ZEF-Discussion Papers on Development Policy No. 337

Sundus Saleemi, Crystal Bubune Letsa, Johnny Owusu-Authur, Abubakri Mohammed, Sylvia Baah-Tuahene, Marilyn Yeboah, Rose Omari

Impacts of mothers' time on children's diets

Bonn, January 2024

Sundus Saleemi, Crystal Bubune Letsa, Johnny Owusu-Authur, Abubakri Mohammed, Sylvia Baah-Tuahene, Marilyn Yeboah, Rose Omari, Impacts of mothers' time on children's diets, ZEF – Discussion Papers on Development Policy No. 337, Center for Development Research, Bonn, January 2024, pp. 46.

ISSN: 1436-9931

Published by:
Zentrum für Entwicklungsforschung (ZEF)
Center for Development Research
Genscherallee 3, D – 53113 Bonn, Germany
Phone: +49-228-73-1861 | Fax: +49-228-73-1869
E-Mail: zef@uni-bonn.de | www.zef.de

The authors:
Sundus Saleemi, Center for Development Research, University of Bonn.
Contact: ssaleemi@uni-bonn.de
Crystal Bubune Letsa, Council for Scientific and Industrial Research of Ghana - Science and Technology Policy Research Institute (CSIR-STEPRI), Accra, Ghana. Contact: letsacrystal@gmail.com
Johnny Owusu-Authur, CSIR-STEPRI, Accra, Ghana. Contact: jonnieowusu@gmail.com
Abubakri Mohammed, CSIR-STEPRI, Accra, Ghana. Contact: abubakarim62@gmail.com
Sylvia Baah-Tuahene, CSIR-STEPRI, Accra, Ghana. Contact: sbaahtuahene@gmail.com
Marilyn Yeboah, CSIR-STEPRI, Accra, Ghana. Contact: sbaahtuahene@gmail.com
Rose Omari, CSIR-STEPRI, Accra, Ghana. Contact: rose.omari@yahoo.com

Acknowledgements

The study is part of the "Program of Accompanying Research for Agricultural Innovation" (PARI), which is funded by the German Federal Ministry of Economic Cooperation and Development (BMZ).

The data for the paper was collected in collaboration with CSIR-STEPRI, Accra, Ghana. Zaneta Kubik provided helpful feedback on an earlier draft of the paper. The authors also thank Heike Baumüller and Joachim von Braun for their support, comments and feedback on various drafts of the paper. We are also grateful to Andrew Aziz for his editorial support.

All errors and omissions are our own.

Abstract

This paper provides insights into how variances in time spent by mothers in home production (i.e., domestic and care work) impact children's diets. We test the hypothesis that a decrease in the time spent by mothers in home production negatively impacts children's diets. Moreover, the paper considers whether substitute caregivers and improved water infrastructure can reduce these impacts. We use primary data from women traders in three markets in two regions in Ghana. Primary data collected from women traders includes women's time use, the food consumed by children in the previous 24 hours, and the socio-economic and demographic characteristics of the traders' households. To overcome the empirical challenge in estimating the relationship, we focus on the differences in the time spent by women traders in home production due to the differing demands on their time on "market" and "non-market" days. Market days are specified days for markets in a given geographic location. Market days are characterized by heightened trading activity, with more buyers and more competition. A comparison of the diets of traders' children on market and non-market days allows for the attribution of effects to changes in the time spent by their mothers in home production while keeping other factors constant. The results suggest that children of women traders are significantly less likely to have achieved Minimum Meal Frequency (MMF) and Minimum Acceptable Diet (MAD) on market days compared to non-market days. This is accompanied by fewer hours spent by women in home production on market days. However, the paper also finds evidence that in certain scenarios the negative effect of demands on women traders' time on children's diets can be mitigated by substitute caregivers and the availability of water infrastructure.

Keywords: Home Production, Dietary Diversity, Diet Adequacy, Children's Diets, Women's Work, Time Use

JEL codes: B54, D13, J2

Table of Contents

1 Introduction

Children's nutrition is determined by complex interactions of several factors including, but not limited to, food intake, food quality/quantity, nutrient absorption and retention, and physical activity. External environmental factors including hygiene and sanitation also play a crucial role. Women typically play a key role in the caregiving of infants and young children and are also responsible for providing food for the family (Ruel et al., 2013; Johnston et al., 2018). Women's access, knowledge and ability to provide healthy, nutritious and diverse food have implications for the nutrition and overall health of children. Thus, the time women spend in home production (i.e., cooking, cleaning, and providing care and supervision to children) potentially impacts these health and nutrition outcomes. The goods (e.g., cooked food) and services (e.g., clean surroundings) women provide are alternatives to those purchased from the market and may contribute to the diets and nutrition levels of children who consume them. However, in addition to home production, women perform other work such as engaging in agriculture (e.g., farming and livestock), business, trading, and other on- or off-farm paid work. There are time trade-offs between home production and other work (Quisumbing et al., 2013; van den Bold et al., 2021). If women spend time in agriculture or paid work outside the home, they may not be able to undertake home production work, such as preparing balanced, healthy, and nutritious food, maintaining adequate hygiene or accessing health services for their children (Bhalotra, 2010). This is also because men typically do not share this work, as social norms including gender roles often preclude their participation. This is corroborated by analyses of time use data, which show that gender gaps in the time spent by men and women in home production persist globally and are wide in many countries of the Global South (Charmes, 2019). Therefore, we can expect that an increase in the time spent by women in other activities reduces outputs from home production and these changes may have implications for their children who are the consumers of its output. As this output includes food, it could have implications for children's diets and, thus, their nutrition. However, due to the accompanying changes in home production, such as a change in income due to a shift from home production to paid work, its impact on children's diets and nutrition is not well-known.

In this paper, we provide insights into how children's diets are affected by the time women have available for home production, contributions from substitute caregivers, and improved access to water infrastructure. We hypothesize that a decrease in a mother's time in home production negatively impacts children's diets and that assistance from substitute caregivers and domestic water infrastructure improvements can help ameliorate these impacts. A novel approach is employed to estimate this effect. We use primary data from women traders in three markets in two regions in Ghana. These markets provided us with an opportunity to observe the changes in women's time use in different types of work due to an exogenous factor. The exogenous factor is the allocation of some days of the week as "market" days. "Market days" are specified days for markets in a given geographic location. Market days experience heightened trading activity and are characterised by more buyers and more competition. Traders arrive at the market earlier and leave at a later time on market days compared to non-market days.[1] A comparison of the diets of traders' children on market and non-market days allows us to attribute the effects to changes in the time spent by mothers in home production, while keeping other factors constant. Moreover, we compare the impact of day type on the diets of children who have an alternative caregiver in the household and those who do not. Furthermore, we assess if the presence of water infrastructure impacts the effect of time demands on these diets.

It is challenging to accurately establish the impact of women's home production on children's diets. First, there are no or little-known metrics for the output of home production. The time spent by individuals in activities subsumed under home production can be used as proxy indicator. However, data on time use is also not widely available, particularly in developing countries. Second, estimating the effect of changes in women's time use patterns on children's dietary outcomes poses several econometric challenges. It may be that changes in children's diets due to a factor other than time use induce mothers to change their time use patterns. For example, it may be that a decrease in household income causes a deterioration of children's diets thereby inducing women to increase the number of hours in paid work. Cross sectional regressions may show a negative association of hours in paid work and dietary quality/quantity in such situations without a negative impact of changes in hours of paid work on dietary quality/quantity. A cross-sectional correlation between changes in time use patterns and diets may also be due to simultaneity or confounders. Individuals may decide to change their time use patterns and the quality/quantity of their children's diets at the same time. Such simultaneous decisions may cause a correlation between changes in time use patterns and diet quality without a causal effect of changes in time use on diets. Similarly, changes in time use patterns may induce other changes, such as earned income, leading to changes in diets. This paper attempts to overcome these challenges by exploiting variations in time in home production due to an exogenous factor that is the allocation of some days in the market as market days.

It has been observed in earlier research that interventions in crop production that increased the demands on women's time negatively impacted the time they spent on childcare (Paolisso et al. 2002). In Zambia, households that adopted hybrid maize were observed to suffer from seasonal malnutrition correlated with the added time burden women faced with agricultural demands (Kumar, 1995). On the other hand, such remunerated work provides women with income that can be used to purchase market-based substitutes for outputs of home production. These substitutes may offset the impact of any reduction in the output of home production. Other factors, such as household socioeconomic characteristics, women's education, education of other members of the household and broader food environment are also likely to play a role (Heady, 2013; Grassi, Landberg & Huyer, 2015). Domestic

[1] Markets are open throughout the week and traders work both on market and non-market days.

technologies and infrastructure may also mitigate the negative effects reduced home production may have on children's diets. Households with access to electricity, domestic appliances and running water would require fewer hours of work for the same output than those without. Therefore, the direction and magnitude of the impacts of changes in home production on nutrition are not well known and are difficult to estimate (Padmaja et al. 2019).

This paper attempts to help fill this gap in the literature by providing additional details on the possible impacts changes in mothers' time use has on children's diets. We compare the differences in the demands on mothers' time due to exogenous factors to better understand the impacts on measures of children's dietary diversity and meal frequency. It is hypothesized that higher demands on women's time on market days negatively impact children's diets. Moreover, we assess the role of substitute caregivers and access to water infrastructure in mediating the impact of mothers' time demands.

Specifically, the following research questions are posed: 1. Do mothers' time demands negatively impact children's diets? 2. Does the presence of alternative caregivers mediate the effect of mothers' time demands on children's diets? 3. Does household access to piped water impact the relationship between mothers' time demands and children's diets?

Survey data were collected from women traders on both market and non-market days. The data includes time spent by women in various activities in the previous 24 hours, the food consumed by the traders' eldest and youngest children in the previous 24 hours and socio-economic and demographic characteristics of the traders' households. For the analysis of infants' (ages 6-23 months) diets, our dependent variables are the WHO's suggested indicators of dietary diversity and meal frequency for infants and young children. An adequate diet, which includes both diversity and meal frequency, is indispensable for children's physical and cognitive development, preventing malnutrition, stunting, and deficiency of micronutrients (WHO, 2017). The indicators used are Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF) and Minimum Acceptable Diets (MAD) (Seymour et al. 2019). MDD is a binary indicator of adequate dietary diversity for infants aged 6-23 months. An infant is considered to have achieved MDD if five of eight food groups (including breast milk) were consumed by the infant in the previous 24 hours. MMF is the minimum acceptable meal frequency for infants.[2,3] These indicators have been validated in a variety of contexts and have been found to correlate with adequate micronutrient intake (Verger et al. 2019). Dietary diversity indicators have been shown to predict childhood nutrition (Headey, 2013). Moreover, these indicators are sensitive to changes in food environments and do not require large samples for validation (Herforth and Ballard, 2016). For children above 23 months, we use the Dietary Diversity Score (DDS) out of nine food groups.[3] A binary indicator is created

[2] Nutrition Landscape Information System (NLis), Nutrition and nutrition-related health and development data. World Health Organization (WHO). https://www.who.int/data/nutrition/nlis/info/infant-and-young-child-feeding

[3] The details of the indicators are presented in data and methods section of the paper.

that takes value 1 if children consumed at least four out of nine food groups in the previous day. We also use the DDS score (1-9) as the dependent variable.

The paper provides two key contributions to the literature on home production and children's nutrition. First, we quantify the impact of home production on a key development outcome, that is, children's diets. Second, in line with SDG goal 5.4, it makes visible the contribution of women's unpaid work to key development outcomes.

2 Literature Review

Few studies have directly estimated the impact of home production on children's dietary and nutritional outcomes. Some recent literature, particularly that exploring pathways from interventions in agriculture to household nutrition, includes changes in women's time burdens as a potential pathway from interventions in agriculture to nutrition (Kadiyala, et al., 2014; Johnston et al., 2015; Johnston et al., 2018; Padmaja et al., 2019). This pathway, however, has not been empirically explored extensively. In a review of studies on the impacts of agricultural interventions on various outcomes, only nine studies were identified as having assessed impacts on women's time use, and fewer identified its link with nutrition (Johnston et al. 2018). Moreover, activities that divert women's time away from home production may, in fact, affect children's nutrition through other pathways (Ruel et al. 2013). Gillespie, Harris & Kadiyala (2012) provide a comprehensive overview of studies that test the various pathways linking agriculture and nutritional outcomes. Among these pathways are changes in women's participation in agricultural activities and its associated impacts on women's incomes, decision making and voice within households. The authors note that a majority of the studies that analysed the pathways from women's engagement in agriculture to nutritional outcomes did not directly observe these outcomes but used proxies instead.

Earlier literature on the impact of mothers' time on children's outcomes focussed not on home production, but instead analysed the impact of women's participation in the labour force on children's outcomes, including nutrition. For example, Blau et al. (1996) used longitudinal data of mothers and infants from one city in the Philippines to estimate the effect of mothers' wage work on children's height and weight. Their results suggest a role of wages in mediating this impact where higher wages appear to positively contribute to children's nutrition. Their results suggest that higher wages earned by mothers potentially compensate for the loss of output from mothers' home production. However, in contexts where wages or earnings are not high enough or when market alternatives to home production are not available, a negative impact on children's outcomes can be expected. Bamji & Thimayamma (2000) examine differences in the levels of various dietary and nutrition indicators between children of working and non-working mothers in selected rural areas in one state in South India. The authors have collected rich data on children and their mothers in various seasons. Although the comparisons of outcomes cannot establish causality, they find that children of working mothers had higher rates of vitamin B complex deficiency. While they did not find any significant differences in the breastfeeding practices of working and non-working mothers, children of working mothers appeared to be introduced to complementary foods later than children of non-working mothers. However, it should be noted that women in these areas were more likely to engage in paid employment out of economic obligation, as is the case in many parts of the world.

Paolisso et al. (2002) model the effects of participation in an agricultural improvement project in areas of Nepal on the time women household heads spent engaged in work related to the care of preschool children. The intervention included training households to shift from subsistence to cash cultivation of crops. Results showed that this shift was accompanied by an increase in farming intensity and associated time investment, with a significant decrease in households' participation in time spent in care work. This result was for households with one child of preschool age and was not observed for households with more children of the same age.

Two studies by Bhalotra (2010) and Rani & Rao (1995) found that women's participation in paid agriculture work resulted in negative effects on children's health and nutrition. Headey, Chiu, and Kadiyala (2011) also directly assess changes in women's childcare due to employment in agriculture but reported no significant differences. The authors emphasize a need for a detailed examination of the impact of women's childcare on children's nutrition and health. Masset, Haddad, Cornelius, & Isaza-Castro (2012) reviewed studies on the effectiveness of agricultural interventions in low- and middle-income countries on nutritional outcomes, fining that robust evidence was lacking. Areas such as the impact of changes in care practices are rarely assessed and evidence is lacking even for areas that studies have attempted to explore, such as changes in income and diets.

Quisumbing et al. (2013) assess changes in assets, household decisions and time allocation in response to interventions in dairy farming in parts of rural Bangladesh. The results of their analysis relevant to our study are the impacts on the allocation of time to various activities, such as childcare and domestic work, by members of household. The findings are mixed, with primary females in households participating in the program spending significantly fewer hours in childcare and domestic work compared to a control group comprised of households in the same locality. Compared to another control group, however, the authors found an increase in the overall time on these activities. This contrast is attributed to the nature of the intervention, which may have shifted households' overall work away from the farm and towards their homestead, thus allowing them to also spend more time domestic and care work.

Komatsu, Malapit & Theis (2015) are among the recent studies that estimate the impact of women's time use on children's nutrition using cross-country data from Bangladesh, Ghana, Mozambique, and Nepal. They find mixed results depending on the country context and income status of the households. Their analysis of children's dietary quality shows a positive effect of women's domestic work on children's diets in Ghana and Cambodia. They also find a positive effect of cooking time on children's minimum acceptable diets for Bangladesh, Ghana and Mozambique—but only in poor households. Their overall results suggest a positive relationship between women's care-related activities and the quality of children's diets. Van den Bold et al. (2020) test the changes in men's and women's time use in response to a program and then assess the impacts of these changes on women's and children's nutritional outcomes. The children's outcome variables assessed in the study are stunting and wasting, prevalence of diarrhoea, and anaemia. Their data do not show any effect of participation in the program on children's nutritional outcomes due to changes in women's time use.

Njuki et al. (2016) assess the impact of an intervention in the dairy sector on households' nutrition outcomes proxied by dietary indicators and infant feeding practices. Among the areas explored are the changes in the time spent by women livestock farmers in the intervention areas on childcare and activities besides livestock. In their sample, there were no significant differences between the time spent by women in households of various levels of production intensity. However, they found that in households with high-intensity dairy production—that is, households that had taken up the interventions—infants started foods complementary to breastfeeding earlier than those in low-intensity or medium-intensity households.

In addition to having an impact through the home production channel, time use is hypothesized to impact nutrition directly as well. Individuals regularly engaging in physically strenuous activities without fulfilling their dietary needs may experience an impact on their nutrition. One study (Padmaja et al., 2019) assesses the direct pathway from an individual's time use in activities of varying physical demands and his/her nutritional status. While the paper does not explore if women's time use impacts children's diets through changes in activities surrounding the preparation of food and maintenance of hygiene, the authors conjectured (based on their data) that these practices are not changed due to time demands. Other studies have looked at only the changes in time use without extending the analysis to its impact on nutrition. Picchioni et al. (2020) use a novel dataset on time use and energy expenditure in various activities collected using wearables. The two case studies presented in the paper corroborate that women and men spend similar time in productive activities but women spend considerably more time and energy in reproductive activities. They also find higher seasonality in productive work and almost none in reproductive work. Rowland, et al (2022) is a mixed methods study on the time use of men and women smallholder farmers in palm plantations in Indonesia. Their qualitative analysis suggests trade-offs between women's time in care and domestic work and the time demands due to their participation in production-related activities. However, their quantitative analysis suggests reproductive labour to be relatively inelastic, with women working outside the home balancing their reproductive work with paid work by sacrificing their rest and leisure time.

The literature reviewed here can be summarized in four key takeaways. First, the impact of changes in women's time use on children's dietary outcomes has been conceptualized but lacks empirical support (Ruel et al., 2013; Webb & Kennedy, 2014; Njuki et al., 2016). Second, empirical assessments of the impact of changes in time use on diets and nutrition yield mixed results; this may be due to changes in other factors, such as income. Third, the impact of changes in time use on diets and nutrition has been conceptualized in recent literature focussing on agricultural households (Kadiyala, et al., 2014; Johnston et al., 2015; Johnston et al., 2018; Padmaja et al., 2019). Fourth, there is insufficient evidence on the role of infrastructure and alternative caregivers in mediating the impact of women's time use on children's outcomes particularly in developing country contexts. This paper attempts to fill the existing gaps in this area. In order to do this, we estimate the impact of changes in women's time use patterns on children's dietary outcomes in a setting where the changes are due to exogenous factors. Moreover, while in literature the impact is conceptualized for agricultural households, our analysis extends to non-agricultural settings.

3 Analytical Framework

This analysis is based on the analytical framework developed by Johnston et al. (2018), which delineates the pathways from agriculture to nutritional outcomes via time use. The framework charts these various channels through which agricultural interventions may impact nutritional outcomes since the impact such interventions have on nutrition remains unknown. Due to the various ways in which these outcomes may be impacted and how the impacts differ in terms of direction and magnitude, it is important to chart all these channels. Change in time demands, resulting from interventions in agriculture, is one pathway in the framework.

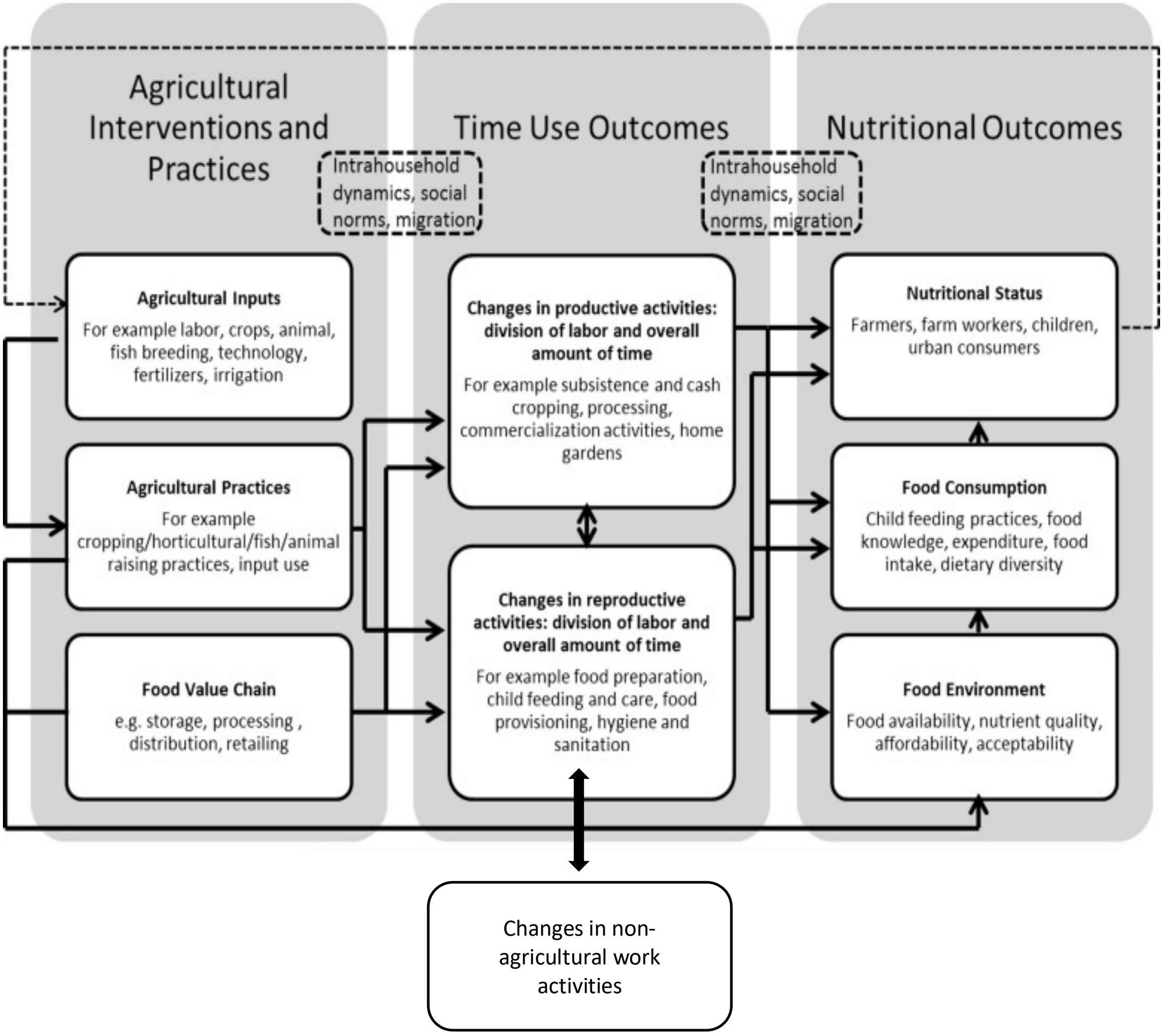

Figure 1: Source Johnston et al. (2018)

The framework posits a set of hypotheses regarding this pathway via women’s time use. It notes that women input significant time in agriculture. This input competes with demands on women’s time for procurement, preparation and provision of food. Interventions in the agriculture sector—such as diversification or expansion of households’ agricultural activities—may increase household members’ time demands for these activities, including that of women. The nature of changes in members' time demands depends on several factors, such as gendered cultural practices. Changes in women’s time demand may, in turn, impact their time input for food preparation and provision. However, the impact of these changes in time use on nutrition depends on other factors, such as fluctuations in food availability, incomes, etc. In this paper, we use the framework for a non-agricultural setting, specifically inquiring whether changes in women’s time demands due to their business may reduce their time input in activities that affect household nutrition. We assess the impact of changes in the time demands of women traders on their children’s diets. It is posited that time demands in the markets compete with the time needed for provisioning of good quality diet, which may result in a worsening of diet quality and/or quantity. However, reduced time input may be compensated in a number of ways. First, an increase in income may allow the consumption of more food. Second, the reduction in the time input by one member of the household may be compensated by another member of the household. Third, income may also allow individuals to purchase market substitutes, such as paid childcare or prepared meals.

4 Data and Methods

We employ primary data collected from 525 women traders in three markets in Ghana: two in Accra and one in Bono East region. Respondent characteristics were recorded and data was collected to assess households' socio-economic status and household demographics. Additionally, information on children's diets was recorded. All respondents were asked to report if their child had consumed food belonging to a list of 21 food groups (Appendix A). The respondents were also asked to report the number of times their children ate the previous day. As the survey was conducted in the market while traders were engaged in their work (to save respondents' time and to avoid exhaustion), only the diets of their eldest and youngest children were recorded. This information allows us to calculate infants' Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD). The three indicators constitute the World Health Organization's (WHO) guidelines for Infant and Young Child Feeding practices (IYCF). The indicators have been validated for children aged 6-23 months, which is why we calculate the values of these indicators for children of the traders in this age group. For our dataset, 90 children fall within this age group.

MDD is defined as the consumption of at least five out of the eight categories of food in the previous day.[4] The eight food groups are (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products (e.g., milk, yoghurt, cheese); (4) flesh foods (e.g., meat, fish, poultry, and liver/organ meats); (5) eggs; (6) vitamin-A rich fruits and vegetables; and (7) other fruits and vegetables. In 2017, the WHO updated the MDD indicator to include breastmilk as the eighth food group. A binary indicator is created which takes the value 1 if MDD is achieved on the previous day, and zero otherwise. MMF is defined as (1) two feedings for breastfed infants 6–8 months old, (2) three feedings for breastfed children 9–23 months old, or (3) four feedings for non-breastfed children 6–23 months old (of which at least two feedings must be milk feeds).[5] A binary indicator similarly indicates with value one if MMF is attained during the previous day, zero otherwise. MAD is defined as a breastfed child having achieved MDD and MMF the previous day or a non-breastfed child having received MDD and MMF and at least two feedings of milk.

For traders' children above two years, we construct an individual dietary diversity score (DDS) based on a nine-food group classification.[6] Steyn et al (2014) test individual DDS indicators for their efficacy in predicting the mean adequacy ratio (MAR) of 11 nutrients. DDS based on the nine-food group classification is highly correlated with MAR and a cut-off of four is

[4] World Health Organization. (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods.

[5] Our data does not include information on the number of times a particular food group was consumed the previous day. We therefore do not have information on if the child had one or more feedings of a particular food group. In our calculation of MMF, for non-breastfed children, we consider MMF = 1 if the child received four or more feedings the previous day.

[6] 1. Starch staples 2. Dairy 3. Organ Meat 4. Eggs 5.Flesh Food 6. Legumes and Nuts 7. Vitamin-A rich Green-Leafy Vegetables 8. Vitamin A-rich Fruit and Vegetables 9. Fruits and Vegetables (other)

suggested. MDD for children above two years is then defined as a child having consumed at least four of the nine food groups the previous day. We have this data for 206 children between the ages of two and five years.

By design, the survey was conducted on both market days and non-market days.[7] Market days are specified for each market in an area and trading activity is heightened on these days. In markets in the Greater Accra region, market days are Wednesdays and Saturdays. In the markets in the Bono East region, market days are Wednesdays, Thursdays, Fridays and Saturdays. As market days attract more buyers and more competition, traders arrive at the market earlier and leave at a later time compared to non-market days. A binary variable indicating the type of day (market or non-market day) is the explanatory variable of interest. Most traders work in the market throughout the week regardless of whether it was a market or non-market day. However, each respondent was asked the number of days they worked in the market and the data was analysed only for those who worked 5 or more days in Bono East and six or more days in Accra.[8]

The following equation was created to process the data:

$$MDD_i \ (or\ MMF_i \ or\ MAD) = \gamma_1 + \gamma_2 MarketDay_i + \gamma_3 Y_i + \gamma_4 X_i + \gamma_5 Accra_i + \varepsilon_i \qquad Eq\ (1)$$

Where,

- MDD_i = 1 if MDD (or MMF or MAD) was achieved the previous day
- $MarketDay_i$ = 1 if the previous day was a Market Day;
- Y_i are children's characteristics including child sex, age in months and if the child is the eldest or the youngest child;
- X_i are children's mothers and household characteristics including mother's age, literacy, marital status, the number of days working in the market, number of household members, households' monthly expenditure per capita and household wealth quintile; and
- $Accra_i$ is a binary indicator taking value 1 if the trader was in the market in Accra, 0 if it was in Bono East.

It is hypothesized that children are less likely to achieve MDD, MMF and MAD on market days compared to non-market days. However, the effect of women's time demands on children's diets is expected to be mitigated by the presence of alternative caregivers available to

[7] The time use module of the survey and module on children's diets referred to the previous 24-hrs and not the day the data was being collected. Therefore, the day of the week on the previous day was also recorded. Time Use and dietary diversity data is categorised as being from a market or a non-market day based on the day of the week it was a day prior to the survey. Market days in Accra are Wednesdays and Saturdays while in Bono East, Wednesday to Saturday are market days.

[8] A trader who works at least six days in Accra means that she must be working on both market and non-market days. Similarly, a trader who works at least 5 days in the Bono East, she must be working on both market and non-market days.

working mothers. Moreover, water infrastructure can help mothers and caregivers use their time more efficiently. Access to piped water can increase the efficiency of time in home production activity; carers may be able to prepare healthier, diverse diets more easily when they do not have to spend long periods collecting water for domestic use. To estimate the role of caregivers on diets, we add indicators for caregivers and piped water to equation (1). Responding traders were asked, "Who takes care of your child when you are in the market?" Responses included, "Husband/Child's Father", "Adult Women Member of the Household," "Adolescent Girl in the Household," "Adult Man Member of the household," "Adolescent Boy in the Household," "Paid Non-Household Member Adult," "Unpaid Non-Household Member Adult," "No One," or "Child Accompanies Mother to the Market." We construct a binary variable that takes value 1 if an alternate caregiver is available, and 0 if the child accompanies the mother to the market or is left by him/herself at home. We also add a binary indicator that takes value 1 if the traders' household received piped water. Then we calculate the marginal effect of day type at the two values of these binary indicators.

Additionally, we separately interact the binary indicator for market day with the indicators for alternate carer and the indicator for the presence of piped water in the household. Thus, the equation takes the following form:

$$MDD_i \ (or\ MMF_i \ or\ MAD) = \gamma_1 + \gamma_2 MarketDay_i + \gamma_4 PipeWat_i \ (or\ Care_i) + \gamma_5 MarketDay * PipeWat_i \ (or\ Care_i) + \gamma_6 Y_i + \gamma_7 X_i + \gamma_8 Accra_i + \varepsilon_i \qquad Eq\ (2)$$

Where,

- MDD_i , $MarketDay_i$, Y_i and X_i are as defined above;
- $PipeWat_i$ = 1 if the trader's household received piped water; and
- $Care_i = 1$ if the child was taken care of by an alternative caregiver in the household.

Table 1 summarizes our key variables. We have data on the diets of 90 children aged 6-23 months and 206 children aged 24 months and above. Among infants, only 29 percent achieved an MDD score the previous day (as indicated by the binary indicator), 75 percent of this sample met the MMF threshold, and only 26 percent of children received the MAD the previous day. Among older children, 45 percent had reportedly achieved the MDD score the previous day.

Table 1: Summary Statistics

	Infants (Aged 6-23 Months)					Children (Aged 24 - 67 months)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
Child Age, in months	90	13.8	4.55	6	23	206	45.0	12.8	24	67
Minimum Diet Diversity, Binary	90	0.29	0.45	0	1	206	0.45	0.50	0	1
Minimum Meal Frequency, Binary	90	0.76	0.43	0	1					
Minimum Acceptable Diet, Binary	90	0.26	0.43	0	1					
Mother's Age, in years	90	35.7	10.46	18	65	206	36.8	8.89	19	70
Mother's Marital Status, (% married/cohabiting)	90	0.77	-			206	0.54			
Mother Literacy (% literate)	90	0.52	-			206	0.51			
Household Size	90	5.15	2.01	2	10	206	4.72	1.57	2	10
Household Monthly Expenditure (Cedi)	90	3346.3	2329	437	13815	206	2,537	1,870	0	12,500
Expenditure per capita	90	631.2	450.1	70	1977	206	583.5	449.8	0	3,155
Market Day	90	0.20	-			206	0.21			
Days worked in the market	90	6.3	0.91	4	7	205	6.54	0.73	4	7

In the sample, the average age of mothers with infants and mothers with older children is 35.7 years and 37 years, respectively. The average mother is married and half of them are literate, with literacy defined as being able to read and write any language and performing basic numeracy. Mothers of older children in the sample were more likely to be divorced or separated than mothers of infants. There is a difference between the percentage of mothers of infants and mothers of older children who are married or cohabitating with partners; seventy-seven percent of infants' mothers live with their partners as opposed to fifty-four percent of older children.

The distribution of samples between market and non-market days is not balanced. By design, we surveyed traders on market and non-market days. However, because the dietary diversity and time use data refers to the 24 hours prior to the day of the survey, more data was obtained from non-market days (20 percent of observations refer to diets and time use on a market day and 80 percent are from non-market days). With regard to assessing days worked, the sample is restricted to traders who work both on market and non-market days, since it can be argued that there may be a selection of traders on market and non-market days. Also, the analysis is restricted to traders who worked six or more days in Accra and those who worked five or more days in Bono East. The average reported number of days worked in the market is six.

We claim that due to the demands on their mothers' time on market days, children are less likely to attain MDD, MMF, and MAD. However, it can be argued that traders working on market days are different from traders working on non-market days. As noted above, traders work in the same market throughout the week. Whether a trader was interviewed on a market day or a non-market day is a random selection. However, we see if there are any significant differences in potential factors impacting these variables between market and non-market days. We test if children's age, number of children, household monthly income, household monthly expenditure, household monthly expenditure per capita, and mother's literacy and age are significantly different for market and non-market days. The mean values and differences are reported below in Table 2 along with the t-statistic and p-values. There are no statistically significant differences between the mean values of all indicators, except the traders' with infant age children. It may be that younger women with small children are less likely to work on market days due to excessive time demands. We take this observation into account when interpreting our results.

Table 2: Summary Statistics disaggregated for Market and Non-Market Days

	Infants (Ages 6-23 Months)					**Children (Aged 24-67 months)**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
	Non-Market Day	**Market Day**	**Diff**	**t-stat**	**p**	**Non-Market Day**	**Market Day**	**Diff**	**t-stat**	**p**
Child Age, in months	13.5	15.1	-1.6	-1.37	0.173	44.6	46.5	-1.9	-0.851	0.40
Number of Children	2.6	3.2	-0.57	-1.46	0.148	2.5	2.7	-0.16	-0.75	0.45
Household Monthly Income	3345.6	3348.8	-3.17	-0.00	0.995	2991.7	3023	-31.27	-0.084	0.933
Household Monthly Expenditure	2876.4	2869.4	7.06	0.01	0.989	2535.0	2542.7	-7.63	-0.024	0.98
Expenditure per capita	644.5	578.2	66.30	0.55	0.579	602.1	515	87.1	1.14	0.255
Mother's Age	34.4	41.2	-6.91	-2.58	0.033	36.5	38.2	-1.72	-1.14	0.255
Observations	72	18				162	44			

5 Market and Non-Market Days and Traders' Time Use

In this paper, we have hypothesized that excess demand on women's time on market days negatively affects children's diets as they reduce the time in home production work. Home production includes cooking, maintenance of hygiene (cleaning home, kitchens, and surroundings, laundry, washing cooking utensils, helping children maintain personal hygiene and maintaining the hygiene of infants and young children), provision of water for drinking and other purposes, collecting fuel for cooking, providing care and supervision and many other tasks for the functioning of the household economy. Home production potentially impacts children's outcomes including diets, nutrition, health, education and overall well-being as it produces outputs (goods and services) consumed by household members including children. Here, we explore whether women traders spend significantly different time on home production on the market and non-market days.

The survey conducted in the markets included a time-use module. This module is based on the time use module for the Women's Empowerment in Agriculture Index (WEAI). The module asked the respondents to list the activities they were involved in during the previous day at each 30-minute interval (see Appendix Table 9). The intervals start from 4:00 a.m. to 3:49 a.m. the subsequent day. Activities are classified into 19 possible categories.[9] From the categories, we assess if women's time spent in home production differs on market and non-market days. Table 3 below, shows the average time spent by women traders in home production work on these two types of days. We calculate the mean values for the sample of traders with children aged 0-5 years.[10] There is a significant difference in the number of hours spent in home production work on market days compared to non-market days. Women traders report spending almost 7.1 hours on cooking, domestic work, and care work on non-market days and 4.6 hours on market days.[11] There also appears to be a reduced amount of time spent on the collection of fuel and water on market days and the overall time spent on participant's own business activity (market work) is longer, though, statistically non-significant.

[9] The categories are 1. Sleeping and resting 2. Eating and drinking 3. Personal care 4. School work 4. Work as employed 5. Own business Work 6. Farming/Livestock/Fishing 7. Shopping/Getting services 8. Weaving/Stitching/Textile care 9. Cooking 10. Domestic work 11. Fetching fuel/Firewood 12. Fetching water 13. Care of children/Elderly/Sick 14. Travelling/Commuting (including to workplace, farm) 15. Watching TV/Listening to radio/Reading 16. Exercising 17. Social activities and hobbies 18. Religious activities 19. Other

[10] Mean values for whole sample shown in Appendix Table 10

[11] To take multi-tasking into account, respondents could report more than one activity being performed in a time slot, one primary and one secondary activity. For example, cooking and domestic work if a woman cleaned and organized the kitchen while preparing food. The averages are unweighted means of the time reported.

Table 3: Time Spent in Minutes in Work on Market and Non-Market Days

	(1) Non-Market Day	(2) Market Day	(3) Diff	(4) t-stat	(5) p
Home Production [a,c] (in minutes)	427.5	281.6	145.8	1.71	0.089
Home Production [b,c], Water and Fuel (in minutes)	452.1	295	157.0	1.76	0.081
Own Work [c] (in minutes)	438.3	528.3	-90	-1.39	0.165
Observations	72	18			

a. Minutes spent in cooking, domestic work and care work
b. Home production plus minutes spent collecting fuel and water
c. To take multi-tasking into account, respondents could report more than one activity being performed in a time slot, one primary and one secondary activity. For example, cooking and domestic work if a woman cleaned and organized the kitchen while preparing food. These averages are the unweighted means of the total time reported.

It can be argued that this reduction in the time spent by women in home production work—particularly in the absence of suitable substitutes, either from the market or other adult members of the household—impacts children's dietary outcomes. As shown in Appendix Table 10, the differences in the time spent on these different types of work are also significant for the full sample of traders.

It can also be argued that traders may not have spent different time on home production on market and non-market days, but have reported different times due to a greater workload or stress on market days. The traders may have been too busy, distracted, or annoyed to respond carefully. This would mean that the differences in the time spent in home production on the two types of days are not due to the actual differences in time but due to the difference in reporting. We test if the reported time spent in various activities differs depending on whether the day of the interview was a market or a non-market day and find no significant differences in the means.

6 Results

First, we present our estimates of the impact of day type (market or non-market day) on the MMF, MDD, and MAD of infants. Then the estimated effects of day type on DDS of older children (ages 24 months and above) are presented. These results are followed by the estimates of the effects of the availability of piped water and the presence of alternative caregivers for the children.

6.1 Impact of Day Type on Minimum Meal Frequency (Infants, Age 6-23 Months)

Logit regressions are used to estimate Equation 1. In the first model, the outcome variable is Minimum Meal Frequency (MMF), which is a binary indicator that is assigned a value of one if the children in the sample aged 6-23 months achieved MMF the previous day. MMF is defined as (1) two feedings for breastfed infants age 6-8 months, (2) three feedings for breastfed children age 9-23 months, or (3) four feedings for non-breastfed children age 6-23 months. MMF is an indicator of diet sufficiency for infants aged 6-23 months, with explanatory variables including a binary indicator if the previous day was a market or non-market day. Control variables included in the model are the child's age, sex, and indicator if the child is the eldest or the youngest child in the household. The characteristics of mothers included as controls are age, literacy, and marital status. Household-level indicators included as control variables are household per capita expenditure per month and household size. Moreover, a household-level wealth index is calculated from the information on household assets and the household wealth quartile (based on the wealth index scores) is added as a control variable. Other market-related variables included as controls are binary indicators if the market was in Accra (1) or elsewhere (0). The standard errors are clustered at the respondent ID level as more than one child may be of the same respondent. The regression results are presented in Appendix Table 2.

Figure 2, below, shows the estimated probabilities that the child attained MMF on market and non-market days. The figure suggests that for both boys and girls, the probability that the child achieved the MMF is lower on market days compared to non-market days. The estimated average marginal effect (i.e., the impact of a change in the day from a market day to a non-market day on the probability that the child achieves MMF) is between 0.30 and 0.35. Thus, the probability that a child attains MMF is between 30 and 35 percent lower on a market day compared to a non-market day (see estimated marginal effects in Appendix Table 3).

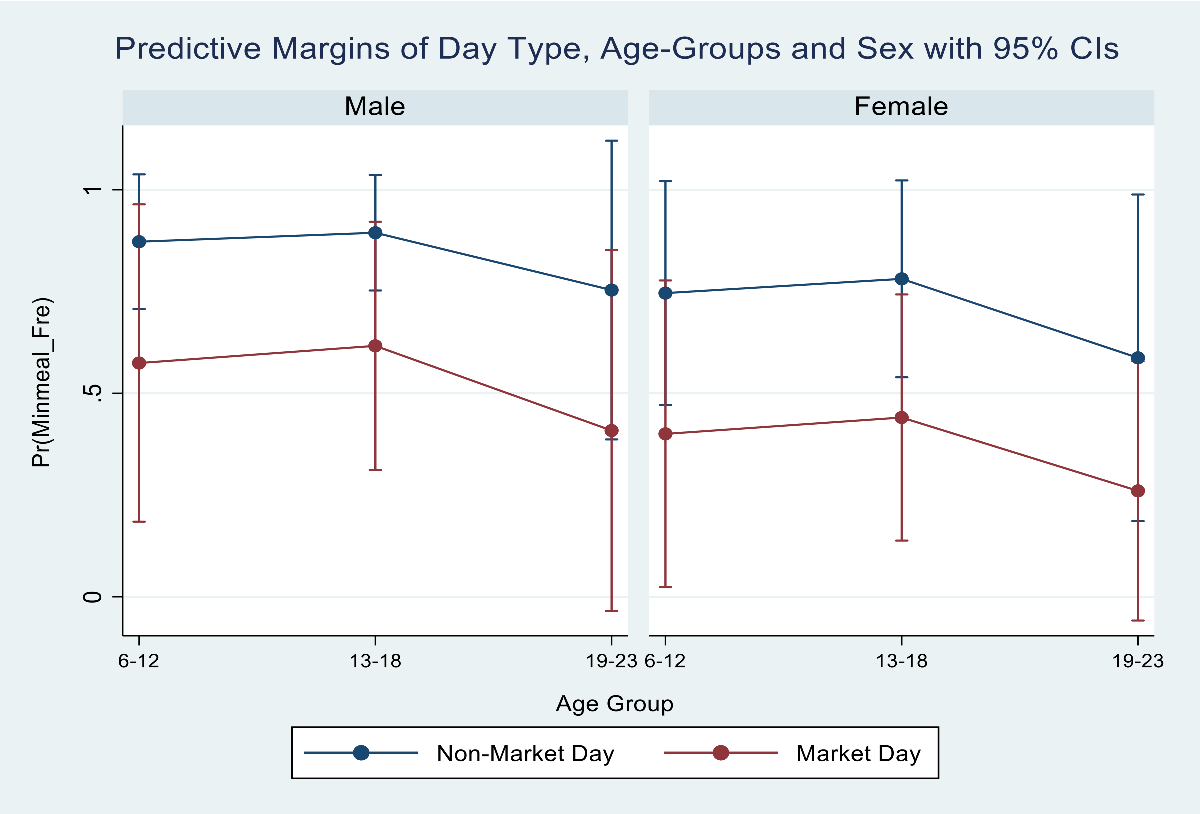

Figure 2: Predicted Margins for MMF on Market and Non-Market Day, by Sex and Age Group

6.2 Impact of Day Type on Minimum Dietary Diversity (Infants, Age 6-23 Months)

Equation 1 is also estimated with a binary indicator with MDD as the dependent variable. Analogous to the first model, control variables include child age and sex an indicator if the child is the eldest or the youngest, as well as characteristics related to the mother and household. Logit estimates are presented in the Appendix Table 2. Figure 3, below, shows the estimated probabilities that a child aged 6-23 months achieved MDD on market and non-market days. The probability that a child received MDD is higher on a non-market day compared to a market day. However, the difference is not statistically significant. The estimated marginal effects are shown in Appendix Table 3.

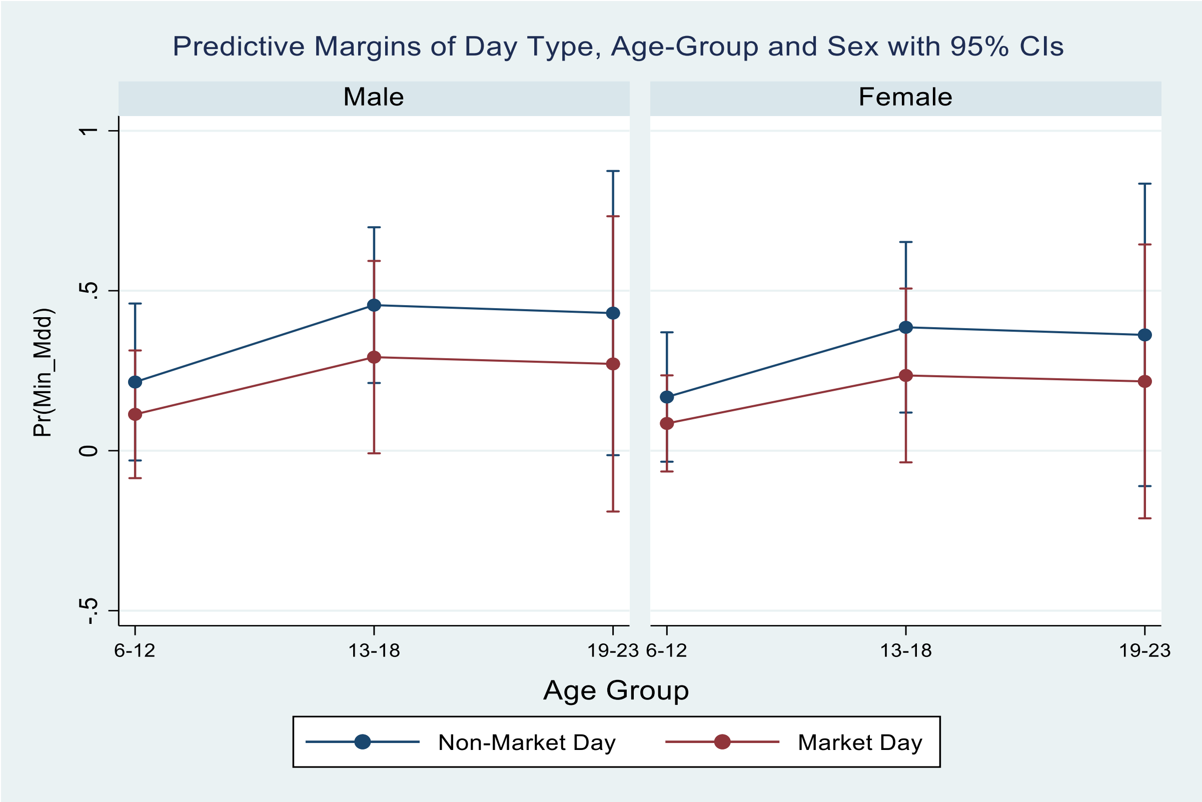

Figure 3: Predicted Margins for MDD on Market and Non-Market Day, by Sex and Age Group

6.3 Impact of Day Type on Minimum Acceptable Diet (Infants, Age 6-23 Months)

Finally, Equation 1 is used to estimate children's Minimum Acceptable Diet (MAD), which is defined as a breastfed child having achieved MDD and MMF the previous day or a non-breastfed child having received MDD and MMF and at least two feedings of milk.[5] All control variables—including child age, sex, an indicator if the child is the eldest or the youngest, and the mother's characteristics and household characteristics—are included. Logit estimates are presented in Appendix Table 2. Figure 4, below, shows the estimated probabilities that a child aged 6-23 months achieved MAD on market and non-market days. The probability that a child attained MAD is higher on a non-market day than on a market day. The estimated marginal effects are presented in Appendix Table 3. The probability that the child attains MAD is between 21 and 18 percent lower on market days than on non-market days.

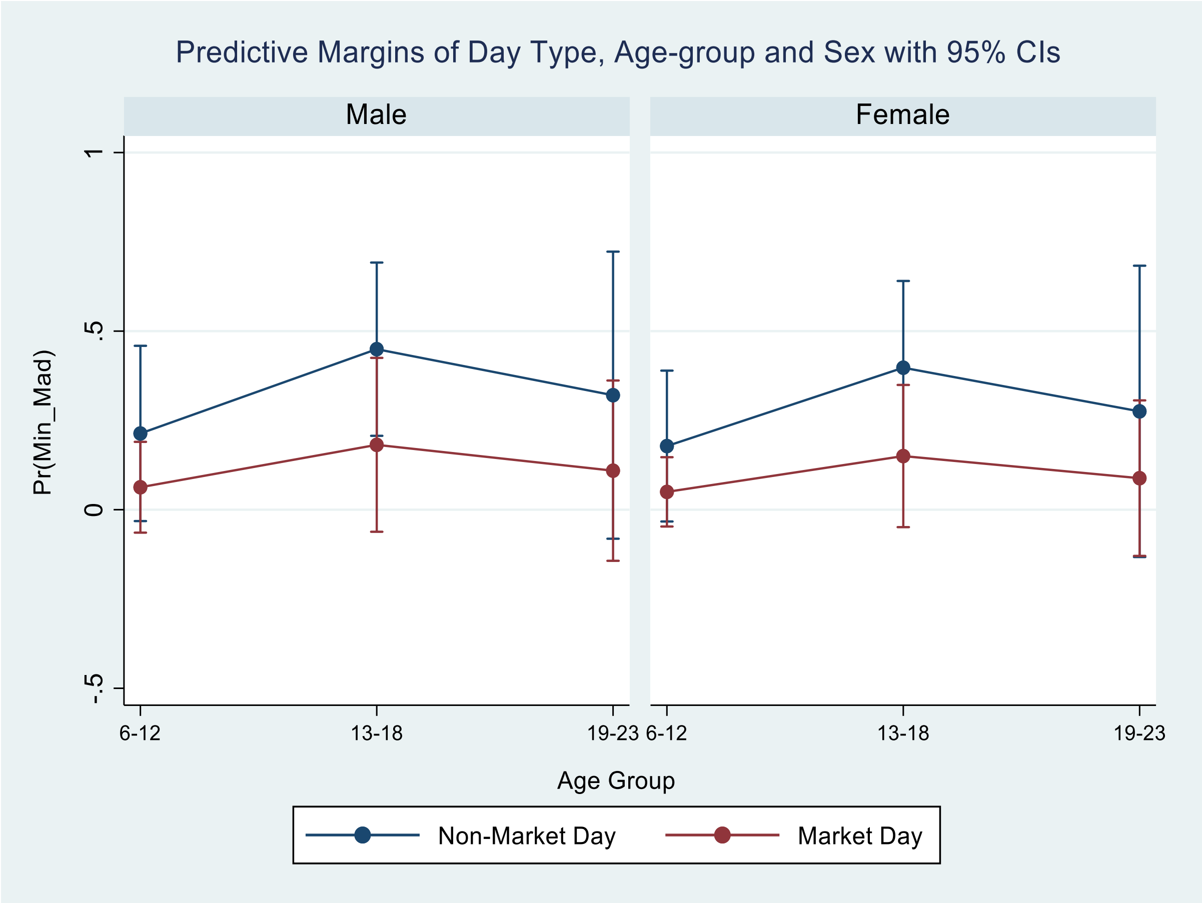

Figure 4: Predicted Margins for MAD on Market and Non-Market Day, by Sex and Age Group

In the foregoing analysis, we use the day type as the explanatory variable since we expect it to affect the time traders spend in different types of work. Provided that this change in the pattern of work on market and non-market days is due to this exogenous factor, the differences in the day type provide more precise estimates of the impact of changes in time patterns on children's dietary outcomes. However, we still estimate equation (1) substituting the explanatory variable "market days" with the log of hours in home production and business work. We do not find a significant effect of log hours home production on any of the three indicators. However, disaggregating this time spent in home production into its three components; care work, domestic work and cooking, shows a clearer picture. Estimates suggest a positive relationship between log hours in care work and MDD and MAD (Appendix Table 4). Perhaps unsurprisingly, but counter to our expectations, the hours spent in domestic work have a negative relationship with both MDD and MAD. Moreover, log hours in own business work are positively associated with MAD potentially capturing the effect of higher incomes earned with longer hours in business work. The estimated effect of change in log hours of care and domestic work and hours in own business work on the probability of achieving MMF, MDD and MAD are presented in Table 4 below.

Table 4: Average Marginal Effects of Hours in Care, Domestic and Own Business Work (in ln) on MMF, MDD and MAD

VARIABLES	(1) MMF	(2) MDD	(3) MAD
Own Work, ln	0.00647	0.0257	0.0357*
	(0.0241)	(0.0192)	(0.0183)
Care work, ln	0.0439	0.0560**	0.0641***
	(0.0311)	(0.0267)	(0.0232)
Domestic, ln	-0.0809*	-0.0966***	-0.106***
	(0.0449)	(0.0303)	(0.0245)
Observations	90	90	90

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.4 Impact of Day Type on Dietary Diversity Score (Children, Age 2 years and above)

The indicators of diet quality used in the above analysis are recommended by the WHO to monitor the diets of children aged 6-23 months. Women traders in our sample also had children older than 23 months.[12] To assess the impact of market days on the diets of older children (2 years and older), we use the information from the children's diets module to create the Dietary Diversity Score (DDS). The DDS is a simple count of nine possible food groups out of a pre-defined number of categories consumed by an individual the previous day. The nine food groups are (1) all starch staples, (2) dairy, (3) organ meat, (4) eggs, (5) flesh, (6) all legumes and nuts, (7) vitamin-A rich green-leafy vegetables, (8) vitamin-A rich fruits and vegetables, and (9) other fruits and vegetables. Steyn et al (2014) test the efficacy of DDS based on 6, 9, 13, and 21 food group classifications and find that all the food group classifications perform well to explain the adequacy ratios of micronutrients with the higher number of food categories performing slightly better. Our data allows us to calculate DDS out of nine food groups. A cut-off of four out of nine is suggested for assessments of children's

[12] Children in the sample are aged 24-67 months (Table 1 summarizes our key variables. We have data on the diets of 90 children aged 6-23 months and 206 children aged 24 months and above. Among infants, only 29 percent achieved an MDD score the previous day (as indicated by the binary indicator), 75 percent of this sample met the MMF threshold, and only 26 percent of children received the MAD the previous day. Among older children, 45 percent had reportedly achieved the MDD score the previous day.

Table 1).

dietary adequacy (i.e., having consumed at least 4 out of 9 food groups is considered an adequately diverse diet) and this is used to estimate Equation 1 for children aged 2 years and older. The dependent variable is a binary indicator that assigns a value of one if a child ate at least four food groups in the previous 24 hours. Figure 5 shows the estimated probability that a child achieved DDS on market versus non-market days. The estimated logit coefficients are shown in Appendix Table 5. The estimated average marginal effect of a market day on DDS is -0.16 (Appendix Table 3), meaning that children are on average 16 percent less likely to have achieved a DDS of four out of nine on a market day than on a non-market day (see Figure 5).

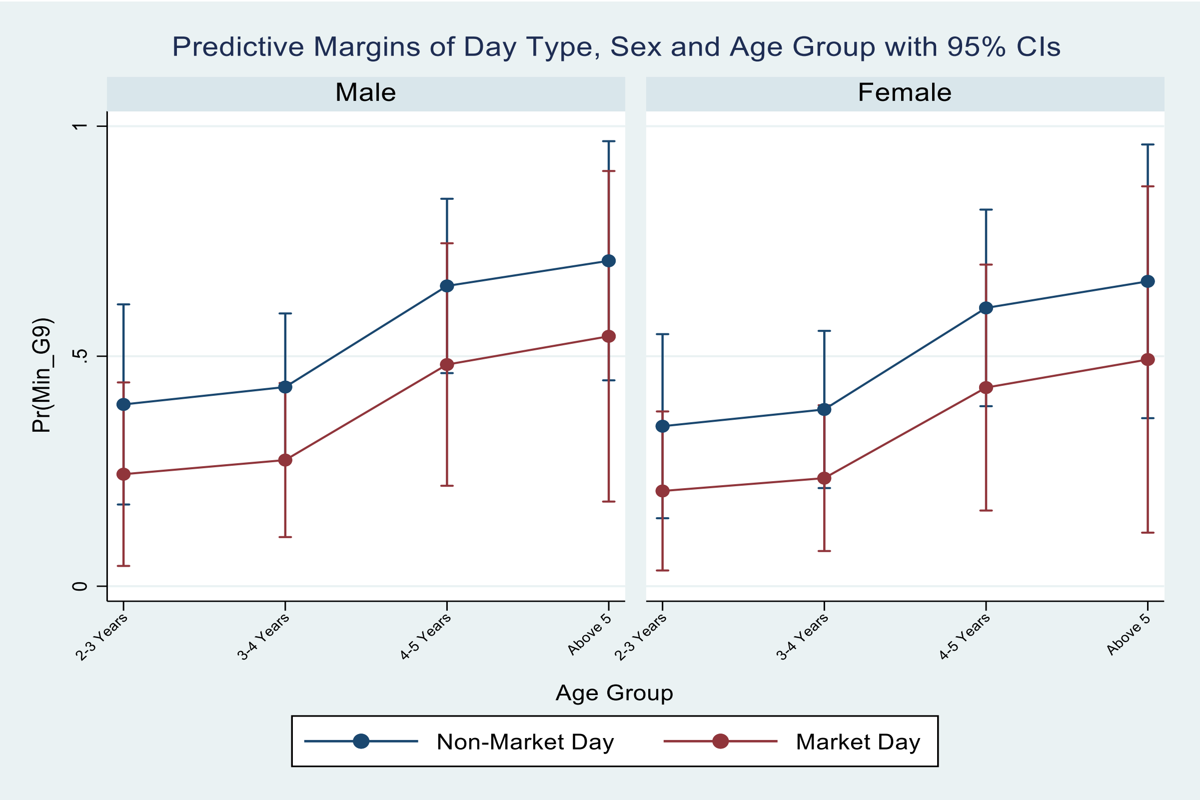

Figure 5: Predicted Margins for DDS>=4 on Market and Non-Market Days

Additionally, a Poisson regression model is employed with the DDS as the dependent variable, giving a score between on and nine (see Table 5). The coefficient of the binary variable indicating a market day is negative and statistically significant suggesting that children's diets are less diverse on market days than on non-market days. The estimate of 0.23 suggests that the DDS is score is lower by 0.23 on a market day compared to a non-market day.

Additionally, we replace the explanatory variable market day with the log of hours spent by traders in care, domestic, and own work and cooking. Analogous to the estimates for children 6-23 months, estimates for children 2 years and above shows a positive relationship between log hours in care work and minimum DDS (Appendix Table 5). Similarly, Poisson estimates with DDS as dependent variable and log of hours spent by traders in care, domestic, and own work and cooking show a positive relationship between log hours in care work and DDS (Table 5).

Table 5: Dependent Variable: Dietary Diversity Score (1-9)

VARIABLES	(1) MDD Score	(2) MDD Score
Own Work, ln		0.002
		(0.012)
Care work, ln		0.035*
		(0.020)
Domestic, ln		-0.030
		(0.020)
Cooking, ln		0.018
		(0.022)
Child Sex = 2, Female	-0.043	-0.085
	(0.060)	(0.064)
Exp per Capita, log	0.069	
	(0.047)	
Market Day = 1, Market Day	-0.231***	
	(0.086)	
Constant	1.044*	1.076***
	(0.559)	(0.267)
Observations	203	203
All Controls	Yes	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6.5 Infrastructure and Alternative Carers

Our analysis suggests that due to traders' time demands on market days, their infants receive less diverse diets at inadequate frequency, based on a low probability of achieving MMF and MAD on market days. Moreover, older children also appear to receive less diverse diets during these days. It is, however, expected that on days when traders are time-burdened, home production work is undertaken by other members of the household, or these services are purchased from caregivers. Moreover, water infrastructure, particularly that which may increase the efficiency of home production, may reduce the negative impacts of reduced time for home production. For example, an individual responsible for cooking and cleaning in the household would require less time accomplishing these tasks if there is piped water available in the household.

To assess the role that substitute caregivers and infrastructure play, we re-examine Equation 1 and add indicators for alternate caregivers and households' access to piped water. Access to piped water is indicated by a binary variable that assigns a value of one if the traders' household received piped water and zero otherwise. Alternate caregiver is indicated by another binary variable that assigns a value of one if the child was taken care of by a caregiver. As noted in the Data and Methods section of this report, survey respondents were asked "Who takes care of your child when you are in the market?" Responses included, "Husband/Child's Father," "Adult Women Member of the Household," "Adolescent Girl in the Household," "Adult Man Member of the household," "Adolescent Boy in the Household," "Paid Non-Household Member Adult," "Unpaid Non-Household Member Adult," "No One," and "Child Accompanies Mother to the Market." We construct a binary variable that assigns a value of one if an alternate caregiver is available and zero if the child accompanies the mother to the market or is left by him/herself at home. The estimated logit coefficients of the effect of access to piped water and the presence of alternative caregivers on MMF, MDD, and MAD of infants (6-23 months) are provided in Appendix Table 6. Infants in households with access to piped water are more likely to have achieved MMF on the previous day. There does not appear a statistically significant relationship with MDD and MAD. We estimate the marginal effect of having access to piped water on the probability that an infant achieved MMF on market and non-market days. The estimates suggest that on both types of days, the probability is higher when the household has access to piped water (Figure 6).

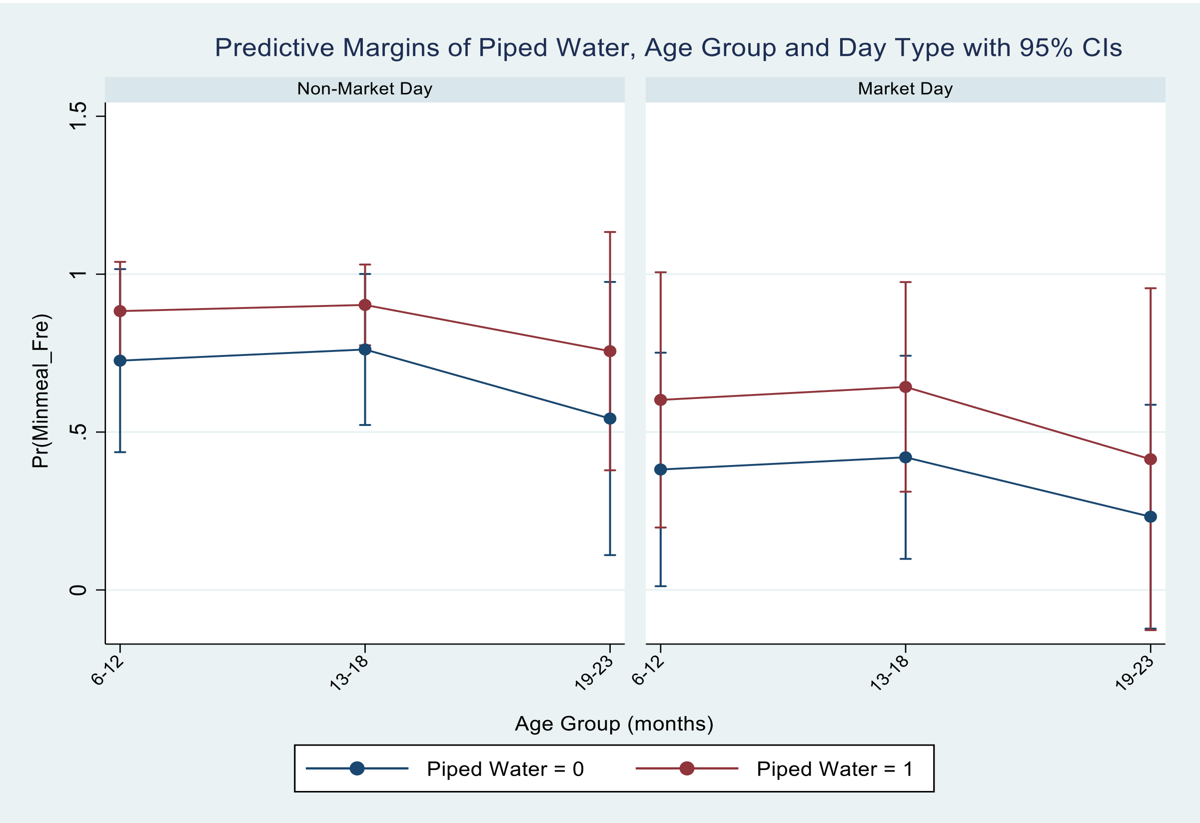

Figure 6: Predicted Margins for MMF on Market and Non-Market Days with and without piped water

The presence of alternative caregivers does not appear to be correlated with any of the dependent variables. Moreover, when we apply Equation 2 for MMF, MDD and MAD (where we interact the variable day type with the presence of piped water and caregiver), we do not find a significant association between outcome variables and the interaction terms. The estimated coefficients are shown in Appendix Table 7. The interaction terms capture the relationship of market days on the outcome variable for children in households with access to piped water (or caregivers). Adding the interaction terms, however, renders the impact of market days insignificant. It may be that due to our small sample size, we are unable to capture any differences in the effects.

We also estimate Equation 1 for children above age two with DDS as the dependent variable and indicators of caregivers and piped water as additional explanatory variables. Estimated Logit coefficients are appended in Appendix Table 5 and the estimated marginal effects of day type with and without a caregiver are in Appendix Table 8. The effect of day type on the probability of achieving a DDS of four or above is higher if an alternative caregiver is present in the household. The estimated probabilities are also shown in Figure 7.

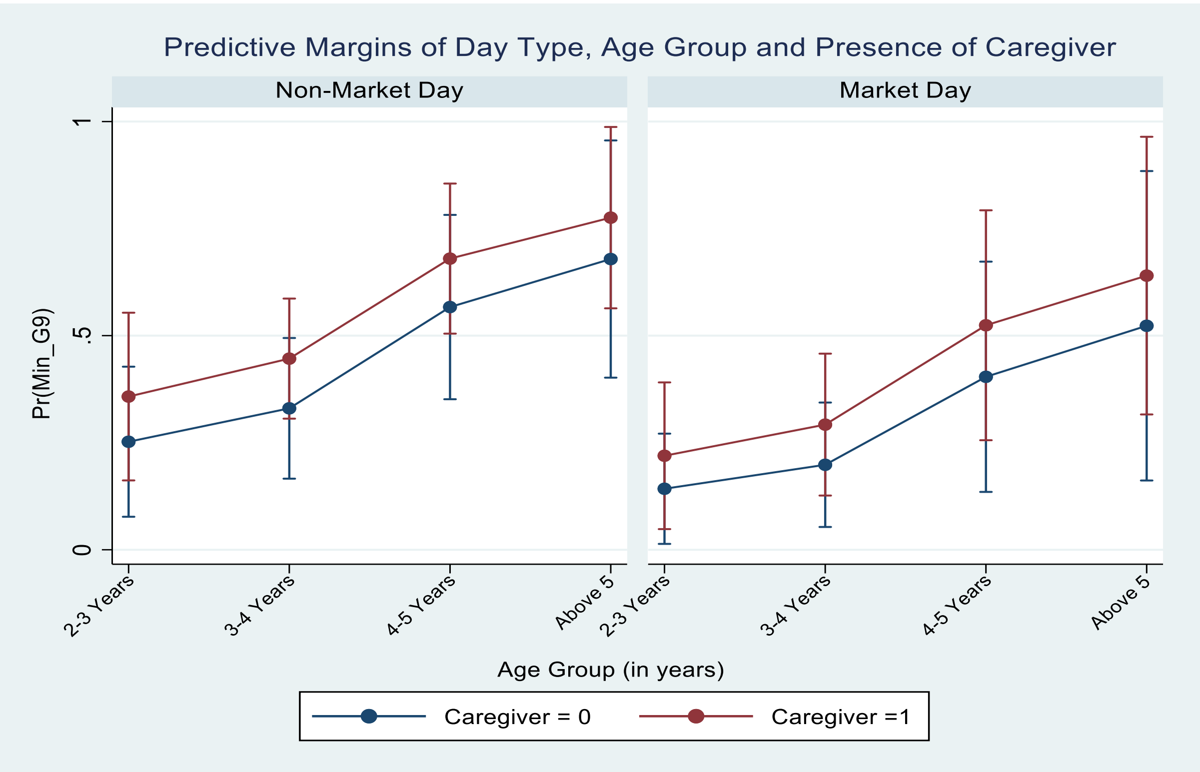

Figure 7: Predicted Margins for DDS>=4 on Market and Non-Market Days with and without caregiver

Finally, we estimate Equation 2 with DDS as the dependent variable. The estimates in Table 6 suggest that traders' children receive less diverse diets on market days only when there are no alternate caregivers at home shown by the significant and negative coefficient of the binary indicator for a market day. However, children who have an alternative caregiver on market days appear to receive more diverse diets, as suggested by the interaction of market day and the presence of a substitute caregiver in the household.

Table 6: Dependent Variable, Dietary Diversity Score (0-7)

VARIABLES	(1) DDS Score
Child Sex = 2, Female	-0.009
	(0.060)
Exp per Capita, log	0.068
	(0.043)
Market Day = 1, Market Day	-0.827***
	(0.176)
Caregiver = 1	0.004
	(0.089)
Market Day * Caregiver	0.731***
	(0.193)
Constant	0.985*
	(0.531)

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7 Discussion

In this paper, we have provided insights into the effect that changes in mothers’ time spent in home production has children’s diets. In order to achieve this, we take advantage of a unique setting where the time women spend in different kinds of work varies depending on an exogenous factor: the allocation of some days in markets in Ghana as “market days.” While women traders in these markets work throughout the week, trading activity is heightened on market days and therefore more demanding of the traders’ time. These higher time demands reduce the time available for other activities, including home production. We test if this reduced time impacts indicators of children’s diets: Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD), and Minimum Acceptable Diet (MAD) of infants aged 6-23 months and Dietary Diversity Score (DDS) of children aged 24-67 months. Furthermore, we assess the role of substitute caregivers and the availability of water infrastructure in mediating the impact of traders’ time demands on market days.

Primary data was collected from women traders in markets of two regions on “market” and “non-market” days to exploit the different demands on women’s time on these two types of days. Our results suggest that children aged 6-23 months are significantly less likely to attain MMF and MAD on market days than on non-market days. Moreover, children aged 24-67 months are also less likely to eat adequately diverse diets on market days compared to non-market days. We compare traders’ time on home production on these two types of days and find that the traders spend significantly less time in home production. These results are in line with similar literature including Komatsu, Malapit & Theis (2015), who found a positive effect of home production on children’s diets in some countries in their sample, including Ghana.

However, we show that the negative effect of demands on mothers' time can be mitigated both by the presence of substitute caregivers and the availability of water infrastructure. We find that in households with access to piped water, the marginal effect of market day on infants’ MMF is lower compared to households without this access. Similarly, we find some evidence that children aged two and older who are taken care of by their fathers or another adult in the household receive even more diverse diets on market days compared to children who do not have alternative caregivers. Moreover, the marginal impact of day type on the probability of achieving DDS is lower for children in households with caregivers.

There are several reasons which make these findings notable. First, by estimating the impact of a reduction of women’s home production work on children’s diets, this work positively contributes to children’s dietary quantity and quality. Dietary quality and quantity—particularly in the first two years of infants’ lives—have implications for their physical and mental development. A reduction in diet quality and quantity due to mothers’ time demands may potentially have long-term negative impacts on children’s lives. As this work remains woefully ignored in mainstream development research, we bring to the fore its significance for children’s well-being; this is in line with SDG goal 5.4.

The paper further shows that the negative impact of women's time demands can be reduced if children receive care and when households have access to water infrastructure, such as piped water. These results enlighten two paths in which policy can be pursued. First, affordable, good-quality childcare should be provided to help substitute for women's home production work while they are engaged in outside work. Second, infrastructure—particularly access to safe water—should be improved to reduce the amount of time needed for home production work. Additionally, we observe that older children in households with substitute caregivers are less likely to be negatively affected by women's time burdens. This further suggests that there is an opportunity for fathers and other members of households to make a meaningful contribution to the improvement of children's diets and nutrition through caregiving in the absence of mothers. Global data show that women are by far the largest contributors to domestic and care work—and this is particularly true for countries in Africa. An increase in the contribution of men and other non-traditional caregivers (including childcare facilities) could have significant positive implications on the wellbeing of children.

Some limitations of our analysis should be noted. For example, the sample is small and the observations are not balanced between market and non-market days. Moreover, while the survey was conducted in the same market on these two types of days, the same trader was not interviewed. This is because, in these large markets, many traders do not have a set stall. Also, the data on time use is available only for the trader (the child's mother); it is expected that on days when mothers are busy in the market, another adult or adolescent in the household undertakes home production work. While the data on substitute caregivers is recorded, we do not have the full picture of the distribution of home production work in the household. Also, as noted in our summary statistics, there is a difference in the mean ages of women traders on market days compared to non-market days. In the sample corresponding to market days, women are older than those from the non-market days. This could imply that younger women with younger children are less likely to work in the markets on market days due to the time demands. However, this does not undermine our finding that children's diets are negatively affected when women who have young children face high demands on their time. This observation would mirror what Blau et al (1996) observed: a negative association between children's nutrition and mothers working outside the home for poor households. They inferred that if women's wages do not compensate for the loss of home production, children's nutrition is negatively affected.

Our results should also to be read with caution, as are not meant to suggest that women should discontinue their business or paid work activities to engage more extensively in home production work. Economic and development policymakers should pay more attention to women's home production work while making policies. There is also a need for research on technologies, infrastructure and services that may increase the efficiency of home production. Furthermore, wide gaps remain in the home production work undertaken by men and women; reducing these gaps can allow both men and women to engage in paid work and reduce any adverse effects on children's outcomes.

References

Bamji, M. S., & Thimayamma, B. V. S. (2000). Impact of women's work on maternal and child nutrition. Ecology of food and nutrition, 39(1), 13-31.

Bhalotra, S. (2010). Fatal fluctuations? Cyclicality in infant mortality in India. Journal of Development Economics, 93(1), 7-19.

Blau, D. M., Guilkey, D. K., & Popkin, B. M. (1996). Infant health and the labor supply of mothers. Journal of Human Resources, 90-139.

Charmes, J. (2019). The Unpaid Care Work and the Labour Market. An analysis of time use data based on the latest World Compilation of Time-use Surveys. International Labour Office.

Gillespie, S., Harris, J., & Kadiyala, S. (2012). The Agriculture-Nutrition Disconnect in India: What Do We Know? (No. 1187). International Food Policy Research Institute (IFPRI).

Grassi, Flavia, Josefine Landberg, and Sophia Huyer. "Running out of time: The reduction of women’s work burden in agricultural production." Rome: Food and Agricultural Organization of the United Nations (2015).

Headey, D. D. (2013). Developmental drivers of nutritional change: a cross-country analysis. World Development, 42, 76-88.

Headey, D., Chiu, A., & Kadiyala, S. (2012). Agriculture’s role in the Indian enigma: help or hindrance to the crisis of undernutrition? Food Security, 4(1), 87-102.

Jabs, J., & Devine, C. M. (2006). Time scarcity and food choices: an overview. Appetite, 47(2), 196-204.

Johnston, D., Stevano, S., Malapit, H. J., Hull, E., & Kadiyala, S. (2018). Time use as an explanation for the agri-nutrition disconnect: evidence from rural areas in low and middle-income countries. Food policy, 76, 8-18.

Kadiyala, S., Harris, J., Headey, D., Yosef, S., & Gillespie, S. (2014). Agriculture and nutrition in India: mapping evidence to pathways. Annals of the New York Academy of Sciences, 1331(1), 43-56.

Komatsu, H., Malapit, H. J., & Theis, S. (2015). How does women's time in reproductive work and agriculture affect maternal and child nutrition? Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal.

Kumar, S. K. (1995). Adoption of hybrid maize in Zambia: Effects on gender roles, food consumption, and nutrition. Food and Nutrition Bulletin, 16(3), 1-3.

Masset, E., Haddad, L., Cornelius, A., & Isaza-Castro, J. (2012). Effectiveness of agricultural interventions that aim to improve nutritional status of children: systematic review. Bmj, 344.

Njuki, M J., Wyatt, A., Baltenweck, I., Yount, K., Null, C., Ramakrishnan, U., ... & Sreenath, S. (2016). An exploratory study of dairying intensification, women's decision making, and time use and implications for child nutrition in Kenya. The European Journal of Development Research, 28(4), 722-740.

Padmaja, R., Pramanik, S., Pingali, P., Bantilan, C., & Kavitha, K. (2019). Understanding nutritional outcomes through gendered analysis of time-use patterns in semi-arid India. Global food security, 23, 49-63.

Paolisso, M. J., Hallman, K., Haddad, L., & Regmi, S. (2002). Does cash crop adoption detract from child care provision? Evidence from rural Nepal. Economic Development and Cultural Change, 50(2), 313-338.

Picchioni, F., Zanello, G., Srinivasan, C. S., Wyatt, A. J., & Webb, P. (2020). Gender, time-use, and energy expenditures in rural communities in India and Nepal. World Development, 136, 105137.

Quisumbing, A., Roy, S., Njuki, J., Tanvin, K., & Waithanji, E. (2013). Can dairy value-chain projects change gender norms in rural Bangladesh? Impacts on assets, gender norms, and time use (No. 1311). International Food Policy Research Institute (IFPRI).

Quisumbing, A., Roy, S., Njuki, J., Tanvin, K., & Waithanji, E. (2013). Can dairy value-chain projects change gender norms in rural Bangladesh? Impacts on assets, gender norms, and time use (No. 1311). International Food Policy Research Institute (IFPRI).

Rowland, D., Zanello, G., Waliyo, E., & Ickowitz, A. (2022). Oil palm and gendered time use: A mixed-methods case study from West Kalimantan, Indonesia. Forest policy and economics, 137, 102682.

Ruel, M. T., Alderman, H., & 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.

Seymour, G., Masuda, Y. J., Williams, J., & Schneider, K. (2019). Household and child nutrition outcomes among the time and income poor in rural Bangladesh. Global food security, 20, 82-92.

Steyn, N. P., Nel, J., Labadarios, D., Maunder, E. M. W., & Kruger, H. S. (2014). Which dietary diversity indicator is best to assess micronutrient adequacy in children 1 to 9 y?. Nutrition, 30(1), 55-60.

van den Bold, M., Bliznashka, L., Ramani, G., Olney, D., Quisumbing, A., Pedehombga, A., & Ouedraogo, M. (2021). Nutrition-sensitive agriculture programme impacts on time use and associations with nutrition outcomes. Maternal & Child Nutrition, 17(2), e13104.

van den Bold, M., Quisumbing, A. R., & Gillespie, S. (2013). Women’s empowerment and nutrition: An evidence review. IFPRI discussion papers, (1294).

Verger, E. O., Ballard, T. J., Dop, M. C., & Martin-Prevel, Y. (2019). Systematic review of use and interpretation of dietary diversity indicators in nutrition-sensitive agriculture literature. Global Food Security, 20, 156-169.

Webb, P., & Kennedy, E. (2014). Impacts of agriculture on nutrition: nature of the evidence and research gaps. Food and nutrition bulletin, 35(1), 126-132.

WHO, 2017 Global Nutrition Monitoring Framework: operational guidance for tracking progress in meeting targets for 2025. Geneva: World Health Organization (WHO); 2017. Licence: CC BY-NC-SA 3.0 IGO

Appendix

Appendix Table 1: Food Groups in the Children's Diets Module of Questionnaire

A)	**Children's Diets** **[Note: the section is to be asked for each child aged 5 years and below separately. The Names and PID of all children will be automatically transferred to this section and children's diets will be asked for each individual child]**						
CHILD PID	For Children aged 2 and below [Only ask women who have children aged 2 and below]		FOR CHILDREN AGED 5 YEARS AND BELOW Did [Name] drink any of the following yesterday (during the day or night)?				
	A1	A2	A3	A4	A5	A6	A7
	Has [Name] ever been breastfed? 1 = Yes 0 = No > go to E3	Was [Name] breastfed yesterday during the day or at night? 1=Yes 0= No	Plain water 1=Yes 0=No	Infant formula ***Aptamil, SMA, Lactogen, Similac, Cow and Gate, Emfamil, NAN*** 1=Yes 0=No	Juice or juice drinks ***Fresh juices such as Orange, Pineapple, Mango, Watermelon, Apple etc.*** 1=Yes 0=No	Thin porridge ***Hausa Kooko, Mori Kooko, Weanimix/Tom brown, Rice water*** 1=Yes 0=No	Other Water-based liquids ***Chocolate drinks (e.g. Milo, This Way Chocolate drink, Cadbury Chocolate drink)*** 1=Yes 0=No

	FOR CHILDREN AGED 5 YEARS AND BELOW Did [Name] any of the following foods yesterday (during the day or night)? 1=Yes 0=No																		
	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26
CHILD PID	Food made from grains e-g maize, sorghum, millet, wheat, oats, rice including ***Hausa Kooko, Fula, Mori, Yumvita, Cerelac, Banku, Tuo Zaafi, Akple, Kenkey, Bread***?	Pumpkin, carrots, squash, or sweet potatoes *that are yellow or orange inside*?	White potatoes, white yams, manioc, cassava, or any other foods made from roots? ***Cocoyam, Taro, Plantain***	Any *dark green leafy vegetables* such as spinach, curry leaves, amaranth leaves or reddish leaves? ***Kontomire, Cassava leaves, Ayoyo, Gboma, Alefu, Water leaf, Bitter leaves***	Ripe mangoes, ripe papayas?	Any other fruits or vegetable?	Liver, kidney, heart, or other organ meats ***Gizzard, Sausage***	Any meat, such as beef, pork, lamb, goat, chicken, or duck ***Turkey, Guinea fowl, Lamb, Goat***	Eggs ***Chicken Eggs, Guinea fowl Eggs, Turkey Eggs, Duck Eggs, Quail Eggs***	Fish and Seafood	Any food made from beans, peas, soybeans, cowpeas, Bambara beans, lentils, nuts or seeds? ***Agushie, Koose, Dawadawa***	Curd, yoghurt, or other milk products? ***Evaporated milk, skimmed milk, powdered milk, condensed milk, milkshakes***	Any oil, fats, or butter, or foods made with any of these? ***Palm oil, Coconut oil, Groundnut oil, Vegetable oil, Shea Butter***	Any sugary foods such as chocolates, sweets, candies, pastries, cakes or biscuits?	Condiments for flavour such as spices, chillies, herbs, or fish powder?	Grasshoppers, ants, termites, grubs, snails or other insects? ***Palm Weevil Larvae, Akorkono***	Foods made with red palm oil, red palm nut, or red palm nut pulp sauce? ***Mportom portor, Palmnut soup, Apapransa, Garden Egg Stew, Kontomire Stew***	How many times in total did you feed your child yesterday [breastfeeding]? [Number times] **To be skipped if E2=0**	How many times did you feed your child yesterday [food]? [Number times]

Appendix Table 2: Logit Estimates of Equation (1), Dependent Variables Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD) and Minimum Adequate Diet (MAD)

VARIABLES	(1) MMF	(2) MDD[a]	(3) MAD[b]
Child Sex = 2, Female	-1.025	-0.343	-0.258
	(0.664)	(0.521)	(0.511)
Child Age, in months	-0.0128	-0.0477	-0.0466
	(0.156)	(0.170)	(0.167)
Mother Literacy = 1, Literate	-0.0205	1.213	1.011
	(0.812)	(0.740)	(0.800)
Mother's Age, in years	-0.0245	-0.000778	0.00415
	(0.0413)	(0.0357)	(0.0379)
Household Size	0.213	0.00254	-0.144
	(0.252)	(0.231)	(0.250)
Expenditure per capita	0.00352**	-0.000419	-0.000684
	(0.00149)	(0.000751)	(0.000865)
Market Day = 1, Market Day	-2.074**	-0.839	-1.544*
	(0.838)	(0.819)	(0.892)
Constant	2.206	1.554	1.322
	(2.647)	(3.070)	(3.226)
Observations	90	89	89
All Controls	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
a, b One observation is dropped as data on the child's diet is missing

Appendix Table 3: Estimated Marginal Effects on Day Type on MMF, MDD and MAD

	Infants (6-23 months)			Children (Above 23 months)
VARIABLES	(1) MMF	(2) MDD	(3) MAD	(4) DDS
Day Type, Market Day				
Boy	-0.301**	-0.136	-0.211**	-0.164*
	(0.131)	(0.115)	(0.0866)	(0.0841)
Girl	-0.347***	-0.121	-0.188**	-0.158**
	(0.132)	(0.104)	(0.0844)	(0.0803)
Observations	90	89	89	203

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: The base category is Non-Market Day

Appendix Table 4: Logit Estimates of Equation (1), Dependent Variables Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD) and Minimum Adequate Diet (MAD)

VARIABLES	(1) MMF	(2) MDD	(3) MAD
Child Sex = 2, Female	-0.683	-0.244	-0.0795
	(0.689)	(0.567)	(0.593)
Exp per Capita, log	1.854***	-0.131	-0.649
	(0.650)	(0.540)	(0.553)
Own Work Hrs, ln	0.0473	0.168	0.261**
	(0.175)	(0.123)	(0.122)
Care-work Hrs, ln	0.320	0.366**	0.469***
	(0.236)	(0.180)	(0.167)
Domestic Hrs, ln	-0.591*	-0.632***	-0.777***
	(0.340)	(0.224)	(0.208)
Cooking Hrs, ln	-0.104	0.154	0.229
	(0.179)	(0.164)	(0.172)
Constant	-7.331	-3.171	0.751
	(5.267)	(5.041)	(4.865)
Observations	90	90	90
All Controls	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 5: Logit Estimates of Equation (1) for Children Age 2 and above, Dependent Variables Minimum Dietary Diversity (DDS)

VARIABLES	(1) DDS	(2) DDS	(3)
Child Sex = 2, Female	-0.258	-0.163	
	(0.338)	(0.325)	
Child Age, in months	-0.0437	-0.0599	
	(0.0380)	(0.0382)	
Mother Literacy = 1, Literate	-0.273	-0.152	
	(0.383)	(0.376)	
Mother Age, in years	0.0105	0.00858	
	(0.0227)	(0.0222)	
Mother Marital Status = 1, Single	1.098	0.849	
	(1.037)	(1.139)	
Mother Marital Status = 2, Married/Cohabitating	1.142	1.043	
	(1.020)	(1.135)	
Mother Marital Status = 3, Divorced/Widowed	-0.00128	-0.00921	
	(1.051)	(1.174)	
Market Day = 1, Market Day	-0.867*	-0.857*	
	(0.473)	(0.453)	
Dwelling receives Piped Water = 1		0.149	
		(0.373)	
Carer = 1 (Yes)		0.632*	
		(0.356)	
Care work, ln			0.174*
			(0.0931)
Cooking, ln			0.113
			(0.0895)
Domestic, ln			-0.223**
			(0.109)
Own Work, ln			-0.0559
			(0.0641)
Constant	2.124	-3.583	-0.0824
	(3.369)	(3.015)	(0.558)
Observations	203	204	203
All Controls	Yes	Yes	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 6: Logit Estimates of Equation (1), Dependent Variables Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD) and Minimum Adequate Diet (MAD) with additional explanatory variables; Caregiver and Piped-water

VARIABLES	(1) MMF	(2) MDD	(3) MAD
Child Sex = 2, Female	-1.036	-0.353	-0.255
	(0.673)	(0.498)	(0.489)
Mother Literacy = 1, Literate	-0.426	1.190	0.879
	(0.894)	(0.726)	(0.745)
Market Day = 1, Market Day	-1.844**	-0.896	-1.642*
	(0.810)	(0.865)	(0.945)
Dwelling receives Piped Water = 1	1.125*	0.111	0.0400
	(0.655)	(0.800)	(0.810)
Alternative Caregiver = 1	-0.187	0.370	0.164
	(0.825)	(0.813)	(0.696)
Constant	-6.393	1.598	-0.0783
	(4.987)	(3.052)	(1.483)
Observations	90	89	90
All Controls	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 7: Logit Estimates of Equation (1), Dependent Variables Minimum Meal Frequency (MMF), Minimum Dietary Diversity (MDD) and Minimum Adequate Diet (MAD) with interaction terms (Caregiver * Market Day, Piped Water * Market Day)

VARIABLES	(1) MMF	(2) MAD	(3) MMF	(4) MMF	(5) MMF	(6) MMF
Child Sex = 2, Female	-1.050*	-0.252	-0.367	-1.092	-0.374	-0.267
	(0.637)	(0.511)	(0.508)	(0.664)	(0.503)	(0.502)
Child Age, in months	-0.00609	-0.0158	-0.00428	-0.0389	-0.0111	-0.0273
	(0.163)	(0.154)	(0.153)	(0.167)	(0.171)	(0.176)
Market Day = 1, Market Day	-0.993	-0.735	0.0574	-1.339	-0.856	-1.485
	(0.946)	(1.215)	(1.111)	(1.022)	(1.078)	(1.266)
Dwelling receives Piped Water = 1	1.685**	0.0217	0.164	1.322*	0.124	0.181
	(0.757)	(0.717)	(0.726)	(0.754)	(0.784)	(0.827)
Carer Present = 1				0.498	0.352	0.325
				(1.349)	(0.818)	(0.799)
Market Day * Carer Present				-2.780	-0.0145	-0.343
				(2.084)	(1.543)	(1.650)
Market Day * Dwelling Receives Water	-2.096	-1.316	-1.364			
	(1.553)	(1.572)	(1.381)			
Constant	-7.299	0.787	-1.647	1.431	-0.602	0.698
	(5.118)	(3.896)	(3.701)	(3.015)	(2.163)	(2.060)
Observations	90	90	90	90	90	90
All Controls	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 8: Estimated Marginal Effects of Day Type on DDS>=4 with and without substitute care providers

VARIABLES	(2) DDS
Day Type = Market Day	
Caregiver = 0	-0.150**
	(0.0745)
Caregiver = 1	-0.168**
	(0.0847)
Observations	204

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix Table 9: Time Use Module of Survey Questionnaire

Time Allocation

Instructions: Please log activities undertaken by the individual during the last 24 hours (starting yesterday morning at 4 am, finishing at 3:59 am of today). Thirty-minute time intervals are marked. One to two activities can be marked for each time interval. Draw a line through the activity undertaken in the time interval. IF TWO ACTIVITIES ARE MARKED, DISTINGUISH (1) FOR PRIMARY ACTIVITY AND (2) FOR THE SECONDARY ACTIVITY IN LAST COLUMN.

"I would like to ask you about how you spent your time during the past 24 hrs. This will be a detailed accounting. We will begin from yesterday morning at 4 am, and continue through 4 am of this morning"

	Activity	**Night**								**Morning**								**Day**								
		4		**5**		6		**7**		8		**9**		10		**11**		12		**13**		**14**		**15**		**Primary/Secondary**
A	Sleeping and resting																									
B	Eating and drinking																									
C	Personal Care																									
D	School (also homework)																									
E	Work as employed																									
F	Own business work																									
G	Farming/livestock/fishing																									
H	Shopping/getting service (incl health services)																									
I	Weaving/sewing/textile care																									
J	Cooking																									
K	Domestic work																									
L	Fetching wood/fuel																									
M	Fetching Water																									
N	Care for children/adults/elderly/sick																									
O	Traveling and commuting (incl to work/workplace, market/farm)																									
P	Watching TV/listening to radio/reading																									
Q	Exercising																									

R	Social activities and hobbies																									
S	Religious activities																									
T	Other, specify																									

		CONTINUED Time Allocation																				Person ID				
Activity		**Evening**								**Night**																
		16		**17**		**18**		**19**		**20**		**21**		**22**		**23**		**24**		**1**		**2**		**3**		**Primary/Secondary**
A	Sleeping and resting																									
B	Eating and drinking																									
C	Personal Care																									
D	School (also homework)																									
E	Work as employed																									
F	Own business work																									
G	Farming/livestock/fishing																									
H	Shopping/getting service (incl health service)																									
I	Weaving/sewing/textile care																									
J	Cooking																									
K	Domestic work																									
L	Fetching wood/fuel																									
M	Fetching Water																									
N	Care for children/adults/elderly/sick																									
O	Travelling and commuting (incl to work/workplace, market/farm)																									
P	Watching TV/listening to radio/reading																									

Q	Exercising																									
R	Social activities and hobbies																									
S	Religious activities																									
T	Other, specify																									

Appendix Table 10: Time Spent in Minutes in Work on Market and Non-Market Days, Full Sample

	(1) Non-Market Day	(2) Market Day	(3) Diff	(4) t-stat	(5) p
Home Production [a,c] (in minutes)	362.3	264.5	97.8	2.51	0.012
Home Production [b,c], Water and Fuel (in minutes)	382.2	278.3	104.1	2.58	0.010
Own Work [c] (in minutes)	448.0	510.9	-62.8	-1.85	0.064
Observations	234	65			

d. Minutes spent in cooking, domestic work and care work
e. Home production plus minutes spent collecting fuel and water
f. To take multi-tasking into account, respondents could report more than one activity being performed in a time slot, one primary and one secondary activity. For example, cooking and domestic work if a woman cleaned and organized the kitchen while preparing food. These averages are the unweighted means of the total time reported.