

Maternal dietary diversity and the implications for children's diets in the context of food security

Introduction

The United States Agency for International Development's Infant & Young Child Nutrition Project conducted this study to evaluate the relationship of maternal dietary diversity to children's dietary intake in countries in three developing regions.

Maternal nutrition is an important public health problem in low-income countries around the world. It is particularly evident in Africa, South/Southeast Asia, Latin America, and the Caribbean. Between 10 and 20 percent of women are undernourished (low body mass index) in most countries surveyed by the Demographic and Health Surveys, and serious undernutrition (greater than 20 percent) is evident in most countries in sub-Saharan Africa and South/Southeast Asia.¹ The most frequent proximate causes of maternal malnutrition include inadequate food intake, poor nutritional quality of diets, frequent infections, and short inter-pregnancy intervals. These causes are recognized as stemming from wider contextual factors such as educational and socioeconomic status, ethnic and cultural beliefs, agricultural practices, national policies, and food insecurity.

Women, especially mothers, are gatekeepers of the family diet, and have long been entrusted with the principal responsibility of selecting, preparing, and serving nutritious foods to support families and households. However, the diets of women and mothers are often overlooked,² along with the potential impacts of poor diets on women and their families. A better understanding of the relationship of women's diets to patterns of food security in the home and family is needed. Do the diets of mothers reflect the diets of the family, particularly children?

Women of reproductive age are particularly vulnerable to food insecurity and associated nutrient inadequacies for two major reasons, each with important implications for families. First, physiological vulnerability comes with childbearing. Maternal nutrient needs increase during pregnancy and breastfeeding, and when these needs are not met, mothers may experience wasting and fatigue

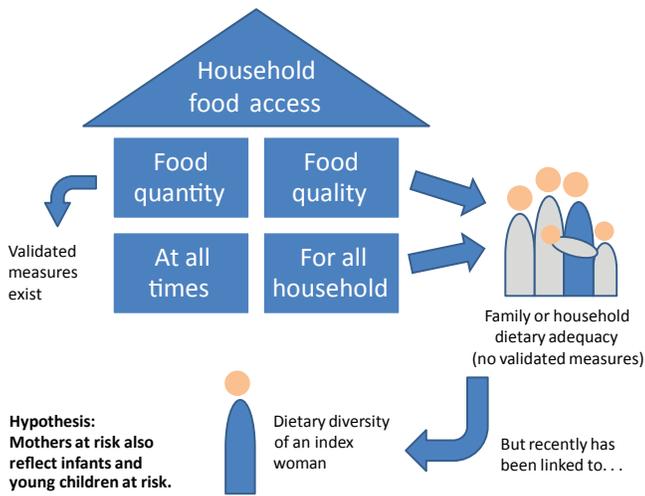


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that may limit their ability to fully satisfy infant needs. These limitations may result in infants who are small for gestational age and children with stunted growth and slowed cognitive development, which may persist into adulthood and transmit to the next generation. Second, women have a sociological vulnerability. Food security research indicates that during periods of reduced food supply, women experience reduced intakes relative to men.^{3,4} Furthermore, mothers are likely to reduce their own intakes to secure those of infants and small children.^{5,6} Mothers are the first to sacrifice in times of distress and the last to experience improvements when supplies are replenished.^{7,8} A striking example of this occurred during a food crisis in Java (1997–1998): child weight-for-age remained constant while there was an increase in the prevalence of maternal wasting due to buffering children's energy intake.⁹ The vicious cycle of intergenerational growth failure, to which mothers have been called the key,⁸ is reinforced by the sociological vulnerability of mothers, particularly in situations of food insecurity.

New measures to evaluate whether households have adequate food quantity¹⁰ and economic access to varied foods¹¹ were recently developed. At the individual level, dietary diversity scores (DDS) provide simple, validated

FIGURE 1. Do poor maternal diets also reflect children at risk?



measures of food quality or nutrient adequacy,¹¹ and maternal and infant (6–23 months) DDS were recently mandated as indicators by the Feed the Future¹² initiative and Food for Peace¹³ program.

Whether maternal diets are sufficiently sensitive to reflect household nutrient adequacy fluctuations—and whether the dietary diversity indicators that are now in use can capture this relationship—invites further investigation. One recent validation study was able to show that the dietary diversity of an index individual—generally, a woman—was related to a much more comprehensive measure of household nutrient adequacy.¹⁴ This early finding may reflect a relationship between the diets of mothers and infants, children, or others in the household. However, little research has characterized these relationships, and almost no research has been conducted in developing countries. This study focused on the relationship between maternal diets and infant and young child diets. Figure 1 depicts the broad relationship between women’s dietary diversity and household adequacy, along with the more focused hypothesis for this study: that the dietary diversity of mothers also reflects that of their dependent infants and young children.

FIGURE 2. Food groups from two dietary diversity indicators

Maternal indicator	Child indicator
Grains, roots, & tubers	Grains, roots & tubers ^a
Legumes & nuts	Legumes & nuts
Dairy products (milk, yogurt, cheese) ^b	Dairy Products ^b
Eggs	Eggs
Flesh foods (meat, fish, poultry) ^c	Flesh Foods & organ meats ^c
Organ meats	
Vit A-rich dark green, leafy vegetables	Vit A-rich fruits & vegetables
Other vit A-rich fruits & vegetables ^d	
Other fruits & vegetables	Other fruits and vegetables

^a Includes infant cereals
^b Includes formula, canned and powdered milk, as well as other dairy products
^c Also includes grubs, insects, rodents, and other small game
^d Includes vit-A rich yellow, orange, or red fruits and vegetables

Maternal vulnerability to food insecurity within the home may provide a helpful key for measuring risk in the household food environment. Since they are the first to feel the nutritional impacts of economic shocks, mothers’ diets may have the potential to provide an early warning of household food security declines at population level. Further research exploring the link between maternal and family diets may be beneficial.

Methods

Data were drawn from recent Demographic and Health Surveys. Three countries were selected from key developing regions: Cambodia (2005) in South/Southeast Asia, Ghana (2008) in Africa, and Haiti (2005/2006) in Latin America and the Caribbean. Surveys were selected among 17 countries that collected 24-hour dietary intake data of specific food groups on women and their last child born. All women were of reproductive age (15–49 years), and infants were of recommended age for consuming solid foods (6–23 months) and were living with their mothers. Mother-child pairs included Cambodia: 2,207; Haiti: 1,519; and Ghana: 800. Children were stratified by breastfeeding status. Descriptives included all mothers, but relationships presented here are limited to breastfed children, who were the majority of samples (84 percent Ghana, 82 percent Cambodia, 73 percent Haiti).

Food group intakes for mothers and children were scored by two different dietary diversity indicators (see Figure 2) which are currently required for use by countries participating in the Feed the Future initiative.¹² These indicators group foods with similar nutrient profiles so that a count of food groups consumed represents the breadth of micronutrient intake in the diet. The nine-category maternal diversity indicator was validated in the Food and Nutrition Technical Assistance’s Women’s Dietary Diversity Project.¹⁵ The seven-category child indicator was defined and recommended for international use by the Working Group on Infant and Young Child Feeding.¹⁶ The child indicator is meant to represent only the complementary foods in the diet and excludes breastmilk intake. It is simpler than the maternal indicator, with organ meats and flesh foods combined into one group, and dark green, leafy vegetables and orange/yellow/red fruits and vegetables combined into another.

A “minimum diversity” score of ≥ 4 has been recommended for assessing the nutritional quality of young children’s diets¹⁶ and was the key outcome predicted in this analysis. The range of maternal dietary diversity was restricted from ≤ 2 to 5+ for comparison with children’s dietary diversity and a variety of other related socioeconomic, demographic, and health

factors. Factors positively related to maternal and child dietary diversity were evaluated for influence in a multivariate analysis.

Key findings

Dietary diversity is limited for mothers and children

As seen in Figure 3, maternal diets in the different countries were based on starchy staples, but flesh foods were commonly consumed in Cambodia and Ghana. In Haiti, flesh foods were consumed less frequently, but legumes were eaten more frequently, and are a good alternate protein source. Organ meats and other animal products—dairy and eggs—were consumed quite infrequently in all three countries. Consumption of fruits and vegetables fell in between these two extremes. Dark green, leafy vegetables were most commonly eaten in Cambodia (70 percent), and other fruits and vegetables were most common in Ghana (67 percent). In Haiti, all categories of fruits and vegetables were consumed by only 30 percent of mothers.

The mean diversity scores for women were 4.0 in Cambodia and Ghana, but only 3.0 in Haiti. About 41 percent of Haitian women consumed no more than 2 food groups, compared to 10 percent in Cambodia and 14 percent in Ghana. Mean scores among breastfed children were 2.7 in Cambodia, 2.7 in Haiti, and 3.1 in Ghana. Surprisingly, the dietary diversity for Cambodian mothers

was higher (similar to Ghana), but dietary diversity of breastfed children paralleled Haiti.

Food groups eaten are similar for mothers and children

Stacking the percentages for each food group consumed (Figure 4) produces a sort of population fingerprint for which food groups were common in the diet. The height of each stripe represents the proportion of all women or breastfed children who consumed each food group. The more disaggregated food groups for mothers are represented by similar colors—greens for vitamin A-rich fruits and vegetables, and red or pink for flesh foods and organ meat. The similarities between the dietary fingerprints of mothers and children country to country are quite striking. Food groups eaten commonly by mothers, such as flesh foods in Cambodia and legumes in Haiti, were also commonly eaten by breastfed children. Foods not commonly eaten were also similar between mothers and breastfed children.

FIGURE 3. Percentage of all mothers consuming food groups

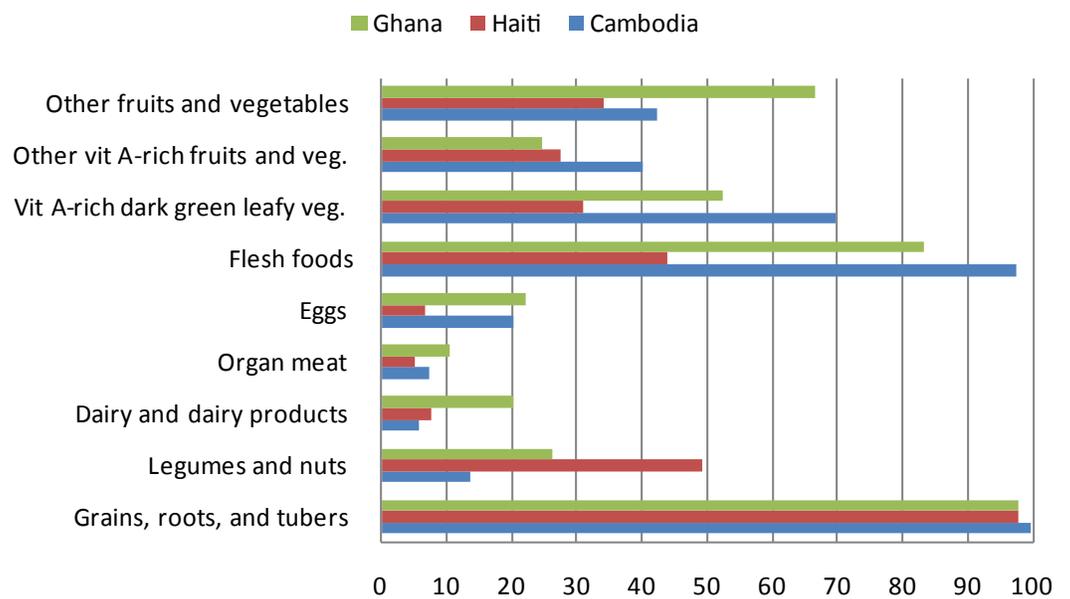
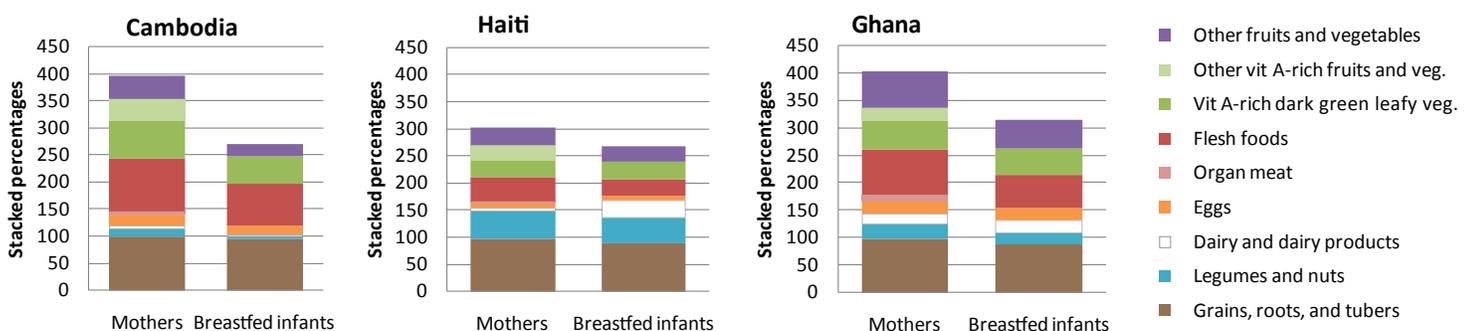


FIGURE 4. Stacked percentages of food groups consumed by mothers and breastfed children





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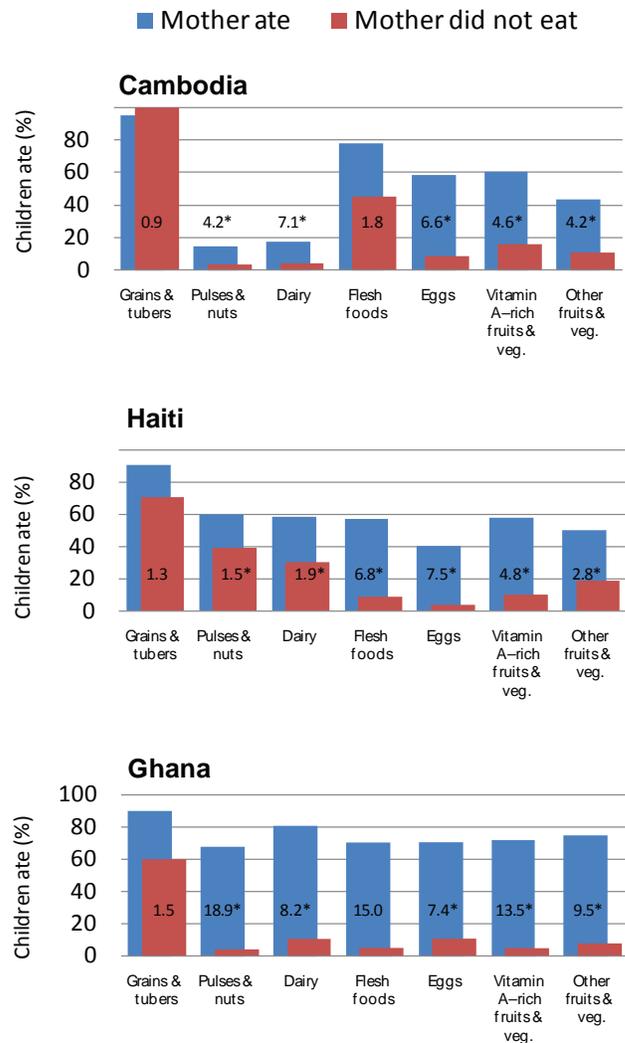
Breastfed children are likely to consume the same food groups as their mothers

If mothers and breastfed children are consuming similar diets within countries, what happens when we look directly at breastfeeding mother-child pairs? Figure 5 shows that the percentage of children eating each food group was strongly related to whether their mothers also ate the food group, but the strength of these relationships varied by diet and country. Since grains and tubers were so commonly consumed, children were likely to eat them whether or not their mothers did. When mothers ate a food group (blue bars), breastfed children in Ghana were between 7 and 19 times more likely to eat that food group, compared to when mothers did not eat a food group (red bars). Similar patterns were clear in Cambodia, but somewhat less pronounced. In Cambodia, flesh foods were almost as commonly eaten as grains; 43 percent of children consumed flesh even if their mothers did not (n=44). In Haiti, maternal diets were much poorer. Other than grains and tubers, in every category, the majority of mothers were non-consumers. Nevertheless, mothers' dietary diversity still predicted increases in child diet (between 1.5 and 7.5 times). Possibly maternal buffering may have benefited children's diets but more research is needed.

Breastfeeding mothers with higher dietary diversity have children with higher dietary diversity

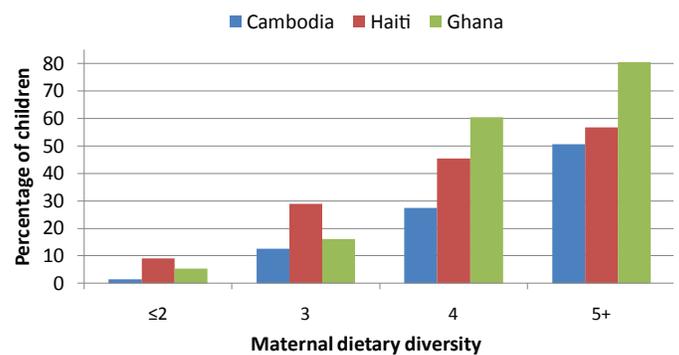
The Working Group on Infant and Young Child Feeding has defined the minimum adequate dietary diversity among children 6–23 months to be ≥4 food groups per day.¹⁶ In this study, as the mothers' diversity increased, the percentage of breastfed children meeting this criterion increased dramatically. Figure 6 shows that less than 10 percent of children in any country met the criterion if mothers' diversity was ≤2, but

FIGURE 5. Percentage of children eating each food group, by whether the mother ate[†]



[†]Numbers are weighted crude prevalence ratios.
*Significant if 95% Confidence Interval excludes 1

FIGURE 6. Percentage of breastfed children with minimum dietary diversity increases rapidly with maternal diversity



*Weighted crude percentages.

between 50 percent and 80 percent of children met the criterion if maternal dietary diversity reached 5 or greater. Within countries, increases in the percentage of children reaching minimum diversity were significantly greater ($p < 0.05$) with each successive increase in maternal diversity. Most differences were strongly significant ($p < 0.001$).

We statistically modeled the relationship between the dietary diversity of breastfeeding mothers and their children's minimum diversity (Figure 7), and tested whether it could be explained by other factors.

While a wide variety of potential influences were evaluated in the three countries (Figure 8), relative risk estimates were robust, and only children's age (in Ghana) changed them appreciably. Compared to mothers consuming 1–2 food groups, breastfed children whose mothers consumed more than 5 food groups were estimated to be 4.8 to 9.4 times more likely to achieve minimum diversity across the three countries (adjusted for children's age).

Conclusions and recommendations

This study provides compelling evidence that within multiple contexts, the diets of mothers reflect not only their own intake, but also the diets of their small children. Therefore, we suggest that food security programs include nutrition education and social and behavior change interventions that target maternal dietary diversity. The benefit of these interventions for maximizing maternal nutrition will also be transferrable to young children.

Maternal dietary diversity indicators are known to reflect population-level adequacy for mothers, but their versatility may extend further. Maternal dietary diversity has been demonstrated elsewhere¹⁴ to relate to average household nutrient adequacy, and in this study, the dietary diversity of mothers was found to be strongly linked to that of infants in the same household. Therefore, we recommend further research to evaluate the linkages between maternal and family diversity to explore the potential of this indicator. Women's traditional role as caregivers links their own health with the health of their families. Preserving the health of women through good nutrition may be a key to safeguarding the health of children and families.

FIGURE 7. Breastfed children achieve minimum diversity when maternal diversity is higher

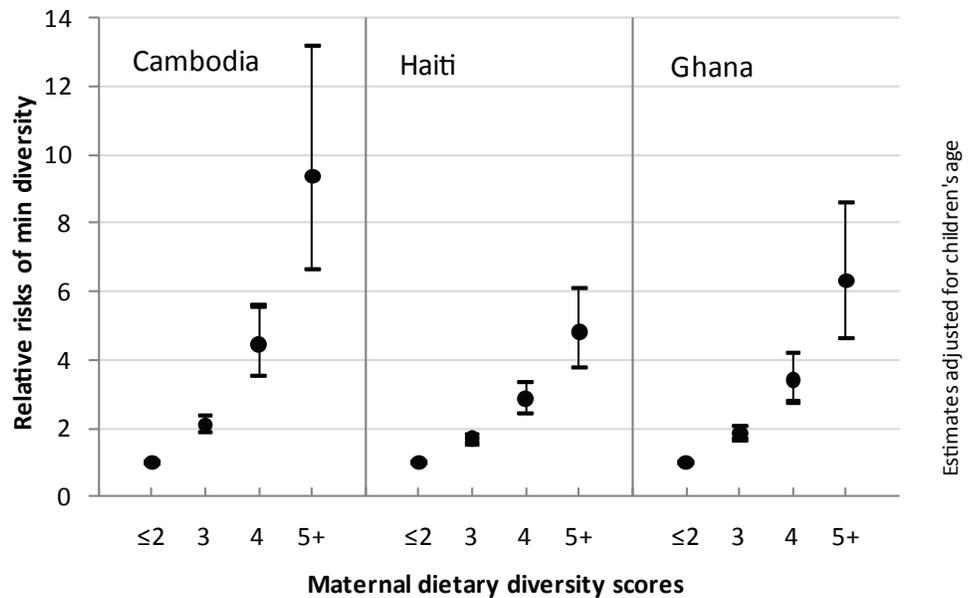


FIGURE 8. Potential influential factors evaluated

Mothers:

Reproductive status: pregnant/non, parity, last birth interval

Health/health care access: recent illness, antenatal and delivery care provider, number of antenatal visits, deworming and iron supplementation

Social status: age, marital status, head of household, participation in household decision-making, working last 12 months

Education: highest level of education, literacy

Children:

Age and gender

Households:

Hygiene measure: bednets, improved toilets, proper stool disposal, water source

Assets: electricity, transportation, refrigeration, telephone (any)

Wealth: Demographic and Health Survey quintiles



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ABOUT THE INFANT & YOUNG CHILD NUTRITION PROJECT

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