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GEORGE WARREN BROWN SCHOOL OF SOCIAL WORK

# Assets and Child Well-Being in Developing Countries

A Research Review

Gina A. N. Chowa  
University of North Carolina, Chapel Hill

David Ansong  
Center for Social Development  
George Warren Brown School of Social Work

Rainier Masa  
Center for Social Development

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Washington University in St. Louis

# Assets and Child Well-Being in Developing Countries: A Research Review

*The impact of assets on child well-being in developing countries has received considerable attention in the last decade. Increased recognition of the critical role played by assets in enhancing children's well-being has spurred efforts to study the relationship between assets and a range of outcomes for children. This chapter reviews current studies (i.e., conducted within the past 10 years) that explore the relationship of asset ownership and a range of outcomes. The studies we have included in this review illustrate the impact that assets can have on children's outcomes in the area of health, education, and child labor. Overall, the studies reviewed show that asset ownership improves children's health conditions, advance schooling outcomes, and decrease incidence of child labor. Further research on the asset effects for child outcomes can inform progressive asset-building initiatives that will provide impetus for programs and policies to enhance household well-being in developing countries.*

**Key words:** *savings, assets, children, developing countries, child well-being*

The effect of assets on the well-being of children in developing countries has received considerable attention in the last decade. Research in developing countries has demonstrated that assets owned by families tend to be the gateway to accessing essential services (Thind, 2004; Xie & Dow, 2005); lowering child mortality (Armstrong Schellenberg et al., 2003; Thomas, Conteras, & Frankenberg, 2002; Woelk & Chikuse, 2000); improving child development outcomes (Paxson & Schady, 2007; Montgomery & Hewett, 2005); as well as preventing occurrences of negative incidences such as child labor (Basu, Das, & Dutta, 2007; Blunch & Verner, 2001). In addition, owning assets (land and livestock) has a positive affect on rates of children's school enrollment and educational attainment (Filmer & Pritchett, 2001). As a consequence, households with access to various forms of assets are better able to provide for their children's basic needs as well as to make investments in future generations through healthcare, education, and training (Aryeetey, 2004; Filmer 2005; Guitirrez, 2002; Thomas et al., 2002). Conversely, households lacking assets are more vulnerable to the negative child outcomes associated with living in poverty (McKernan, Ratcliffe & Nam, 2007).

Increased recognition of the critical role played by assets in enhancing children's well-being has spurred efforts to better understand the relationship between assets and a range of outcomes for children. This overview of studies that have investigated these relationships also aims to provide insight into understanding how core contributors to child well-being, such as access to health care services, schooling, and the incidence of child labor, are affected by assets. Our review includes 29 studies conducted over the course of the past 10 years. The review includes the effects of assets on health outcomes, schooling, and the incidence of child labor. The ages of children included in these studies range from birth to 19 years.

The term *assets* may mean different things to different people (Nam, Huang, & Sherraden, 2008). These meanings differ based on culture, ideological leanings, and disciplinary orientations. Thus, assets in developing countries have been defined in a variety of ways. For the purposes of this review, assets are defined as the stock of wealth used to generate well-being; a definition

incorporating many definitions that primarily consider assets as productive tangible assets that generate returns (Oliver & Shapiro, 2006; Sherraden, 1991). These assets can be exchanged for some value or can be passed on to the next generation.

Measurement of assets in developing countries is challenging for several reasons. First, a broad range of tangibles and durable goods are considered as assets. For example, livestock, land, houses, and durable household goods such as televisions, cell phones, refrigerators, and stoves are all considered assets in developing countries. Second, although tangible assets are usually the easiest type of assets to measure, this is not always true in developing countries that often lack access to information such as consumer price indexes and are plagued by the inability of governments to create and implement national pricing standards or control other factors that act as barriers for market dynamics. Third, determining the asset value of land is particularly challenging because many respondents do not know how to report the size of their holdings in acreage (Barrett & Reardon, 2000; Baulch & Hoddinott, 2000). As a result, whether land or livestock, owners do not know the value of their assets.

In contrast to tangible assets, durable assets are easier to measure because respondents are able to accurately report the number of durable assets in their household, even though the reported value may still be unreliable due to the reasons previously mentioned. Nevertheless, assets offer a more reliable measure of household wealth in developing countries than income and expenditure (Fafchamps & Quisumbing, 2002, 2005; Filmer & Pritchett, 2001; Hoddinott, Haddad, & Murkherjee, 2000; Sahn & Stifel, 2000). Unlike income, which is defined as the flow of resources, assets refer to accumulated wealth (Sherraden, 1991).

Some of the asset measurements currently used by researchers include the World Bank's Living Standard Measurement Survey, which lists durable household goods, livestock, land, and home ownership (Grosh & Glewwe, 1995). This household questionnaire collects information on these assets and calculates an annual use value. To account for the differences in the value of houses, the type of material used to build portions of the house is listed and the data is weighted according to the value assigned to the building material.

Researchers also measure household assets using the asset index that was introduced by Filmer and Pritchett (1999). The index was constructed using principal component analysis, which is a simple, nonparametric method of extracting relevant information from complex data sets. The asset index, which uses household data on durable and semi-durable goods, is not prone to measurement errors because it requires less data than other measurement tools. Sahn and Stifel (2000) expanded on Filmer and Pritchett's index by using factor analysis to construct weights for each asset in listed in the asset index. In addition, Sahn and Stifel presented three reasons why the asset index is an effective method for measuring household welfare: (a) household assets are fewer and easier to measure as compared to income and expenditure data; (b) the asset index provides increased accuracy and validity of an asset; and (c) asset data are less likely to contain reporting bias and can be easily verified.

## The Effect of Assets on the Incidence of Child Labor and Schooling

### Assets and child labor

For the past decade, a number of empirical studies have focused on the association between household assets and the high incidence of child labor. Not only is the issue of child labor complex but there is no universally agreed upon definition of the phenomenon (Fares & Raju, 2007). Most studies on child labor, including some of those reviewed here, fail to adequately address the definition of child labor and what distinguishes child labor from child work. In many developing countries it is hard to distinguish child labor, which is “objectionable,” and child work, which is “not objectionable” (Bachman, 2000; Forsythe & McMahon, 2003; World Bank, 2007). The International Labor Organization (ILO) defines child labor as comprising “children’s work which is of such a nature or intensity that it is detrimental to their schooling or harmful to their health and development.” (IPECL, IPSHWE, ILO, & IALI, 2002: 3).<sup>1</sup> On the basis of this definition, children who work in mines, work with dangerous machinery, or whose work in agriculture exposes them to chemicals such as pesticides and herbicides can be classified as child laborers. UNICEF defines child labor based on the age of the child and work that exceeds a set number of hours per week: “Age 5-11: at least one hour of economic work or 28 hours of domestic work; Ages 12-14: at least 14 hours of economic work or 28 hours of domestic work; Ages 15-17: at least 43 hours of economic work or domestic work” (UNICEF, 2008, definition). Although these two definitions seem clear, some families involve their children in economic activities (e.g., a family business) as a way of instilling entrepreneurial skills in their children (Torimiro & Dionco-Adetayo, 2005). Such an economic activity may not be hazardous to a child’s development<sup>2</sup> but would be classified as child labor in certain circumstances, such as if the work interfered with the child’s education. This disparity is an indication that the concept of child labor is not uniformly defined across countries and studies (Guarcello, Kovrova, Lyon, Manacorda, & Rosati, 2008)

In contrast, child work is work conducted by children that is socially acceptable in some countries. Our focus is primarily on the relationship between child labor and assets, although we also discuss other studies that use the terms child work and child labor interchangeably. Further, some studies do not make clear which of the two terms are used; therefore, the findings that may pertain to child work, which is acceptable, may have been presented as negative child labor and vice versa. This lack of clarity may be problematic to the interpretation of the findings as the outcomes of child labor and child work are not the same. Therefore, we try to distinguish the two outcomes as we discuss the findings of the studies.

In developing countries, 218 million children are engaged in some form of economic activity (Kruger, Soares, & Berthelon, 2007). This trend has been attributed to the high levels of poverty, suggesting that the poorer the family, the higher the level of engagement in labor for the children in the family (Blunch & Verner, 2001). However, the studies we review here do not all support this direction of the association. For example, in their study conducted in Tanzania, Beegle, Dehejia, and Gatti (2002) found that a 10% decrease in the yield of farm crops was associated with 7% increase in

<sup>1</sup> International Programme on the Elimination of Child Labour (IPECL), InFocus Programme on Safety and Health at Work and the Environment (IPSHWE), International Labour Office (ILO), International Association of Labour Inspection (IALI)

<sup>2</sup> Development in this context could be education, physical, mental, and social.

the average number of hours worked by children between the ages of 7 and 15 years.<sup>3</sup> Crop loss is an important predictor of labor because the reduced yield means a reduced asset stock for the family that would require the family to work harder to recoup their losses and reduce the risk of lack of food,

Findings in another study by Blunch & Verner (2001) conducted in Ghana showed that ownership of land, sheep, and cattle decreased the probability of child labor. In this case, one study supported the suggestion of a positive association between lack of asset ownership and use of child labor whereas a second study supported a negative association. The contradiction in these findings may point to the differences in the utility of the asset itself. As mentioned previously, crop loss increases a family's labor demand because the asset stock for the family in terms of crops is reduced and the family needs to work hard to reduce the risk of lack of food. In contrast, ownership of other types of assets such as land, sheep, and cattle might mean that the family has assets on which they can draw on in times of income and financial shocks. However, this concept of the utility of assets is a speculation that may be true in one setting but not in another, as demonstrated in studies conducted in India, in which the findings showed that unlike livestock, larger land assets led to a decline in child labor (Basu, Das, & Dutta, 2007; Dar, Blunch, Kim, & Sasaki, 2002; Gautam & Sarangi, 2005). Basu, Das, and Dutta (2007), found an inverted U-shaped relationship between ownership of land and child labor. Initially, ownership of land leads to increased incidence of child labor at the rate of 30 minutes per day for every acre of land, until the size of land holdings increased beyond 3.6 acres. At that point, the incidence of child labor began to decline. Counter evidence to this land-labor relationship was presented in a study Gautam and Sarangi (2005) conducted in Malawi, which demonstrated that greater assets increased the probability of child labor and affected boys and girls differently. In this study, Gautam and Sarangi (2005) investigated the influence of microcredit on the probability of child labor. As the household enterprises financed with microcredit flourished, children from those households engaged in greater domestic work so that their parents could increase their involvement in the enterprises. The gender dynamics were such that girls bore an even heavier burden as compared with boys (Bhalotra & Heady, 2003).

One explanation of these findings is that certain types of assets are more prominent in rural areas than urban areas and vice versa. Therefore, the effects of assets on child labor and the gender differentials are likely influenced not only by the prominence of labor intensive assets in rural areas but also by other factors, such as traditional gender roles among children. Consequently, boys would be affected differently than girls (Blunch & Verner 2001; Fares & Raju, 2007). Another explanation to the different effects is the proportionately high rates of poverty in some areas of the world, which necessitates that children work to supplement family income.

Table 1 summarizes the findings of the studies conducted to investigate the effect of assets on child labor.

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<sup>3</sup> According to UNICEF a child between the ages of 5 and 11 can be considered a child laborer if he or she works more than one hour of economic work or 28 hours of domestic work per week. This means that in Beegle, Dehejia and Gatti's study, a child between the ages of 7 and 11 who works more than one hour on the farm could be considered a child laborer.

## Assets and child schooling

Asset ownership has differential effects on child schooling in developing countries (Dar, Blunch, Kim & Sasaki, 2002). In this chapter, the term *child schooling* includes both the decision to attend school, which is often termed school attendance, and the time allocated for schooling, which often involves decisions of whether a child should attend school or engage in activities that benefit the family economics. As discussed earlier, some societies regard levels of child work as acceptable and an important part of the socialization of children. In some families, children are expected to engage in certain types of work within the homestead before and after school. Although this type of work may not necessarily be defined as child labor, (i.e., harmful to the child's development and for economic gains), once combined with school or done during school hours, such work may impede the child's education attainment by reducing the time devoted to school work. A question of interest to many social researchers is how asset ownership influences families' decisions regarding whether children should attend school or skip school some days to work at home.

Research evidence exist showing a positive association between asset ownership and school enrollment, attendance, and completion (Filmer and Pritchett, 2001; Montgomery, Grant, Mensch & Roushdy, 2005; Montgomery & Hewett, 2005). Filmer and Pritchett (1999) used survey data from 35 developing countries to examine how household wealth affected the educational attainment for children between the ages 15 to 19 years. The study used an asset index as a measure for a household's long-term economic status. Filmer and Pritchett's results showed that "the wealth gap" or wealth inequality was responsible for regional differences in primary education enrollment: in some regions (e.g., South America) enrollment was high but very few poor children completed primary education, whereas in other regions (e.g., South Asia, Central Africa) poor children were never enrolled in school. Further, Filmer and Pritchett found that in most countries, children from families at the top 20% of the asset index stayed in school longer than children from families who occupied either the middle 40% or the bottom 40% of the asset index. In addition, children from the middle 40% of the asset index had a higher school retention rate than those in the bottom 40% of the asset index. In most countries, the poor (bottom 40% of the asset index) did not complete primary school.

Similarly, Ssewamala and Curley (2005) found that a family's ownership of assets (measured by savings) had a positive effect on children's school attendance. To adequately interpret this finding, it is important to understand what school attendance involves in most developing countries. Generally, in developing countries elementary school attendance requires the child to wear a uniform, which limits attendance to those who have resources to purchase uniforms. Lack of resources for uniforms and school supplies poses a considerable barrier for poor families who want to send their children to school.

In cases where assets require substantial amounts of time to maintain, asset ownership may be negatively associated with school attendance. Cockburn's (2007) study analyzed households' decisions about children's time use, and showed that the ownership of permanent crops decreased school attendance and increased work for boys. Because maintaining field crops require a great deal of time and effort, children in the family are needed to help plant, maintain, and harvest the crops. This type of agricultural work often keeps children from attending school. In Cockburn's study, a family's ownership of assets, in the form of ploughs and sickles, increased school attendance for their children. This finding suggests that when families own equipment, the time required to

maintain or generate income from crops is reduced. This negative relationship between asset ownership and child school attendance is supported by the evidence showing that the children's labor is not as required by the family to the extent that it is when this equipment is absent. Studies conducted in Ghana, Kenya, and Ethiopia also support this association (Admassie, 2002; Moyi; 2006). For example, a study conducted in Ethiopia by Admassie (2002), showed that household assets increased the probability of children dividing their time between school and work, which decreased their overall school attendance. Interesting findings in this study showed that a family's ownership of cattle (large livestock) was inversely associated with school attendance but positively associated with increased likelihood that a child would combine school and work. One explanation for this finding is that children sometimes herd cattle during school hours, and will divide their time between attending school and herding. However, children who work and attend school at the same time do not get the full benefit of their education because of the stress involved in combining school and work. In addition, children who work before or after school may not have time to do homework as well as may be exhausted at school and, therefore, unable to pay attention in class.

The mixed empirical evidence regarding the association of assets and children's work participation brings into question the theoretical support for asset-based poverty reduction strategies. For now, it is possible that the lack of valid and reliable measures of child labor is responsible for the conflicting results of the relationship between asset ownership and schooling. Theoretically, families with low levels of productive assets devise ways to survive including making use of available human capital, which encompasses making children work instead of going to school (Admassie, 2002; Cockburn, 2007). Although this aspect of child work may seem to negate the proposed positive effects of asset ownership, the evidence presented supports that asset ownership overall is positively associated with children's well-being, albeit with some caveats. Arguably the most important among these caveats, is that caution should be exercised in advancing asset-based policies in developing countries to avoid the negative outcomes that some assets may have on children. Table 2 summarizes the studies that have investigated the effects of assets on child schooling, both school attendance and family decisions between attending school and work for children.

### **The Effect of Assets on Children's Health**

In its recent *State of the World's Children Report*, UNICEF (2008) outlined common threats to child survival, including undernutrition, lack of safe drinking water and sanitation, and lack of access to health care. The threats specified by UNICEF have subsequently been used in studies to examine the association between asset ownership and child health outcomes. Findings from such studies conducted in developing countries have not only shown the positive overall effect of assets on child health but have also provided critical evidence that assets have the potential to prevent these common threats to child survival.

#### **Assets and undernutrition**

UNICEF defines *undernutrition* as, "the deprivation of a child's body and mind of the nutrients needed for growth and development" (UNICEF, 2008: 1). Characteristics of children suffering undernutrition include being underweight for their age, shorter than children of the same age (i.e., stunted height); dangerously thin (i.e., wasted); and showing symptoms of vitamin and mineral deficiency (i.e., micronutrient malnutrition; UNICEF, 2006).

The evidence from the studies reviewed in this chapter show that a family's asset ownership decreases the likelihood that their children will suffer from undernutrition. In particular, studies show that lower wealth status (as measured by productive assets) is associated with chronic childhood undernutrition. Studies conducted in Bangladesh, Cambodia, Ghana, Tanzania, and Zimbabwe, have shown that children from wealthier households are less likely to suffer stunted growth rates as compared with children from poorer households (Gwatkin et al., 2000; Hong, 2006; Hong, Banta, & Benatacourt, 2006; Hong & Mishra, 2006; Woelk & Chikuse, 2000). Notably, the study conducted in Tanzania (Gwatkin et al., 2000) revealed differences in mortality, nutrition, and treatment of illness according to household wealth level. In addition, Woelk and Chikuse's (2000) Zimbabwean study showed that children from households in the lowest rank of asset ownership faced 3 times the increased risk of being underweight as compared with children from households with highest rank of assets. Overall, growth stunting, low weight, and occurrence of diarrhea (which is a major cause of child death in developing countries) varied according to household wealth status.

These findings from developing countries point to the importance of productive assets that either generate income for families to purchase food or the assets themselves are sources of food for the families. For instance, as an asset, cows provide milk for the family and any surplus milk can be sold. In the absence of productive assets, families often lack food, which results in their children's stunted growth as well as other developmental delays. In addition to serving as a source of nutrition, when assets generate income for the family, that income can have a positive effect on child health by increasing access to health care services. For example, such income can be used to pay fees for acute or chronic health care services; preventative health care, such as inoculations and vaccinations; or routine health monitoring. When families have access to health services, symptoms of undernutrition are likely to be detected at earlier stages and treatment initiated. In contrast, children who lack routine health monitoring may suffer from undetected and untreated malnutrition, which often ends in irreversible physical and mental impairments or death.

Studies that have used household goods as a measure of assets have reported a positive correlation between asset ownership and children's nutritional status. Studies conducted in Ghana and Tanzania have provided evidence showing that lack of household appliances and automobiles influenced the incidence of undernutrition (Madise, Matthews, & Margetts, 1999). Although this finding does not establish a direct and clear link between assets and nutrition, we speculate that the ownership of household appliances and automobiles indicates a higher level of economic status and the ability of these families to access other resources. Whereas an automobile may not directly influence the household's nutrition, ownership of an automobile indicates greater household resources and greater likelihood that the household can provide adequate nutrition and health care for its members. This speculation may also hold true for household appliances used as a measure of asset wealth.

Similarly, studies conducted in Latin America have shown asset ownership, specifically the quality of housing, was inversely related to incidence of childhood undernutrition. These studies investigated the relationship between assets and childhood undernutrition; assets were measured using an asset index that includes indicators for housing, household assets, and employment. The housing index included type of construction (e.g., roofing material, wall and floor materials, housing type, type of kitchen); availability of utilities (e.g., electricity, telephone) and hygiene factors (e.g., whether the home had a shower, how garbage and trash were disposed of, access to drinking water). The housing index has been used as a measure of wealth inequality in many Latin American countries. Results from these studies have indicated that a lower rank on housing index was associated with children's

delayed physical growth (Aerts, Drachler & Giugliani, 2004; Larrea & Freire, 2002; Larrea & Kawachi, 2005). Similar to the implication of automobile ownership, housing material and conditions may not have a direct influence on children's nutrition, but rather may be a proxy of the resources available to the household. For example, a metal roof (as opposed to a thatched roof) may indicate that a household has sufficient resources to afford more expensive, stronger housing materials and, therefore, is more likely to have resources for health care and other services important to the well-being of family members.

### **Assets and other childhood health problems**

In addition to undernutrition, research has also shown associations between asset ownership and the childhood health problems of asthma and anemia. A study conducted in Chile examined the connection between socioeconomic status with children's asthma symptoms and severity (Coravalan, Amigo, Bustos, & Rona, 2005). The study used three measures of asset ownership to determine a household's socioeconomic status: number of domestic appliances; automobile ownership; and an index that combined the type of tenancy (e.g., owned or rented) and the quality of housing. Coravalan and colleagues' results showed that young adults from households with few household assets were more likely to have asthma symptoms (e.g., wheezing and shortness of breath) compared to their peers from wealthy. In addition, these young adults with asthma were more likely to experience greater severity of asthma symptoms than those from households with more assets.

Similar to the association found between wealth and asthma, results from studies investigating the relationship between anemia and wealth have demonstrated that wealth is associated with lower incidence of anemia. A study conducted in Brazil examined the prevalence of several child health problems, including anemia, in children 5 years and younger and the association of child health problems with household wealth (Muniz et al., 2007). The families' socioeconomic status was calculated using a wealth index based on household ownership of consumer goods and home appliances. The analysis of this cross-sectional data showed a statistically significant inverse association between household wealth and incidence of anemia (Muniz et al., 2007), meaning that households with more wealth had fewer children with anemia. A similar study in Timor-Leste assessed prevalence and factors associated with hemoglobin concentration. Surprisingly, the study revealed that children from the poorest households had higher mean hemoglobin level (i.e., lower rates of anemia) than children from either middle-class or the richest households (Agho, Dibley, D'Este, & Gibberd, 2008). One explanation for this counterintuitive finding is that the high-altitude location of the poor households in the study acts as a protective factor because the transmission of malaria (and resulting anemia) is substantially lower at high altitudes (Agho et. al, 2008). Malaria infection is associated with a reduction in hemoglobin levels that is labeled anemia at certain thresholds; severe, persistent anemia can lead to death (Menendez, Fleming & Alonso, 2000). Many children who have been repeatedly infected with malaria have developed immunity against the disease but continue to shelter malaria parasites without displaying any symptoms (Snow & Marsh, 2002). These asymptomatic infections can lead to anemia when left undiagnosed and untreated (Clarke et al., 2004). Therefore, although findings point to an association between wealth and anemia, other factors such as altitude, location, and type of malarial infection may affect the wealth-anemia relationship. Consequently, the wealth-anemia relationship may not be an asset effect, rather the demonstration of underlying variables that have a direct affect on anemia.

### **Assets and lack of child health care services**

Access to child health care services such as immunizations and antibiotics can prevent or treat childhood diseases such as measles and pneumonia (UNICEF, 2006). Vitamin A deficiency can cause blindness and reduce resistance to infectious diseases such as measles and diarrhea, both of which are major causes of child death in developing countries (UNICEF, 2006). Two empirical studies that have examined the determinants of immunization and vitamin A receipt showed household wealth had a positive association with both outcomes (Choi, Bishai, & Hill, 2005; Xie & Dow, 2005). A longitudinal study conducted in China found a positive association between household wealth and children's receipt of immunizations (Xie & Dow, 2005). In a study in the Philippines, Choi et al. (2005) found receipt of vitamin A supplement varied with ownership of assets and quality of housing. Choi and colleagues analyzed data obtained from the 1993 and 1998 Philippines Demographic and Health Surveys; their results showed that children living in poor households were less likely to receive vitamin supplements.

### **Assets and treatment-seeking behavior**

Although key health interventions have been well established, health service utilization for children is directly affected by the amount of resources available to families. Research shows that asset ownership not only increases a child's likelihood of survival by acting as a buffer to threats to children's health, but also increases probability of child health service use (Deressa, Ali & Berhane, 2007; Thind, 2004). Using data from India's Second National Family Health Survey, Thind (2004) investigated the determinants of health services utilization for children suffering from diarrhea and respiratory illness in rural Bihar. The Thind study found that children from families with few or no assets were 23% less likely to use health services as compared with their wealthier counterparts.

Conversely, as a household's standard of living increases, so does the probability of health service use by children in the household. Deressa, Ali, and Berhane (2007) conducted a study in Ethiopia that assessed household and socioeconomic factors associated with childhood febrile illness (i.e., malaria) and treatment-seeking behavior. In this study the socioeconomic status was measured by household asset ownership. Deressa and colleagues' findings showed that the gap between the poorest and wealthiest socioeconomic categories in the incidence of fever (used as a measure for febrile illness) was not statistically significant. However, Deressa and colleagues also found that when children were sick, more febrile children from households in the middle (37.1%) and highest (44.6%) wealth categories sought treatment within 24 hours as compared with households in the lowest wealth category (18.3%). The researchers also observed differences in the sources of care used by wealthier and poorer households. Wealthier children (39.4%) were more likely to seek treatment in public health facilities than their counterparts from middle-income (31.0%) and poor (12.5%) households. Children from poorer households were more likely to seek treatment from community health workers, and initiate home treatment without medical supervision than their wealthier counterparts. In addition, only 9% of children from the wealthiest households did not obtain any treatment, as compared with 16% of children from middle-class households and 15% of children from households in the lowest wealth index category. Findings from this Ethiopian study were consistent with those from an earlier study in Tanzania that demonstrated treatment-seeking behavior was worse among poor households as compared with richer households (Armstrong Schellenberg et al., 2003). Table 3 summarizes the findings of the studies conducted to investigate the effect of assets on children's health.

### Limitations

The studies we reviewed used a wide range of asset measures and child well-being outcomes. The lack of consistent measures across studies produces a range of different and sometimes contradictory findings. As previously mentioned, discrepancies in the findings could be attributed to the use of the assets and not the asset itself. In some cases, although an asset does not have direct negative association with child well-being, the use of that asset can cause an increase in child labor because of the maintenance requirements of that particular asset. Therefore, the asset may have indirect negative impacts as a consequence of this maintenance requirement. As such, this situation poses a limitation to the comparison of effects across assets given the indirect effects of some assets.

Another limitation pertains to the confounded definitions of outcomes for child well-being including child labor and child work. Indeed, these confounded definitions of outcomes have been a challenge to our review of the research because it is often difficult to identify which outcome the researchers were measuring, and, therefore, such uncertainty makes the discussion of the affects of factors of interest unclear. Although ILO and UNICEF have attempted to give clear definitions, there are instances when these definitions are still not adequate to isolate child labor from child work. Thus, findings cannot be clearly or easily categorized as child labor or child work. Further, the challenge of categorizing findings may also contribute to the contradictory findings presented. For example, in those instances in which the findings indicates that child labor increased with asset ownership, it might be that what is being termed as child labor is actually child work, which is acceptable and is part of the child's socialization process in some countries. However, the reverse may also be true. If indeed a phenomenon is being measured as child labor but not acknowledged as such, it might be that the negative affects of asset ownership on children are not reported with the magnitude warranted, depicting a false picture. The findings from these confounded definitions are mixed and may not represent the true effects of asset ownership.

Studies that have investigated the affects of asset ownership on health outcomes, such as anemia, indicated that assets do not always have direct effects on the outcomes mentioned, and other factors might be at play in the relationships under study. Several of the conceptual models used to investigate asset ownership effects do not include the factors that may better explain health outcomes and, therefore, assets are regarded as the factor contributing most to such outcomes. In this case, the relationship between asset ownership and anemia brings to bear the importance of developing conceptual models that depict a better explanatory picture of relationships of health outcomes. In the studies we reviewed, asset ownership had a negative association with anemia. The explanation may be that assets do not independently influence anemia, but other factors, such as altitude and malaria, may explain anemia prevalence better than assets. These limitations demonstrate not only that the findings of the studies reviewed should be interpreted with caution, but also the need for future research to establish definitions of child labor and child work that can be used in comparisons across studies.

### Programs and Policy Implications of the Effect of Assets on Child Well-Being

Research has demonstrated that assets have positive effects on child well-being. However, few asset-based policies and programs exist in developing countries, especially programs targeted toward poor families with children. Given the rapidly expanding priorities, policies, and programs being implemented in developing countries, inclusive asset-based policies targeted specifically toward poor

families should be a part of a broader, widely supported social policy initiative. Such intentional inclusion of asset-based programs targeting those with little experience or opportunity to acquire assets may contribute to the long-term reduction of poverty. This support of society's poorest is especially needed in developing countries in which public resources are extremely limited and social programs are integrated in wide-ranging national development strategies to garner political and international support. An example of one such initiative is the emerging consensus that social protection provides an effective response to poverty and vulnerability in developing countries. Social protection is about protecting households and communities from vulnerability and risk by helping people to accumulate and preserve assets (Barrientos & Hulme, 2008). The social protection framework of development is forward-looking and could be carefully designed so that the focus on providing poor people with opportunities for asset development is enhanced.

In the event that policymakers incorporate asset-based policies in the broader social protection agenda, a fertile environment for developing programs that will provide ways for children and families to accumulate assets could be created. The policy atmosphere in many developing countries favors such a strategy. There is strong and renewed interest in pro-poor social protection policies (also known as social assistance or safety nets), which was precipitated by the sharp rise in poverty and vulnerability during the 1980s and 1990s (Rodrik, 1997). Policy makers have recognized that social assistance is the primary safety net for the poor in developing countries with inadequate basic services and only a small fraction of the population covered by social insurance.

Three salient points underpin both asset-based policies and social assistance programs in developing countries. First, both asset-based policies and social protection programs utilize interventions aimed at strengthening the productive capacity of the poor. Social assistance protects basic levels of consumption, whereas asset-based policies facilitate investment in productive assets; both strengthen the agency of the poor. Second, asset-building and social assistance programs bring together a range of financial and social development interventions that effectively address the root causes of poverty. At the same time, this new social policy paradigm recognizes the role of assets in providing escape routes from persistent and intergenerational poverty (Barrientos, in press). Third, social assistance programs have demonstrated positive impacts on the saving and investing behaviors of program participants. In Paraguay, poor households saved 20% percent more after participating in a social assistance program. Before the program, the same households had a negative savings rate of 17% (Soares, Ribas, & Hirata, 2008). Similar positive investing behaviors were found in rural Mexico, where 25% of the cash transfers received from government were invested in microenterprises and agriculture that generated income (Gertler, Martinez, & Rubio, 2006).

Developing countries provide several examples of social protection programs for the poor that combine social assistance and asset-based principles. Mexico's Oportunidades (formerly Progresa) combines monthly cash transfers to families with a savings account awarded to a child upon completion of high school; the cash transfers and savings accounts are conditional on poor households sending their children to school and keeping regular appointments at health centers (Fiszbein & Schady, 2009). In India's Haryana State, savings bonds (in addition to cash stipends to mothers) are provided to girls born in poor households. Girls receive additional bonus (e.g. higher savings maturity and credit subsidy for entrepreneurship loans) if they defer cashing their savings certificates and complete Grades 5 and 8. The program implicitly aims to reduce child mortality among girls, abortion of female fetuses, and delay marriage until 18 years of age (Fiszbein & Schady,

2009). These examples demonstrate the feasibility of developing social assistance programs that include savings or asset-based components.

Conditional cash transfers for human development is only one example of a social assistance program that can be combined with a savings component, that is, a savings benefit conditioned on social development (e.g., school attendance, participating in health and nutrition interventions). Other social assistance programs, ranging from public works employment to food and nutrition programs to subsidies, can be leveraged by policy makers to incorporate asset-building strategies. Although basic social assistance programs can be provided in low-income countries (Pal, Behrendt, Leger, Cichon, & Hagemeyer, 2005; Weber, 2006), policy makers have to carefully consider the context of each developing country and which type of social assistance programs are feasible within that context. Constraints for social assistance and asset-based programs include availability of information to identify the populations most likely to benefit from such programs, administrative capacity to direct programs to specified populations, and the fiscal resources to afford programs that include asset transfers. According to Smith and Subbarao (2003), these constraints can be overcome by using the following five strategies: (a) selecting programs that are self-targeting or use community targeting; (b) choosing fewer and simpler program designs, and utilizing existing administrative systems; (c) developing programs that achieve other development goals; (d) selecting populations that are generally accepted as deserving of support; and (e) focusing on interventions that reduce the impact of risks on households' livelihoods. Effective social assistance programs with savings and asset-based components accomplish two primary goals. First, effective programs allow a household to maintain its current consumption level by assisting the household out of short-term poverty. Second, effective programs facilitate investment in human capital and other productive assets, which buffer poor households against chronic, long-term poverty.

Using a social protection framework that enhances asset-based policies, would promote households that are stable economically. In addition, the evidence provided in this review shows that these households that are less vulnerable and have a better risk management foundation of asset ownership would translate into better health and educational outcomes.

### **Next Steps in Research**

This review has demonstrated that having assets positively influences child well-being outcomes including health, schooling, and the incidence of child labor in developing countries. However, a number of the studies reviewed used cross-sectional data and do not provide any platform for causal claims in these relationships. Although cross-sectional research contributes to explaining the influence of assets and child well-being, only those investigations that have longitudinal designs can provide reliable causal explanations. More experiments that assess the affect of assets on child well-being using longitudinal data are needed to build knowledge in this area. Such evidence will build the foundation for progressive asset-building policies that will contribute to the agenda for child well-being in developing countries.

Asset measurement across studies investigating the effects of assets is confounded by the use of different definitions and approximations of assets that may be questionable. Although some of these studies were eliminated from this review of the research, asset measurement still remains one of the most evasive challenges to researchers. More empirical studies are needed to clarify what constitutes assets in developing countries and how such assets can be consistently measured across countries.

As discussed earlier, many developing countries are gradually adopting social protection programs and policies that seek to protect people against the impact of financial shocks, risks, and vulnerability. This forward-thinking policy movement also presents researchers with an opportunity to investigate how specific asset-building mechanisms can be incorporated into the social protection policies under consideration by developing nations.

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Table 1. Assets and child labor

Study	Country	Purpose	Description	Analysis	Findings
Basu, K., Das, S., & Dutta, B. (2007)	India	To examine the influence of household's land-ownership and livestock on the incidence of child labor.	The study uses a sample of 3,505 children (ages 6-14 years) from 1,490 households in the rural areas of Himachal Pradesh and Uttaranchal in India. The study measures the incidence of child labor by the number of hours that a child works per day. The study defines child labor as both domestic chores and work done outside the household.	A fixed-effects regression model is used to assess the extent to which ownership of land and livestock influence the incidence of child labor.	Findings show that unlike livestock, more land leads to decline in child labor. However, this relationship is initially positive until the household land holdings increase beyond the 3.6 acres (maximum value of land-holding). Child labor increases by approximately 30 minutes per day for every acre of land.
Beegle, K., Dehejia, R. H; & Gatti, R. (2002)	Tanzania	To investigate the association between household income shocks, access to credit, and child labor.	The study used a sample of 800 households from the Kagera Health and Development Survey conducted in Tanzania. The sample was drawn from 51 communities, from 1991 to 1994. Physical assets (that could serve as collateral) were used as proxy for access to credit. The study defines child labor as the total hours that a child spent in the last week engaging in economic activities and chores.	Ordinary least square (OLS) and fixed effects models are used to estimate the effects of shocks (change in assets) on child labor. Further, OLS is used to estimate the interaction between shocks and collateral.	Findings show a one standard deviation income shock (change in assets) is associated with 10% increase in child labor, and the presence of durable assets is associated with 5% reduction in the likelihood of child labor.

Study	Country	Purpose	Description	Analysis	Findings
Blunch, N. & Verner, D. (2001)	Ghana	To examine the relationship between the household socioeconomic characteristics and the incidence of child labor.	The study uses data from the Core Welfare Indicators Questionnaire household survey conducted by the Ghana Statistical Service and the World Bank in 1997. The sample consists of 60,686 individuals from 14,514 households. Household socioeconomic characteristics are proxied by ownership of land, cattle, sheep, and employment status.	A probit model is used to estimate the determinants of child labor. In this model, child work serves as a binary dependent variable (i.e. whether child works or not).	The study shows a positive relationship between low socioeconomic status and the incidence of child labor. Children from poor households are more likely (10.6%) than children from nonpoor households (6.2%) to engage in child labor.
Gautam, H., & Sarangi, S. (2005)	Malawi	To investigate whether access to microcredit affects the relationship between the incidence of child labor, and household ownership of land and retail enterprises.	The data for this study are drawn from the Malawi Financial Markets and Food Security Survey conducted by the International Food Policy research Institute and the Department of Rural Development at the University of Malawi in 1995. The sample comprises 404 rural households from 45 villages.	This study uses a Bivariate Probit Maximum Likelihood technique to estimate the influence of microcredit on the probability of child labor.	The results show access to microenterprise loans mediates the relationship between the likelihood of child labor and household ownership of land or retail enterprises.

Table 2. Assets and schooling

Study	Country	Purpose	Description	Analysis	Findings
Admassic, A. (2002).	Ethiopia	To re-examine the relationship between asset ownership and child work and/ or schooling.	The study uses data from a five round household survey conducted by Addis Ababa University. The study has a sample of 3,611 children between ages 4 and 14 years. Decisions about child time allocation is divided into three options: school only; work only; school and work; and inactive.	A multinomial logistic regression model is used to regress “decisions about child-time-allocation” on parental, household, technological and cultural characteristics.	Ownership of large livestock has negative effects on school attendance and a positive effect of combining school with work. Increased farm size reduces likelihood of school attendance by 4% and increases likelihood of work attendance by 2%.
Bhalotra, S., & Heady, C. (2003)	Ghana & Pakistan	To re-examine the relationship among children from land-rich families, child work, and school participation rate.	The study uses a cross-sectional data from a large, nationally representative sample of the Ghana Living Standards Survey (GLSS) in 1991/92 and the Pakistan Integrated Household Survey (PIHS) in 1991. Land size is used as a proxy for wealth.	Probit and OLS models are used to estimate the affect of land ownership on the probability of child labor and schooling.	The results show that there is a statistically significant positive relationship between increased farm size and the number of work hours for girls living in Ghana and in Pakistan. The relationship is not strong for boys. Data for Pakistan shows a significant negative relationship between larger household farms and the likelihood of girls attending school.
Cockburn, J., & Dostie, B. (2007)	Ethiopia	To investigate the relationship between asset ownership and child time-use decisions.	The study uses data from three rounds of surveys of 1,477 rural households in Ethiopia from January 1994 to March 1995. Measure of child time use is based on whether a child schools, works or is inactive.	Multinomial logit, mixed logit and simultaneous equation models are used to analyze decisions about child time use	The study finds that ownership of plows and sickles has a positive effect on schooling (0.035 and 0.023 respectively) and negative effect on work (-0.040 and -0.009 respectively). The ownership of permanent crops tend to increase work (0.070) and reduce schooling (-0.010) among boys.

Study	Country	Purpose	Description	Analysis	Findings
Filmer, D., & Pritchett, L. (1999)	35 developing countries in Asia, Africa, Middle East, and Latin America	To examine how educational attainment within countries differs by household wealth.	The study uses data from the Demographic and Health Surveys carried out in 35 countries. An asset index is used as a proxy for a household's wealth.	Descriptive statistics are used to analyze the variations in household wealth and educational attainment across countries.	The study finds that wealth inequality is associated with low level of educational attainment, low median grade completed and high primary school drop-out.
Filmer, D., & Pritchett, L. (2001)	India	To estimate the relationship between household wealth and children's school enrollment.	The study analyzes data taken from India's National Family Health Survey also known as the Demographic and Health Survey. The study uses household asset variables (rather than income or expenditure data) as a proxy for household's long-term economic status.	Probit regression models are used to examine the determinants of school enrollment. The same models are estimated separately for India as a whole and for each state.	The study finds that household wealth is positively associated with children's school enrollment.
Kruger, D., Soares, R.R., & Berthelon, M. (2007)	Brazil	To investigate the relationship between permanent household wealth and decisions about child labor and schooling.	The study uses data from the Brazilian Household Survey (PNAD) and the Brazilian Census Bureau. The study categorizes household decisions (dependent variable) into three options: work only, schooling only, and work and schooling. Household wealth is measured by ownership of durable goods, nonlabor income, and job tenure of head of household.	The study uses a generalized ordered discrete choice model to investigate how household wealth influences decisions about whether children go to school and/or work. The model controls for age of child, gender, race, years of schooling, and place of residence (rural or urban).	The study finds that assets and household infrastructure moderate the association between household wealth, and lower incidence of child labor and increased school attendance. Also, shocks to household economic activities increase the demand for children's time (child labor)

Study	Country	Purpose	Description	Analysis	Findings
Montgomery, M., Grant, M., Mensch, B., & Roushdy, R. (2005)	Egypt & India	To examine urban poverty effects at both household and neighborhood levels on children's schooling	The study analyzes data drawn from the 2003 Egypt Interim Demographic and Health Survey and from a reproductive health and livelihood interventions (for girls aged 14-19 years) study conducted in the slums of Allahabad, India. Indicators of living standard include ownership of land, house, automobiles.	A multivariate censored regression analysis model is used to estimate the effects of urban poverty at both levels on children's schooling. Both household and neighborhood factors are compared.	Results indicate that household living standards and economic composition of neighborhoods exert substantial influence on the educational attainment of urban children.
Montgomery, M., & Hewett, P. (2005)	Senegal	To investigate the effects of living standards and relative poverty on children's schooling in urban and rural areas of Senegal.	The study draws data from the 2000 Multiple Indicator Cluster Survey. A MIMIC model <sup>4</sup> is used to identify proxies for living standard that include a car, household appliances, a motorcycle or bicycle, and housing quality.	Bivariate and multivariate regression analyses are used to estimate the effects of living standards and relative poverty on children's schooling. The predicted living-standards are grouped into quintiles specific to urban and rural areas, and these quintiles provide the base for the multivariate analysis.	Results show living standards in urban areas exert substantial influence on schooling. This effect is weaker in rural areas of Senegal.

<sup>4</sup> MIMIC (multiple-indicator, multiple-cause) is a highly structured, statistically based approach that measures living standards from a set of proxy variables. The proxy variables are mainly assets that range from ownership of consumer durables to assessments of the quality of housing. In separating determinants from indicators, the MIMIC approach brings more structure to bear on the problem as compared to the relatively unstructured methods of principal component analysis and the simple factor approach.

ASSETS AND CHILD WELL-BEING IN DEVELOPING COUNTRIES

Study	Country	Purpose	Description	Analysis	Findings
Moyi. P. (2006)	Ghana & Kenya	To investigate the association between household socioeconomic status (proxied by family resources/ access to arable land) and schooling and/or child labor.	The study uses data from Ghana and Kenya. For Ghana, data are from the Statistical Information and Monitoring Programme on Child Labor with a nationally representative sample of 47,955 individuals and 17,034 children (ages 5 to 17 years). The data for Kenya are from the Multiple Indicator Cluster Survey by UNICEF. It has a sample of 17,159 children(ages 5 to 17 years).	A multinomial logistic regression model is used to generate a relative risk ratio to assess the probability of choosing one outcome category (school and work, neither school nor work, and work only) over the probability of choosing the reference category (full-time schooling).	Household socioeconomic status is associated with the probability of a child combining work and school in Kenya, but not in Ghana. The probability of attending school full-time increases by the wealth and expenditure quintile of households.
Ssewamala, F., & Curley, J. (2005)	Uganda	To examine the effect of family or caregivers' assets on children's educational outcomes	Using data from the socio-economic module of the Uganda National Household Survey (UNHS) 1999-2000 collected by the Uganda Bureau of Statistics, this Study sought to examine the effects of asset-ownership (household income, ownership of bicycles and inherited land) on children's school attendance, controlling for numerous observable factors.	A logistic regression is used to determine the relationship between asset ownership and children's educational outcomes.	Results show that asset ownership account for a 3 percentage point increase in the likelihood of a child attending school and /or staying in school.

Table 3. Assets and health outcomes

Study	Country	Purpose	Description	Analysis	Findings
Aerts, D., Drachler, M., & Giugliani, E. R. (2004)	Brazil	To examine the determinants of growth retardation in children younger than 5 years old in the southern Brazilian city of Porto Alegre.	The study analyzes data drawn from the 1990 cross-sectional survey <sup>5</sup> that investigated the nutritional status of young children (0 to 5 years).	Nonconditional logistic regression is used to estimate the odds ratio for stunting. Logistic regressions, consisting of three steps, are conducted to determine the factors associated with stunting.	The study finds that the main determinants of stunting include per capita family income < 0.8 times the minimum wage, maternal illiteracy, living in a wooden or mixed-construction house.
Agho, K. E., Dibley, M. J., D'Este, C., & Gibberd, R. (2008)	Timor-Leste	To assess the prevalence of and factors associated with hemoglobin levels of children aged 6-59 months.	The study uses data from Timor Leste's 2003 Demographic and Health Survey, which is a multi-stage cluster survey of 4,320 households. 4,519 children aged 6-59 months are included in the analysis.	Multiple hierarchical analyses with a backward stepwise method are used for identifying the factors associated with hemoglobin levels.	The results show that children from poorest households have higher mean hemoglobin levels (i.e., lower prevalence of anemia) than children from middle and richest households.
Choi, Y., Bishai, D., & Hill, K. (2005)	Philippines	To examine whether receipt of vitamin A supplements vary by socioeconomic status as measured by a wealth index.	The study uses data on supplementation of vitamin A and independent variables from two Philippines Demographic and Health Surveys (DHS) conducted in 1993 and 1998. A household wealth index was created based on household ownership of four selected assets and on housing quality.	Univariate and multivariate odds ratios are used to test the associations. Six independent predictors <sup>6</sup> are included in the logistic regression model. The same set of bivariate and multivariate analyses is performed for both 1993 and 1998.	The study finds that children living in poor households are less likely to receive supplementation. This disparity increases between the surveys: the adjusted odds of vitamin A intake by poor households compared to middle-class households declined from 0.73 in 1993 to 0.52 in 1998.

<sup>5</sup> These are the most recent population data concerning the health conditions of the children in Porto Alegre, Rio Grande do Sul, Brazil.

<sup>6</sup> The six predictors are wealth status, age of mother at childbirth, gender of child, education of mother, education of father, and type of residence.

ASSETS AND CHILD WELL-BEING IN DEVELOPING COUNTRIES

Study	Country	Purpose	Description	Analysis	Findings
Coravalan, C., Amigo, H., Bustos, P., & Rona, R. (2005)	Chile	To examine the association among socioeconomic status (SES) and asthma symptoms, and severity of asthma	The study collects data from a sample of 1,232 men and women randomly selected from a total of 3,096 live birth between 1974 and 1979. The study utilized three measures of assets ownership: number of domestic appliances, car ownership, and an index that combined type of tenancy and quality of housing.	Multiple logistic regressions are used to assess the association of each asthma definition with a single SES variable, while adjusting for age, gender, active and passive smoking, birth weight and body mass index. Multiple logistic regression models were carried out for each asthma definition that included all SES predictor variables.	The study finds that young adults whose families have fewer household assets are more likely to have asthma symptoms; experience severity of asthma; and report wheezing.
Da Cunha, S., Pujades-Rodriguez, M., Barreto, M., Genser, B., & Rodrigues, L. (2007)	Brazil	To examine the relationship among asthma prevalence and health and socioeconomic status.	The study uses data from population-based surveys of asthma that were conducted in Brazil. Asthma prevalence is measured by the proportion of school children with reported wheezing in the last 12 months. Socioeconomic indicators include type of house based on sanitation, and family resources.	Two models are developed based on child age: 6-7 years and 13-14 years age groups. Bivariate analyses examine the association between asthma prevalence rates and 11 health and socioeconomic indicators in both models.	Results indicate that six health and economic variables show a clear pattern of association with asthma. Among the positively related socioeconomic indicators, the prevalence of asthma increases with poorer sanitation, Gini wealth index and external mortality.
Deressa, W., Ali, A., & Berhane, Y. (2007)	Ethiopia	To assess household and socioeconomic factors associated with childhood febrile illnesses and treatment-seeking behavior.	The study draws on data from a community-based cross-sectional survey of 2,372 households with at least one child younger than 5 years. An index of relative household wealth is constructed using principal component analysis.	A logistic regression is employed to assess the relationship using two models. The first model has 10 predictor variables <sup>7</sup> and the second has five <sup>8</sup> .	The study finds a statistically significant association between wealth status and early treatment-seeking behavior. However, the gap between the poorest and wealthiest socioeconomic categories in the incidence of fever is not significant.

<sup>7</sup> These predictor variables include age, sex, house sprayed with aerosols, house sprayed with DDT, household possessed mosquito net, type of roof, presence of windows, presence of opening holes on walls, livestock in house, and household wealth status.

<sup>8</sup> These predictor variables include age, sex, educational status of mother/caretaker, family size, and household wealth status.

Study	Country	Purpose	Description	Analysis	Findings
Hong, R. (2006)	Ghana	To examine the association between household economic inequality and chronic childhood undernutrition.	The study uses a sample of 3077 children (aged 0-59 months) from 6,251 households in Ghana. Household wealth index is used as a proxy for household economic status, based on household ownership of durable assets.	Bivariate and logistic regression analyses are used to estimate the effects of household economic status on growth stunting. The nutritional status of children is measured by a Z-score of height-for-age.	The unadjusted odds of stunting are more than 4 times greater for children living in poorest (lowest wealth index quintile) households than those in the richest (highest wealth index quintile) households.
Hong, R., Banta, J., & Betancourt, J. (2006)	Bangladesh	To examine the relationship between household wealth inequality and chronic childhood undernutrition <sup>9</sup> .	The study uses a sample of 5,977 children (aged 0-59 months) included in the 2004 Bangladesh Demographic and Health Survey. An index based on household characteristics and ownership of durable assets is developed to measure household wealth status.	Univariate and multivariate odds ratio are used to assess the effects of household wealth status and other factors on chronic childhood undernutrition. In addition to wealth index variable, 16 independent <sup>10</sup> predictors are included in the logistic regression.	The study observes that lower wealth status is associated with chronic undernutrition. Children in the poorest 20% of households are more than 3 times as likely to suffer\ from adverse growth rate (i.e., stunting) as children from the wealthiest 20% of households.

<sup>9</sup> A child is defined as being chronically undernourished or whose growth rate is adversely stunted, if his or her z-score of height-for-age is more than two standard deviations below the median of international reference population recommended by the World Health Organization.

<sup>10</sup> The 16 variables are children of multiple births, age, gender, birth order, mother's access to antenatal care, availability of professional assistance at delivery, duration of breastfeeding, mother's age at childbirth, mother's body mass index, mother's education, household access to safe drinking water, presence of arsenic in drinking water, access to toilet facility, cleanliness of cooking fuel, residence and geographical location.

Study	Country	Purpose	Description	Analysis	Findings
Hong, R., & Mishra, V. (2006)	Cambodia	To examine how wealth inequality is associated with inequalities in chronic childhood undernutrition or stunting <sup>11</sup> .	The study draws data from the 2000 Cambodia Demographic and Health Survey containing information on 3,235 children (aged 0-59 months). Household wealth status is measured by an index based on household ownership of durable assets.	Binary and multinomial logistic regressions models are used to estimate the effects of wealth status and other factors on chronic childhood undernutrition. Twelve independent <sup>12</sup> predictors are included in the logistic regression models to assess their affect on stunting.	The study demonstrates that wealth inequality is strongly associated with chronic childhood undernutrition. Children in the poorest 20% households are more than 2 times as likely to suffer from stunting as children in the richest 20% households.
Larrea, C., & Freire, W. (2002)	Bolivia, Colombia, Ecuador, and Peru	To analyze the effects of socioeconomic, regional and ethnic conditions on chronic malnutrition.	Data are drawn from the Demographic and Health Surveys for Colombia (1995), Peru (1996), and Bolivia (1997), and on a Living Standard Measurement Survey for Ecuador (1998). The study develops an index of household socioeconomic status that includes indicators for education, housing, household assets, and employment.	Descriptive data on stunting prevalence by place of residence, geographic region, ethnicity and socioeconomic status (SES) were calculated. To analyze SES effects on chronic malnutrition, smoothed regression curves and linear functions were applied, with specific models for three Andean countries with severe geographical disparities.	Results show that lower SES is associated with chronic malnutrition in all four Andean countries. Peru has the strongest association between stunting and socioeconomic inequality, whereas Bolivia, Colombia and Ecuador have lower levels of socioeconomic inequality in stunting.

<sup>11</sup> Stunting (*moderate and severe*) refers to a condition below minus two standard deviations from median height for age of reference population.

<sup>12</sup> The 12 predictor variables are wealth status, age, gender, birth order, duration of breastfeeding, age of mother at childbirth, mother's body mass index, maternal education, access to safe drinking water, presence of hygienic toilet, residence and geographic location.

Study	Country	Purpose	Description	Analysis	Findings
Larrea, C., & Kawachi, I. (2005)	Ecuador	To examine the association between economic inequality (measured in several ways including housing characteristics) and child malnutrition.	The study derives data from the 1998 Living Standard Measurement Survey (LSMS) of Ecuador. The analyses include anthropometric measures from 3,054 children younger than 5 years. Contextual factors include economic inequality, measured by the Gini coefficient of household consumption, at three different geographical levels, and average per capita consumption.	Ordinary least squares regression models are used to test the independent effects of individual and contextual factors on stunting at different geographical scales.	Results show that socioeconomic indicators are independently associated with child malnutrition. The study also illustrates that stunting still affects 26% of children younger than 5 years in Ecuador. Stunting in the rural highlands and among indigenous peoples is higher and is associated with the contextual economic inequality at the provincial level.
Madise, N. J., Matthews, Z., & Margetts, B. (1999).	Ghana Malawi Nigeria Tanzania Zambia Zimbabwe	To test the extent of the association between child nutritional status and its determinants.	The study uses data from the Demographic and Health Surveys conducted in six countries from 1990 to 1994. The explanatory variables include household SES, breastfeeding patterns, and morbidity of children within 2 weeks of the survey date. SES is measured by ownership of modern household items.	The z-scores of height-for-age, weight-for-age, and weight-for-height are used to measure the nutritional status of children. The z-scores are compared across the six countries. The study uses a correlation model to assess the association between each of the explanatory variables and a child's nutritional status.	The study finds a positive correlation between ownership of modern household items and a child's nutritional status in Ghana (0.19) and Tanzania (0.13)

Study	Country	Purpose	Description	Analysis	Findings
Muniz et al. (2007)	Brazil	To examine the prevalence of several child health problems in children younger than 5 years and their association of health problems with household wealth.	The study uses data from a cross-sectional study of the entire population of children 0-5 years in two counties. The families' SES is calculated using a wealth index. The child health issues include malnutrition, anemia, and intestinal parasitic infection.	Descriptive statistics are used to examine the prevalence of child health problems by wealth status. An independent <i>t</i> test and a chi-square test are used to compare the means and proportions.	The study indicates a statistically significant inverse association between prevalence of both malnutrition and anemia <sup>13</sup> , and household wealth, but not parasitic infection.
Thind, A. (2004)	India	To investigate the determinants of health services utilization for children suffering from diarrhea and respiratory illness in rural Bihar, India.	The study analyzes data of 2,703 children younger than 3 years of age obtained from the Second National Family Health Survey (NFHS-2).	Logistic regression is used to estimate the determinants of health services utilization for children suffering from diarrhea and respiratory illness. Eleven independent predictors <sup>14</sup> were included in the logistic regression models.	The study finds that children from lower wealth status are 23% less likely to use health services compared with their wealthier counterparts. Alternatively, a rising household standard of living increases probability of health service use.
Xie, J., & Dow, W. H. (2005)	China	To investigate the determinants of child immunization (including household wealth) in 1990s China	The study uses data derived from the 1991, 1993, and 1997 China Health and Nutrition Survey (CHNS). The sample comprises of children 7 years or younger in the each wave. An asset index is created to measure household wealth.	A logit model of immunization use, including each of the predictor variables is estimated. To test the effects of the explanatory variables, all of the data waves were pooled into a single regression. Chamberlain <sup>15</sup> community fixed-effects and household fixed effects conditional logit models are designed to control for unobserved characteristics.	The findings show that household wealth is positively associated with immunization use. After controlling for unobserved community heterogeneity, prices, and maternal education are observed to be statistically significant determinants of immunization.

<sup>13</sup> Anemia is defined as low hemoglobin concentration. It has been shown to affect cognitive development, shorten attention span, cause irritability, fatigue, difficulty with concentration, lethargy, increased mortality, and susceptibility to infection.

<sup>14</sup> The 11 independent variables are age, weight-for-age, sex, household size, maternal education, religion, caste or tribe, health care-seeking decision maker, household wealth status, number of clinical facilities in village, and presence of diarrhea only, respiratory infection only or both.

<sup>15</sup> Chamberlain, G. (1980). Analysis of covariance with qualitative data.