case of cooking time, the direction of the bias is not clear. Therefore, we use an instrumental variables technique to take into account the endogeneity of time use. The instruments are discussed later in this section.

The first outcome we study is women's dietary diversity. Given the possible endogeneity of time, we use a two-stage least squares (2SLS) model, first estimating the log of women's time spent in activity *j,* and in the second stage assessing the impact of women's time use in activity *j* on their dietary diversity. The results from the 2SLS model will be compared with estimates from an ordinary least squares (OLS) model. We estimate the equation

$$\boldsymbol{N} = \beta_0 + \beta_1 log\ (time\ use\ +1)_j + \beta_2 log\ (time\ use\ +1)_j \times poor + \beta_3 poor + \beta_4 \boldsymbol{X} + u, \qquad (11)$$

where $\boldsymbol{N}$ is women's dietary diversity in the previous day, β_i are parameters to be estimated, $log(time\ use\ +1)_j$ is the log of time spent plus 1 minute in activity *j* in the last 24 hours (in minutes), $\boldsymbol{X}$ is a vector of individual and household characteristics, and u is the error term. In order to examine how the effect of time on women's dietary diversity changes with poverty status, we include an interaction term: β_2 is the interaction effect of time use and poverty. Time allocation is aggregated into seven activity groups for reproductive and productive work, as discussed in Section 3.

The other outcomes we study are whether a child aged 6–23 months achieved the minimum acceptable diet, minimum dietary diversity, minimum meal frequency, and child dietary diversity (out of seven food groups) in the past 24 hours. These are population-level infant and young child feeding (IYCF) indicators that measure food-related aspects of child feeding that are critical for child nutritional status and, ultimately, child survival. These indicators are intended to be assessed together to capture the multidimensional nature of appropriate child feeding (WHO 2008). Because minimum acceptable diet, minimum dietary diversity, and minimum meal frequency are binary outcomes, we estimate the average marginal effects from a probit model, and for child dietary diversity score, we use an OLS regression. Instrumental variable (IV) models were not used because the models did not converge.

Our data are particularly well suited to studying the relationship between women's time use and these outcome variables because the time frame is consistent. It is possible to estimate the effect of women's time use in the last 24 hours on the women's and children's nutrition outcomes in the past 24 hours precisely because the reference periods are comparable. However, there are several limitations of this methodology. First, while we are able to assess the quantity of caregiving in terms of time, we are not able to evaluate the quality of care adults or children receive. Second, the activities are classified in broad terms. For example, it is not possible to assess the kind of agricultural activity the respondent engaged in, even though the implications on dietary diversity may be different if the respondent engaged in subsistence agriculture rather than agricultural wage work. Our data do not permit us to make these distinctions. Third, the data collection took place in only one season in a given country and may not fully reflect seasonality in time use. Fourth, given the low response rate on secondary activities in the datasets, the methodology is likely to underestimate time spent on certain activities, particularly caregiving, that usually occur concurrently with others. Last, even though maternal and child anthropometric measures were collected in the datasets, we do not assess the impact of time use on these outcomes because the causality is likely to be reversed. Anthropometric outcomes are a result of activities that took place before the surveys were conducted, while the time use information is collected in reference to the past 24 hours.

Outcome Variables

This section defines the outcomes used in the analysis.

Women's Dietary Diversity (out of Nine Food Groups)

Women's dietary diversity is defined by the number of food groups, out of nine, that female respondents consumed from in the past 24 hours. The food groups include (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, Ballard, and Dop 2011). Individual-level dietary diversity scores for women and children have been demonstrated to positively correlate with micronutrient adequacy of the diet (Arimond et al. 2010).

IYCF Minimum Dietary Diversity

Minimum dietary diversity is achieved when a child aged 6–23 months has consumed from at least four food groups during the previous day (WHO 2008). The seven food groups used for calculating this indicator are (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products (milk, yogurt, cheese); (4) flesh foods (meat, fish, poultry, and organ meats); (5) eggs; (6) vitamin A–rich fruits and vegetables; and (7) other fruits and vegetables. Breastmilk is not included in the seven food groups because the indicator is intended to measure the quality of the complementary food diet (WHO 2008).

IYCF Minimum Meal Frequency

Minimum meal frequency is the proportion of breastfed and nonbreastfed children 6–23 months old who receive solid, semisolid, or soft foods a minimum number of times per day. Meals do not include breastmilk but do include milk feedings for nonbreastfed children. For nonbreastfed children, the minimum number of feedings per day is four. For breastfed children, the minimum is two feedings at ages 6–8 months, and three for 9–23 months.

IYCF Minimum Acceptable Diet

Minimum acceptable diet is the summary IYCF indicator that is achieved when a breastfed child 6–23 months old has consumed the minimum dietary diversity and the minimum meal frequency in the previous 24 hours. To meet this indicator, in the past 24 hours a nonbreastfed child 6–23 months old must have received at least two breastmilk feedings, and also achieved minimum dietary diversity (not including breastmilk) and minimum meal frequency.

Children's Dietary Diversity (out of Seven Food Groups)

Children's dietary diversity is measured as the number of food groups a child aged 6–23 months consumed from in the past 24 hours. This indicator uses the same seven food groups as minimum dietary diversity, and similarly, breastmilk is not included in order to reflect the quality of a complementary food diet.

Independent Variables

Time Use

Time use activities are classified into seven categories, as discussed in Section 3. For Bangladesh, we exclude the regression analysis for time spent in domestic work and agriculture because off-farm postharvest activities and drying paddy from the harvest are classified as domestic work, and livestock rearing falls under nonagricultural work. In addition, for Bangladesh, Nepal, and Mozambique, we exclude women's nonagricultural activities because more than 87 percent of respondents recorded zero minutes for these activities.

Instrumental Variable

A woman's time allocation could be influenced by the social norms in her village. Studies have shown that gender norms dictate the types of economic activities women engage in, or their level of involvement (Kevane and Wydick 2001; Balagamwala, Gazdar, and Mallah 2015). Social norms also affect the degree of involvement in reproductive work by women and men (Akerlof and Kranton 2000; Bittman et al. 2003). For example, a woman may feel compelled to spend more time in agricultural work if she sees other women in the village engaged in these activities. Similarly, a woman may be obliged to spend a significant amount of time in domestic tasks because women in the village are equally burdened with these chores.

In this study, social norms can be proxied by the leave-out means of women's time spent in productive work or reproductive work in the village. The leave-out mean of woman *i*'s productive work is derived by taking the average of the female villagers' productive work time, minus woman *i*'s productive work time. It is a good candidate for an instrument to identify equation (11) because the leave-out mean for woman *i* is exogenous to woman *i*'s time allocation, since it excludes her time in the calculation, and the leave-out mean does not directly affect nutrition in her household. The leave-out means for women's time in reproductive work (or cooking or caregiving) are included as instruments in the first stage of regressions measuring reproductive work (or cooking or caregiving), while leave-out means for time in productive work are used as instruments in the first-stage regressions estimating productive work. If women feel pressure to follow social norms in their communities, we expect the leave-out means for a particular activity to have a positive effect on women's time allocated to that activity.

Other Control Variables

Individual characteristics contained in vector $\boldsymbol{X}$ in equation (11) to estimate women's dietary diversity include the respondent's age and years of education,[15] and whether the respondent is pregnant or lactating. For household characteristics, we control for the household size and the household head's age, schooling, and occupation.[16] When estimating children's diet, we include the mother's age and education, age in months and sex of the child, and whether there is a younger child present in the household. Owning or having access to land is important for agricultural livelihoods; thus the size of cultivable land is included in the Bangladesh regressions, and a dummy variable for owning agricultural land is included for Ghana and Nepal.[17] Ownership of livestock is likely to improve nutrition by allowing households access to meat, eggs, and milk. Therefore, dummy variables for owning large or small livestock are included among the control variables. Using wood, dung, or agricultural residue as the main source of cooking fuel is included because this type of fuel can prolong women's domestic work and cooking due to gender-assigned roles in collecting fuel.

Household composition has implications on women's reproductive work because young children require more of their time, while older children, especially girls, can substitute for women in household responsibilities. Hence, the numbers of people living in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex, are included as regressors. We also include the household dependency ratio, defined as the ratio of household members aged 0–14 and 65 and up, to those between the ages of 15 and 64.

Local dummy variables for divisions in Bangladesh, provinces in Cambodia and Mozambique, regions in Ghana, and areas in Nepal (mountains, hills, and Terai) are included to account for unobservable location-specific characteristics. We also control for the household's religion by including a dummy variable for whether a household is Hindu for Bangladesh, and whether a household is Muslim for Ghana. For Nepal, we include dummy variables for low-caste and mid-caste households.

[15] In the case of Cambodia, Ghana, and Mozambique, we use a dummy variable on whether the respondent is literate instead of years of education because there is considerable missing information on educational attainment.

[16] For Ghana, Mozambique, and Nepal, because the household head's occupation is missing from the questionnaire, we use proxy variables that ask whether the male respondent participated in food crop production, cash work, livestock raising, fishing, nonfarm economic activities, or wage work in the past 12 months.

[17] Due to the high percentage of households owning agricultural land in Cambodia and Mozambique, this variable is excluded from the regressions.

5. RESULTS

Table 5.1 summarizes the first stage of the 2SLS, estimating women's time allocation by activity, showing only the coefficients on being poor, the household composition, and the instruments.[18] The proxies for social norms, namely the leave-out means for time in the respective activities, are positive and significant at the 1 percent level in most activities by country, confirming that social norms influence the way women spend their time. However, the instruments in Cambodia do not perform well because they are not significant for reproductive work, cooking, caregiving, productive work, and nonagricultural work. For domestic work and caregiving in Mozambique, and cooking in Ghana, the instruments are weakly significant or not significant. In these cases, the OLS results are preferred over the 2SLS.

Table 5.1 Summary of first-stage estimations

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh	**Cambodia**	**Ghana**	**Mozambique**	**Nepal**
	n = 4,248	*n* = 1,494	*n* = 1,735	*n* = 1,741	*n* = 4,003
Panel 1: Total reproductive work					
Poor	n/a	-1.877	2.591**	-1.785	-0.152
		(2.054)	(1.128)	(1.676)	(0.660)
Number of boys 0–4		0.438***	0.022	0.065	0.095***
		(0.098)	(0.043)	(0.076)	(0.027)
Number of boys 5–11		0.104	-0.032	-0.049	-0.015
		(0.093)	(0.035)	(0.079)	(0.024)
Number of men 11–18		0.035	-0.007	0.048	-0.059**
		(0.091)	(0.037)	(0.080)	(0.025)
Number of men 19–59		0.065	0.017	-0.141	0.037
		(0.095)	(0.058)	(0.151)	(0.024)
Number of men 60+		-0.279	0.222**	-0.198	0.077*
		(0.180)	(0.106)	(0.229)	(0.040)
Number of girls 0–4		0.446***	0.095**	0.131*	0.076***
		(0.101)	(0.046)	(0.076)	(0.023)
Number of girls 5–10		0.035	0.022	-0.023	-0.036
		(0.095)	(0.035)	(0.081)	(0.026)
Number of women 11–18		-0.164*	-0.039	-0.191**	-0.070***
		(0.089)	(0.039)	(0.075)	(0.022)
Number of women 19–59		-0.088	-0.138**	-0.137	-0.086***
		(0.088)	(0.068)	(0.109)	(0.024)
Number of women 60+		0.014	-0.035	0.006	-0.045
		(0.118)	(0.083)	(0.243)	(0.032)
Log of leave-out means of women's time in reproductive work in community		-0.095	0.535***	0.505***	0.761***
		(0.219)	(0.100)	(0.176)	(0.053)
Log of leave-out means of women's time in reproductive work in community × poor		0.349	-0.461**	0.313	0.017
		(0.371)	(0.203)	(0.309)	(0.111)
R-squared		0.130	0.075	0.125	0.136

[18] Full sets of results are available upon request.

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified		0.794	0.557	0.001	0.000
Kleibergen-Paak F-statistic for weak identification		0.033	0.170	5.435	126.966
Anderson-Rubin F-test of significance of endogenous regressors (Ho: endogenous variables are jointly irrelevant)		0.190	0.003	0.145	0.921
P-value of Anderson-Rubin Chi-sq test of endogenous regressors		0.182	0.002	0.139	0.921
Endogeneity test p, Ho: exogenous		0.209	0.003	0.124	0.894
Panel 2: Domestic work					
Poor	n/a	1.648	2.908***	-1.264	-0.335
		(1.782)	(1.083)	(2.024)	(1.189)
Number of boys 0–4		0.131	0.001	0.049	0.041
		-0.18	(0.076)	(0.128)	(0.044)
Number of boys 5–11		0.309*	0.080	0.086	0.067*
		-0.173	(0.062)	(0.122)	(0.038)
Number of men 11–18		0.354**	0.101	0.172	-0.016
		-0.164	(0.067)	(0.114)	(0.038)
Number of men 19–59		0.306*	0.087	-0.022	0.121***
		-0.159	(0.093)	(0.190)	(0.040)
Number of men 60+		0.518*	0.229	-0.090	0.175***
		-0.272	(0.222)	(0.373)	(0.063)
Number of girls 0–4		0.388**	0.131*	0.100	0.031
		-0.19	(0.075)	(0.122)	(0.040)
Number of girls 5–10		0.375**	0.049	0.030	0.011
		-0.176	(0.061)	(0.127)	(0.038)
Number of women 11–18		0.169	-0.078	-0.035	-0.042
		-0.16	(0.073)	(0.117)	(0.036)
Number of women 19–59		0.196	-0.203**	-0.054	-0.067
		-0.154	(0.091)	(0.166)	(0.041)
Number of women 60+		0.427**	-0.267*	0.126	-0.055
		-0.203	(0.157)	(0.504)	(0.053)
Log of leave-out means of women's time in domestic work in community		0.447**	0.769***	0.355*	0.718***
		(0.207)	(0.116)	(0.201)	(0.079)
Log of leave-out means of women's time in domestic work in community*poor		-0.350	-0.599**	0.253	0.050
		(0.412)	(0.236)	(0.449)	(0.217)
R-squared		0.049	0.089	0.042	0.062

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified		0.068	0.426	0.033	0.000
Kleibergen-Paak F-statistic for weak identification		1.657	0.310	2.251	44.659
Anderson-Rubin F-test of significance of endogenous regressors (Ho: endogenous variables are jointly irrelevant)		0.464	0.066	0.026	0.629
P-value of Anderson-Rubin Chi-sq test of endogenous regressors		0.456	0.062	0.024	0.626
Endogeneity test p, Ho: exogenous		0.552	0.066	0.023	0.880
Panel 3: Cooking					
Poor	0.585	2.163	-1.054	-0.013	n/a
	(1.359)	(2.642)	(1.573)	(0.042)	
Number of boys 0–4	-0.203**	0.179	0.015	-0.054	
	(0.079)	(0.127)	(0.069)	(0.088)	
Number of boys 5–11	-0.144**	0.173	-0.020	-0.033	
	(0.068)	(0.122)	(0.053)	(0.083)	
Number of men 11–18	-0.094	0.050	0.093	0.076	
	(0.070)	(0.119)	(0.059)	(0.080)	
Number of men 19–59	-0.130	0.161	0.231***	-0.006	
	(0.085)	(0.124)	(0.077)	(0.126)	
Number of men 60+	0.014	0.172	0.236	-0.228	
	(0.093)	(0.199)	(0.156)	(0.242)	
Number of girls 0–4	-0.207***	0.025	0.119*	-0.056	
	(0.076)	(0.134)	(0.062)	(0.089)	
Number of girls 5–10	-0.105	0.054	0.044	-0.042	
	(0.069)	(0.122)	(0.049)	(0.091)	
Number of women 11–18	-0.173**	-0.138	-0.070	-0.262***	
	(0.071)	(0.116)	(0.064)	(0.085)	
Number of women 19–59	-0.393***	-0.349***	-0.048	-0.291**	
	(0.090)	(0.127)	(0.081)	(0.133)	
Number of women 60+	-0.177**	-0.019	0.113	-0.168	
	(0.085)	(0.150)	(0.110)	(0.354)	
Log of leave-out means of women's time in cooking in community	0.575***	0.262	0.288*	0.779***	
	(0.094)	(0.317)	(0.149)	(0.233)	
Log of leave-out means of women's time in cooking in community x poor	-0.140	-0.487	0.208	-0.026	
	(0.270)	(0.596)	(0.326)	(0.018)	
R-squared	0.059	0.070	0.070	0.709	

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified	0.000	0.923	0.033	0.001	
Kleibergen-Paak F-statistic for weak identification	6.248	0.005	2.203	5.618	
Anderson-Rubin F-test of significance of endogenous regressors, Ho: endogenous variables are jointly irrelevant	0.942	0.130	0.013	0.680	
P-value of Anderson-Rubin Chi-sq test of endogenous regressors	0.941	0.124	0.012	0.675	
Endogeneity test p, Ho: exogenous	0.893	0.116	0.017	0.656	
Panel 4: Care					
Poor	-0.467	-0.386	0.018	-0.148	-0.650
	(0.464)	(0.931)	(0.349)	(0.407)	(0.714)
Number of boys 0–4	1.150***	1.459***	0.279***	0.416***	0.300***
	(0.108)	(0.180)	(0.092)	(0.112)	(0.054)
Number of boys 5–11	0.250***	-0.324**	-0.219***	-0.225**	-0.052
	(0.095)	(0.140)	(0.073)	(0.103)	(0.054)
Number of men 11–18	-0.089	-0.610***	-0.326***	-0.312***	-0.067
	(0.096)	(0.138)	(0.077)	(0.092)	(0.049)
Number of men 19–59	-0.078	-0.350**	-0.146	-0.466***	-0.078*
	(0.105)	(0.142)	(0.098)	(0.145)	(0.047)
Number of men 60+	-0.058	-0.571**	-0.311	-0.277	0.062
	(0.141)	(0.261)	(0.226)	(0.310)	(0.078)
Number of girls 0–4	1.044***	1.238***	0.398***	0.431***	0.313***
	(0.108)	(0.186)	(0.091)	(0.107)	(0.049)
Number of girls 5–10	0.069	-0.346**	-0.094	-0.146	-0.050
	(0.095)	(0.158)	(0.085)	(0.105)	(0.048)
Number of women 11–18	-0.145	-0.676***	-0.312***	-0.370***	-0.098**
	(0.095)	(0.134)	(0.088)	(0.100)	(0.045)
Number of women 19–59	-0.303**	-0.415***	-0.363***	-0.531***	-0.172***
	(0.119)	(0.132)	(0.096)	(0.138)	(0.049)
Number of women 60+	-0.061	-0.430**	-0.322**	-0.800*	-0.023
	(0.117)	(0.184)	(0.155)	(0.454)	(0.066)
Log of leave-out means of women's time in caregiving in community	0.478***	-0.018	0.301***	0.073	0.983***
	(0.058)	(0.102)	(0.054)	(0.085)	(0.071)
Log of leave-out means of women's time in caregiving in community × poor	0.082	0.147	-0.006	0.095	0.133
	(0.126)	(0.220)	(0.105)	(0.126)	(0.145)
R-squared	0.336	0.379	0.167	0.157	0.305

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified	0.000	0.992	0.000	0.231	0.000
Kleibergen-Paak F-statistic for weak identification	39.260	0.000	19.630	0.709	106.914
Anderson-Rubin F-test of significance of endogenous regressors, Ho: endogenous variables are jointly irrelevant	0.048	0.045	0.001	0.384	0.503
P-value of Anderson-Rubin Chi-sq test of endogenous regressors	0.047	0.042	0.001	0.377	0.499
Endogeneity test p, Ho: exogenous	0.028	0.037	0.005	0.379	0.798
Panel 5: Total productive work					
Poor	-0.022	-1.873	3.268	-2.695*	0.252
	(0.126)	(2.805)	(2.223)	(1.470)	(0.901)
Number of boys 0–4	-0.156*	-0.501**	-0.012	-0.167	-0.027
	(0.093)	(0.206)	(0.100)	(0.148)	(0.077)
Number of boys 5–11	0.003	0.320*	0.012	0.123	0.027
	(0.085)	(0.178)	(0.077)	(0.146)	(0.076)
Number of men 11–18	-0.045	0.060	-0.009	0.074	0.058
	(0.084)	(0.172)	(0.090)	(0.135)	(0.068)
Number of men 19–59	-0.163*	0.173	0.247*	0.292	-0.057
	(0.095)	(0.183)	(0.129)	(0.216)	(0.076)
Number of men 60+	-0.174	0.047	-0.267	-0.312	-0.307**
	(0.126)	(0.336)	(0.302)	(0.407)	(0.124)
Number of girls 0–4	-0.041	-0.439**	0.033	-0.151	-0.029
	(0.092)	(0.208)	(0.102)	(0.147)	(0.072)
Number of girls 5–10	0.058	0.009	-0.093	-0.010	0.053
	(0.083)	(0.197)	(0.085)	(0.152)	(0.068)
Number of women 11–18	0.117	0.251	0.025	-0.012	0.062
	(0.084)	(0.169)	(0.091)	(0.142)	(0.066)
Number of women 19–59	0.209**	0.220	0.226**	-0.279	0.111
	(0.103)	(0.164)	(0.114)	(0.212)	(0.076)
Number of women 60+	0.006	-0.110	-0.070	0.142	0.145
	(0.108)	(0.235)	(0.199)	(0.753)	(0.098)
Log of leave-out means of women's time in productive work in community	0.180***	0.490*	1.066***	1.632***	1.060***
	(0.020)	(0.297)	(0.169)	(0.176)	(0.087)
Log of leave-out means of women's time in productive work in community*poor	0.009	0.272	-0.518	0.507*	-0.019
	(0.046)	(0.501)	(0.388)	(0.274)	(0.157)
R-squared	0.066	0.146	0.100	0.179	0.305

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified	0.000	0.050	0.036	0.000	0.000
Kleibergen-Paak F-statistic for weak identification	47.254	1.922	2.435	44.456	81.793
Anderson-Rubin F-test of significance of endogenous regressors, Ho: endogenous variables are jointly irrelevant	0.105	0.837	0.000	0.406	0.158
P-value of Anderson-Rubin Chi-sq test of endogenous regressors	0.102	0.833	0.000	0.399	0.155
Endogeneity test p, Ho: exogenous	0.117	0.815	0.000	0.370	0.056
Panel 6: Agriculture					
Poor	n/a	-1.175	-0.003	-3.865***	-0.612
		(1.906)	(0.527)	(1.421)	(0.689)
Number of boys 0–4		-0.485**	-0.010	-0.095	0.001
		(0.213)	(0.106)	(0.151)	(0.075)
Number of boys 5–11		0.281	0.051	0.191	0.044
		(0.192)	(0.082)	(0.149)	(0.074)
Number of men 11–18		-0.030	0.140	0.120	0.124*
		(0.180)	(0.093)	(0.138)	(0.067)
Number of men 19–59		0.109	0.060	0.239	-0.040
		(0.187)	(0.132)	(0.219)	(0.076)
Number of men 60+		0.218	-0.313	-0.062	-0.303**
		(0.339)	(0.296)	(0.403)	(0.123)
Number of girls 0–4		-0.450**	0.021	-0.104	0.004
		(0.217)	(0.104)	(0.151)	(0.071)
Number of girls 5–10		0.166	-0.030	0.066	0.087
		(0.203)	(0.086)	(0.155)	(0.067)
Number of women 11–18		0.125	0.107	0.070	0.053
		(0.177)	(0.095)	(0.146)	(0.066)
Number of women 19–59		0.266	0.133	-0.190	0.087
		(0.171)	(0.121)	(0.209)	(0.073)
Number of women 60+		0.068	-0.144	-0.044	0.119
		(0.242)	(0.205)	(0.711)	(0.096)
Log of leave-out means of women's time in agriculture in community		1.009***	0.516***	1.496***	0.697***
		(0.203)	(0.047)	(0.160)	(0.057)
Log of leave-out means of women's time in agriculture in community × poor		0.214	0.114	0.722***	0.139
		(0.362)	(0.098)	(0.267)	(0.121)
R-squared		0.183	0.291	0.207	0.372

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified		0.000	0.000	0.000	0.000
Kleibergen-Paak F-statistic for weak identification		13.976	67.331	45.774	82.443
Anderson-Rubin F-test of significance of endogenous regressors, Ho: endogenous variables are jointly irrelevant)		0.668	0.000	0.576	0.143
P-value of Anderson-Rubin Chi-sq test of endogenous regressors		0.662	0.000	0.569	0.140
Endogeneity test p, Ho: exogenous		0.618	0.000	0.451	0.114
Panel 7: Nonagriculture					
Poor	n/a	-1.680***	0.275	n/a	n/a
		(0.579)	(0.179)		
Number of boys 0–4		-0.024	-0.088		
		(0.205)	(0.097)		
Number of boys 5–11		0.240	-0.079		
		(0.195)	(0.077)		
Number of men 11–18		0.093	-0.146*		
		(0.187)	(0.082)		
Number of men 19–59		0.253	0.199*		
		(0.193)	(0.116)		
Number of men 60+		-0.003	0.092		
		(0.292)	(0.261)		
Number of girls 0–4		0.056	-0.055		
		(0.211)	(0.089)		
Number of girls 5–10		-0.061	-0.103		
		(0.196)	(0.077)		
Number of women 11–18		0.245	-0.075		
		(0.184)	(0.086)		
Number of women 19–59		-0.009	0.123		
		(0.184)	(0.112)		
Number of women 60+		-0.255	-0.073		
		(0.235)	(0.187)		
Log of leave-out means of women's time in nonagriculture in community		0.115	0.222***		
		(0.108)	(0.034)		
Log of leave-out means of women's time in nonagriculture in community × poor		0.274*	-0.197***		
		(0.150)	(0.063)		
R-squared		0.119	0.217		

Table 5.1 Continued

Independent variable	First-stage results estimating women's dietary diversity (without interaction) Dependent variable: Women's time allocation				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Instrumental variable diagnostics					
Under ID test p, Ho: underidentified		0.283	0.002		
Kleibergen-Paak F-statistic for weak identification		0.543	4.620		
Anderson-Rubin F-test of significance of endogenous regressors, Ho: endogenous variables are jointly irrelevant		0.303	0.350		
P-value of Anderson-Rubin Chi-sq test of endogenous regressors		0.294	0.342		
Endogeneity test p, Ho: exogenous		0.309	0.511		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Other independent variables include the respondent's age and years of education; whether the respondent is pregnant or lactating; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Having other women (aged 19–59) in the household reduces women's reproductive work burdens, especially for cooking and caregiving. Younger girls (aged 11–18) and older women (aged 60 and up) can also substitute for women's caregiving in Cambodia, Ghana, and Mozambique. Interestingly, for Cambodia, Ghana, and Mozambique, the presence of younger boys reduces women's caregiving time, suggesting that boys can substitute in these activities, too. Women's time in agricultural and nonagricultural work is not affected by household composition, except in Cambodia, where women spend less time in agriculture when they have young children.

Table 5.2 presents the estimations of the effects of women's time use on their dietary diversity. OLS coefficients are shown unless 2SLS coefficients are preferred. OLS estimates are preferred when the IV diagnostic tests reveal that the endogenous variables are not endogenous, when the Kleibergen-Paap Wald F-statistic shows that the instruments may be weak, or when the underidentification test suggests that the system may be underidentified.

Table 5.2 Summary of coefficient estimates: Women's dietary diversity

Independent variable	Dependent variable: Women's dietary diversity				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Panel 1: Total reproductive work					
Poor	n/a	-0.023	-0.884	-0.115	-0.419
		(0.396)	(0.574)	(0.265)	(0.390)
Log of reproductive work time	n/a	0.231***	0.051	-0.019	-0.001
		(0.046)	(0.041)	(0.036)	(0.027)
Log of reproductive work time × poor	n/a	-0.058	0.107	0.011	0.050
		(0.073)	(0.104)	(0.050)	(0.067)

Table 5.2 Continued

Independent variable	Dependent variable: Women's dietary diversity				
	Bangladesh *n* = 4,248	**Cambodia** *n* = 1,494	**Ghana** *n* = 1,735	**Mozambique** *n* = 1,741	**Nepal** *n* = 4,003
Panel 2: Domestic work					
Poor	n/a	-0.220	-0.741***	-0.121	-0.148
		(0.148)	(0.249)	(0.164)	(0.229)
Log of domestic work time	n/a	0.051**	-0.004	-0.011	0.048***
		(0.020)	(0.024)	(0.020)	(0.018)
Log of domestic work time × poor	n/a	-0.034	0.107*	0.016	0.004
		(0.037)	(0.056)	(0.039)	(0.042)
Panel 3: Cooking					
Poor	0.059	-0.606**	-0.721***	-0.028	n/a
	(0.224)	(0.253)	(0.256)	(0.136)	
Log of cooking time	0.062***	0.100***	0.060**	0.018	n/a
	(0.020)	(0.033)	(0.030)	(0.029)	
Log of cooking time × poor	-0.045	0.070	0.098*	-0.009	n/a
	(0.045)	(0.059)	(0.055)	(0.034)	
Panel 4: Care					
Poor	-0.525***[a]	-0.274**	-0.931*[a]	-0.086	-0.091
	(0.182)	(0.109)	(0.495)	(0.098)	(0.109)
Log of caregiving time	0.007	0.025	0.360**	-0.012	-0.021*
	(0.069)	(0.019)	(0.173)	(0.018)	(0.012)
Log of caregiving time × poor	0.175**	-0.024	0.338	0.016	-0.010
	(0.085)	(0.030)	(0.260)	(0.034)	(0.024)
Panel 5: Total productive work					
Poor	-0.182***	-0.097	-0.033	-0.346***	-0.266***
	(0.050)	(0.167)	(0.201)	(0.131)	(0.100)
Log of productive work time	-0.034***	0.029	0.010	-0.039**	0.013
	(0.010)	(0.023)	(0.016)	(0.015)	(0.009)
	0.022	-0.050	-0.058	0.070**	0.027
Log of productive work time × poor	(0.022)	(0.033)	(0.038)	(0.028)	(0.018)
Panel 6: Agriculture					
Poor	n/a	-0.298**	0.047[a]	-0.351***	-0.251**
		(0.141)	(0.278)	(0.128)	(0.098)
Log of time in agriculture	n/a	0.003	-0.294***	-0.037**	0.009
		(0.018)	(0.069)	-0.015	(0.010)
	n/a	-0.005	-0.028	0.072***	0.025
Log of time in agriculture × poor		(0.030)	(0.068)	-0.027	(0.018)
Panel 7: Nonagriculture					
Poor	n/a	-0.249***	-0.305***	n/a	n/a
		(0.094)	(0.100)		
Log of time in nonagriculture	n/a	0.025	0.042**	n/a	n/a
		(0.017)	(0.018)		
	n/a	-0.071*	0.025	n/a	n/a
Log of time in nonagriculture × poor		(0.038)	(0.044)		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. [a] Estimates from a two-stage least-squares regression. Other independent variables include the respondent's age and years of education; whether the respondent is pregnant or lactating; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Tables 5.3, 5.4, and 5.5 show the average marginal effects from probit estimates of the impact of women's time use on achieving minimum acceptable diet, minimum dietary diversity, and minimum meal frequency, respectively. Table 5.6 provides the OLS coefficients of the impact of women's time use on children's dietary diversity (out of seven food groups).

Table 5.3 Summary of average marginal effects from a probit: Minimum acceptable diet

Independent variable	Dependent variable: Minimum acceptable diet = 1, 0 otherwise				
	Bangladesh	**Cambodia**	**Ghana**	**Mozambique**	**Nepal**
	n = 705	*n* = 292	*n* = 391	*n* = 488	*n* = 1,370
Panel 1: Total reproductive work					
Poor	n/a	-0.469	-0.533	-0.325**	-0.262
		(0.487)	(0.524)	(0.165)	(0.257)
	n/a	0.024	0.097***	0.013	-0.001
Log of reproductive work time		(0.029)	(0.027)	(0.011)	(0.026)
Log of reproductive work time ×	n/a	0.071	0.081	0.035	0.043
poor		(0.081)	(0.092)	(0.030)	(0.044)
Panel 2: Domestic work					
Poor	n/a	-0.218*	-0.209	-0.176**	-0.048
		(0.121)	(0.148)	(0.071)	(0.151)
Log of domestic work time	n/a	0.003	0.042***	0.010	0.013
		(0.015)	(0.014)	(0.007)	(0.014)
	n/a	0.050*	0.031	0.011	0.007
Log of domestic work time × poor		(0.029)	(0.031)	(0.015)	(0.029)
Panel 3: Cooking					
Poor	-0.558*	-0.156	-1.029**	-0.281***	n/a
	(0.326)	(0.212)	(0.482)	(0.073)	n/a
Log of cooking time	-0.014	0.014	0.017	0.007	n/a
	(0.011)	(0.018)	(0.015)	(0.008)	n/a
Log of cooking time × poor	0.113*	0.027	0.194**	0.034**	n/a
	(0.066)	(0.048)	(0.096)	(0.015)	n/a
Panel 4: Care					
Poor	0.069	-0.034	-0.004	-0.131*	-0.031
	(0.074)	(0.167)	(0.069)	(0.070)	(0.126)
Log of caregiving time	0.006	0.016	0.005	0.000	0.003
	(0.009)	(0.013)	(0.010)	(0.006)	(0.013)
Log of caregiving time × poor	-0.018	-0.004	-0.024	0.000	0.003
	(0.017)	(0.032)	(0.020)	(0.022)	(0.026)
Panel 5: Total productive work					
Poor	0.004	0.004	-0.082	-0.278***	-0.073
	(0.038)	(0.096)	(0.122)	(0.058)	(0.084)
Log of productive work time	-0.003	-0.009	0.016**	-0.014***	0.004
	(0.010)	(0.013)	(0.008)	(0.005)	(0.007)
	-0.021	-0.018	0.004	0.036***	0.011
Log of productive work time × poor	(0.022)	(0.022)	(0.022)	(0.009)	(0.015)
Panel 6: Agriculture					
Poor	n/a	-0.024	-0.001	-0.282***	-0.058
		(0.088)	(0.090)	(0.060)	(0.083)
Log of time in agriculture	n/a	-0.006	0.004	-0.014***	0.014**
		(0.012)	(0.007)	(0.005)	(0.007)
	n/a	-0.008	-0.015	0.037***	0.007
Log of time in agriculture × poor		(0.023)	(0.017)	(0.010)	(0.015)

Table 5.3 Continued

Independent variable	Dependent variable: Minimum acceptable diet = 1, 0 otherwise				
	Bangladesh *n* = 705	Cambodia *n* = 292	Ghana *n* = 391	Mozambique *n* = 488	Nepal *n* = 1,370
Panel 7: Nonagriculture					
Poor	n/a	-0.023	-0.088*	n/a	n/a
		(0.067)	(0.049)		
	n/a	-0.011	0.011	n/a	n/a
Log of time in nonagriculture		(0.014)	(0.008)		
	n/a	-0.054	0.030	n/a	n/a
Log of time in nonagriculture × poor		(0.041)	(0.020)		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Other independent variables include mother's age and education; age and sex of the child; whether there is a younger child present in the household; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana,; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Table 5.4 Summary of average marginal effects from a probit: Minimum dietary diversity

Independent variable	Dependent variable: Minimum dietary diversity = 1, 0 otherwise				
	Bangladesh *n* = 662	Cambodia *n* = 292	Ghana *n* = 391	Mozambique *n* = 488	Nepal *n* = 1,370
Panel 1: Total reproductive work					
Poor	n/a	-0.424	-1.197**	-0.237	-0.134
		(0.456)	(0.560)	(0.181)	(0.264)
	n/a	0.006	0.033	0.010	0.003
Log of reproductive work time		(0.030)	(0.028)	(0.019)	(0.026)
	n/a	0.066	0.191*	0.020	0.013
Log of reproductive work time × poor		(0.076)	(0.099)	(0.033)	(0.045)
Panel 2: Domestic work					
Poor	n/a	-0.208*	-0.198	-0.185*	-0.026
		(0.113)	(0.142)	(0.108)	(0.144)
Log of domestic work time	n/a	-0.005	0.030**	0.005	0.012
		(0.016)	(0.015)	(0.011)	(0.015)
	n/a	0.052*	0.019	0.014	-0.007
Log of domestic work time × poor		(0.028)	(0.031)	(0.025)	(0.027)
Panel 3: Cooking					
Poor	-0.745*	-0.207	-0.308	-0.045	n/a
	(0.428)	(0.205)	(0.227)	(0.077)	
Log of cooking time	0.052	0.018	0.006	0.002	n/a
	(0.044)	(0.020)	(0.019)	(0.011)	
Log of cooking time × poor	0.145	0.041	0.043	-0.028	n/a
	(0.092)	(0.047)	(0.047)	(0.019)	
Panel 4: Care					
Poor	-0.022	-0.035	-0.144*	-0.295***	-0.035
	(0.328)	(0.171)	(0.083)	(0.103)	(0.130)
Log of caregiving time	-0.016	-0.003	-0.001	0.005	0.001
	(0.034)	(0.014)	(0.012)	(0.008)	(0.013)
Log of caregiving time × poor	-0.015	0.001	0.014	0.054**	-0.006
	(0.074)	(0.032)	(0.025)	(0.026)	(0.027)

Table 5.4 Continued

Independent variable	Dependent variable: Minimum dietary diversity = 1, 0 otherwise				
	Bangladesh	Cambodia	Ghana	Mozambique	Nepal
	n = 662	*n* = 292	*n* = 391	*n* = 488	*n* = 1,370
Panel 5: Total productive work					
Poor	-0.040	0.057	-0.123	-0.101	-0.122
	(0.164)	(0.096)	(0.122)	(0.071)	(0.079)
Log of productive work time	0.009	0.003	0.015	-0.014**	0.001
	(0.041)	(0.013)	(0.010)	(0.007)	(0.007)
	-0.072	-0.030	0.001	-0.007	0.012
Log of productive work time × poor	(0.058)	(0.022)	(0.023)	(0.017)	(0.015)
Panel 6: Agriculture					
Poor	n/a	0.011	-0.046	-0.099	-0.113
		(0.087)	(0.097)	(0.071)	(0.079)
Log of time in agriculture	n/a	0.005	0.006	-0.013*	0.010
		(0.012)	(0.009)	(0.007)	(0.007)
	n/a	-0.017	-0.018	-0.008	0.010
Log of time in agriculture × poor		(0.023)	(0.020)	(0.017)	(0.015)
Panel 7: Nonagriculture					
Poor	n/a	-0.004	-0.134**	n/a	n/a
		(0.068)	(0.061)		
	n/a	-0.005	0.015	n/a	n/a
Log of time in nonagriculture		(0.014)	(0.010)		
	n/a	-0.074*	0.021	n/a	n/a
Log of time in nonagriculture × poor		(0.039)	(0.023)		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Other independent variables include mother's age and education; age and sex of the child; whether there is a younger child present in the household; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Table 5.5 Summary of average marginal effects from a probit: Minimum meal frequency

Independent variable	Dependent variable: Minimum meal frequency = 1, 0 otherwise				
	Bangladesh	Cambodia	Ghana	Mozambique	Nepal
	n = 662	*n* = 292	*n* = 391	*n* = 488	*n* = 1,370
Panel 1: Total reproductive work					
Poor	n/a	-0.175	-0.495	0.091	-0.022
		(0.353)	(0.638)	(0.219)	(0.275)
Log of reproductive work time	n/a	0.036	0.041	0.003	-0.037
		(0.023)	(0.031)	(0.024)	(0.024)
Log of reproductive work time × poor	n/a	0.028	0.101	-0.037	0.019
		(0.059)	(0.113)	(0.041)	(0.047)
Panel 2: Domestic work					
Poor	n/a	-0.013	-0.060	-0.010	0.125
		(0.094)	(0.175)	(0.118)	(0.139)
Log of domestic work time	n/a	0.014	0.016	0.013	0.006
		(0.013)	(0.016)	(0.014)	(0.013)
Log of domestic work time × poor	n/a	0.003	0.032	-0.023	-0.006
		(0.024)	(0.038)	(0.028)	(0.026)

Table 5.5 Continued

Independent variable	Dependent variable: Minimum meal frequency = 1, 0 otherwise				
	Bangladesh	**Cambodia**	**Ghana**	**Mozambique**	**Nepal**
	n = 662	*n* = 292	*n* = 391	*n* = 488	*n* = 1,370
Panel 3: Cooking					
Poor	-0.378	0.095	-0.144	0.022	n/a
	(0.267)	(0.243)	(0.228)	(0.096)	
Log of cooking time	-0.004	0.018	0.015	0.028**	n/a
	(0.016)	(0.016)	(0.021)	(0.014)	
Log of cooking time × poor	0.087	-0.025	0.048	-0.030	n/a
	(0.055)	(0.054)	(0.048)	(0.023)	
Panel 4: Care					
Poor	0.013	0.003	0.175**	-0.130*	0.119
	(0.107)	(0.134)	(0.089)	(0.073)	(0.129)
Log of caregiving time	-0.004	0.025**	-0.005	-0.018	-0.028**
	(0.011)	(0.012)	(0.013)	(0.011)	(0.014)
Log of caregiving time × poor	0.004	-0.005	-0.038	0.014	-0.006
	(0.024)	(0.026)	(0.027)	(0.022)	(0.026)
Panel 5: Total productive work					
Poor	0.035	0.011	0.034	-0.162*	0.126*
	(0.053)	(0.087)	(0.151)	(0.092)	(0.066)
Log of productive work time	0.003	-0.006	0.014	-0.010	0.002
	(0.014)	(0.012)	(0.011)	(0.010)	(0.006)
Log of productive work time × poor	-0.010	-0.006	0.009	0.016	-0.007
	(0.028)	(0.020)	(0.028)	(0.020)	(0.012)
Panel 6: Agriculture					
Poor	n/a	0.054	0.092	-0.156*	0.128**
		(0.078)	(0.112)	(0.091)	(0.064)
Log of time in agriculture	n/a	0.001	0.004	-0.007	0.007
		(0.011)	(0.010)	(0.010)	(0.006)
Log of time in agriculture × poor	n/a	-0.022	-0.004	0.015	-0.008
		(0.020)	(0.023)	(0.020)	(0.012)
Panel 7: Nonagriculture					
Poor	n/a	-0.025	0.060	n/a	n/a
		(0.063)	(0.069)		
Log of time in nonagriculture	n/a	-0.013	0.014	n/a	n/a
		(0.013)	(0.012)		
Log of time in nonagriculture × poor	n/a	0.026	0.021	n/a	n/a
		(0.034)	(0.026)		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Other independent variables include mother's age and education; age and sex of the child; whether there is a younger child present in the household; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household in age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/ division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Table 5.6 Summary of ordinary least squares estimates: children's dietary diversity (out of seven food groups)

Independent variable	Dependent variable: Children's dietary diversity (7 food groups)				
	Bangladesh	**Cambodia**	**Ghana**	**Mozambique**	**Nepal (6-59 months)**
	n = 662	*n* = 318	*n* = 391	*n* = 488	*n* = 3,623
Panel 1: Total reproductive work					
Poor	n/a	-1.815	-3.826*	-0.167	0.253
		(1.417)	(2.175)	(0.526)	(0.327)
Log of reproductive work time	n/a	-0.007	0.038	0.011	0.017
		(0.084)	(0.102)	(0.070)	(0.029)
Log of reproductive work time × poor	n/a	0.308	0.611	-0.005	-0.069
		(0.233)	(0.388)	(0.098)	(0.057)
Panel 2: Domestic work					
Poor	n/a	-0.315	-0.445	-0.041	0.168
		(0.344)	(0.532)	(0.301)	(0.196)
Log of domestic work time	n/a	0.022	0.066	0.037	0.021
		(0.058)	(0.059)	(0.042)	(0.021)
Log of domestic work time × poor	n/a	0.099	0.015	-0.040	-0.059
		(0.085)	(0.118)	(0.072)	(0.037)
Panel 3: Cooking					
Poor	-0.721*	-1.002**	-1.895***	-0.079	n/a
	(0.426)	(0.456)	(0.714)	(0.241)	
Log of cooking time	0.055	0.060	0.014	-0.043	n/a
	(0.043)	(0.059)	(0.078)	(0.041)	
Log of cooking time × poor	0.139	0.240**	0.335**	-0.046	n/a
	(0.092)	(0.108)	(0.150)	(0.059)	
Panel 4: Care					
Poor	-0.020	0.149	-0.645**	-0.533***	0.025
	(0.330)	(0.534)	(0.282)	(0.201)	(0.105)
Log of caregiving time	-0.017	0.058	-0.053	-0.025	-0.001
	(0.034)	(0.047)	(0.047)	(0.033)	(0.013)
Log of caregiving time × poor	-0.015	-0.039	0.116	0.139**	-0.041*
	(0.074)	(0.099)	(0.089)	(0.059)	(0.024)
Panel 5: Total productive work					
Poor	-0.041	0.113	-0.234	-0.359	-0.309***
	(0.164)	(0.292)	(0.433)	(0.234)	(0.117)
Log of productive work time	0.008	-0.048	0.071*	-0.041	-0.002
	(0.041)	(0.046)	(0.042)	(0.029)	(0.010)
Log of productive work time × poor	-0.072	-0.047	-0.032	0.041	0.034
	(0.059)	(0.069)	(0.082)	(0.053)	(0.021)
Panel 6: Agriculture					
Poor	n/a	-0.028	-0.178	-0.326	-0.288***
		(0.258)	(0.387)	(0.228)	(0.111)
Log of time in agriculture	n/a	-0.056	0.041	-0.031	0.004
		(0.044)	(0.038)	(0.028)	(0.010)
Log of time in agriculture × poor	n/a	0.002	-0.053	0.033	0.030
		(0.071)	(0.076)	(0.052)	(0.020)

Table 5.6 Continued

Independent variable	Dependent variable: Children's dietary diversity (7 food groups)				
	Bangladesh *n* = 662	**Cambodia** *n* = 318	**Ghana** *n* = 391	**Mozambique** *n* = 488	**Nepal (6-59 months)** *n* = 3,623
Panel 7: Nonagriculture					
Poor	n/a	0.155	-0.431**	n/a	n/a
		(0.212)	(0.217)		
Log of time in nonagriculture	n/a	0.008	0.042	n/a	n/a
		(0.054)	(0.043)		
Log of time in nonagriculture × poor	n/a	-0.230***	0.068	n/a	n/a
		(0.079)	(0.096)		

Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

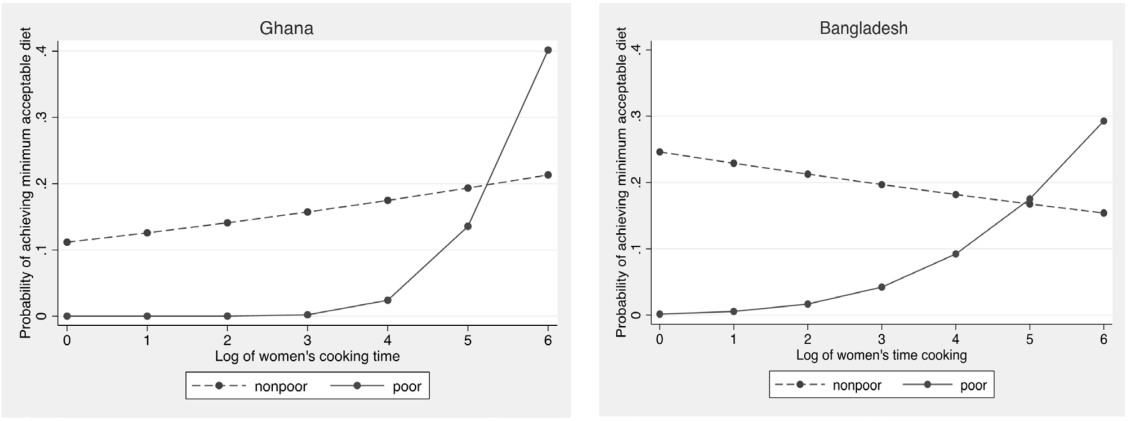
Notes: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Other independent variables include mother's age and education; age and sex of the child; whether there is a younger child present in the household; the household size; the household head's age, schooling, and occupation; the size of cultivable land for Bangladesh; a dummy for owning agricultural land for Ghana and Nepal; dummy variables for owning large livestock or small livestock; the number of people in the household by age categories 0–4, 5–10, 11–18, 19–59, and 60 and up, disaggregated by sex; the dependency ratio; region/division/province/urban dummy variables; religion dummy variables for Bangladesh and Ghana; and caste dummy variables for Nepal. n/a indicates that the data were not available.

Women's Domestic Work and Cooking

Women's time in domestic work increases their dietary diversity in Cambodia and Nepal; the same is true for poor women in Ghana. Further, women who spend more time cooking have improved diets in Bangladesh, Cambodia, Ghana, and Nepal,[19] suggesting that those close to the pot have better diet quality.

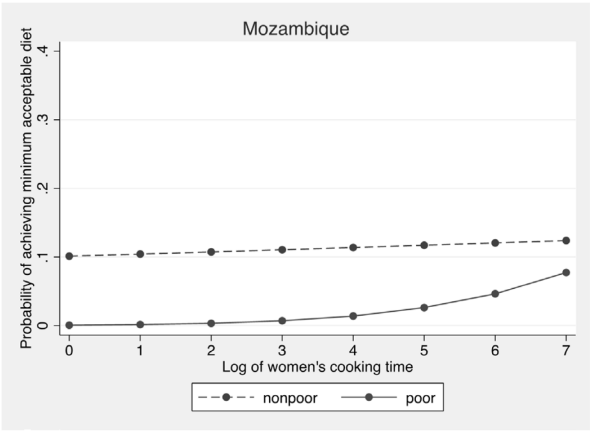
For children's dietary quality outcomes, women's domestic work is positively correlated with achieving a minimum acceptable diet and minimum dietary diversity in Ghana; the correlation also holds true for children in poor households in Cambodia. Furthermore, women's cooking time has a positive effect on the likelihood that poor children consume a minimum acceptable diet in Bangladesh, Ghana, and Mozambique (as shown in Figure 5.1), but the effect is insignificant for nonpoor children.

Figure 5.1 Predicted marginal effects of women's cooking time on achieving minimum acceptable diet by poverty in Bangladesh, Ghana, and Mozambique (from a probit model)



[19] In Nepal, cooking time is included in domestic work, and domestic work has a positive effect on women's dietary diversity.

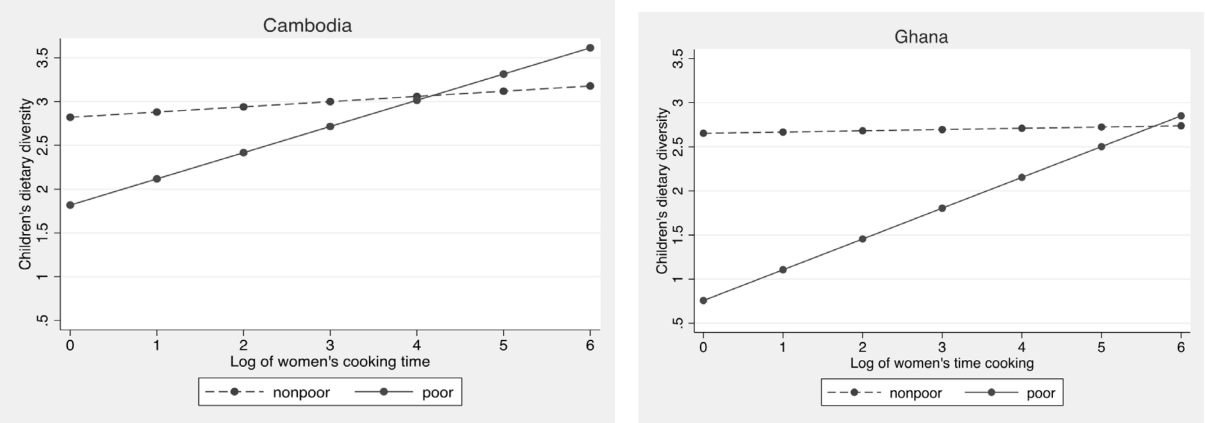
Figure 5.1 Continued



Sources: Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh and Feed the Future surveys for Ghana (2012) and Mozambique (2012–2013).

Women's cooking time also improves poor children's dietary diversity scores in Cambodia and Ghana, as presented in Figure 5.2, but its effect is insignificant for nonpoor children.

Figure 5.2 Predicted margins of women's cooking time on children's dietary diversity (out of seven food groups) by poverty in Cambodia and Ghana (from an ordinary least-squares regression)



Sources: Authors' calculations using data from Feed the Future surveys for Cambodia (2012) and Ghana (2012).

We find that women's cooking time does not impact minimum dietary diversity and meal frequency except in one case. In Mozambique, cooking time increases the chances that children attain minimum meal frequency. Unlike the results on minimum acceptable diet, the effect of cooking time on meal frequency in Mozambique does not vary by poverty status. Not having enough time to cook affects poor and nonpoor children equally in attaining minimum meal frequency because meal frequency does not measure the quality of diet, as the number of food groups consumed does.

These results suggest that lack of cooking time has a detrimental effect on women's dietary diversity and children's dietary diversity in poor households but does not have any impact on children in nonpoor households. Therefore children in nonpoor households—households with more assets—are less sensitive to reductions in cooking time; women can spend less time cooking but their children can still achieve more diverse diets than poor children.

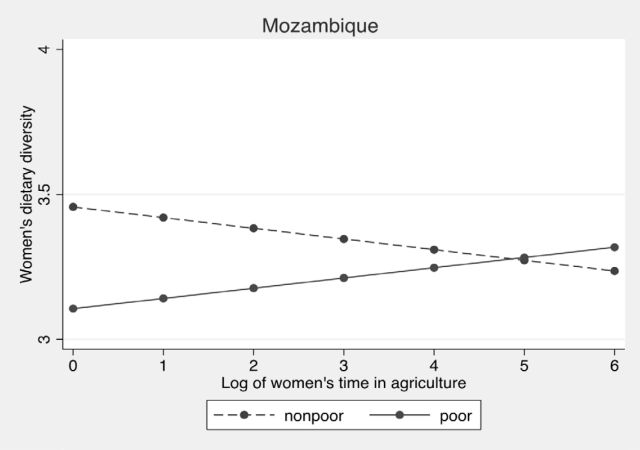
Women's Time in Caregiving

We find evidence that caregiving can be compatible with having more diverse diets. Women's caregiving improves their own dietary diversity in Ghana; the same is true of poor women in Bangladesh. For poor children in Mozambique, women's caregiving is correlated with higher children's dietary diversity scores and a greater probability of achieving minimum dietary diversity, and in Cambodia, women's time in caregiving has a positive effect on children's minimum meal frequency. However, in Nepal, caregiving can come at the expense of nutrition-improving activities when a woman is faced with a time constraint. In Section 3, the descriptive statistics revealed that women in Nepal have the largest workloads among the five countries. Our regression results show that time spent in caregiving reduces women's dietary diversity, children's probability of achieving minimum meal frequency, and poor children's dietary diversity scores.

Women's Time in Agriculture

We find a negative and significant relationship between working long hours in agriculture and women's dietary diversity in Ghana and Mozambique, suggesting that engaging in agriculture conflicts with nutrition-improving activities. However, in Mozambique, the interaction effect between time spent in agriculture and being poor is positive (Figure 5.3). Even though poor women have less diverse diets than nonpoor women, engaging in agriculture is correlated with higher dietary diversity scores, which implies that the income and consumption effects from agriculture dominate the substitution effect of spending less time in reproductive work.

Figure 5.3 Predicted effects of women's time in agriculture on their dietary diversity by poverty in Mozambique (from an ordinary least-squares regression)



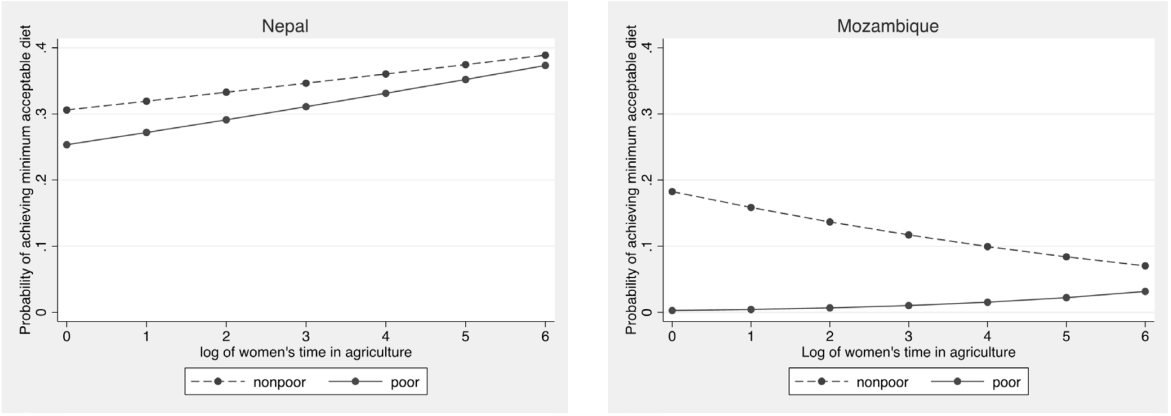
Source: Authors' calculations using Feed the Future survey for Mozambique (2012–2013).

While the data do not reveal whether the agricultural work involved receiving cash or food, the summary statistics in Table 3.5 reveal that most women in Mozambique (96.6 percent) were involved in cash crop farming. This suggests that working in agriculture provides poor women with food or incomes from cash crop farming, confirming the first two agriculture-nutrition pathways, which identify agriculture as an important source of income and food for the poor (Kadiyala et al. 2014; Ruel and Alderman 2013). Agriculture could also increase women's status within the household, which in turn improves their nutrition (Kadiyala et al. 2014).

Women's working long hours in agriculture has no effect on child dietary quality outcomes in Cambodia and Ghana. In Nepal, a woman's engagement in agriculture increases the likelihood of her child's achieving a minimum acceptable diet. The descriptive statistics in Section 3 reveal that most

women in Nepal were engaged in food crop farming; hence, engaging in agriculture may provide children with a better-quality diet. In Mozambique, agriculture lowers nonpoor children's likelihood of consuming a minimum acceptable diet, but for poor children, the reverse is found, as shown in Figure 5.4. Therefore for children in Nepal and poor children in Mozambique, the income and consumption effects from agriculture exceed the substitution effect of reduced time in reproductive work.

Figure 5.4 Predicted marginal effects of women's time in agriculture on children's minimum acceptable diet by poverty in Nepal and Mozambique (from a probit model)



Sources: Authors' calculations using Feed the Future survey for Mozambique (2012–2013) and baseline survey of Suaahara project for Nepal (2012).

Women's Time in Nonagricultural Work

Long hours spent in nonagricultural work improve women's dietary diversity in Ghana, while in Cambodia, the interaction effect with being poor is negative, suggesting that for poor women, nonagricultural work is associated with less diverse diets (although the effect is only weakly significant). For children, women's nonagricultural work is correlated with a lower probability of attaining a minimum dietary diversity and lower children's dietary diversity scores among poor children in Cambodia.

Other Factors Affecting Maternal and Child Nutrition

Looking at other factors affecting nutrition, we do not find any evidence of a gender bias in children's diet quality. The only model that shows a significant effect of being a girl is found in Ghana, where girls are more likely to achieve a minimum acceptable diet.

Owning small livestock has a positive effect on women's dietary diversity in Cambodia and Nepal and on children's diets in Bangladesh, Ghana, and Nepal, consistent with findings in India (Kadiyala et al. 2014). However, small livestock ownership has a negative effect on children's dietary diversity in Mozambique. In contrast, owning large livestock is correlated with more diverse diets for children in Mozambique.

Using wood, dung, or agricultural residue as the main source of cooking fuel reduces women's dietary diversity in Bangladesh, Mozambique, and Nepal, and children's dietary diversity in Ghana, Mozambique, and Nepal. However, since our first-stage estimations show that the source of cooking fuel does not have any effect on women's time allocation, this is indicative of a wealth effect: women and children in poorer households consume less diverse diets.

We find that men's occupations impact diet quality. Women's dietary diversity in Ghana and Nepal, and children's diet quality in Cambodia and Nepal are improved when men have been involved in nonfarm work in the past year. In Bangladesh, women have more diverse diets when the head of household is a trader.

Children in Muslim households in Ghana are less likely to consume a minimum acceptable diet and achieve minimum dietary diversity, which may be because the data collection took place during Ramadan. However, women in Muslim households do not consume less diverse diets than other women. Children in the middle and low castes face a lower probability of achieving minimum dietary diversity in Nepal. In Bangladesh, women in Hindu households have less diverse diets, but residing in Hindu households does not affect children's diets. Educated women consume more diverse diets in Cambodia and Nepal, and they are more likely to have children with higher dietary diversity scores in Mozambique and Nepal.

Last, we find no evidence that household composition has any effect on maternal and child nutrition, with a single exception in Nepal. Having a greater number of women aged 11–18 in the household improves the likelihood that a child will attain minimum meal frequency, suggesting that the presence of other caregivers can improve IYCF practices and child nutrition.

6. CONCLUSION

Using data from five countries, we examined whether the lack of women's time in reproductive work leads to poorer maternal and child nutrition, and whether an increase in women's time in agriculture or productive work has a detrimental effect on maternal and child nutrition.

We found evidence that poor and nonpoor households experience different impacts on nutrition from women's time use on reproductive and agricultural work. For reproductive work, our results show that lack of time to cook negatively impacts women's dietary diversity and poor children's diet quality but does not impact nonpoor children.

On the whole, women's and children's nutrition in nonpoor households appears to be less sensitive to reductions in time on reproductive work. In part, this is because they start from different places, with nonpoor households more likely to achieve adequate nutrition than poor households, and nonpoor households less time-burdened than poor households. In contrast, in poor households, reductions in women's reproductive work time tend to be more detrimental to nutrition, especially for children.

Nonpoor households—households with more assets—achieve better nutrition outcomes with less time in reproductive work than the poor. Assets enhance the overall impact of reproductive work time on nutrition. From this evidence, it is clear that agricultural development interventions need to be particularly careful to not encroach on the time of women in poor households, especially because these women already face greater time constraints than women in nonpoor households.

There are several ways women can reduce their time burden in reproductive work without detracting from nutrition. We found evidence of substitution by girls and older women in the household, especially in cooking and caregiving. There was also some substitution by boys in caregiving. Transformation of gender norms, with men taking on greater responsibility in domestic work, can help reduce women's work burdens.

Another way to reduce time burdens in reproductive work is to increase access to time-saving assets or technologies, as suggested by Johnston and others (2015). However, our theoretical framework predicts that the nutrition effect of time-saving technologies in domestic work is not so clear-cut because women may shift toward farm work. Agricultural interventions that introduce capital that saves time in domestic work should therefore be careful to ensure that the other effects of capital offset the potential reduction in nutrition-improving activities. The shift itself away from domestic work is not necessarily detrimental, because the overall effect on nutrition depends on the type of capital investments, which in turn determine whether the consumption, income, nutrition productivity, and agricultural productivity effects on nutrition outweigh the reproductive time displacement effect. Consistent with the predictions of the theoretical model, we see from the empirical evidence that the net effect of capital on nutrition is often positive. However, we do not know the relative strengths of the five effects posited in the theoretical model because the data do not allow for income measurements.

Furthermore, the data show that additional time in reproductive work is not always beneficial for nutrition. Women's time in caregiving can be compatible with improving maternal and child nutrition, but in the case of Nepal, where women are most time burdened, caregiving time negatively impacts women's dietary diversity and poor children's dietary diversity and meal frequency. In situations where women face extreme time constraints, caregiving may come at the expense of other activities that would enhance diets for women and children.

Women's time in agricultural work also has differential impact on poor versus nonpoor households. Working long hours in agriculture has a detrimental effect on women's dietary diversity in Ghana and that of nonpoor women in Mozambique, confirming the prediction of the agriculture-nutrition pathways and the theoretical model. However, for poor women and children in Mozambique, and children in Nepal, women's working in agriculture in fact increases dietary diversity. This suggests that agriculture as a source of food and income is particularly important for the poor (Kadiyala et al. 2014; Ruel and Alderman 2013).

Our empirical findings suggest that the impact of policy interventions on women's time allocation and nutrition outcomes are likely to vary by socioeconomic status and local context. They also imply that assets are important mediators of the nutrition impact of time use, often enhancing it. Poor women are extremely time constrained and would have to spend much more time in nutrition-enhancing activities in order to catch up with nonpoor households' nutrition levels—time that they do not have. However, certain assets can reduce the time necessary to achieve adequate nutrition. The theoretical model could provide a useful tool to identify what kinds of investments are appropriate for women's and children's nutrition and where the trade-offs of agricultural investments can be in affecting women's time and nutrition.

REFERENCES

Akerlof, G. A., and R. E. Kranton. 2000. "Economics and Identity." *Quarterly Journal of Economics* 115 (3): 715–753.

Alkire, S., R. Meinzen-Dick, A. Peterman, A. Quisumbing, G. Seymour, and A. Vaz. 2013. "The Women's Empowerment in Agriculture Index." *World Development* 52: 71–91.

Arimond, M., D. Wiesmann, E. Becquey, A. Carriquiry, M. C. Daniels, M. Deitchler, N. Fanou-Fogny, M. L. Joseph, G. Kennedy, Y. Martin-Preve, and L. E. Torheim. 2010. "Simple Food Group Diversity Indicators Predict Micronutrient Adequacy of Women's Diets in 5 Diverse, Resource-Poor Settings." *The Journal of Nutrition* 140 (11): 2059S–2069S. doi:10.3945/jn.110.123414.2059S.

Balagamwala, M., H. Gazdar, and H. B. Mallah. 2015. *Women's Agricultural Work and Nutrition in Pakistan: Findings from Qualitative Research*. LANSA Working Paper 2015, 02. Leveraging Agriculture for Nutrition in South Asia.

Bhalotra, S. 2010. "Fatal Fluctuations? Cyclicality in Infant Mortality in India." *Journal of Development Economics* 93 (1): 7–19. doi:10.1016/j.jdeveco.2009.03.006.

Bittman, M., P. England, L. Sayer, N. Folbre, and G. Matheson. 2003. "When Does Gender Trump Money? Bargaining and Time in Household Work." *American Journal of Sociology* 109 (1): 186–214. doi:10.1086/378341.

Cunningham, K., S. Kadiyala, S. Chakrabati, H. J. L. Malapit, P. Menon, K. Singh, P. Tyagi, and W. Quabili. 2013. *Suaahara Baseline Survey Report*. Washington, DC: International Food Policy Research Institute.

Engle, P. L., P. Menon, and L. Haddad. 1999. "Care and Nutrition: Concepts and Measurement." *World Development* 27 (8): 1309–1337. doi:10.1016/S0305-750X(99)00059-5.

Famine Early Warning Systems Network (FEWS NET). 2014.*Mozambique Livelihood Zones*. Washington, DC: USAID. Accessed June 2015. http://www.fews.net/sites/default/files/documents/reports/MZ%20LHdescriptions%20August%202013%20en3.pdf.

Feed the Future FEEDBACK. 2014. *Feed the Future Mozambique Zone of Influence Baseline Report*. Rockville, MD, US: Westat.

GIEWS (Global Information and Early Warning System on Food and Agriculture) and FAO (Food and Agriculture Organization of the United Nations). 2015. *GIEWS Country Brief—Bangladesh*. Rome.

Gillespie, S., J. Harris, and S. Kadiyala. 2012. "The Agriculture-Nutrition Disconnect in India: What Do We Know ?" Discussion Paper 01187. Washington, DC: International Food Policy Research Institute.

Glick, P. 2002. *Women's Employment and Its Relation to Children's Health and Schooling in Developing Countries: Conceptual Links, Empirical Evidence, and Policies*. Cornell Food and Nutrition Policy Program Working Paper 131. Ithaca, NY, US: Cornell University.

Headey, D., A. Chiu, and S. Kadiyala. 2012. "Agriculture's Role in the Indian Enigma: Help or Hindrance to the Crisis of Undernutrition?" *Food Security* 4 (1): 87–102. http://link.springer.com/10.1007/s12571-011-0161-0.

Higgins, P.A., H.Alderman. 1997. "Labor and Women's Nutrition: The Impact of Work Effort and Fertility on Nutritional Status." *The Journal of Human Resources* 32 (3): 577-595.

Johnston, D., S.Stevano, H.Malapit, E.Hull, S.Kadiyala. 2015. *Agriculture, Gendered Time Use, and Nutritional Outcome: A Systematic Review*. IFPRI Discussion Paper 01456. Washington, DC: International Food Policy Research Institute.

Kadiyala, S., J. Harris, D. Headey, S. Yosef, and S. Gillespie. 2014. "Agriculture and Nutrition in India: Mapping Evidence to Pathways." *Annals of the New York Academy of Sciences* 1331: 43–56. doi:10.1111/nyas.12477.

Kennedy, G., T. Ballard, and M. Dop. 2011. *Guidelines for Measuring Household and Individual Dietary Diversity*. Rome: Food and Agriculture Organization of the United Nations.

Kevane, M., and B. Wydick. 2001. "Social Norms and the Time Allocation of Women's Labor in Burkina Faso." *Review of Development Economics* 5 (1): 119–129.

Lamontagne, J. F., P. L. Engle, and M. F. Zeitlin. 1998. "Maternal Employment, Child Care, and Nutritional Status of 12–18-Month-Old Children in Managua, Nicaragua." *Social Science & Medicine* 46 (3): 403–414. doi:10.1016/S0277-9536(97)00184-6.

Malapit, H. J. L., and A. R. Quisumbing. 2015. "What Dimensions of Women's Empowerment in Agriculture Matter for Nutrition in Ghana?" *Food Policy* 52: 54–63. doi:10.1016/j.foodpol.2015.02.003.

Rani, M. U., and K. C. Rao. 1995. "Socio-economic and Demographic Factors as Predictors of Nutrition and Health Knowledge of Mothers in Rural Andhra Pradesh." *Journal of Research APAU* 23 (2): 12–16.

Rao, S., A. Kanade, B. M. Margetts, C. S. Yajnik, H. Lubree, S. Rege, B. Desai, A. Jackson, and C. H. D. Fall. 2003. "Maternal Activity in Relation to Birth Size in Rural India: The Pune Maternal Nutrition Study." *European Journal of Clinical Nutrition* 57 (4): 531–542. doi:10.1038/sj.ejcn.1601582.

Ruel, M. T., Alderman, H., and the Maternal and Child Nutrition Study Group. 2013. "Nutrition-sensitive Interventions and Programmes: How can They Help to Accelerate Progress in Improving Maternal and Child Nutrition?." *The Lancet* 382 (9891): 536–551.

Singh, I., L. Squire, and J. Strauss. 1986. *Agricultural Household Models: Extensions, Applications, and Policy*. Baltimore: Johns Hopkins University Press.

Smith, L. C., U. Ramakrishnan, A. Ndiaye, L. Haddad, and R. Martorell. 2003. *The Importance of Women's Status for Child Nutrition in Developing Countries*. Research Report 131. Washington, DC: International Food Policy Research Institute. http://www.ifpri.org/publication/importance-womens-status-child-nutrition-developing-countries.

Sraboni, E., H. J. Malapit, A. R. Quisumbing, and A. U. Ahmed. 2014. "Women's Empowerment in Agriculture: What Role for Food Security in Bangladesh?" *World Development* 61: 11–52. doi:10.1016/j.worlddev.2014.03.025.

Tickner, V. 1996. *Food Security in Cambodia: A Preliminary Assessment.* Geneva: United Nations Research Institute for Social Development.

UNICEF. 1990. *Strategy for Improved Nutrition of Children and Women in Developing Countries*. New York.

Vuthy, T., K. Socheat, K. Pirom, C. Chhun, and P. Dary. 2013. *HARVEST Baseline Study Report.* Phnom Penh: US Agency for International Development.

WFP (World Food Programme). 2012. *Nepal Food Security Bulletin 35*. Rome.

———. 2013. *Nepal Food Security Bulletin 37*. Rome.

WHO (World Health Organization). 2008. *Indicators for Assessing Infant and Young Child Feeding Practices. Part 1: Definitions.* Geneva.

World Bank. 2015. *World Development Indicators 2015.* Washington, DC. Accessed November 6, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.

Zereyesus, Y. A., Ross, K. L., Amanor-Boadu, V., T. J. Dalton. 2013. *Baseline Feed the Future Indicators for Ghana 2012.* Manhattan, KS, US: Department of Agricultural Economics, Kansas State University.

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