There's no place like home: Urban-rural differentials in nutritional status among children in Ethiopia

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Children under 5 years of age in Ethiopia experience one of the highest rates of malnourishment in the world. Though there is a growing body of literature outlining determinants of children's nutritional status, little attention has been given to the nutritional status of the rapidly increasing urban population of children. In this study, I contribute to this gap by asking, "What is the relationship between household residential location, feeding practices of children under 5 years of age and nutritional status?" Using data from the 2000 Ethiopian Demographic and Health Survey, I find that rural children continue to have worse nutritional status outcomes than urban children. I also find that liquid foods, mother's occupation and household characteristics all are significant externalities associated with household residential location, that impact urban-rural differences in nutritional intake among young Ethiopian children.

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Chapter 1: Introduction

The United Nations (UN) estimates that between 2010 and 2025, the world's population will increase from 6.8 billion to 8 billion, with 5.2 billion people of the 2025 estimate residing in developing countries. 50 percent of the world's population will reside in urban places by then and 37 percent of the population of sub-Saharan Africa (SSA) will reside in cities (United Nations Population Division [UNPD], 2010). These estimates are of interest because almost half of SSA's population currently lives below the international poverty line (Clover, 2003). The United Nations Conference on Trade and Development (UNCTAD) reports that of all countries listed as Least Developed Countries (LDCs), more than 80 percent are located in Africa (United Nations Conference on Trade and Development [UNCTAD], 2009). SSA has experienced an increase in economic disasters, political instability, ethnic battles and civil wars, which have disrupted the lives of many of its citizens. At the forefront of these problems are the growing number of nutrition related illnesses and deaths.

Currently, over 265 million people in SSA are malnourished (Food and Agriculture Organization of the United Nations [FAO], 2009b). Malnourishment occurs when calorie intake falls below the minimum dietary energy requirement (MDER). The MDER is the amount of energy needed for light activity and a minimum acceptable weight for attained height (FAO, 2009a). The lack of food resources has been extremely devastating for children, the most vulnerable people in SSA. Malnourishment and under-nutrition affects up to 40 percent of children under 5 years in developing countries (United Nations Children's Fund [UNICEF], 2000). Malnourished children are usually shorter and weigh less than children the same age who receive adequate nutrition. Approximately 32 percent of SSA children are malnourished (FAO, 2009a). About 5

million SSA children die each year from hunger and malnutrition, while many survivors continuously battle hunger-related diseases (FAO, 2009a). Malnutrition has many long lasting effects: developmental deficits, increased levels of chronic illnesses in adulthood and adverse pregnancy outcomes (Alderman, 1993; Silva, 2005; Strauss & Thomas, 1998).

The worldwide economic crisis that began in late 2008 increased food prices to levels that put moderately malnourished children at increased risk of starvation. Many low income SSA countries that always depended on commercial imports of goods became unable to meet food related needs. International food-aide and health initiatives to SSA also declined due to high oil and gas prices. The United Nations Millennium Development Goals (MDGs) are a set of initiatives that aim to halve the number of people who live on less than a $1 a day. Yet due to rising world-wide costs, organizational progress reports show that the goals of reducing population hunger and poverty levels by 2015 may not be attained within the near future (United Nations Department of Economic and Social Affairs, 2008). This crisis has led to many countries becoming food insecure. Food insecurity exists when people do not have adequate physical, social or economic access to food (FAO, 2009a). Poor SSA households, and in turn poor SSA children, have little food to sustain themselves. In addition to political and economic strife, the HIV/AIDS pandemic has orphaned many children, putting them at greater risk of having little nutritional support (United Nations Department of Economic and Social Affairs, 2008).

Previous studies in SSA have tended to concentrate on income and nutritional status (Alderman, 1986; Behrman & Delolalikar, 1987; Boius & Haddad, 1992; Grimard, 1996; Hussain & Lunven, 1987; Subramanian & Deaton, 1996; Wolfe & Behrman, 1983) and urban/ rural differences in mortality (Gilbert & Gugler, 1992). Little work has been

done to test for urban-rural differences in SSA children's nutritional status and whether children's food intake differs by location. Barrachlugh's (1991) and Goodman and Reclift's (1991) studies on indicators of food crises in developing countries focus most clearly on the agricultural sector and its effects on rural unemployment, but the authors ignore the urban sector. The general focus on determinants of rural household food insecurity may be due to a rural-bias in the research. Perhaps because of the large number of poor rural children, there seems to be a reluctance in the field to shift toward an analysis of urban children and their adverse health outcomes.

Researchers on urban children's nutrition work within a 'double-burden' disease framework. This framework states that urban children face many types of infectious and non-communicable diseases that are found in their communities (Popkin, 2003; Stephens, 1995; Vorster, Bourne, Venter & Oosthuizen, 1999). They are at risk of being malnourished if they do not get enough food to eat or at risk of being obese because they are eating unhealthy street or westernized foods that are high in trans-fats and sugars. This framework to understand the nutritional status of children, especially very young children, focuses less on lack of food and more on an excess of food, a circumstance that is hard to find in many African countries. Kruger, Kruger, Vorster, Joste, and Wolmaran's (2005) work on urbanization and adult micronutrient status in South Africa shows the importance of using iodized salt in foods. But their work does not indicate the early childhood nutritional status of their study participants, which may be important for understanding adult outcomes.

Lastly, children's nutritional status has been heavily studied for children who are still breastfeeding. Children who are not exclusively breastfeeding need to be studied more because they have moved past the stage of getting the nutrients from their mother's milk and may be at greater risk of malnourishment because of a lack of other foods to

make up for this. Gracey (2002) gives an excellent analysis of the effects of urbanization on children' health but fails to discuss the eating habits of non-breastfeeding urban children in developing countries.

In the present study, I explore the relationship between household residential location and daily feeding practices of children under 5 years of age and the effects of each on children's nutritional status. I use stunting as a proxy for nutritional status, using a nationally representative sample of Ethiopian children. This study attempts to answer 2 main questions:

1. Does children's nutritional status differ by household residential location?
2. Do feeding practices mediate the effect of household residential location on children's nutritional status?

This paper has four parts. First, I provide a review of the theoretical arguments on determinants of children's nutritional status. Second, I describe the data to be used from the 2000 Ethiopia Demographic Health Survey (DHS). Third, I present the study results. Finally, I conclude with a discussion of the study limitations and directions for future research on the topic.

Chapter 2: Theoretical and Empirical Background

ETHIOPIA

This thesis focuses on the nutritional status of Ethiopian children. Ethiopia is located in East Africa and is bordered by Djibouti, Somalia, Kenya, Sudan and Eritrea (FAO, 2010a) and is one of the poorest countries in the world. It has a population of 88 million people, making it the 14th most populated country in the world (CIA World Factbook, 2010). The country's population by 2025 is expected to reach 125 million (United Nations Population Division [UNPD], 2010a). Though only 17 percent of the population lives in cities, Ethiopia is rapidly becoming urbanized (Tolossa, 2010), necessitating the need for the current study. The annual GDP of Ethiopia (in US dollars) is $900, the 213th lowest in the world (CIA, 2010). 44.2 percent of the population lives below the national poverty line (World Bank, 2010).

Ongoing border wars continue to slow the development of Ethiopia. Though a cease fire with Eritrea was called in May 1998, millions of people continue to suffer from violent conflicts with Somalia. A food crisis from 1999-2000 was more devastating than the crisis that crippled the country in 1985. During 2002-2003, a combination of drought and economic problems left more than 13 million Ethiopians in a state of food insecurity (Calow, MacDonald, Nicol, & Robins, 2009). Currently, it is estimated that 34.6 million Ethiopians are malnourished (44 percent of the total population). Ethiopia also has one of the highest child malnutrition rates in the world. More than 50 percent of children under 5 suffer from malnourishment (Tolossa, 2010). According to 2003-2004 estimates of total dietary energy consumption, Ethiopians only obtain 10% of their energy intake from dietary fats and oils, whereas dietary guidelines define 15% as a baseline for healthy adults and 20% for women of child bearing age (FAO, 2008b). Food deprivation estimates show that Ethiopians fall 310 kilocalories short of required daily energy

consumption. These estimates of the food insecurity crisis, along with the rapidly urbanizing population, make it a very important study context.

HOUSEHOLD RESIDENTIAL LOCATION

Urban communities present residents with a diverse amount of resources. They are the hub of political and economic activities as well as an outlet for entertainment purposes. In general, cities are at the center of health inventions and advancements (Stephens, 1995). Yet the current literature on the state of urban households in SSA paints a different picture, one of great inequality and disparity. SSA cities are growing at rapids rates that overwhelm already weak infrastructures (Preston, 1979). Gerard Piel, a scientific journalist, stated that, "The world's poor once huddled largely in rural areas. In the modern world, they have gravitated to the cities" (as cited in Ravallion, Chen & Sangraula, 2007, p. 667). Families move to urban communities to flee rural poverty with hopes of finding better lives, but end up facing more problems: population density, poor housing, high crime, limited access to resources, and disease (Brockerhoff & Brennan, 1998; Caldwell, 1986; Preston, 1996; Smith, 1998; Starr, 1987). Urban children's health outcomes are therefore influenced by their parents' abilities to survive the financial and social shocks felt in many urban SSA communities.

First, urban households have to contend with higher prices for basic subsistence goods, i.e., food, water shelter, sanitation, transportation, than do rural households, which may significantly reduce the purchasing power of urban household incomes (Kjellstrom & Mercado, 2008). Previous research on rural-urban household differentials shows that the urban poor may even pay more than the urban rich for the facilities they have access to (Leitmann, 1992; Hardoy & Satterthwaite, 1991; Hardoy & Satterthwaite, 1989). The

environmental locations of many urban SSA households put children at high risks of eating contaminated foods due to dirty water and poor human waste management. Only 31 percent of SSA residents have access to adequate sanitation (WHO, 2010b). Poor sanitation leads to diarrhea, cholera, dysentery, typhoid and hepatitis (World Health Fact Sheet, 2010). Human excrement, poor sanitation and unsafe water have contributed to about 1.5 billion in deaths of children under 5 years of age over the last 5 years (Sheuya, 2008).

MATERNAL EDUCATION AND OCCUPATION

Past research on the effects of parental socio-economic factors on children in developing countries has identified maternal education as one of the most important factors determining children's health outcomes (Pena, Wall, & Persson 2000). Maternal education has been linked to more exclusive breastfeeding (Aghaji, 2002; Li, Li, Ali, & Ushijima, 2003; Giashudiin, Kabir, Rahman, & Hannan, 2003; Nwankwo & Brieger, 2002; Vaahtera, Kulmala, Hietanen, Ndekha, Cullinan, Salin, & Ashom, 2001), increased infant survival rates (Burgess, Burgess, & Wheeler, 1973; Bicego & Boerma, 1993), better physical growth (Engle, Zeitlin, Medrano & Garcia, 1996), and more positive nutritional status outcomes (Aguillion, Caedo, Arnold, & Engel, 1982; Bicego & Boerna, 1993; Christiansen & Alderman, 2004; Engle, Castle, & Menon, 1996; Genebo, Girma, Hadir, and Demmissie 1999; Glewwe, 1999; Popkin and Bisgrvoe 1988; Wachs & McCabe, 2001; Tagoe-Darko, 1995; Yimer, 2000). Results from Wamani, AstrØm, Peterson, Tumwind, and Tylleskar's (2006) on the effects of socio-economic indicators on the growth stunting of Ugandan children showed that mother's education had a much stronger positive effect on child growth than did fathers' education. Maternal education

in developing countries takes on even greater importance for young children because of the limited buffers to reduce infant morbidity and mortality (Stevenson, Chen & Booth, 1990; Wachs, McCabe, Yunis, Kirskey, Harrison, Galal, & Jerome, 1996).

Maternal education influences children's health outcomes by providing changes in individual behavior (Castro-Martin, & Juarez 1995; Heaton, Frost, Hoffmann, & Flake, 2005). Literacy and number skills help women read instructions on how to dispense medications. Health information learned through education is essential when treating household members (Sandiford, Cassel, Sanchez & Coldham, 1997; Bhuiya, Streatfield, & Meyer, 1990). Exposure to modern treatment methods may increase the use of local health care centers when children become ill. Semba, Pee, Sun, Sari, Akhter and Bloem's (2008) study on the effects of parental education on child stunting among Bangladeshi and Indonesian families shows that educated mothers take part in more health-promoting activities than uneducated mothers. Educated mothers also have more autonomy which may also increase their decision making power within the household (Becker, Fonseca-Becker, & Schneck-Yhlesias, 2006; Frost, Has, & Forste, 2005). Thus, education has a positive effect on children's growth, developmental and nutritional status because mothers typically allocate more family resources to increase children's nutrition than fathers (Pfeiffer, Gloyd, & Ramirez, 2001; Caldwell, 1993). Increases in education provide mothers with job opportunities that may help increase total household income and the living conditions. Women's work should therefore have a positive effect on children's health because it provides children with food and/or treatment when they get ill.

But for many poor urban households, a combination of adverse factors within their communities may make them more financially vulnerable than rural households. Dependence on a cash economy is a factor related to urban household poverty. Because

of a weak formal employment sector, many SSA urban households have to survive on incomes that are erratic, unreliable and insufficient (Smith, 1998). If household members do find regular work, many of the jobs are seasonal. These disruptions in household income harm children's nutrition: their bodies are continuously playing 'catch-up' because their meals are so unpredictable.

Though previous estimates of rural-urban income differentials in SSA implied that average incomes in rural areas are often lower than those in urban areas, these estimates can be misleading. Due to high urban averages created by a very affluent minority, rural-urban differentials may actually be narrower than shown by mean differences (Kjellstrom & Mercado, 2008).

Many women in SSA work in informal jobs or are self employed (Basu, 1996). Most jobs for urban mothers are in the market or on the streets. Crowded work spaces, dirty streets and air pollution make work environments unsafe for mothers to bring their young children to. Working rural mothers typically have large extended family networks that may help look after young children, whereas working urban mothers may have to pay for child-care or rely on other siblings within the household to look after the younger children (Wandel & Holmboe-Ottesen, 1992). For many SSA households where birth-spacing is short, urban mothers may be relying on very young siblings to take care of even younger siblings. This care may include taking them to school, bathing, entertaining and feeding them. Maternal occupation has been linked to lower height and weight for age measures (Engel, 1989; Ukwuani & Suchindran, 2003) as well as an earlier termination of breastfeeding compared to mothers who do not work outside the home (Benefo & Parnell, 1991; Di Domenico & Asuni, 1979; Ekanem, 1993).

FEEDING PRACTICES

Food is typically one of the largest portions of SSA urban families' monthly expenditures. Research has shown that the urban poor typically spend between two-thirds and three-quarters of their income on food and even go into debt to feed themselves and their households (Pryer & Crook, 1988; Sanyal, 1987). Ahmed, Hill, Smith, Wiseman and Frankenberger (2007) examined household spending in 14 developing countries where most residents live on less than $1/day and found that 12 of the countries had most households spending more than half of their weekly budget on food. Urban Ethiopian households spend close to 39% of their total household income on food consumption expenditures (FAO, 2008). Current bodies of work on urban food deficits report that urban households are less vulnerable than their rural counterparts because of urban farming and agriculture. Ellis and Sumberg (1998), as well as Berry (1989), give a thorough illustration of urban agriculture and its manifestation in SSA, but fail to draw a more direct link between urban agriculture and urban households' health status. Rogerson (1993) claims that the urban poor use urban agriculture as a survival strategy; however this does not take into account that investments in basic tools, space, and labor needed to farm is very hard to come by for the urban poor, who usually live in squatter settlements or very cramped housing units.

Overall, urban dwellers have been unable to reliably depend on agricultural production to supplement food-deficits in the household (Ruel, Garrett, Hawkes, & Cohen, 2010). Instead, many urban households employ a number of coping mechanisms. Drawing on the economic meltdown that began at the end of 2008, Ruel et al. (2010) describe a set of food-based coping practices that households have had to employ to fight increasing food prices:

- Switch to cheaper or lower quality staples to protect energy intake

- Reduce overall food intake.
- Decrease intake of non-staple foods like vegetables, fruits, and dairy products.
- Eat out or increase consumption of street foods, which are typically cheaper.
- Find new cooking methods or ingredients.
- Modify within-household allocation of food and nutrition resources.

Bijjlmakers, Bassett, and Sanders' (1995) study of infant nutritional status in Zimbabwe showed that 80 percent of families surveyed in the nations' capital had fewer meals and decreased consumption of basic food staples due to a national financial crisis. A consequence of this was that there was a 12-20 percent jump in stunting incidence among 1-4 year olds.

Malnutrition in young children affects brain growth and is highly associated with child morbidity and mortality, especially in SSA (Reyes, Perez-Cuervas, Sandovla, Castillo, Santos, Doubova, & Gonzalo, 2004). Malnourished children have poor psychomotor development and are less interactive. School enrollment for malnourished children is usually delayed, but of those who do eventually enroll, they tend to score significantly lower on cognitive tests than non-malnourished children (Pelletier, 2003; Yamano, Alderman, & Christiansen, 2005). Haddad, Ruel, and Garrett (1999) showed that the number of undernourished urban preschoolers in SSA has been increasing in the past 10 years.

CONCEPTUAL FRAMEWORK

Poor childhood nutritional status is an outcome of several factors resulting from a mix of environmental, economic, political, social, technological, and spiritual difficulties that result in a lack of food. My research uses the household livelihood security framework to analyze determinants of children's nutritional status, in this case, childhood stunting. Households that face numerous crises and shocks have to use the skills and resources available to them to cope. Households that lack the necessary skills and knowledge become most vulnerable to any form of loss, and therefore the initial loss begets future loss, resulting in a loss spiral (Zamani, Gorgievski-Duijvesteijn, & Zarafashani, 2006).

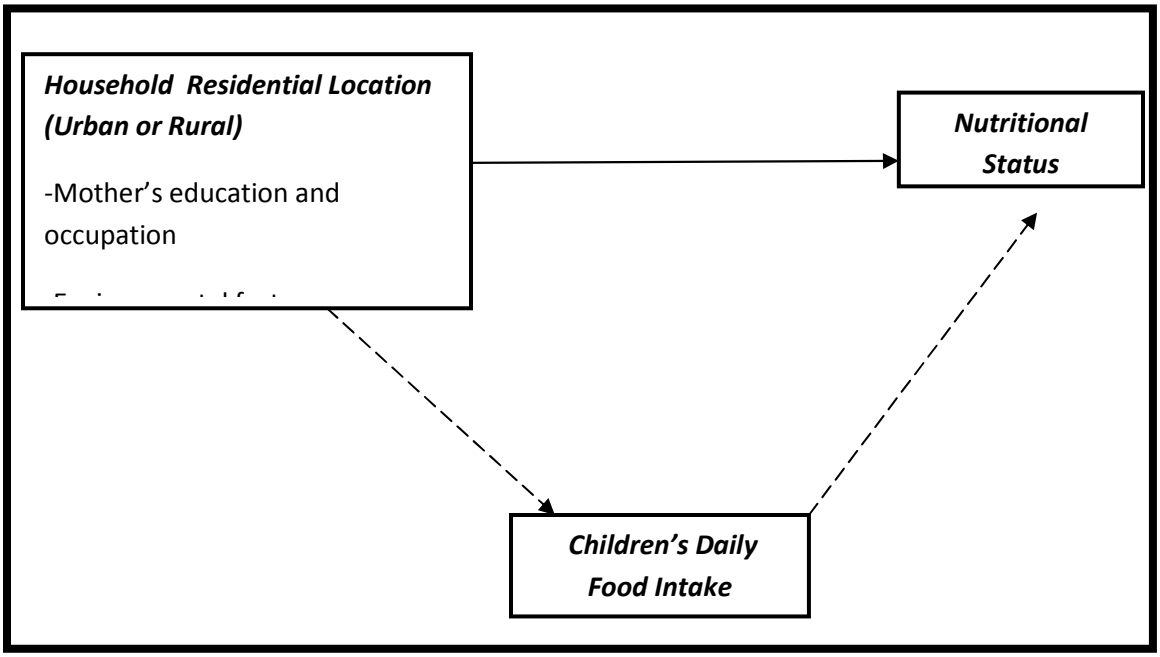

Figure 1: Conceptual framework of potential determinants of poor nutritional status

My conceptual framework begins with the fact that there are multiple influences on childhood stunting, which is a biological response to an environmental shock. According to Figure 1, household residential location influences children's stunting measures directly and/or indirectly through the feeding practices of children. Household residential location's intermediate factors –mother's education, occupation, sanitation, and health access/knowledge- are all characteristics that strongly impact rural-urban differences in children's nutritional status outcomes.

Chapter 3: Data and Methods

DATA

This thesis models the effect of urban household location on childhood nutritional status in Ethiopia using the 2000 Demographic and Health Survey (DHS). The objective of the DHS is to provide data on fertility and family planning behavior, child mortality, children's nutritional status, maternal and child health services, and knowledge of HIV/AIDS. The Ethiopia 2000 DHS has complete interviews from 14,072 households, 15,637 women aged 15-49, and 2,607 men aged 15-59. A stratified cluster-sampling design was used to randomly select women aged 15-49 within each cluster. The survey was conducted in four main steps: (1) 539 enumeration areas (EA) and 27 households per EA were selected, the survey was designed, tested, and translated into local languages; (2) field staff were trained and eligible households were interviewed; (3) the data were entered, edited, and coded; and finally (4) the data were made public for analysis (Central Statistical Authority [Ethiopia] and ORC Macro, 2001).

In addition to the information that the DHS collects, anthropometric measures (height and weight) were recorded for children under age 5 and women aged 15-49. The three commonly used indicators to measure children's nutritional statuses are height-for-age, weight-for-age and weight-for height. The survey had information on 10,837 children less than 5 years of age. In order to estimate the effect of household residential location on children's nutritional status, I limited the study to children between the ages of 7 and 59 months. Children under 6 months were dropped from the analysis because most children under 6 months in Ethiopia are exclusively breastfed and the analysis aims

to determine the nutritional status of children who depend on solid foods. Additionally, children who had incomplete anthropometric measures, measures out of limit or cases with missing information on all measures were deleted from the analysis. The total study sample includes 7, 686 children.

Dependent Variable

The outcome variable of children's nutritional status is measured by using children's stunting as a proxy. Stunting is an anthropometric height-for-age index that shows pre- and post-natal linear growth. It also serves as a measure of long-term inadequacies in nutrition and/or health (WHO,1997). The National Center for Health Statistics/World Health Organization definitions of childhood stunting describe children two standard deviations below the median height-for-age curve as stunted (WHO, 2010a). I measured stunting as a dichotomous variable of whether or not the child in question is too short for his/her age.

Independent Variables

This analysis has two main independent variables: household location and children's feeding practices. Household residence was coded as a dichotomous variable, [0]=rural and [1]=urban. Mothers of children in our sample were asked: "How many days in the last 7 days was [NAME] given each of the following [FOOD ITEM]?" This question was asked of 11 different types of foods, measured on an interval scale from 0-7 days. Children's individual characteristics were sex, age and health status over the two weeks prior to the survey. Sex was coded as a dichotomous variable. Age was coded as an interval variable from 7-59 months. The child health status variables of diarrhea, cough and fever in the last two weeks were each coded as dichotomous variables.

Maternal education was split into 3 categories: no education, primary school education, and secondary school and more education. Maternal occupation was split into

4 categories: no occupation, manual occupation, agriculture occupation, and professional occupation. I used work by Popkin (1980) and Abbi, Christian, Gujral, and Gopaldas (1991) to determine the categories of occupation. Health access and knowledge were captured by including four variables: (a) ability to seek-help if the child was sick, (b) has heard of oral rehydration therapy, (c) has a child's health card and (d) has seen a doctor in the last 12 months. These were all coded as dichotomous variables, taking the value "1" if the child is in the specified category (for example, has a health card) and "0" otherwise (for example, does *not* have a health card). Having electricity, a household with an earth floor, bed-nets, piped water in the household or compound, and a functioning toilet facility were dichotomous variables used to describe household characteristics (Getaneh, Assefa, & Taddesse, 1998; Sommerfelt, & Stewart, 1994). All missing values were imputed.

METHODS

The data were analyzed with STATA SE 11.1 (2009). A series of logistic regression models were used to test the net effects of (a) household residential location and (b) feeding practices on children's nutritional status. The first logistic regression analysis tested the bivariate association between household location and children's stunting measures. The second logistic regression tested if feeding practices mediated household residential location on stunting. Subsequent regressions include additional determinants of stunting to best understand why stunting may vary across urban and rural localities.

Chapter 4: Analysis and Results

[*Table 1 goes here]*

Table 1 shows the descriptive statistics for Ethiopian children. Forty-nine percent of urban and 55 percent of rural Ethiopian children are stunted. The children's sex distribution is split in half in both residential locations. The mean age of all children was approximately 33 months. Overall, more rural children had diarrhea, a cough, or a fever 2 weeks prior to the survey than urban children. 88 percent of rural mothers had no formal education. Twenty-six percent of urban mothers had completed primary school and 32 percent of urban mothers had finished secondary school or more. Almost 50 percent of rural mothers worked in the agricultural sector, compared to only 3 percent of urban mothers. A larger percentage of urban Ethiopian mothers recorded not working. Urban households have the overwhelming advantage of having electricity, piped water to the house or compound, and a toilet. Seventy-eight percent of urban children's mothers would be able to seek help for their children if they became sick, compared to only 42 percent of rural children's mothers. Concerning food in the last 7 days, urban children had more liquids (sugar water, tea, coffee, carbonated drinks or soup broth) in the last 7 days than rural children. They also had more than twice the daily intake of fruits. In all, the description data not only show an urban advantage with regard to child stunting, but also urban advantages in the socioeconomic and health advantages.

[*Table 2 goes here]*

Table 2 presents the results of a sequence of multi-variate logistic regression models of child stunting. Results are presented in the form of odds ratios. An odds ratio

can be interpreted as the odds of being stunted (versus not stunted) if the predictor variable is 1, divided by the odds if the predictor variable is 0. For example, an odds ratio less than 1, for "health card", means that the odds of being stunted are less (although not significantly less) for children with a health card than for children without a health card. An odds ratio greater than 1 is associated with higher odds of being stunted.

Model 1 simply tests whether children living in urban households had different stunting outcomes than children living in rural households. The results show that urban children have 24 percent lower odds of being stunted than rural children and that the difference is highly significant at the alpha level of 0.001. Model 2 tests the mediating effect of the types of liquids and foods children in our sample ate during the 7 days prior to the survey. Net of foods eaten in the last 7 days, the urban household location remains statistically significant. Daily increases in the consumption of juice, water and milk are associated with 7, 6 and 2 percent decreases in the odds of stunting respectively. Interestingly the odds of being stunted goes up by 3 percent for consumption of legumes. To test the impact of individual child factors, Model 3 introduced children's sex, age, and health status. These child-level measures are not significant. Model 4 introduces maternal education, occupation and health access/knowledge. Mother's education is not significant, but children whose mothers work in agricultural jobs have 13 percent higher odds of being stunted than children whose mothers do not work work net of food in the last 7 days and household residential location. The urban household effect decreases (moves toward 1.00) by 0.06: urban children have approximately 19 percent lower odds of being stunted than rural children net of maternal factors and food intake in the last 7 days.

In Model 5, the urban household effect disappears when household characteristics are introduced. Children who live in homes with earth floors have 22

percent higher odds of being stunted than children who live in homes with no earth floors. Children in households with bed-nets had 25 percent lower odds of being stunted than children living in households without bed-nets. Food intake in the last 7 days (water, fruits, meat and legumes) are significant. Daily increases in legumes continues to increase the odds of being stunted by 3 percent. Finally, in Model 6, I controlled for all independent variables. The only significant variables in the model are having a home with an earth floor, and consuming water, fruits, and legumes in the last 7 days.

Chapter 5: Discussion and Conclusion

This study used a nationally representative sample of Ethiopian children under 5 years of age conducted in 2000 to investigate the relationship between household residential location - measured as living in an urban or rural community – and the risk of children being stunted. I found important pieces of evidence that make a contribution to the literature on children's nutritional and health status. First, the analysis finds evidence that there continues to be a larger disadvantage in rural children's nutritional status than that of urban children. Its strong statistical significance revealed that though a large percentage of children in urban communities of Ethiopia are stunted, the adverse effects of living in a rural community outweigh the negative effects of urbanization on children. Because stunting is a measure of a long-term nutritional deficiency, future research on urban-rural nutritional differentials should detail the household coping mechanisms employed. In doing so, aide organizations can pinpoint the exact needs of families.

I had hypothesized that because urban and rural Ethiopian livelihoods are so different, foods that children in both locations consume would be different as well and that these differences would have an effect on their nutritional status. Though I do find small effects of diet, they do not diminish the effect of household residential location on the odds of stunting. Across all models, liquid food items are statistically significant: increases in these items are associated with decreased odds of children being stunted. A lack of water or the high price of water in the market may explain the effect of these particular food effects on stunting. Though the descriptive statistics show that children in the sample consume liquid food items almost every day, they may not have been receiving adequate amounts of these foods. Better monitoring and education concerning the diet of young children need to be established to make sure they are receiving ample quantities of food.

The results of the present study show that children's age and sex are not determinants of stunting. This indicates the absence of sex preferences related to child feeding. Mother's report of children's health status two weeks prior to the survey also has no effect on stunting.

Mother's education was not a determinant of children's nutritional status, probably reflecting the overall low maternal education levels seen in Ethiopia. Mother's agriculture occupation was the only maternal characteristic that exhibited an effect on children's stunting. Agricultural occupations may be capturing a general socio-economic status effect. Women in many of the agriculture jobs are paid very low wages and work very long hours, which shortens their child rearing time. Health access and health knowledge also failed to have an effect on children's stunting outcomes. This may also be due to low maternal education levels.

When household characteristics were entered into the model, the protective effect of living in an urban household disappeared. Bed-nets had a diminishing effect on children's stunting and by the last model, the coefficient became insignificant. Having an earth floor captured an overall poverty effect, explaining its increasing effect on the odds of children being stunted. It seems that regardless of household location, the poverty status of households is the most important determinant of children's nutritional status. Urban areas have socioeconomic advantages for children when compared to rural areas. But when all other predictors are combined, this advantage disappears, revealing that across both household residential locations, the underlying story is that household poverty is the force behind higher childhood stunting outcomes in rural areas of Ethiopia.

This analysis has a few limitations. First, because the Ethiopia 2000 DHS did not ask households how they divide up their monthly expenditures, my hypothesis that urban households may be spending more on food cannot be tested here. This would have been

beneficial when comparing mothers across occupation and education levels to see how much more of an advantage mothers in certain jobs have in feeding their children. Second, though maternal education did not have an effect on children's stunting, it may have been because the variable was measured as three categories. Future work on the effects of maternal education may permit a better analysis using continuous measures of mother's education, especially in areas that have low educational attainment. Third, I was unable to find effective ways to measure individual children's food consumption except for what they had been fed in the last 7 days. The Ethiopia 2000 DHS does not have additional food related questions. But this analysis still adds to current work on the nutritional status of children in Ethiopia, by helping to pinpoint the determinants of malnutrition in children and to identify which children are most vulnerable.

Appendix A

Table 1: Demographic, Social, and Health Characteristics of Children Aged 7- 59 Months in Ethiopia, by Urban-Rural Location of Residence

VARIABLES	URBAN	RURAL
Stunting[1]	49%	55%
Individual-factors[1]		
Child		
Male	50%	50%
Age (months)	33.14	32.28
Diarrhea	17%	22%
Cough	22%	32%
Fever	25%	28%
Maternal factors[1]		
Education		
None	42%	88%
Primary	26%	11%
Secondary or more	32%	1%
Occupation		
Not working	46%	36%
Manual	17%	7%
Agric	3%	49%
Professional	35%	8%
Health access/knowledge[1]		
Seek help for child	78%	42%
Know of ORT	93%	69%
Has health card	79%	37%
Doctor in 12 months	72%	48%
Environmental factors[1]		
Electricity	73%	.01%
Earth floor	51%	96%
Bed-net	5%	2%
Piped water	78%	6%
Toilet	69%	9%
Feeding practices[2]		
Water[3]	6.92(.62)	6.79(1.06)
Juice[4]	.67(1.57)	.06(.5)
Milk[5]	2(2.94)	1.86(2.93)
Liquid[6]	4.80(2.62)	2.82(2.92)
Grain[7]	6(1.88)	5.73(2.25)
Roots[8]	1.85(2.27)	1.15(2.21)
Fruits[9]	1.95(2.4)	.7(1.46)
Meat[10]	1.62(2.17)	.92(1.75)
Legumes[11]	3.09(2.69)	2.79(2.9)
Oil rich foods[12]	5.17(2.58)	2.41(2.79)
Vitamin A rich food[13]	1.32(1.97)	.72(1.75)

N	**1150**	**6536**

Source: 2000 Ethiopia DHS

Notes:

[1]n (percent)

[2]Mean (standard deviation)

[3]plain water

[4]fruit juice

[5]milk other than breast-milk

[6] any other liquids such as sugar water, tea, coffee, carbonated drinks, or soup broth

[7] food from grains (millet, sorghum, maize, rice, wheat, barley, teff, oats)

[8] food from roots or tubers (white potatoes, cassava, enset or other local roots/tubers)

[9] any other fruits or vegetables (bananas, apples, avocados, tomatoes)

[10]meat poultry, fish, egg, cheese or yoghurt

[11]food from legumes (lentils, beans, soybeans, pulses, or peanuts)

[12]any food made with oil, fat, or butter

[13]food from pumpkins, carrots, red sweet potatoes, green leafy vegetables, mango, papaya

Table 2: Multivariate Logistic Regression Models of Childhood Stunting among, Ethiopian Children, 2000

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Urban	**.76*** **	**.76*** **	**.76*** **	**.81***	1.04	1.06
Child factors						
Male			.93			.93
Age			1.00			1
Diarrhea			1.03			1.03
Coughing			.95			.95
Fever			1.01			1.02
Mother's factors						
Education						
None				ref		ref
Primary				1.09		1.11
Secondary				.96		1.0
Occupation						
Not working				ref		ref
Manual				1.01		.99
Agric				**1.13***		1.12
Professional				1.11		1.11
Environment						
Electricity					.90	.88
Earth Floor					**1.22***	**1.23***
Bed-net					**.75***	.76
Piped water					.85	.86
Toilet					.93	.93
Health access						
Seek help				1.02		1.04
Know of ORS				.90		.9
Health card				.96		.97
Doc visits				.98		.98
Food in last 7 days						
Juice		**.93***	**.93***	**.93***	.96	.94
Water		**.94****	**.94***	**.94****	**.94***	**.95***
Other liquids		1	1	1	1	1.01
Grain		.99	1	.99	.99	1
Roots		1.01	1.01	1.01	1.01	1.01
Fruits		1.03	1.03	1.03	**1.04***	**1.03***
Meat		1.02	1.03	1.02	**1.03***	1.03
Oil		1	1	.99	1	1
Vitamin A		1	1	1	1	1
Milk		**.98***	**.98***	.98	.99	.99
Legumes		**1.03****	**1.03****	**1.02***	**1.03****	**1.02***
-2LL	5287.79	**5270.10**	**5267.80**	**5269.58**	**5260.47**	**5251.97**

Source: 2000 Ethiopia DHS; Notes: [1]OR [95% CI], *p-value<.05, **p-value<.01, ***p-value<.001

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