Structural Violence and Child Health: A Multi-Level Analysis of Development, Gender Inequality, and Democracy in Developing Countries

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of Sociology in the Graduate School
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ABSTRACT

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Abstract

More than 26,000 children under the age of 5 die every day on average, mostly in the developing world. Malnutrition accounts for up to half of those deaths, and diarrheal diseases account for another 17 per cent. The concentration of child malnutrition and diarrhea in developing countries should be of particular interest to sociologists because of the potential role of macro, structural and institutional forces in accounting for such cross-national disparities. This study focuses on country-level development, gender inequality, and democracy as three dimensions of structural violence that have important effects on child health in developing countries. In addition, the analysis also incorporates household and maternal characteristics that have already been shown to affect child health at the individual level. Using data from the Demographic and Health Surveys and several other archival sources, I conduct a multi-level analysis of young children nested in a sample of approximately 50 developing countries. Specifically, I estimate a series of hierarchical generalized linear logit models (HGLM) that predict the likelihood that a child is stunted, wasted, underweight, or has had a recent episode of diarrhea, based on a set of country- and individual-level explanatory variables.

The introduction in Chapter 1 describes the concept of "structural violence," the orienting theoretical framework for the dissertation. It also reviews related studies in

medical sociology and demography and gives an overview of the dissertation. Chapter 2 combines several theoretical perspectives to examine the effects of household-level socioeconomic resources as well as country-level economic development, water, sanitation, health care, and education. Household wealth and maternal education are the most important predictors of child health at the individual level; whereas, GDP per capita, secondary school enrollment, and a "capability development" scale have the most robust effects at the country level. Chapter 3 focuses on women's decision-making and resource control by examining 5 aspects of gender inequality: education, employment, political participation, reproductive autonomy, and life expectancy. Taken together, the results demonstrate that child health is likely to be better in countries where women have more education, control over their reproduction, representation in national politics, as well as longer life expectancy. Finally, Chapter 4 explores the link between democracy and child health, paying particular attention to various ways of measuring democracy. Surprisingly, bivariate correlations between democracy and child health are weak, and multivariate models do not yield consistent or robust effects. Overall, this dissertation demonstrates how child health is embedded in social, political, and economic contexts of inequality larger than the individual that partially determine who faces increased health risk factors and who is protected from them.

Dedication

To my parents, Terrence and Susan Burroway, for their limitless support, encouragement, and love. Thank you for believing in me.

And to my grandparents, Dean and Fern Eade and Don and Sophia Burroway, who would have been so proud.

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1. Introduction: Understanding Cross-National Variation in Child Diarrhea and Malnutrition

More than 26,000 children under the age of 5 die every day on average, mostly from preventable causes and mostly in the developing world. Malnutrition accounts for up to half of those deaths, and diarrheal diseases account for another 17 per cent (UNICEF 2007). About 43 per cent of children in Africa and 42 per cent in Southeast Asia are stunted, compared to approximately 14 per cent in the Americas. Similarly, 23 per cent of children under 5 in Africa and approximately 33 per cent in Southeast Asia are underweight, compared to just 4 per cent in the Americas (WHO 2008a). New cases of rotavirus (the leading cause of diarrhea) among children that require home-based care range from 104 million in developing countries to 7 million in industrialized countries per year. Furthermore, new cases of rotavirus that require either a clinic visit or hospitalization range from 25 million to 2 million respectively (Parashar et al. 2003). Almost 18 per cent of child deaths are attributed to diarrhea in low income countries, but the rate is only 1.6 per cent in high income countries (WHO 2008a). Perhaps not surprisingly, then, the majority of all diarrhea deaths among children worldwide (more than 80 per cent) occurs in poor countries (Parashar et al. 2006).

Child malnutrition and diarrhea are strikingly concentrated in certain regions of the world. Understanding these patterns of inequality could not only affect the well-being of children in the present, but could also have long-term consequences for the

future as well. Adults who have suffered from poor health and malnutrition in childhood are less physically and intellectually productive and experience more chronic morbidity (Blackwell et al. 2001; Smith and Haddad 1999). Healthy children, however, are generally more likely to develop cognitive, emotional, and social skills, and subsequently, succeed in school and society. This makes child health a fundamental underpinning of development in developing countries because it shapes how nations progress (UNICEF 2007).

This dissertation examines the multi-level sources of cross-national variation in child health. In the process, I ask how structural characteristics of countries shape individual health outcomes. More specifically, I investigate the macro-level effects of development, gender inequality, and democracy on malnutrition and diarrhea among children under five in approximately 50 developing countries. In addition, I also investigate how household and maternal characteristics influence child health as well. Health is a productive site for studying inequality as it is one of the most fundamental indicators of life chances and is integrally related to many other aspects of disadvantage. Thus, this dissertation is motivated by several key questions: What explains global patterns and vast inequalities in health? How do macro structures shape individual life chances?

A number of macro-level factors emerge as important predictors of cross-national variation in diarrhea and malnutrition. Chapter 2 shows that GDP per capita,

secondary school enrollment, and a "capability development" scale are particularly beneficial for health. Chapter 3 demonstrates that child health is likely to be better in countries where women have more education, control over their reproduction, representation in national politics, as well as longer life expectancy. Chapter 4 finds that the link between democracy and child health is not as robust as expected based on previous literature. The analyses further indicate that household wealth and maternal education are the most important predictors of child health at the individual level. Overall, this dissertation demonstrates how child health is embedded in social and economic contexts of inequality larger than the individual that partially determine who faces increased health risk factors and who is protected from them. While recognizing the role of individual characteristics, the analyses underscore the importance of social structures for shaping the distribution of well-being across societies.

The social predictors of infant and child mortality have been well studied among sociologists (e.g., Mosley and Chen 1984; Bradshaw et al. 1993; Shen and Williamson 1997, 2001; Shandra et al. 2004). However, the influence of macro-level contextual factors on malnutrition and diarrhea has been understudied in the social science literature to date, despite the fact that they remain two of the largest causes of child mortality in developing countries. In comparisons of social development in LDCs, child mortality is often recognized as a reliable predictor of the general well-being of children (Shen and Williamson 1997). It is used to reflect the nutrition and health knowledge of

mothers, levels of oral rehydration therapy use, access to health services, and the availability of food, clean water, and sanitation in the family (Bradshaw et al. 1993). Yet, the Demographic and Health Surveys (DHS) contain data that specifically measure malnutrition and diarrhea among young children, which also reflect the availability of food, clean water, and sanitary living conditions (Black 1984; WHO 2008b). The present study specifically focuses on malnutrition and diarrhea in order to more fully understand child health in developing countries.[1]

The concentration of child malnutrition and diarrhea in certain areas of the world should also be of particular interest to sociologists because of the potential role of structural factors in accounting for such cross-national disparities. Paul Farmer (2005: 22) notes that "the quandaries of the sick in industrialized countries are important and should never be dismissed, [but] the failure of ethics to grapple with the tragedy of the modern era's *destitute* sick is nothing short of obscene." He uses the concept of *structural violence* to help explain how social and economic inequities partially determine who faces increased health risk factors and who is protected from them (Farmer 2005). Individual biographies are embedded in larger social contexts that curb agency (Farmer

[1]It is possible that malnutrition and diarrhea act as mediators between a set of social predictors and child mortality, since they are such large contributors to child mortality. However, this dissertation will not estimate such models. Instead, I argue that malnutrition and diarrhea perhaps more specifically approximate the aspects of well-being that child mortality typically represents (e.g., access to nutrition, clean water, and sanitation), and therefore deserve to be studied in their own right if we want to more fully understand child well-being in LDCs. As more direct measures of general well-being, they may help us better identify ways to increase child health, and therefore, survival. Perhaps more specific indicators can also guide health policies in a way that mortality cannot.

1997). Structural violence occurs when this context harms human health. This concept provides an orienting theoretical framework for the analysis of child health by contending that a child's likelihood of experiencing malnutrition or diarrhea is shaped in part by social and economic forces larger than the individual. I posit that development, gender inequality, and democracy are three specific dimensions of structural violence at the country level that should have important effects on child health, and I build and elaborate on the general theoretical concept by decomposing it according to these dimensions.

In addition to exploring the macro, country-level predictors of child malnutrition and diarrhea, the analyses also incorporates household and maternal characteristics that have already been shown to affect child health at the individual level (e.g., Mosley and Chen 1984; Heaton et al. 2005; Parashar 2005; Hatt and Waters 2006). I employ a multi-level methodological approach that examines individuals nested in a sample of approximately 50 developing countries. Specifically, I estimate a series of hierarchical generalized linear logit models (HGLM) that predict the likelihood that a child is stunted, wasted, underweight, or has had a recent episode of diarrhea, based on a set of country- and individual-level explanatory variables. The advantage of this technique is that the effects of one level can be estimated while controlling for variation in the other level (Raudenbush and Bryk 2002). Using this approach, I can determine how country-level factors affect child health net of the individual-level factors, and I can further

ascertain whether individual-level effects are conditional upon country-level effects. Individual-level data are drawn from the Demographic and Health Surveys (DHS), a set of nationally representative, population-based surveys in developing countries. Country-level data are drawn from a number of archival sources, including but not limited to World Development Indicators, Polity IV, and Freedom House.

In the remainder of this introductory chapter, I describe the concept of "structural violence" and how it has been applied in previous literature. Then, I review related studies in medical sociology and demography that explore the relationship between structure and health, noting how this dissertation contributes to these fields. After stating the research questions, I provide a brief overview of the theories and results of subsequent empirical chapters.

1.1 Theoretical Background and Literature Review

1.1.1 Structural Violence

The term *structural violence* has roots in anti-colonial resistance movements and liberation theology, but was first defined in academia in 1969 by Johan Galtung, the founder of the field of Peace and Conflict Studies (Bourgois 2001). The concept has been popularized more recently in medical anthropology by Paul Farmer (1996; 2001; 2005) in his work on HIV/AIDS and resurgent tuberculosis. The term refers to social relations that become embodied as individual experience (Farmer 1996). These relations are *structural* because they are embedded in large-scale historical processes of social and

economic inequality that combine to constrain agency (Farmer 2005). In other words, private troubles of individuals are rooted in and shaped by public issues of society (Mills 2000). The social relations are *violent* because they prevent human beings from realizing their full somatic and mental potential (Galtung 1969). Violence in this case refers to preventable harm, where there is no specific actor committing the violence (Lane et al. 2004). Scheper-Hughes (1993: 16) refers to this as *everyday violence*, and describes it as "the routinization of human suffering" in "normal" lives filled with hunger and poverty. Violence is built into the structure of society and manifests as unequal power and resources, and consequently, as unequal life chances (Galtung 1969). Thus, *structural violence* is harm that results from inequalities entrenched in social, political, and economic systems (Mukherjee 2007).

This concept has been deployed in a variety of applications across the social sciences. Perhaps most notably, Farmer uses structural violence to frame his analysis of the AIDS epidemic in Haiti (2005). Generally, the most popular and recent applications of structural violence have been to explain why some populations have excess risk of contracting HIV. Mukherjee (2007) argues that structural violence, in the form of economic deprivation, gender inequality, and lack of access to education and work opportunities, constrains choice and impedes HIV risk mitigation in poor countries. Renwick (2002) demonstrates how structural violence contributes to the escalating HIV risk of women in China through employment practices, restricted access to public goods,

illegal trafficking, and commercialized sex. Shannon and colleagues (2008) discuss how structural violence compromises Canadian sex workers' ability to practice HIV prevention, and Lane and colleagues (2004) use the concept to explain disparate rates of HIV among women of color in New York. Several authors also comment on how structural violence determines in large part who suffers from AIDS-related stigma (Abadia-Barrero and Castro 2006; Castro and Farmer 2005).

In addition to the HIV/AIDS epidemic, Farmer also invokes the concept to understand the emergence of drug-resistant tuberculosis in Haiti and Russia (Farmer 2005, 1997). Furthermore, others use structural violence to explain the onset of type 2 diabetes among Mexican agricultural workers (Cartwright et al. 2006); the adverse effects of social and economic factors on individuals with schizophrenia (Kelly 2006, 2005); and the substance abuse of welfare recipients (James et al. 2004, 2003). As a whole, these studies elucidate some of the large-scale social and economic factors that result in unequal life chances and, consequently, harm health in various ways.

This dissertation contributes to extant literature on structural violence in several ways. Although previous studies have shown the physical manifestations of structural violence in adults, they have not yet examined children. More specifically, to the best of my knowledge, no study has applied this concept to explain disparities in child health. Despite Farmer and others' clear contributions, the concept of structural violence has also remained very general, perhaps even vague. It remains a compelling, but

metatheoretical idea that has not been fully developed in a concrete way. Farmer (2005: 8) admits that he uses structural violence as "a broad rubric that includes a host of offensives against human dignity," such as social and economic inequality, poverty, racism, sexism, and human rights abuses. Wacquant (2004) criticizes such a broad definition for lumping too many forms of inequality under the same heading and for conflating varying forms of violence that should be differentiated. In addition, the concept has not been applied analytically and empirically in most extant literature. Instead, it is typically used as a general theory and applied descriptively. This dissertation aims to make structural violence more concrete by conceptualizing it as development, gender inequality, and democracy and by using a large, cross-national sample to test specific measures of each of these components empirically. In doing so, this project advances our understanding of what kinds of macro-level social inequalities influence the health of children in developing countries.

Various authors conceptualize the specific components of structural violence in different ways, which is partly what makes the concept a bit amorphous. Farmer himself includes gender, development, and politics in his general discussions of the aspects of structural violence that affect well-being. Based on this and other relevant literature, I focus on these three aspects as key components of structural violence here. Admittedly, other macro, structural factors (e.g., globalization, structural adjustment,

war and conflict) could also be considered as structural violence and provide areas for future research.

Although he uses the term broadly, Farmer's (2005) interest is in theorizing how large-scale social forces become embodied as sickness and suffering. Sociologists have long recognized that individual actors are in part shaped by social facts, or collective realities external to individuals (Durkheim 1951). Thus, the concept of structural violence should be brought into sociology, as it underscores the notion that there are forces larger than the individual that affect individual biographies (Mills 2000). Moreover, sociologists understand social structures as rules and resources that both empower and constrain individual agency (Sewell 1992; Giddens 1979). Medical sociologists in particular recognize the ways in which social structures shape individuals' risk and experience of illness and disease (House 2002; Link and Phelan 1995). The term *structural violence* provides an expression of these sociological principles that highlights the capacity for social realities to harm individual health.[2]

1.1.2 Related Studies in Medical Sociology and Demography

The concept of structural violence may not be widely used in medical sociology or demography, but both of these fields certainly recognize the importance of social

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[2] Of course, if the concept of structural violence is similar to the ways in which medical sociologists conceptualize the relationship between structure and individual health, it is fair to ask if the application of structural violence to health provides something new for sociology. Farmer (2004: 308) considers himself an anthropologist, but also notes, "I do not make much of a distinction between anthropology and sociology. This is not a polemic point but a humble one also made by Kroeber: 'Sociology and anthropology are hard to keep apart.'"

structure for health and well-being.[3] Link and Phelan (1995: 87) argue that some social conditions may be "fundamental causes" of disease that "involve access to resources than can be used to avoid risks or to minimize the consequences of disease once it occurs." For this reason, individually-based risk factors should be contextualized "by examining what puts people *at risk of risks*" (Link and Phelan 1995: 80). One "structural" way in which medical sociologists have attempted to do this is by studying neighborhood effects on health. As a whole, this literature finds that neighborhoods do affect physical health, above and beyond individual characteristics. For example, neighborhood affluence has a positive effect on self-rated health, even controlling for individual socioeconomic status (Cagney et al. 2005). Conversely, residents of disadvantaged neighborhoods have worse self-reported health, worse physical functioning, and more chronic conditions than their counterparts in more advantaged neighborhoods, and this relationship is mediated by the fear and stress of perceived neighborhood disorder (Ross and Mirowsky 2001). Neighborhood residential instability is further associated with poor health care access, even controlling for the prevalence of poverty and the supply of health care (Kirby and Kaneda 2006).

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[3] Some research in the dependency/world-systems field also examines the relationship between country-level structural factors and well-being in less developed countries (Shen and Williamson 1997, 2001; Brady et al. 2007). However, much of the literature in this tradition is quite dated, ranging from the 1980s to the early 1990s (e.g., Dixon 1984; Moon and Dixon 1985; London and Williams 1988, 1990; Stokes and Anderson 1990; Wimberley 1990; Bradshaw et al. 1993; Firebaugh and Beck 1994). The dependency/world-systems field also tends to focus more on cross-national differences in economic growth or income inequality (e.g., Chase-Dunn and Grimes 1995; Alderson and Nielsen 1999; Beer and Boswell 2002; Lee 2005; Lee, Nielsen and Alderson 2007) than on population health.

Other exemplary studies in this field report a relationship between neighborhood context and mental health as well. For instance, Latkin and Curry (2003) find that perceptions of neighborhood social disorder predict depressive symptoms, and Schultz and colleagues (2000) maintain that the proportion of households below the poverty line in a census block group is significantly related to psychological distress. Finally, in a study that takes both time and place into account, Wheaton and Clark (2003) find that childhood neighborhood socioeconomic disadvantage has a lagged effect on early adult mental health. Although studies in this field make important contributions to our understanding of the relationship between contextual social factors and health, they are limited in several ways. They do not go beyond the neighborhood level, neglecting country-level structural factors that could also affect health. Furthermore, they typically focus on domestic samples, leaving the possible effects of structural factors on countries outside of the U.S. understudied.[4]

In addition to this body of research linking neighborhood context to individual health, another body of research links collective income inequality to population health. Studies that link aggregate levels of income inequality to population health have proliferated since the mid-1990s, following Wilkinson's (1992) seminal study on the effects of income distribution on life expectancy. In this study, he finds a strong

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[4] One important exception to this is Montgomery and Hewett's (2005) study of household and neighborhood effects on poverty and health in developing countries. They find that neighborhood living standards do significantly affect young children's height-for-age.

correlation between life expectancy and income inequality, and in subsequent work (1996) he continues to advance the claim that countries with the smallest income differences between rich and poor have the best health. This finding led many to argue that the health disadvantage of low SES groups is not driven by an absolute standard of well-being, but by one's relative position in the SES hierarchy (Adler et al. 1994; MacIntyre 1997; Williams and Collins 1995).

The literature on this topic has since grown large and contentious, with some studies focusing on cross-national comparisons and some on state comparisons within the U.S. Lynch and Kaplan (1997: 297) claim that in the U.S., "Distributional aspects of the economy are important determinants of health and may well provide one of the most pertinent indicators of overall social well-being." However, in later research, Lynch and colleagues (2001) find that although higher income inequality is strongly associated with greater infant mortality among wealthy nations, it is not consistently related to other health outcomes. Many researchers present empirical results that support the hypothesis that income inequality exerts negative effects on population health (Kawachi and Kennedy 1999; Kawachi et al. 1997; Wolfson et al. 2000), but others contradict these claims (Beckfield 2004; McLeod, Nonnemaker and Call 2004; Mellor and Milyo 2001). Again, this body of literature adds to our understanding of the relationship between structure and health, but defines structure in a narrow way by focusing only on income inequality.

Perhaps most relevant for the present study, a small but growing literature in demography uses multi-level models to estimate the effects of individual and contextual factors on such varied outcomes as domestic violence, fertility, and child health. Two multi-level studies in India demonstrate that women's education and literacy at the individual and community levels significantly affect child mortality (Kravdal 2004) and immunization rates (Parashar 2005). Using data from two rural areas of Bangladesh, Koenig and colleagues (2003) suggest that individual- and community-level measures of women's autonomy significantly lower the risk of domestic violence. Two studies that pool DHS data for multiple countries in Sub-Saharan Africa demonstrate that community education levels have significant effects on birth rates and first-birth timing (Kravdal 2002; DeRose and Kravdal 2007). Larrea and Kawachi (2005) show that economic inequality at the provincial level increases stunting in Ecuador, even controlling for a range of relevant individual and household covariates. Most of these studies are limited to one country or one region. Heaton and colleagues (2005) provide an important exception with a pooled analysis of 42 DHS countries in Latin America, Africa, and Asia. Using a multi-level modeling strategy, they examine cross-national variation in family influences on infant mortality and stunting. Nonetheless, the theory and results of their study concentrate primarily on individual-level family resources, decision-making, and childcare practices.

Thus, the present study contributes to medical sociology, demography, and global inequality studies in several key ways. First, it focuses on less developed countries and examines child malnutrition and diarrhea in particular, which have been relatively understudied in sociology. It also includes both individual- and country-level explanatory variables in the analyses. Most previous studies using the DHS have only focused on the individual level by analyzing data from one country at a time. Although a growing number of scholars are beginning to analyze the DHS with multi-level models, they still typically concentrate on one country or region at a time. By pooling the data over a large cross-national sample of approximately 50 countries, I broaden the scope of comparison. In addition, the multi-level modeling strategy employed here demonstrates how individuals are embedded in larger social, economic, and political contexts that affect child health. This analysis brings a more macro and a more diversified conception of structure to the study of health, by examining multiple dimensions and indicators across a large sample of countries.

1.2 Research Questions

The overall motivation for this study is to understand the macro-structural factors that explain child health disparities in developing countries. A review of the relevant literature on development, gender inequality, and democracy leads to the following set of research questions to be addressed in each chapter:

- Chapter 2: How do three parallel perspectives on socioeconomic resources and health (fundamental cause, economic development, and capability development) contribute to a better understanding of child diarrhea and malnutrition in developing countries? Do the results support each perspective, and can the frameworks be integrated?
- Chapter 3: Does gender inequality explain within- and between-country variation in child health in developing countries? Which component of gender inequality is most important? How do the effects of gender inequality compare to those of economic development and household wealth?
- Chapter 4: How is democracy measured? Does democracy have direct effects on child diarrhea and malnutrition in developing countries? Which measure is most important?

1.3 Introduction to the Empirical Chapters

1.3.1 Development

Few concepts are as central to the sociological study of health as socioeconomic status (SES). The vast literature on SES and health reveals much disagreement on indicators, modeling, and mechanisms. But one thing is for certain: the SES-health link remains strong across time and space (Bollen et al. 2001). Furthermore, SES effects also remain robust across multiple levels of measurement, operating on both within- and between-country variation in health (Marmot 2005). Several theoretical perspectives

attempt to account for the SES-health link, including fundamental cause, economic development, and the capability approach. Each perspective has a different emphasis and each is thoroughly examined in literatures that do not appear to be in conversation with each other.

Chapter 2 integrates the three perspectives in order to explain within- and between-country variation in child malnutrition and diarrhea in developing countries. The fundamental cause perspective demonstrates the enduring importance of socioeconomic status (particularly wealth and education) for health. However, this framework has rarely been applied to developing country contexts or to cross-national comparisons. Proponents of the economic development perspective claim that increasing GDP per capita is the most effective way to improve health in developing countries. In contrast, the capability approach emphasizes improvements in education, sanitation, water, and health care over the maximization of GDP. A considerable body of literature supports each perspective. Using a multi-level modeling technique, the analysis includes indicators of all three theories at both the individual and country levels.

The results yield evidence in support of all three theories. At the individual level, household wealth and maternal education are the most robust predictors of child health, supporting fundamental cause. At the country-level, results are mixed. GDP per capita has the most consistent effect on child health for the most part, supporting the economic

development perspective. However, the effects of sanitation, doctors, and school enrollment are larger than those of GDP in some models, supporting the capability approach. Thus, this chapter calls for an integration and synthesis of the three theoretical frameworks in order to provide a more comprehensive understanding of the SES-health link in developing countries.

1.3.2 Gender Inequality

Limiting the active agency of women seriously affects the lives of all members of the household (Sen 1999b). Gender inequality plays a particularly integral role in child survival, as women typically bear the primary responsibility for caregiving and maintaining household food security and health (Smith et al. 2003). In addition, a variety of studies suggest that women are more likely than men to use resources on enhancing children's nutrition and general family welfare (Blumberg 1995; Smith et al. 2003). Thus, gender inequality deserves serious attention by scholars who are interested in understanding disparities in child health outcomes.

Chapter 3 examines the ways in which multiple indicators of gender inequality effect child diarrhea and malnutrition. I focus on two aspects of inequality: decision-making and resource control. I further argue that these two aspects are manifest in women's education, employment, political representation, reproductive autonomy, and life expectancy. At the individual-level, greater autonomy allows women to take better care of their children through their increased mobility, income, knowledge, and

bargaining power. At the country-level, women's greater overall decision-making power and control over resources helps solidify and reinforce new gender norms and rules governing women's behavior (Koenig, Ahmed, Hossain, and Mozumder 2003). Women in influential positions begin to transform social institutions, promote the growth of public services, and mobilize resources that can help satisfy their own and other women's needs, resulting in a "positive 'dispersion' effect" of expanded female autonomy on child health (Parashar 2005: 991).

Results confirm that child health is better in countries where women have more education, control over their reproduction, representation in national politics, as well as longer life expectancy. This is further illustrated by a gender equality scale, which has the most sizable effects of all the country-level gender variables and significantly reduces all four child health outcomes. In fact, the health enhancing benefits of this broad measure of gender equity are just slightly larger in size to those of economic development and household wealth. Contrary to the economic development perspective, these results suggest that broad contexts are of gender equality are just as important as GDP, if not more so, for child health.

1.3.3 Democracy

An interest in the beneficial effects of democracy has risen across multiple academic disciplines including sociology, economics, political science, and even public health. The paramount theme throughout much of this scholarship is that democracy

improves health and well-being, both directly and indirectly through a variety of intervening mechanisms. Political rights augment the capacity for people to assess social problems, identify basic needs, express their claims through public discussion and debate, and demand an appropriate governmental response (Sen 1999bb). Thus, democratization enhances health and social welfare by creating an avenue for people to press their government to make public investments in nutrition, education, and health care (Sorensen 1991; Goldsmith 1986). As issues come into public debate and confrontation, authorities are more likely to respond. When the people vote, they exert their political influence, and democratic governments tend to redistribute public resources according to the general public's preferences (Tsai 2006). Competitive elections ensure this is the case by keeping state authorities accountable to their citizens (Frey and Al-Roumi 1999). Elected officials have incentives to listen to what their constituents want and need because they have to face their criticism and seek their support (Sen 1999bb).

The attempt to accurately measure democracy has a long history. Recent research has relied heavily on subjective measures that are determined by expert judges who assign ratings to countries (Bollen and Paxton 2000). Chapter 4 describes the variety of ways in which these indicators have been used and then empirically tests their effectiveness for improving child health in developing countries. Most scholars utilize one dataset and base their findings on 1-2 measurements. I consider several datasets as

well as multiple ways of operationalizing democracy indicators, including level of democracy at one time point, the dichotomous presence of democracy (or not), stock of democracy over time, and stability and change. This provides a more comprehensive examination of democracy and all of the ways in which it might affect child health.

Overall, results are not as consistent or robust as previous literature would predict. In fact, democracy exhibits very little association with child diarrhea and malnutrition. Bivariate relationships are surprisingly weak. The majority of correlations between democracy and each child health indicator are between -.20 and .20. Although some countries follow the expected pattern of high democracy and low diarrhea and malnutrition, others have relatively low democracy but also low diarrhea and malnutrition. As a result, the multivariate models yield only a few significant democracy coefficients that are neither consistent nor robust. A number of sensitivity analyses reveal similar patterns.

1.4 Conclusion

In sum, sociologists and other social scientists have made progress in the past 10-15 years in demonstrating the role of institutions, power relations, and macro-level social contexts in shaping the distribution of resources and well-being in society. This study advances that literature by showing how macro-level context constrains or enables the life chances of children. More specifically, the analyses demonstrate that child health is better in contexts of increased gender equality and economic development, as well as

improved sanitation, health care, and school enrollment. This study contributes to medical sociology by investigating cross-national sources of health inequality in developing countries. It also contributes to a small, but growing demography literature that uses multi-level models to examine community- and individual-level effects on well-being, usually in one country. By pooling the DHS to incorporate a large sample of developing countries, I broaden the scope of comparison.

By examining development, gender inequality, and democracy at the country level, this study more broadly advances our understanding of what kinds of structural inequalities affect individual well-being. Using a multi-level, comparative perspective, I illustrate how social forces that are larger than the individual shape well-being. Child health is a one of the most fundamental indicators of life chances and is integrally related to many other aspects of disadvantage. This dissertation demonstrates how contexts of social and economic inequality manifest as unequal power and resources, and consequently, as unequal life chances for children. While recognizing the role of individual characteristics, my work underscores the importance of social structures for shaping the distribution of well-being across societies.

2. Integrating Fundamental Cause, Economic Development, and Capability Development: A Multi-Level Analysis of Child Malnutrition and Diarrhea in Developing Countries

> The gross inequalities in health that we see within and between countries present a challenge to the world. That there should be a spread of life expectancy of 48 years among countries and 20 years or more within countries is not inevitable…To reduce inequalities in health across the world there is a need…to take action on the social determinants of health.
>
> –Sir Michael Marmot (2005)

Marmot, knighted by the Queen of England for his contributions to epidemiology and understanding health inequalities, argues that social factors should be of the highest concern to improve the health of the world's most vulnerable populations. Announcing the launch of the WHO Commission on Social Determinants of Health, Marmot (2005) points out that health inequalities, between and within countries, are avoidable. Such inequalities are not biological, but result from socioeconomic factors like poverty and lack of access to education, clean water, and adequate medical care. This more recent public attention to the socioeconomic factors that influence health echoes the claims that sociologists have been making for decades. Bollen and colleagues (2001) go so far as to claim that few concepts are as central to the sociological study of health as socioeconomic status (SES). The vast literature on SES and health reveals much disagreement on indicators, modeling, and mechanisms. But one thing is for certain: the SES-health link remains strong across time and space (Bollen et al. 2001). Furthermore,

as noted by Marmot (2005), SES effects also remain robust across multiple levels of measurement, operating on both within- and between-country variation in health.

Several theoretical perspectives attempt to account for the SES-health link, including fundamental cause, economic development, and the capability approach. Each perspective has a different emphasis and each is thoroughly examined in literatures that are not in conversation with each other. The goal of this chapter is to integrate and synthesize these literatures in a multi-level analysis of child health in developing countries. The fundamental cause perspective demonstrates the enduring importance of individual-level socioeconomic resources such as wealth and education for health. However, this framework has rarely been extended to developing country contexts or to cross-national comparisons. Proponents of the economic development perspective claim that increasing GDP per capita is the most effective way to improve health in developing countries. The capability approach stresses that improvements in education, sanitation, water, and health care are more important in developing countries than maximizing wealth. Each perspective is generally concerned with the relationship between socioeconomic resources and health, although they tend to highlight varying components of SES. Moreover, a considerable body of evidence supports each perspective, but in parallel literatures that neglect each other's focus. This neglect is due, in part, to the tendency of American medical sociology to concentrate on the U.S. A synthesis of the perspectives could yield important insights that have been overlooked

by a constrained theoretical frame. This chapter builds bridges between the perspectives by drawing on all three, in an effort to gain a more comprehensive understanding of the SES-health link in developing countries. Using a multi-level modeling technique, it includes indicators of all three theories at both the individual and country levels. Thus, the analysis examines the contributions of each perspective for understanding within- and between-country variation in child malnutrition and diarrhea across 47 developing countries.

2.1 Three Perspectives on Health Disparities

2.1.1 Fundamental Cause

The fundamental cause perspective began with Bruce G. Link and Jo C. Phelan's (1995) seminal article "Social Conditions as Fundamental Causes of Disease." They point out that epidemiological studies have been tremendously successful in identifying and publicizing the risk factors for major diseases. However, such studies focus almost exclusively on individual-level proximate causes of illness, such as diet, cholesterol, exercise, and high blood pressure. Link and Phelan (1995) argue that individual risk factors must be contextualized "by examining what puts people *at risk of risks*" (80). For this reason, epidemiologists and medical sociologists should focus their intervention efforts on fundamental causes of disease – social factors, such as socioeconomic status, that determine the extent to which individuals are able to avoid risks for morbidity and mortality. A fundamental cause has four components: it involves access to resources, it

influences multiple risk factors, it affects multiple health outcomes, and its association with health is reproduced over time.

Among these four, the essential feature of fundamental social causes is that they embody important access to resources that allow individuals to avoid disease or minimize the consequences once it occurs (Link and Phelan 1995, 2010). Diseases, knowledge of risks, and treatments may change over time, but the association between social factors like SES and health remains because people with more resources will always use them to garner a health advantage. The mechanisms between SES and health may change, but "when a population develops the wherewithal to avoid disease and death, individuals' ability to benefit from that wherewithal is shaped by resources of knowledge, money, power, prestige, and beneficial social connections" (Link and Phelan 2002: 730). Thus, SES should have particularly strong effects on preventable health conditions with known measures of treatment (Phelan et al. 2004), such as child malnutrition and diarrhea.

The resources that are so central to this perspective operate at both individual and contextual levels. At the individual level, for example, they influence whether people know about or can afford particular treatments. But resources also shape entry to broader contexts that can enhance health, such as better neighborhoods with access to clean water, sanitation, and health care. Phelan and colleagues (2010) explain that "In these circumstances, the person benefits in numerous ways that do not depend on his or

her own initiative or ability to personally construct a healthy situation; it is an 'add on' benefit operative at the contextual level" (S30).

There are several limitations to the fundamental cause perspective as it has been employed by scholars. Applications of fundamental cause have been limited by their primary use of micro-level data, lack of cross-national analyses, and inattention to developing countries. Despite Phelan and colleauges' (2010) claim that resources can be contextual, *most* empirical tests of the theory have been limited to the individual level. (See Phelan et al. 2010 for a detailed and comprehensive review of empirical evidence supporting the fundamental cause theory). Macro-level applications of the theory are still infrequent, although several U.S.-based studies aggregate data at the county-level. For example, Phelan and Link (2005) examine mortality rates by race and county-level SES, and Krieger and colleagues (2010) similarly examine breast cancer incidence rates by race and county-level income. Both studies find a social patterning of poorer health outcomes for less advantaged groups.

In addition, applications of the fundamental cause perspective have neglected cross-national comparisons. A few exceptions deserve mention. Two comparative studies use fundamental cause to evaluate whether SES has similar effects on health among Western, industrialized societies. Olafsdottir (2007) suggests that SES has a weaker relationship with health in Iceland than the U.S. and attributes this distinction to differences in the welfare state. Willson (2009) also finds divergence in the SES-health

relationship between Canada and the U.S., similarly attributing the difference to social policy and economic inequality. Both authors use individual-level data and both also recognize that there is much we do not know about how the fundamental cause perspective operates cross-nationally.

Despite an overall focus on the U.S., two studies apply the fundamental cause perspective to health in developing countries. Stratton and colleagues (2008) use fundamental cause to create a framework for thinking about the distal causes of malaria and addressing the environmental, economic and political aspects of malaria risk. Dickinson and colleagues (2011) then empirically test the Stratton framework with individual-level data on malaria in Tanzania. They argue that policies often target the proximal causes of malaria without devoting enough attention to the role of household wealth and education in influencing prevention, illness, diagnosis, and treatment of malaria. In light of the above limitations, this study aims to fill the gaps in this literature by using fundamental cause to explain population health disparities across a large sample of developing countries.

Link and Phelan frequently refer to "SES" as a fundamental cause of health disparities. However, SES is a relatively ambiguous concept that can be operationalized in multiple ways (Bollen et al. 2001). A review of the empirical tests of the perspective points to income/wealth and education as the two most commonly used measures of SES in the fundamental cause literature (Phelan et al. 2010). Thus, following convention,

the analysis that follows also uses wealth and education as individual-level indicators of the fundamental cause theory. Many individual-level studies of child health in developing countries evaluate the effects of household income relative to maternal education and relative to other more proximate determinants of health (even though they do not specifically invoke fundamental cause as a theoretical perspective). The findings are varied and have been reviewed elsewhere (for reviews, see Casterline et al. 1989; Strauss and Thomas 1995; Montgomery et al. 2000; Bollen et al. 2001). Household wealth and education are both generally important determinants of child health, a fact which is evident in multiple cultural contexts (e.g., Cameron and Williams 2009; Lavy et al. 1996; Sahn and Alderman 1997).

Recall that fundamental causes operate at both the individual and macro level (Phelan et al. 2010), despite the lack of cross-national applications of the perspective. The previous emphasis on income and education as individual-level measures of SES suggests that a fundamental cause perspective applied at the country-level might similarly emphasize economic development and school enrollment as the most important predictors of cross-national health disparities. Both of these variables figure prominently in previous sociological research on international variation in child health outcomes.

2.1.2 Economic Development

Social scientists have long been interested in the effects of economic growth and development for well-being. The prominent demographer Samuel Preston (1996: 531) remarks, "The major emphasis during the last half-century…has been on explaining movements in aggregate-level indices of mortality by reference to economic factors." Indeed, the dominant paradigm across the social sciences has been that economic growth and development are the most significant predictors of cross-national differences in health and mortality, particularly in developing countries (Brady et al. 2007).

Furthermore, and a significant body of empirical research substantiates this claim with comparative, country-level analyses of GDP per capita. For example, in an influential article in the *American Sociological Review* titled "What Benefits the Masses?", Firebaugh and Beck (1994) examine the effect of GDP per capita on male and female life expectancy, caloric intake, and infant survival in developing countries. They contend that "Economic growth is the only variable...that shows consistent, nontrivial effects on all four indicators of national welfare" (648). Jenkins and Scanlan (2001) similarly contend that both economic growth and development increase the food supply and reduces child malnutrition, even controlling for an extensive set of relevant variables. Numerous scholars orient their analyses around economic development and find that it significantly influences well-being in developing countries (e.g., Pritchett and Summers 1996; Hales et al. 1999; Hertzman and Siddiqi 2000; Sachs 2005; Collier 2007). An even

greater number of scholars include economic development as a control variable and similarly find robust effects on well-being (e.g., Bradshaw et al. 1993; Shen and Williamson 1997; Wimberley 1990). The frequency with which GDP per capita is included in cross-national studies of health and mortality demonstrates the conventional wisdom of its paramount importance (Brady et al. 2007).

The implication of this literature is that everyone benefits from increasing economic development. Critics contend, however, that GDP does not necessarily benefit all segments of a population equally and that GDP should be evaluated *alongside* other aspects of development to fully understand well-being (Blumberg 1995; Bose and Acosta-Belen 1995; Parpart et al. 2000). One limitation of the economic development perspective is that it neglects inequalities within countries. Yet, national statistics on GDP per capita do not reveal the distribution of income or its real beneficiaries (UNDP 1990). Rising economic development may not provide tangible benefits to everyone uniformly. In fact, recent research documents persistent health inequalities in developing countries despite overall economic growth (Grimm et al. 2008, Goesling and Firebaugh 2004; Eloundou-Enyegue and Rehman 2009).

This perspective is further constrained by neglecting other factors that could plausibly have equally important effects on well-being. Some countries achieve better health than expected relative to their level of economic development (Caldwell 1986). This suggests that something other than economic development is at work and that GDP

per capita may be an imperfect predictor of well-being in developing countries (Robeyns 2000; DaVanzo 1988). Furthermore, fostering economic development alone will not necessarily provide for other central human needs (Nussbaum 2004). Nonetheless, substantial cross-national research shows that economic development is beneficial to health and mortality in developing countries. Thus, following convention, the present study includes GDP per capita at the country level in all models of child diarrhea and malnutrition.

2.1.3 Capability Approach

The capability approach was first introduced by Amartya Sen in a lecture entitled "Equality of What?", delivered at Stanford University on May 22, 1979 (Sen 1980). In contrast to the economic development perspective, Sen's capability approach to improving well-being emphasizes development that expands the freedoms that people have and the things they are able to accomplish, rather than the maximization of income and wealth alone (Sen 1999b). Winner of the 1998 Nobel Prize in Economic Science, Sen is most known for his scholarly works on social welfare and poverty alleviation (e.g., Sen 1999b). In his seminal lecture, he (1980) develops a critique of commodity-based approaches to social welfare, explaining that "what is missing in…this framework is some notion of 'basic capabililities': a person being able to do certain basic things. The ability to move about is the relevant one here, but one can consider others, e.g., the ability to meet one's nutritional requirements, the wherewithal to be clothed and

sheltered, the power to participate in the social life of the community" (218). This approach has continued to evolve over time through Sen's own writing (e.g., 1985,1992, 1999) and through the help of other scholars, most notably Martha Nussbaum (e.g., 1995, 2000; see also Nussbaum and Sen 1993).

The key feature of the capability approach is its emphasis on what people are able to do and to be (i.e., their capabilities) (Sen 1999b; Nussbaum 2000; Robeyns 2005).[1] According to this perspective, then, development is a process of "enlarging people's choices" (UNDP 1990: 10) and "expanding the real freedoms that people enjoy" (Sen 1999b: 36). As such, development entails eliminating major sources of "unfreedom," such as poverty, poor economic opportunities, neglect of public facilities, and lack of access to health care, clean water, basic education or gainful employment (Sen 1999b: 3). The capability approach to development is a human outcome-oriented approach that underscores basic rights and freedoms as the most important means to improve well-being (Nussbaum 2004b; Sen 1999b). Sen notes that a disproportionate focus on economic development neglects other deprivations that are equally, if not more, important for well-being (e.g., social exclusion, ill health, lack of education) (Sen 1999b). Of course, people typically want higher incomes, but "income is not the sum total of human life" (UNDP 1990: 9). Furthermore, economic development can be an important

[1] See Robeyns (2005) for a detailed review of the conceptual and theoretical foundations of the capability approach.

means for improving well-being, but well-being depends on other determinants as well (Sen1999).

In his first empirical application of the capability approach, Sen (1985) showed that the gross national product (GNP) per capita of Brazil and Mexico in the early 1980s was more than 7 times the GNP per capita of Sri Lanka. Nevertheless, Sri Lanka outperformed Brazil and Mexico in terms of life expectancy and infant and child mortality. Sen concluded that public policies concentrating on food distribution and public health services allowed Sri Lanka to achieve remarkable improvements in well-being without the concomitant increase in economic development. In a large-N application of the capability approach, Slottje (1991) compares a well-being index for 126 countries and finds that the well-being varies across levels of economic development. A number of individual-level studies assess the extent to which income accounts for variation in well-being in Russia, Italy, Belgium, Chile, South Africa, India, and California (see Robeyns 2000 for a detailed and comprehensive review). In sum, the capability approach and the empirical evidence that has grown from it, suggests that rankings based on GDP per capita (or income) are quite different from rankings based on human capabilities and that, consequently, GDP per capita (or income) should not be automatically equated with a growth in living standards (Robeyns 2000).

The biggest critique of the capability approach lies in the problem of defining capabilities and operationalizing them in empirical research. Sen develops the idea over

several decades and many publications, but never offers a concrete index of the most important or relevant capabilities. He views well-being as a multi-dimensional phenomenon that is contingent on individual choice and definition (Sen 1999b). For this reason, Rawls (1999) recognizes the importance of the theory behind the capability approach, but claims it is an "unworkable idea" (13). Others have suggested that the approach has not been sufficiently specified and that the idea is too broad to be operationalized in a meaningful way (Sugden 1993; Roemer 1996). Sen (1980) himself admits that defining and indexing capabilities is a serious difficulty in his initial lecture on the topic at Stanford.

Still, an important review of the ways in which the capability approach has been measured in studies of developing countries reveals basic agreement on its most important aspects: education, sanitation, clean water, and health care (see Saith 2001). Thus, the present study concentrates on these variables as indicators of the capability approach. Moreover, this study evaluates the effects of these variables at both the micro and macro levels. In theory, Sen discusses the capability approach at the individual level by focusing on the freedoms that individuals have to live the kind of life that they value. However, he also uses the perspective to critique the disproportionate emphasis on GDP per capita in the social sciences and to explain variation in well-being across countries not accounted for by economic factors. Therefore, the implication of the capability approach as a whole is that capabilities operate at both micro and macro levels.

Although Sen does not adjudicate the importance of various capabilities, Nussbaum (2004b) claims that education is the key to all other capabilities. The importance of education for health in micro-level studies has already been mentioned. Nonetheless, education has an impact on child health not just though individuals, but through the educational level of a society as a whole (Ware 1984). A considerable literature suggests that education at the macro-level has important consequences for population health. For example, secondary school enrollment reduces infant and child mortality (e.g., Frey and Field 2000; Shen and Williamson 2001; Shandra et al. 2004), HIV/AIDS prevalence and death (Burroway 2010), and fertility and maternal mortality (e.g., Hannum and Buchmann 2003; Wickrama and Lorenz 2002), all of which contribute to improved child health in developing countries. Some find that education attenuates the effect of economic development (Pritchett and Summers 1996), although others find that secondary school enrollment has a larger effect on well-being than GDP per capita (Brady et al. 2007).

Inadequate access to clean water and sanitation facilities accounts for a large part of the burden of illness and death in developing countries (World Bank 2003). About half of the developing world (2.6 billion people) lacks even a simple latrine and about one-sixth (a little over 1 billion people) lacks clean water. According to WHO and UNICEF, (2004), this "unremitting but seemingly invisible disaster" often goes beyond the focus of public attention, but kills of thousands of infants and children under 5 every

day (6). Much social science research also finds that water and sanitation are key factors in explaining variation in infant mortality (e.g., DaVanzo 1988; Patel 1980; Young 1994) and child malnutrition (Smith and Haddad 2000; Smith et al. 2003). However, others suggest that the effects of sanitation and water are not as strongly linked to child health as expected (Andes 1989).

Health care is another aspect of capability development that has great consequences for child health. Many developing countries in particular are experiencing human resource shortfalls that hinder the capabilities of local clinics and medical facilities to administer health care. For example, it has been estimated that Africa needs approximately 1 million more health care workers to adequately care for its people (Garrett and Rosenstein 2005). The demand for health care workers is currently exceeding the supply worldwide, but shortfalls in low-income countries are far worse than those in rich countries (Clark et al. 2006). Insufficient infrastructure and lack of access to health clinics also present challenges to effective health care for families. Access to health services in general is strongly associated with reduced child malnutrition (Larrea and Kawachi 2005). In addition, the prevalence of doctors and other health attendants in developing countries reduces malnutrition as well as infant and child mortality (e.g., Flegg 1982; Bradshaw et al. 1993; Heaton et al. 2005) Despite the ambiguity of Sen's definition of capabilities, research in developing countries suggests that education, sanitation, clean water, and health care are among the most

important for improving health (Saith 2001). Because the capability approach has been applied at both the micro and macro levels, the analysis that follows evaluates the effects of these variables at both levels as well.[2]

One might posit that country-level indicators of development could steepen or dampen the gradients of the individual-level variables. For example, in the absence of country-level development, household wealth is probably more important for well-being. In contexts of low economic development, low school enrollment, and low health care access, individual household wealth should be more imperative for keeping children healthy. Alternatively, more prosperous contexts (high GDP per capita and school enrollment) could have a dampening effect on the slopes of individual-level variables. Perhaps individual household wealth is not as important for health in a general context of greater GDP, school enrollment, and health care. Although this is the first study to specifically test cross-level interactions, others suggest that the effects of individual-level SES vary across levels of economic development (e.g., DaVanzo 1988; Lobao and Brown 1998; Dargent-Molina et al. 1994). I examine this possibility in a series of cross-level models that interact GDP per capita, secondary school enrollment, and a capability development scale with individual-level household wealth.

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[2] Unfortunately, data limitations prevent comparable measures of health care from being included at both levels. The availability of health care is not easily assessed using the Demographic and Health Surveys. Respondents are asked if they have visited a health facility in the last 12 months. However, this question is problematic because (1) it is not asked across all countries, (2) it is endogenous to the dependent variables, and (3) it doesn't necessarily measure the availability of doctors. Respondents may not have the money, transportation, or even permission from their husbands to visit a health facility.

2.1.4 Integrating the Perspectives

In sum, the three theoretical perspectives considered here provide multiple ways of conceptualizing the most important predictors of child health in developing countries and at multiple levels of analysis. The theories are complementary, as demonstrated in Table 1. In fact, they are parallel in many aspects, although they are not in conversation with each other. A fundamental cause perspective suggests that wealth and education are the most important predictors of child health at the individual level. Because cross-national applications of the theory are rare (and limited to small-N comparisons of developed countries), macro-level indicators of fundamental focus are a bit more equivocal. Still, Phelan and colleagues (2010) contend that fundamental causes operate at a contextual level. Mirroring the individual-level indicators, this suggests that GDP per capita and school enrollment would be important predictors of health at the country level.

The economic development perspective posits that GDP per capita is the most important predictor of cross-national health inequalities. But, this perspective neglects socioeconomic inequalities within countries – the very types of inequalities that are emphasized by fundamental cause. It also neglects other social factors that could plausibly have equally important effects on well-being. The capability approach, in turn, posits that clean water, sanitation, education, and health care are just as important, if not more so, for improving child health at both the individual and country levels. Although

each perspective is concerned with the general relationship between SES and health, they emphasize different components in separate bodies of literature. Yet, a synthesis of the three frameworks provides an opportunity for a fuller understanding of the SES-health link. In the analyses that follow, I examine the effects of wealth/GDP, education, water, sanitation, and health care at both the individual and country levels. All three perspectives are included in an effort to elucidate the complexities of risk and protective factors that create within- and between-country heterogeneity in child health.

2.2 Methods

2.2.1 Estimation Technique

I estimate hierarchical generalized linear logit models (HGLM) with the HLM 6.08 software developed by Raudenbush and colleagues (2004). These models predict the odds of child health based on a set of both individual- and country-level explanatory variables. The advantage of this technique is that the net effects of one level can be estimated while controlling for variation in the other level. Ignoring the nesting of observations within clusters violates the assumption of independent standard errors and inflates the risk of a Type 1 error. However, hierarchical analysis provides unbiased and efficient estimates of the coefficients, as well as proper standard error estimates (Guo and Zhao 2000; Raudenbush and Bryk 2002). The analysis can be explained in two steps. First, at level 1, the log-odds of being stunted, wasted, underweight, or having a recent episode of diarrhea [log (p_{ij}/1 – p_{ij})] for the ith individual in the jth country is expressed

as a function of country intercepts (β_{0j}) and a set of fixed individual-level characteristics (βX_{ij}), and an error term (r_{ij}):

$$\log (p_{ij}/1 - p_{ij}) = \beta_{0j} + \beta X_{ij} + r_{ij}$$

The individual-level variables are group-mean centered (differenced from their country means) in this equation.[3] They are also weighted to produce unbiased estimates of population paramaters (Raudenbush et al. 2004).[4]

Second, at level 2, the parameters from the first step become the dependent variables and are regressed on a set of country-level predictors. Each country intercept (β_{0j}) and the slopes of the individual-level characteristics (β_{ij}) are expressed as a function of a general intercept term (γ_{0j}), a set of country-level characteristics (γC_j), and an error term (ε_{0j}):

$$(A) \quad \beta_{0j} = \gamma_{0j} + \gamma C_j + \varepsilon_{0j}$$

$$(B) \quad \beta_{ij} = \gamma_{ij} + \gamma C_j + \varepsilon_{ij}$$

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[3] Group-mean centering decomposes the relationship between the outcome and the explanatory variables into two components: a within-group component and a between-group component. Thus, in this study, the individual-level variables explain the within-country variation in child health, and the country-level variables explain the between-country variation. In contrast, grand-mean centering results in coefficients that are a less easily interpretable blend of within- and between-country variation. Group-mean centering also has the advantage of producing the most accurate estimates of slope variance (Bryk and Raudenbush 2002). Group-mean centering implies that an individual's relative position within a country influences the outcome (Enders and Tofighi 2007). This is appropriate for cross-country comparisons in which levels of wealth or education, for example, may have different value depending on context.

[4] The DHS sampling weights are factors applied to each observation in order to adjust for differences in the probability of selection and interview. Many times DHS samples are selected with unequal probability to expand the number of cases for certain areas or subgroups. Weights correct for such sample design issues, as well as for differential response rates, to produce more accurate representations of the population (Macro 2009).

Equation A represents the random intercept component of the model that tests the effects of the country-level variables on child health, while holding the individual-level characteristics constant.[5] Equation B represents the random coefficient component of the model which estimates the effect of the country-level variables on the slopes of individual-level characteristics (cross-level interactive effects).[6]

2.2.2 Data

The individual-level analysis (level 1) pools data from the Demographic and Health Surveys (DHS), a collection of nationally representative, population-based surveys in developing countries (Macro 2009). The MEASURE DHS project is funded primarily by the U.S. Agency for International Development, with additional contributions from other donors and participating countries, and implemented by ICF Macro. Since 1984, the project has been through five phases and provided technical

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[5] Using HGLM, a statistically significant 5 percent of the variation in diarrhea, 10 percent of the variation in stunting, 14 percent of the variation in wasting, and 19 percent of the variation in underweight is between countries. The level 1 error variance is heteroscedastic in a binary HGLM. In order to calculate the intra-class correlation coefficient (i.e., the proportion of total error variance at level 2), Raudenbush and Bryk (2002: 334) recommend taking a latent variable approach, which assumes that the level 1 error variance is $\pi^2/3$ (with a logit link). The formula is: ICClogit= $\tau_{00}/(\tau_{00} + \pi^2/3)$. The level 2 error variance from intercept only models of each dependent variable is .17 for diarrhea, .37 for stunting, .55 for wasting, and .79 for underweight. Therefore, the ICC is .05 for diarrhea, .10 for stunting, .14 for wasting, and .19 for underweight (Brady, Fullerton, and Moren Cross forthcoming).

[6] Children are certainly nested in households, as well. However, a little over half (52.20 percent) of the mothers in this sample report on only one child. (Another 41.34 percent report on 2 children, only 6.15 percent report on 3 children, and .31 percent report on 4-5 children.) A 3-level model is infeasible because information on single children would be dropped, yet to analyze single children alone (to eliminate clustering) introduces a different source of bias. Other scholars using DHS data acknowledge this point, but do not view it as particularly problematic since the number of children per household in the data is relatively small (Fotso 2006). Although ignoring this bias could possibly result in over-confident t-scores for individual-level variables, t-scores will be quite confident regardless because of the large sample size.

assistance for the implementation of over 240 surveys in 84 countries. The goal is to collect data on health and population trends that are comparable across countries, which is achieved by using model questionnaires and recoding raw data into standardized formats.

Probability samples are drawn using a stratified two-stage cluster design. First, enumeration areas are drawn from census files. Second, in each selected enumeration area, a sample of households is drawn from an updated list of households. Sample sizes range between 5,000 and 30,000 households per country, and samples are generally representative at the residence (urban-rural), regional (departments, states), and national levels (Macro 2009).

Data are collected using three core questionnaires. A general Household Questionnaire collects information on age, sex, relationship to household head, education, and parental survivorship for every usual household member and visitor. In addition, questions are asked about the characteristics of the dwelling unit, and the height and weight of women and children (under age 5) are measured to assess nutrition. Eligible respondents are then interviewed using the Women's or Men's Questionnaire. In most DHS surveys, eligible respondents include women age 15-49 and men age 15-59 (or in some cases 15-54), although only women are interviewed in

some countries.[7] The Women's and Men's Questionnaires include information on socioeconomic characteristics, fertility, family planning, maternal and child health, gender roles, HIV/AIDS, malaria, and nutrition (Macro 2009).

Country-level data (level 2) are drawn from World Development Indicators (WDI) (World Bank 2010). The sample for this study is confined to countries with DHS surveys collected during phases 3 through 5 (1995-2008) for comparability in time and content. Thus, the analysis pools data on 258,761 children under five in 47 developing countries.[8]

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[7] Detailed information on response rates for individual countries is included in the final report of every DHS survey. Unfortunately, DHS does not provide a summary of overall response rates, and many of the final reports are not in English. Several examples of women's response rates are as follows: 96 percent in Malawi (2004), 97 percent in Armenia (2005), 96 percent in Ethiopia (2005), 96 percent in Ghana (2003), 95 percent in India (2006), and 98 percent in Azerbaijan (2006). The main reason for non-response was failure to find the respondent, despite repeated visits to the household. DHS tries to ensure data quality in several ways. Quality control tables, including information on response rates, are generated in the field on a regular basis in order to indicate potential problems and help improve data quality while still in the field (Macro 2009).

[8] The total sample (N=59) includes Armenia, Azerbaijan, Bangladesh, Benin, Bolivia, Brazil, Burkina Faso, Cambodia, Cameroon, Central African Republic, Chad, Colombia, Comoros, Cote d'Ivoire, Democratic Republic of the Congo, Dominican Republic, Egypt, Ethiopia, Gabon, Ghana, Guatemala, Guinea, Haiti, Honduras, India, Indonesia, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Moldova, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Peru, Philippines, Republic of the Congo, Rwanda, Senegal, South Africa, Swaziland, Tanzania, Togo, Turkey, Uganda, Uzbekistan, Vietnam, Zambia, and Zimbabwe. However, Indonesia, Pakistan, Philippines, South Africa, and Vietnam do not collect height and weight data. Turkey does not collect information on recent episodes of diarrhea, and Zimbabwe is missing on GDP per capita. Thus, the maximum possible sample size for the dissertation is 52 countries, which are listed in Appendix A. In this particular chapter, five countries are missing information on key independent variables of interest, so the sample size is reduced to N=47. Haiti, Benin, and the Dominican Republic are missing country-level data on doctors. Haiti and Liberia are missing data on country-level education, and Cambodia is missing data on individual-level access to clean water. Although the countries included here have not been randomly sampled, they provide a good approximation of the population of developing countries. The study sample represents a range of least developed (e.g., Democratic Republic of the Congo and Niger) to middle income countries (e.g., Gabon and Brazil) from all over the world. On average, it is fairly comparable to low and lower middle income countries on several key sample characteristics (see Appendix B for a comparison).

2.2.3 Dependent Variables

This study examines four binary outcome variables for child well-being. *Diarrhea* is self-reported by the respondent (the child's mother) for all children under five in the household.[9] Following Hatt and Waters (2006), a child is coded 1 for having diarrhea if s/he has been ill with diarrhea at any time during the two weeks preceding the interview. Stunting, wasting, and underweight are calculated using anthropometric measures of height and weight. The benefit of these measures is that they provide a good indication of health status that is independent of maternal perceptions (Hill and Upchurch 1995). *Stunting* is defined as low height-for-age. A child is coded 1 for stunting if s/he is more than two standard deviations below the median of the World Health Organization child growth standards for his/her height, age, and gender (WHO 2008b).[10] *Wasting* is defined as low weight-for-height, and a child is coded 1 if s/he is more than two standard deviations below the median WHO standards for his/her weight, height, and gender. Similarly, *underweight* is defined as low weight-for-age, and

[9] Obviously, the accuracy of this measure is affected by the reliability of the mother's recall of the illness episode. DHS maintains that a 2 week recall period should ensure that recall errors will not be too serious (Macro 2009). Eiser and Morse (2001) review several studies on the relationship between child and parent ratings of children's health-related quality of life and find general agreement between child and parent ratings for physical health indicators. They only report on one study conducted on children under the age of 7. Still, it is traditionally assumed that adults can answer for children, particularly when they may be too young to have the cognitive and language skills to respond to questionnaires themselves (Eiser and Morse 2001).

[10] Early phases of the DHS based their estimates for stunting, wasting, and underweight on the National Center for Health Statistics international reference population. However, the latest phase of the DHS uses the newly developed WHO standards instead (Macro 2009). In light of WHO recommendations, I recode all phases of DHS data that I use in accordance with the new standards.

a child is coded 1 if s/he is more than two standard deviations below the median WHO standards for his/her weight, age, and gender. [11]

Diarrhea is commonly caused by bacteria, viruses, or parasites in contaminated food or water. Thus, this variable reflects lack of access to clean water, sanitary living conditions, adequate nutritional sources, and good hygiene (Black 1984). Stunting results from prolonged food deprivation or illness and is therefore an indicator of chronic malnutrition. Wasting, however, results from more recent food deprivation or illness, indicating acute malnutrition. Underweight reflects both acute and chronic malnutrition, and is typically used as a composite indicator. Each variable represents distinct biological processes, although of course they often overlap (Nandy et al. 2005). The collection of outcomes together then represents a range of chronic to acute conditions: stunting (most chronic), underweight, wasting, and diarrhea (most acute).

2.2.4 Individual-Level Control Variables

Several indicators of household family structure and size are included as controls: mother's employment and marital status, mother's age, household head's age and sex, child's age and sex, number of household members, and the presence of

[11] The DHS includes anthropometric variables for each individual child's height and weight, as well as the child's age and gender. I use these variables, in conjunction with WHO (2006) gender-specific height-for-age, weight-for-height, and weight-for-age child growth standards, to construct the malnutrition dependent variables. For example, two standard deviations below the median height-for-age for a girl who is 25 months old is 80 centimeters. Thus, a girl is coded as 1 for stunting if her age is greater than 25 months and her height is less than 80 centimeters. In STATA, the code reads: stunting = 1 if male=0 & month > X & height < Y. Similarly, wasting = 1 if male=0 & height > X & weight < Y, and underweight = 1 if male=0 & month > X & weight < Y. The codes are written separately for boys, because they have different height and weight standards.

multiple young children. *Mother employed* is a dichotomous variable, coded as 1 for currently employed and 0 for unemployed.[12] Gainful employment outside the home brings women an independent wage, and therefore more influence in the allocation of household resources (Heaton, Huntsman, and Flake 2005; Sen 1999b). Working also brings women more freedom of movement and increased social contact with the world outside of the home, both of which expose them to new knowledge and behavior norms that could improve child health (Dharmalingam and Morgan 1996; Sen 1999b; Smith et al. 2003). Mother's marital status is measured as a series of categorical variables including *never married* or *formerly married*, with married as the reference group.[13] Extant research links marital status and family structure with child poverty and well-being in developing countries (Lloyd and Desai 1992). It is generally assumed that single mothers are often disadvantaged by limited financial resources (Heaton et al. 2005). An additional dummy variable indicates whether or not the household has a *female head* (coded as 1 for yes and 0 for no). Many studies of developing countries find an

[12] Bereman and Rose (1996) also code maternal employment as a dichotomous variable in their study of 11 DHS countries. They claim that this variable, along with education and urban residence, is a good measure of the socioeconomic and behavioral differences among women. The dichotomous measure of employment has the least amount of missing data in the DHS surveys. Other DHS variables that are related to maternal employment include whether the mother works in or outside the home, whether she is employed all year or seasonally, and type of earnings received for work. However, missing data on these variables is extensive, as not all countries ask these questions. DHS does include a 9-category variable for type of occupation, but it is not used here for the sake of parsimony. Among those women who work and report their occupation (N=135,067), self-employed agriculture is the biggest category by far at 40.28 percent, followed by sales (18.61), agriculture employee (11.71), services (8.00), skilled manual (7.72), professional/technical/managerial (5.93), unskilled manual (3.85), clerical (2.14), and household/domestic (1.76).

[13] "Never married" includes never lived with a partner. "Formerly married" includes widowed, divorced, separated, or previously lived with a partner but not currently living with a partner. The reference group includes both married and living with a partner.

association between female headship and greater poverty; however, evidence of female headship's effect on child nutrition is less conclusive (Buvinic and Gupta 1997). All models control for *mother's age* and *head's age* (both measured in years), expecting that older adults may have more experience and knowledge that contribute to improved child health outcomes.

Child's age (measured in months) and child's sex (coded as 1 for *male*, 0 for female) are also included. Children are particularly susceptible to malnutrition during the weaning and post-weaning period (6-24 months) (WHO 2011). They also have higher nutritional requirements to support growth during the first few years, which exacerbates the potential for growth retardation (Martorell 1999). The prevalence of chronic health conditions tends to increase with age, whereas, the prevalence and severity of acute health conditions tends to decrease with age (Cameron and Williams 2009). Some research claims that gender biased allocation of food and health services results in higher female child mortality (Hossain et al. 2007). Boys may receive preferential treatment in terms of feeding practices and medical care in places where there is a strong preference or need for sons, although there may be little evidence outside of Asia for gender differences in infant and child mortality (Thomas 1994; Ware 1984).

Household size is measured as total number of persons living in the household. *Multiple children* is a binary variable, coded 1 for respondents who report that more than

one child under the age of five is resident in the household.[14] A child's health may be compromised in large families where resources have to be shared among many, and the risk of unsanitary conditions and disease spread is heightened when many people live in close proximity (Heaton et al. 2005). Multiple young children in particular may compromise the available resources for other young children. In fact, some studies find that the presence of an infant sibling increases the risk of death among 2-4 year olds because of greater competition for food and other family resources (LeGrand and Phillips 1996). Still, there is some evidence that the negative effect of increased sibship size is neither inevitable nor universal, especially in developing countries (Lu and Treiman 2008). Finally, *urban residence* is included as a binary variable, coded 1 for urban and 0 for rural.[15] Infant mortality tends to be lower in urban areas, urban women tend to have greater access to health care, and urban families tend to have higher socioeconomic status (Heaton et al. 2005).

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[14] Number of other children for which an observation exists in the data would be an alternative measure. However, only 47.80 percent of mothers report on more than one child in the data. This is compared to 65.96 percent of mothers who report that more than one child under age 5 is resident in the household. This discrepancy is probably due to the fact that significant proportions of young children in developing countries reside with family members beyond the nuclear unit (Lloyd and Desai 1992). Thus, the measure of how many children reside in the household is probably a better measure of resource dilution and overcrowding. Furthermore, measuring the presence of multiple children as a dummy variable minimizes the correlation between this variable and household size. (The correlation between household size and number of children under 5 is .65, but the correlation between household size and the binary variable is only .32).

[15] Generally, urban is a broad classification that includes large (over a million) and small cities (over 50, 000) or towns ("other" urban areas), and rural areas are assumed to be countryside.

2.2.5 Fundamental Cause

At the individual level, fundamental cause is assessed by household wealth and mother's education. Household wealth is measured as a composite *wealth index* that represents the cumulative living standard of a household. Following Heaton and colleagues (2005), this index is calculated as the percentage of household items (including radio, television, electricity, refrigerator, bicycle, motorcycle, car, telephone, and finished floor) present in the home.[16] Mother's education is measured as a series of categorical variables including *primary*, *secondary*, and *higher*, with no education as the reference group.[17] At the country level, fundamental cause is assessed by *GDP per capita* and *secondary school enrollment* (descriptions to follow).

2.2.6 Economic Development

Following convention, economic development is measured as the natural log of real *gross domestic product (GDP) per capita* in hundreds of purchasing power parity dollars.[18]

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[16] I sum all of the items a respondent indicates are present in the home, divide the sum by the number of items asked about in the survey (maximum of 9, not including sanitation and water), and multiply by 100. This is calculated as a percentage because different countries include different numbers of items in their questionnaires. I also examine several other variations of the wealth index, but results remain consistent. See Chapter 3 for details.

[17] Literacy would be another alternative, but missing data is extensive because not every country asks about literacy. Education could also be measured in single years, but measuring it as a series of dichotomous variables is the more common approach in studies of socioeconomic status and health in developing countries (Bollen et al. 2001).

[18] The distribution of GDP per capita is positively skewed with a tail that extends to the right. Using the natural log corrects for this skewness. The skew statistic for GDP per capita is 2.06, versus .28 for the natural

2.2.7 Capability Approach

At the individual level, the capability approach is assessed by mother's education and access to water and sanitation. As aforementioned, mother's education is coded as *primary*, *secondary*, or *higher*. Water and sanitation are coded according to WHO/UNICEF guidelines (2004). Improved water source is defined as either *piped water* or *well water*. A household is coded 1 for piped water if the main source of drinking water is piped into the dwelling, yard, or a public tap/standpipe. A household is coded 1 for well water if the main source of drinking water comes from a protected dug well, covered borehole, protected spring, or rainwater collection. The reference group includes open/unprotected well, surface water (river, dam, lake, pond, stream), irrigation water, tanker truck water, or bottled water.[19] Improved sanitation facilities are defined as *flush toilet* or *pit latrine*. Flush toilets may be piped to a sewer system, septic tank, or pit latrine. A household is coded 1 for pit latrine only if the latrine is ventilated or has a slab covering. The reference group includes open pit latrine, bush/field, bucket, or no facility.

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log of GDP per capita. Furthermore, a skewness/kurtosis test for normality in STATA (sktest) confirms that the distribution of GDP per capita is not normal, but the logged variable is.

[19] WHO/UNICEF (2004) does not consider bottled water as an improved source because of the limitations in quantity, not quality. Improved drinking water is determined not only by type of technology, but also by reasonable (at least 20 liters per person per day) and sustainable access (WHO 2008d). Furthermore, only about 1% of the sample reports bottled water as their main source of drinking water.

The capability approach is further assessed by five indicators at the country level. *Improved water source* indicates the percentage of the population with access to a household water connection, public standpipe, borehole, protected dug well, protected spring, or rainwater collection. *Improved sanitation facilities* indicates the percentage of the population with access to a public sewer, septic system, pour/flush latrine, private pit latrine, or ventilated pit latrine. Healthcare is measured as the natural log of number of *physicians per 1,000* people.[20] Education is measured as gross *secondary school enrollment* as a percentage of age appropriate children. Gross enrollment includes total enrollment, regardless of age, as a percentage of the age group that officially corresponds to the secondary level. Finally, because the indicators of capability development are so highly collinear, I create a *capability development scale*.[21] This is a standardized composite scale created in STATA that includes water, sanitation, physicians, and school enrollment (alpha = .93).

2.3 Results

Appendix A shows the survey year and weighted mean of each dependent variable by country, and Table 2 shows descriptive statistics for all of the variables used

[20] The distribution of physicians per 1,000 is positively skewed to the right, so I use the natural log to correct this. The skew statistic for physicians per 1,000 is 1.51, versus .27 for the natural log. A skewness/kurtosis test in STATA confirms that the distribution of physicians per 1,000 is not normal, but the logged variable is.
[21] See Appendix C for a correlation matrix of the country-level variables.

in this chapter's analysis.[22] Tables 2.3-2.5 display the results for HGLM logit models of child health. First, Table 3 shows the effects of individual-level variables only in Model 1. This model includes household wealth, mother's education, sanitation, and water, controlling for other relevant household and maternal characteristics. Model 2 of Table 3 then adds one country-level variable to the analysis: economic development. Table 4 focuses on the country-level indicators of the capability approach, as well as economic development. Model 1 first displays the bivariate association between child health and water, sanitation, doctors, and education respectively. Then, GDP per capita is added in Model 2. Note that individual-level coefficients are not displayed in Table 4, although all of the individual-level variables are included in these models. The effects of the individual-level variables remain stable throughout, thus the coefficients are not displayed in Table 4 for parsimony. Finally, Table 5 displays all of the individual-level variables again and compares GDP per capita to the capability development scale.

According to Appendix A, diarrhea prevalence ranges from 5.13 percent in Uzbekistan to 31.37 percent in Togo. Over 20 percent of children have had a recent episode of diarrhea in 14 countries (28 percent of the sample). Over 30 percent of children are stunted in approximately half of the countries in the sample. Countries with the highest percentages of stunting include Niger (50.49), Guatemala (48.34), Malawi

[22] The mean of each dependent variable is calculated separately for each country using sample weights provided by DHS (see footnote 2), then multiplied by 100 to get a percent.

(46.75), and Ethiopia (46.51). Comparatively, there are fewer wasted children across countries than stunted children. Wasting ranges from 1.12 percent in Peru to 22.13 percent in Burkina Faso, but Burkina Faso is the only country in which wasting exceeds 20 percent. More than 20 percent of children are underweight in about one-quarter of the sample. India has the highest percentage of children who are underweight (38.39), followed by Bangladesh (35.87), Niger (35.64), and Nepal (33.80).

Beginning with the individual-level variables only, Model 1 of Table 3 shows that wealth has a considerable effect on child health. For each one percent increase in the household wealth index, the odds of a child experiencing malnutrition or diarrhea decline by a factor of about 1.01-1.02. Since the standard deviation for wealth is 23.93 (see Table 2), this translates into relatively sizable effects. A one standard deviation increase in household wealth reduces the odds of a child experiencing malnutrition or diarrhea by a factor of 1.13-1.42. Although the effect is robust across all 4 outcomes, wealth seems to have the strongest negative effect on stunting and underweight, the two most chronic indicators of child health.

In contrast, access to improved water sources at the individual level does not have profound effects on child health as the capability approach would predict. Well water does not significantly affect any of the health outcomes, and piped water only significantly affects the odds of underweight, when controlling for household wealth and a variety of other household and maternal characteristics. Living in a home with

access to piped water reduces the odds of a child being underweight by a factor of 1.08, relative to living in a home without access to any type of improved water source. Because of these surprising results, I regress each child health outcome on piped water and well water only in Model 1 of Appendix D.[23] In these models, piped water significantly reduces the odds of malnutrition by a factor or 1.52-2.15. Piped water does not significantly affect diarrhea, and well water has no effect on any of the outcomes. Piped water appears to be more beneficial for child health than well water in these simple models, but the effects do not hold up in the multivariate models in Table 3. Controlling for wealth (and other factors), clean water does not significantly affect child health. The fact that wealth in particular is a more robust predictor of child health than clean water supports the fundamental cause argument that socioeconomic status is an enduring determinant of health disparities in spite of intervening mechanisms that help eradicate disease.

Access to improved sanitation facilities, on the other hand, appears to be more consequential for malnutrition than access to improved water sources. This supports previous findings that sanitation has a larger impact than drinking water quality on various health outcomes, including child growth (World Bank 2003). Living in a home

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[23] Appendix D shows logistic regression models of child health on individual-level access to improved water sources (Model 1) and sanitation facilities (Model 2). Standard errors are not displayed, but are adjusted for country clusters. These models do not include any other variables. They simply show the bivariate relationship between health and water (Model 1) and between health and sanitation (Model 2) in order to determine whether the other individual-level variables "wash out" the effects in the multivariate models.

with a flush toilet decreases the odds of malnutrition by a factor of 1.24-1.33, compared to living in a home without either a flush toilet or pit latrine. In addition, living in a home with a pit latrine decreases the odds of wasting and underweight by a factor of 1.11-1.13. Still, neither type of sanitation significantly reduces the odds of diarrhea in these multivariate models. This is contrary to expectation, since poor hygiene is one of the largest causes of diarrhea. However, good hygiene is much more than just access to a toilet or latrine. It involves hand washing with soap and safe weaning practices, food preparation, water handling, water storage, and disposal of children's feces (World Bank 2003). It is possible that these hygiene practices are more important for diarrhea-prevention in particular.

Because these results are not quite as robust as the capability approach would predict, I regress each child health outcome on access to a flush toilet or pit latrine only in Model 2 of Appendix D (see footnote 23). In these reduced models, the existence of a flush toilet in the household greatly reduces the odds of all 4 outcomes by a factor of 1.4-3.15. A pit latrine reduces the odds of malnutrition by a factor of 1.39-2.1. Notably, flush toilet has the smallest effect on diarrhea, and pit latrine has no significant effect on diarrhea. However, in the multivariate models of Table 3, household wealth has a more consistent effect on child health than access to improved sanitation. These results are consistent with Casterline and colleagues (1989) who also report in the final models that

household income has a robust effect on child mortality, while water and sanitation are not significant.

Mother's education has a robust, negative effect on all 4 measures of child health and the effects grow stronger with each level of education, supporting both the fundamental cause perspective and capability approach. Primary education reduces a child's odds of being malnourished by a factor of 1.18-1.29, relative to mothers with no education. Secondary education reduces the odds of being malnourished by a factor of 1.33-1.70, and higher education reduces the odds by 1.36-2.38. Higher education reduces the odds of having a recent episode of diarrhea by a factor of 1.47 as well. It is important to note that the effects of mother's education are much more robust than those of water and slightly more robust than those of sanitation. This corroborates Smith and Haddad's (2000) finding that women's education has a larger impact on underweight prevalence than access to safe water. Simply constructing water supply and sanitation facilities is not enough to improve health without simultaneously changing hygiene behaviors. Education, particularly targeted at women, is the most effective way to promote and maximize good hygiene behaviors (World Bank 2003). Additionally, more educated women are more likely to break from tradition and adopt newer innovations in technology and nutrition (Caldwell 1979). This again provides some support for fundamental cause. Despite the intervening mechanisms of water and sanitation, education is still a more robust predictor of child health disparities.

Mother's employment increases the odds of diarrhea by a factor of 1.09. Although this is contrary to expectation, outside employment may have contradictory effects on child health because it reduces the time available for childcare (Bhattacharya 2006; Smith et al. 2003). It is also possible that female employment in developing countries could reflect the worse socioeconomic position of particularly impoverished women who are forced to work (Drovandi and Salvini 2004; Young 2001). Out of those women in the sample who specify, approximately 40 percent report self-employed agriculture as their occupation. Such work likely does not confer many of the benefits associated with working outside the home (i.e., more social mobility and an independent wage). Comparatively, fewer women in the sample are employed in the types of occupations that would likely bring such benefits (see footnote 12). Still, the maternal employment effect is not particularly robust as it does not significantly affect stunting, wasting, or underweight.

Single motherhood disadvantages children in terms of both malnutrition and diarrhea. Having a mother who has never been married increases the odds of a child being underweight by a factor 1.12, relative to having a married mother. Living with a formerly married mother has an even more robust effect across the outcomes, increasing the odds of diarrhea (OR= 1.15), stunting (OR=1.07), and wasting (OR=1.14). Thus, loss of spousal support seems to particularly disadvantage children. In contrast, living in a female-headed household significantly reduces the odds of stunting and being

underweight by a factor of approximately 1.07. This is consistent with Heaton and colleagues' (2005) finding that presence of a female head reduces stunting across 42 DHS countries. Approximately 64% of women in the sample who report living in a female-headed household are also married. Female headship likely confers benefits on children because such women are able to make decisions and allocate resources in ways that improve child health. A variety of studies suggest that women are more likely than men to use resources to enhance children's nutrition and general family welfare (Blumberg 1995; Smith et al. 2003). Thus, single motherhood may be disadvantageous because it represents a loss of resources; whereas, female headship may be beneficial because it represents more control over resources.

Caretaker experience benefits children, as indicated by the negative effect of mother's and household head's age. As expected, older mothers have significant negative effects on diarrhea (OR=.99) and stunting (OR=.995) and older household heads significantly reduce stunting (OR=.997). This means that increasing a mother's age by 10 years would be expected to reduce the odds of diarrhea by a factor of 1.12 and stunting by a factor of about 1.06. For an additional 10 years in household head's age, the odds of stunting would decline by a factor of 1.03. Child's age has mixed effects, increasing the odds of stunting (OR=1.03) and underweight (OR=1.02), but decreasing the odds of diarrhea (OR=.98) and wasting (OR=.98). This could partially reflect the difference between chronic and acute health conditions as Cameron and Williams (2009) suggest.

Because older children require more nutrition to support growth, older children who don't receive appropriate nutrients could be more susceptible to long-term, chronic malnutrition. At the same time, because the immune system develops over time, older children might have better immunities to protect against acute vomiting and diarrhea (both of which contribute to wasting).

Perhaps contrary to expectation, male children have higher odds of being malnourished and experiencing diarrhea (OR=1.1-1.21). Other scholars using the DHS have similarly found that girls are less likely to be stunted or wasted than boys (Hill and Upchurch 1995), and others have found no difference between the sexes in height-for-age or weight-for-age (Shin 2007). Given equal care and feeding, female children actually have a substantial survival advantage over male children (Bhattacharya 2006). Girls may be less prone to disease episodes (Hill and Upchurch 1995). In addition, they are often more restricted in their activities and contact with others and less physically active. Girls are often socialized to pursue hobbies that will contribute to their adult roles as homemakers (i.e., sewing and cooking); whereas, boys are more encouraged to pursue outdoor, physical activities (Verma and Sharma 2003).

Larger households and those with multiple children under age 5 are disadvantageous for chronic malnutrition. For each additional household member, the odds of stunting increase by a factor of 1.02 and the odds of being underweight by 1.01. Living in a household with multiple young children similarly increases the odds of

stunting by a factor of 1.13 and underweight by 1.09. However, the presence of multiple young children in the household surprisingly decreases the odds of diarrhea. Although large households and young children may compromise child nutrition in the long-run, they do not appear to negatively affect the more acute conditions of diarrhea or wasting. Finally, living in an urban area reduces the odds of stunting by a factor of 1.15, but does not have a significant effect on the other health outcomes.

Summarizing the main patterns of Model 1 in Table 3, household wealth and mother's education have the most consistent effects on diarrhea and malnutrition. Access to improved sanitation has a more robust effect on child health than access to improved water sources. However, neither appears to be as important for improving child health as household wealth or mother's education. This may not be surprising in light of the fundamental cause perspective which predicts that socioeconomic resources (like income and education) are more important for health than intervening mechanisms (like water or sanitation). The individual-level results provide mixed evidence for the capability approach which predicts large effects of education as well as water and sanitation. Single motherhood has negative implications for child well-being, but female headship seems to improve child health. This likely reflects the difference between loss of resources (in the case of dissolved partnerships) versus control over resources (in the case of female headed families). Older caregivers tend to be better for child health, and larger households tend to be worse. Male children are surprisingly more likely to be

malnourished or have diarrhea. Finally, age has mixed effects, reflecting the fact that chronic conditions are more common as children age and acute conditions are less common as they age.

Turning to the effects of the country-level variables, Model 2 of Table 3 adds the effects of economic development. A one unit increase in logged GDP per capita (~ $272) reduces the odds of poor health by a factor of approximately 1.12-2.12. Standardizing the coefficient allows a more accurate comparison of effect sizes across models. A one standard deviation increase in GDP reduces the odds of being underweight by a factor of 1.88, stunting by 1.52, wasting by 1.46, and diarrhea by 1.10. Notably, the effect of GDP is largest for the two most chronic conditions and smallest for diarrhea, the most acute condition. The effect of GDP remains negative and robust across all subsequent malnutrition models, as both the fundamental cause and economic development perspectives would posit. However, the effect of GDP on diarrhea is not as consistent or robust and varies with the inclusion of the other development variables. Note that the coefficients of the individual-level variables remain very stable with the addition of GDP per capita.

Table 4 presents the country-level effects of various capability development measures on child health. Individual-level variables are not displayed for parsimony, but they are included in each model and remain stable throughout. Each cell in Table 4

displays odds ratios, standardized factor changes, and t-scores.[24] Access to clean water at the country level has a significant bivariate relationship with all four child health indicators in Model 1. For one standard deviation increase in the percent of the population with access to improved water sources, diarrhea and malnutrition decline by a factor of about 1.15-1.66. Furthermore, this effect is reduced to insignificance when GDP per capita is introduced in Model 2. Similar to the effects of wealth at the individual-level, GDP seems to be a more robust predictor of cross-national differences in child health than access to clean water. This is to be expected according to fundamental cause and the economic development approach, but quite contrary to the capability approach.

Sanitation also significantly improves child health in bivariate models. A one standard deviation increase in the percent of the population with access to improved sanitation facilities decreases the odds of diarrhea and malnutrition by a factor of 1.18-1.93. This effect becomes insignificant for diarrhea and wasting when economic development is added to the model. The effect size weakens, but remains significant for stunting and underweight. Controlling for GDP per capita, a one standard deviation increase in access to sanitation reduces stunting by a factor of 1.19 and underweight by 1.56. For each standard deviation increase in GDP per capita, stunting declines by a

[24] Standardized factor changes are calculated by exponentiating the product of each coefficient and its standard deviation to make the effect sizes comparable across models. Then, odds ratios below one are represented as the negative inverse (-1/OR) to make them substantively comparable to odds ratios above one.

factor of 1.38 and underweight by a factor of 1.46. Thus, the effects of sanitation are slightly larger than those of GDP for the odds of being underweight, which provides some evidence for the capability approach. These country-level effects are again similar to the individual level in that sanitation is more consequential to child well-being than clean water.

Number of doctors has relatively sizable effects in the bivariate models. A one standard deviation increase in physicians per 1,000 reduces the odds of poor child health by a factor of 1.24-1.77. The introduction of economic development into the models has interesting consequences. For each malnutrition indicator, number of doctors becomes insignificant, but GDP per capita has sizable negative effects (OR=.584-.691). However, this is not the case for diarrhea. Number of doctors remains significant, and GDP per capita has no effect, again providing limited evidence that supports the capability approach. For a one standard deviation increase in physicians per 1,000, the odds of diarrhea decline by a factor of 1.34.

Education has the most robust effects compared to the other capability development measures. The bivariate relationship is significant for all health outcomes, and this relationship holds even controlling for GDP in 3 out of the 4 models. Holding level of economic development constant, a one standard deviation increase in secondary school enrollment is expected to decrease the odds of stunting by a factor of 1.27, diarrhea by a factor of 1.28, and underweight by 1.58. A one standard deviation increase

in GDP per capita reduces the odds of stunting by a factor of 1.29 and underweight by 1.37. GDP per capita does not have a significant effect on diarrhea. Thus, as the capability approach would predict, the health-enhancement resulting from improvements in secondary school enrollment is larger than that of GDP per capita for the odds of diarrhea and underweight and comparable to GDP for stunting.

Table 5 compares the effects of the capability development scale to GDP per capita. Water, sanitation, physicians, and school enrollment are well- correlated (see Appendix C). Unfortunately, multi-collinearity among these variables prevents them from being included in the same model individually. Thus, I create a composite capability development scale that represents access to non-economic resources that may be just as important, if not more so, for improving child health. This is a standardized scale that sums the z-scores of water, sanitation, doctors, and education at the country level. Table 5 shows that the capability scale has considerable beneficial effects for child health, even controlling for GDP per capita. A one standard deviation increase in the capability development scale reduces the odds of stunting by a factor of 1.25, diarrhea by a factor of 1.30, and underweight by a factor of 1.51. In comparison, for a one standard deviation increase in GDP per capita, the odds of stunting decline by 1.3, wasting by 1.36, and underweight by 1.37. As Sen and Nussbaum would predict, the health benefits of the capability scale are larger than the benefits of GDP for diarrhea and underweight and fairly comparable for stunting. Notably, the development scale

significantly reduces diarrhea, but GDP has no significant effect. In contrast, the opposite is true for wasting. GDP per capita has a significant negative effect on wasting, but the development scale has no effect. Still, the health enhancement resulting from the capability scale is larger than or comparable to the health enhancement resulting from GDP per capita for 3 out of 4 health outcomes. This gives evidence for the capability approach, suggesting that economic development is not always the most important or effective way to improve well-being.

Finally, in additional analyses not shown, I consider the possibility that the effects of the individual-level variables could vary across different levels of socioeconomic development. I test several cross-level interactive models, examining the effect of GDP per capita, secondary school enrollment, and the capability development scale on individual-level household wealth. None of the cross-level effects are significant, so I do not include them here.

In sum, all three theoretical perspectives find support in the country-level analyses. GDP per capita has the largest and most robust effects on malnutrition for the most part, as predicted by proponents of the economic development perspective. However, GDP does not consistently predict cross-national variation in diarrhea. Furthermore, sanitation, water, and education also have important effects, even controlling for GDP. Several notable results deserve reiteration. First, improved sanitation and secondary school enrollment have larger effects on the odds of being

underweight than GDP per capita. Second, physicians per 1,000 and secondary school enrollment significantly reduce the odds of diarrhea, whereas GDP per capita has no significant effect. As the capability approach would posit, improved sanitation, school enrollment, and doctors have larger health enhancing consequences for some measures of child health. The capability development scale gives further evidence of this. Its effects are larger than or comparable to those of GDP per capita for most of the health outcomes analyzed here. Fundamental cause, with its emphasis on both economic development and secondary school enrollment, is also supported. The results suggest that cross-national studies of child health would benefit from a theoretical approach that synthesizes the three perspectives.

2.4 Discussion and Conclusion

Sociologists have long been interested in the social determinants of health. The present study contributes to this effort in several key ways. First, it focuses specifically on malnutrition and diarrhea, which have been under-utilized measures of child health in extant literature. That the results vary across health outcomes has important implications for understanding the SES-health link, a fact which is obscured by the previous disproportionate focus on infant and child mortality. Furthermore, by utilizing a multi-level modeling technique and multiple theoretical perspectives, it offers a wider, more comprehensive empirical approach to the study of cross-national health disparities. Fundamental cause, economic development, and the capability approach

have, until now, been deployed by scholars in separate bodies of literature that are not in conversation with each other. Yet, in many ways they are parallel theories that complement each other, and the results of this analysis suggest that an integration of these theories best explains within- and between-country heterogeneity in child health.

Fundamental cause emphasizes the enduring importance of socioeconomic resources for individual health, particularly wealth and education. Results confirm that wealth and education are the only variables that have robust and consistent effects across all four dependent variables at the individual level. Household wealth and women's education are even more beneficial to child health than access to clean water and, in some cases, more beneficial than access to improved sanitation facilities. Despite the fact that these results are cross-sectional, this lends some support to the fundamental cause perspective because it suggests that SES is a more robust predictor of child health than the more proximate intervening mechanisms of water and sanitation. Of course, a true test of the fundamental cause perspective would need longitudinal data to assess whether the relationship is reproduced over time with different intervening mechanisms (Phelan et al. 2010). The evidence provided here is suggestive and provides an avenue for future research in developing countries. The robust effect of maternal education at the individual-level also supports the capability approach, particularly Nussbaum's (2004a, 2004b) claim that women's education is the key to other capabilities.

The economic development perspective emphasizes GDP per capita as the most important predictor of cross-national differences in health. In support of this hypothesis, the results of this study demonstrate that GDP per capita has a sizable and consistent negative effect on all three indicators of child malnutrition, both alone and in conjunction with other development indicators. The magnitude of the effects of GDP are larger in size than those of the other development variables for stunting, and GDP is the only variable that consistently predicts between-country variation in wasting. Thus, economic development has clear beneficial consequences for improving malnutrition.

However, economic development is not the most robust or important predictor of variation in the odds of having diarrhea or being underweight, which lends support to the capability approach. Access to improved sanitation facilities and secondary school enrollment both have slightly larger effects on the odds of being underweight than GDP. Perhaps even more surprising, GDP per capita has no significant effect on diarrhea when other development variables are added to the models. Yet, physicians per 1,000 and secondary school enrollment have sizable negative effects on diarrhea. Thus, different health indicators are more or less responsive to different socioeconomic determinants.

One limitation of the analysis is that many of the country-level variables are moderately correlated (see Appendix C). Thus, a bit of caution is warranted in making conclusions about which aspects of development are most important. Part of the way in

which economic development influences health is by increasing access to water, sanitation, doctors, and education. A comparison of Model 2 in Table 3 with Model 2 in Table 4 suggests that the effects of GDP per capita are mediated by the inclusion of the capability variables. However, it is also possible that the capability variables contribute to improved child health by increasing economic development. After all, populations with better water, sanitation, health care, and access to education are likely more productive and can contribute more to the economic growth of society. A comparison of Models 1 and 2 of Table 4 suggest that this might also be the case. The capability development variables are mediated by the inclusion of GDP per capita. Although it is beyond the scope of the current methods to do so, future research could try to parse this out.

Still, given the disproportionate focus on GDP per capita and the conventional wisdom of economic development's benefits, it is notable that sanitation and school enrollment significantly affect the odds of stunting and being underweight, even controlling for economic development. It is even more notable that physicians and school enrollment have beneficial effects on diarrhea, even when economic development does not. So, although it is often assumed that the effects of economic development "trickle down" to influence health and well-being (Jenkins and Scanlan 2001), this may not be the case for particularly acute health issues like diarrhea. It is possible that doctors and education are more important for attending to immediate health needs.

The results of this chapter more broadly point to the need to integrate three theoretical frameworks that have typically been deployed in separate literatures. The analyses provide evidence in support of all three theories, which demonstrates the usefulness of synthesizing them. In tandem, the fundamental cause, economic development, and capability development perspectives complement each other by making up for what each of the others lack. Fundamental cause has rarely been applied to cross-national or developing country contexts, whereas the other two perspectives have. The economic development perspective emphasizes between-country disparities in GDP per capita. But it neglects within-country disparities in socioeconomic resources, which has been the focus of fundamental cause. The capability approach broadens the scope of what is important by bringing sanitation, water, education, and health care to the fore. However, in its emphasis on these aspects of well-being, it perhaps neglects the fact that GDP per capita and wealth certainly contribute to accessing these capabilities. At the same time, better sanitation, education, and health care yield healthier populations that, in turn, are more productive and contribute to growing GDP per capita. Thus, an integration of these theoretical frameworks helps elucidate the complexities of risk and protective factors that create both within- and between-group heterogeneity in child health.

Table 1: Theories of Well-Being in Developing Countries

	Individual-Level Indicators	*Country-Level Indicators*
Fundamental Cause	Household wealth, mother's education	GDP per capita, school enrollment
Economic Development		GDP per capita
Capability Approach	Mother's education, water, sanitation	School enrollment, water, sanitation, doctors

Table 2: Chapter 2 Descriptive Statistics

Variable	Mean	SD	Min	Max
Individual Level (N=258,761)				
Diarrhea	0.15	0.36	0.00	1.00
Stunting	0.33	0.47	0.00	1.00
Wasting	0.10	0.29	0.00	1.00
Underweight	0.18	0.38	0.00	1.00
Wealth Index	30.07	23.93	0.00	100.00
Improved Water Source				
Piped Water	0.44	0.50	0.00	1.00
Well Water	0.19	0.39	0.00	1.00
Improved Sanitation Facilities				
Flush Toilet	0.26	0.44	0.00	1.00
Pit Latrine	0.36	0.48	0.00	1.00
Mother's Education				
Primary	0.33	0.47	0.00	1.00
Secondary	0.27	0.44	0.00	1.00
Higher	0.05	0.22	0.00	1.00
Mother Employed	0.48	0.50	0.00	1.00
Mother's Marital Status				
Never Married	0.04	0.19	0.00	1.00
Formerly Married	0.06	0.23	0.00	1.00
Mother's Age	28.37	6.71	15.00	49.00
Head's Age	40.85	13.56	13.00	97.00
Child's Age (months)	28.32	17.13	0.00	59.00
Male	0.51	0.50	0.00	1.00
Female Head	0.15	0.35	0.00	1.00
Household Size	6.91	3.59	2.00	36.00
Multiple Children	0.66	0.47	0.00	1.00
Urban Residence	0.37	0.48	0.00	1.00
Country Level (N=47)				
GDP per capita (logged)	2.91	0.84	1.06	4.89
Improved water source (% of population with access)	72.53	17.10	41.00	98.00
Improved sanitation facilities (% of population with access)	43.96	26.88	7.00	97.00
Physicians per 1,000 (logged)	-1.39	1.60	-3.84	1.29
Secondary school enrollment	46.60	27.98	6.10	99.18
Development scale	-0.07	0.88	-1.39	1.66

Table 3: HGLM Logit Models of Child Health on Individual-Level Characteristics and Economic Development

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Individual Level								
Wealth Index	0.995***	0.995***	0.986***	0.986***	0.995***	0.995***	0.987***	0.987***
Improved Water Source								
Piped Water	0.988	0.988	0.978	0.978	0.973	0.973	0.927**	0.927**
Well Water	0.988	0.988	0.956	0.956	1.046	1.046	0.981	0.981
Improved Sanitation Facilities								
Flush Toilet	0.964	0.964	0.754***	0.754***	0.804***	0.804***	0.783***	0.783***
Pit Latrine	1.014	1.014	0.925	0.924	0.898*	0.898*	0.886**	0.886**
Mother's Education								
Primary	1.009	1.009	0.850***	0.850***	0.851***	0.851***	0.774***	0.774***
Secondary	0.911	0.911	0.649***	0.648***	0.750***	0.750***	0.587***	0.587***
Higher	0.681***	0.681***	0.499***	0.499***	0.737***	0.737***	0.421***	0.420***
Mother Employed	1.091***	1.091***	1.001	1.001	0.983	0.983	1.002	1.002
Mother's Marital Status								
Never Married	0.973	0.973	1.035	1.035	1.114	1.114	1.115*	1.115*
Formerly Married	1.149***	1.149***	1.074*	1.074*	1.144*	1.144*	1.066	1.066
Female Head	1.027	1.027	0.934***	0.934***	0.994	0.994	0.935***	0.935***
Mother's Age	0.989***	0.989***	0.995***	0.995***	1.004*	1.004*	1.000	1.000
Head's Age	1.000	1.000	0.997***	0.997***	1.000	1.000	0.999	0.999
Child's Age (months)	0.977***	0.977***	1.028***	1.028***	0.976***	0.976***	1.016***	1.016***
Male	1.109***	1.109***	1.175***	1.175***	1.208***	1.208***	1.119***	1.119***

Table 3. continued from previous page								
Household Size	1.008	1.008	1.015***	1.015***	1.002	1.002	1.011**	1.011**
Multiple Children	0.878***	0.878***	1.132***	1.132***	0.996	0.996	1.092***	1.092***
Urban Residence	1.020	1.020	0.867**	0.867**	1.063	1.063	0.892	0.892
Country Level								
GDP per capita (logged)		0.890*		0.605***		0.640***		0.471***
		-1.103		***-1.524***		***-1.456***		***-1.883***
		(-2.100)		(-6.327)		(-4.304)		(-7.131)

*p<.05 **p<.01 ***p<.001

Note: Constants not shown. For individual-level, each cell contains odds ratios only. For country-level, each cell contains odds ratios, t-scores in parentheses, and standardized factor changes in bold and italics.

Table 4: HGLM Logit Models of Child Health on Country-Level Measures of Capability Development

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Improved Water	0.992*	0.992	0.979***	0.992	0.987*	1.003	0.971***	0.992
Source	***-1.149***	***-1.149***	***-1.438***	***-1.154***	***-1.260***	***1.050***	***-1.650***	***-1.139***
	(-2.249)	(-1.440)	(-5.179)	(-1.661)	(-2.450)	(0.438)	(-5.026)	(-0.924)
GDP per capita		0.999		0.683***		0.614***		0.525***
		-1.001		***-1.378***		***-1.506***		***-1.719***
		(-0.007)		(-3.749)		(-3.767)		(-4.064)
Improved Sanitation	0.994*	0.994	0.987***	0.993*	0.987***	0.992	0.976***	0.984***
Facilities	***-1.183***	***-1.182***	***-1.432***	***-1.192***	***-1.430***	***-1.237***	***-1.933***	***-1.556***
	(-2.501)	(-1.841)	(-4.218)	(-2.035)	(-3.562)	(-1.883)	(-7.869)	(-4.752)
GDP per capita		0.999		0.684***		0.740*		0.638***
		-1.001		***-1.376***		***-1.287***		***-1.458***
		(-0.014)		(-4.942)		(-2.553)		(-4.595)
Physicians per 1,000	0.874***	0.835**	0.792***	0.906	0.862*	1.028	0.700***	0.852
	-1.240	***-1.336***	***-1.453***	***-1.171***	***-1.269***	***1.046***	***-1.771***	***-1.292***
	(-3.483)	(-2.976)	(-4.617)	(-1.489)	(-2.304)	(0.337)	(-6.375)	(-1.882)
GDP per capita		1.135		0.691***		0.616**		0.584***
		1.112		***-1.364***		***-1.502***		***-1.572***
		(1.408)		(-3.762)		(-3.369)		(-3.666)
Secondary School	0.993**	0.991*	0.985***	0.991*	0.988**	0.995	0.976***	0.984***
Enrollment	***-1.212***	***-1.275***	***-1.518***	***-1.273***	***-1.389***	***-1.140***	***-1.964***	***-1.578***
	(-2.917)	***(-2.537)***	(-5.292)	(-2.157)	(-2.972)	(-0.976)	(-8.904)	(-4.388)
GDP per capita		1.090		0.741**		0.713**		0.689**
		1.075		***1.287***		***-1.328***		***-1.367***
		(1.034)		(-2.814)		(-2.760)		(-3.289)

*p<.05, **p<.01, ***p<.001. Note: Each cell contains odds ratios, ***standardized factor changes***, and (t-scores). Constants and individual-level variables not shown.

Table 5: HGLM Logit Models of Child Health on Individual-Level Characteristics, Capability Development Scale, and Economic Development

	Diarrhea	Stunting	Wasting	Underweight
Individual Level				
Wealth Index	0.995***	0.986***	0.995***	0.987***
Improved Water Source				
Piped Water	0.988	0.978	0.973	0.927**
Well Water	0.988	0.956	1.046	0.981
Improved Sanitation Facilities				
Flush Toilet	0.964	0.754***	0.804***	0.782***
Pit Latrine	1.014	0.925	0.898*	0.887**
Mother's Education				
Primary	1.009	0.850***	0.851***	0.774***
Secondary	0.912	0.648***	0.750***	0.587***
Higher	0.681***	0.499***	0.737***	0.420***
Mother Employed	1.091***	1.001	0.983	1.002
Mother's Marital Status				
Never Married	0.973	1.035	1.114	1.115*
Formerly Married	1.149***	1.074*	1.144*	1.066
Female Head	1.027	0.934***	0.994	0.935***
Mother's Age	0.989***	0.995***	1.004*	1.000
Head's Age	1.000	0.997***	1.000	0.999
Child's Age (months)	0.977***	1.028***	0.976***	1.016***
Male	1.109***	1.175***	1.208***	1.119***
Household Size	1.008	1.015***	1.002	1.011**
Multiple Children	0.878***	1.132***	0.996	1.092***
Urban Residence	1.020	0.867**	1.063	0.892
Country Level				
GDP per capita (logged)	1.133	0.746**	0.695*	0.690*
	1.110	***-1.279***	***-1.357***	***-1.366***
	(1.301)	(-2.852)	(-2.588)	(-2.633)
Development Scale	0.745**	0.775*	0.903	0.627***
	-1.296	***-1.251***	***-1.094***	***-1.507***
	(-2.716)	(-2.26)	(-0.689)	(-3.614)

*p<.05 **p<.01 ***p<.001.

Note: Constants not shown. For individual-level, each cell contains odds ratios only. For country-level, each cell contains odds ratios, standardized factor changes in bold and italics, and t-scores in parentheses.

3. Empowering Women, Strengthening Children: A Multi-Level Analysis of Gender Inequality and Child Health in Developing Countries

Amartya Sen (2001) claims that "The voice of women is critically important for the world's future – not just for women's future." Limiting the active agency of women seriously affects the lives of all members of the household (Sen 1999b). Gender inequality plays a particularly integral role in child survival, as women typically bear the primary responsibility for caregiving and maintaining household food security and health (Smith, Ramakrishnan, Ndiaye, Haddad, and Martorell 2003). In addition, a variety of studies suggest that women are more likely than men to use resources on enhancing children's nutrition and general family welfare (Blumberg 1995; Smith et al. 2003). Thus gender inequality deserves serious attention by scholars who are interested in understanding disparities in child health outcomes.

Overall, gender equality enhances women's decision-making and resource control, which in turn, improve child health. Consequently, child health is likely to be better in countries where women have more education and employment, representation in political arenas, greater control over fertility, and longer life expectancy. At the individual-level, greater autonomy allows women to take better care of their children through their increased mobility, income, knowledge, and bargaining power. At the country-level, women's greater overall decision-making power and control over resources helps solidify and reinforce new gender norms and rules governing women's

behavior (Koenig, Ahmed, Hossain, and Mozumder 2003). Women in influential positions begin to transform social institutions, promote the growth of public services, and mobilize resources that can help satisfy their own and other women's needs, resulting in a "positive 'dispersion' effect" of expanded female autonomy on child health (Parashar 2005: 991). Thus, women act as "agents of change" and "dynamic promoters of social transformations" that can alter the lives of those around them (Sen 1999b: 189).

The dominant paradigm across the social sciences has been that economic growth is the most significant predictor of cross-national differences in well-being and mortality (Brady, Kaya, and Beckfield 2007; Nussbaum 2004; Preston 1996). This focus on economic growth has been particularly pronounced in studies of developing countries. For example, in their highly influential *ASR* article, Firebaugh and Beck (1994) examine the effect of GDP per capita on male and female life expectancy, caloric intake, and infant survival in developing countries. They contend that economic growth is the only variable that shows consistent effects on all four outcomes. In addition, a rather extensive literature in the late 1980s and early 1990s examined the effects of dependency and debt (Bradshaw, Noonan, Gash, and Sershen 1993; London and Williams 1990; Wimberley 1990). However, gender inequality has not typically been the focal point in

cross-national studies of well-being.[1] In light of this, the current study contributes to the literature on international health disparities by highlighting several dimensions of gender inequality as key predictors of child health.

In this chapter, I first address the problem of defining "gender inequality" and describe the way it will be used here. I focus on two aspects of inequality: decision-making and resource control. I further argue that these two aspects are manifest in women's education, employment, political representation, reproductive autonomy, and life expectancy. I then describe the data and methods. Because a substantial literature has focused on individual-level analysis, this study uses a multi-level design that incorporates maternal and household characteristics as well. I present a series of tables that show the contributions of different dimensions of gender inequality to predicting child malnutrition and diarrhea across a sample of 50 developing countries, and conclude with a summary of findings and implications.

3.1 Dimensions of Gender Inequality

3.1.1 Defining Gender Inequality

Gender inequality results from a system of social processes that differentiates and evaluates people in socially significant ways based on sex differences (Bradley and Khor 1993; Ridgeway and Smith-Lovin 1999). Many scholars use the related phrase "women's status" to signal that men and women are stratified by different social

[1] Note that "well-being" refers to physical well-being, not subjective well-being, throughout.

positions. Various other terms are also associated with gender inequality – autonomy, agency, power, position, rights, authority, respect, and capacity. The problem, however, is that women's status and gender inequality have become elusive concepts, and although they are widely employed, no consensus has been reached on their definition (Bradley and Khor 1993; Smith et al. 2003).

Consider, for example, the ways that some of these concepts have been defined by gender scholars. *Women's status* "refers to both the respect accorded to individuals and the personal power available to them" (Bloom, Wypij, and Gupta 2001: 68). *Agency* "is understood to be the power or freedom to exercise choice in one's actions, free from the constraints of social structure" (Bhattacharya 2006: 263). *Women's autonomy* "indicates the ability – technical, social, and psychological – to obtain information and to use it as the basis for making decisions about one's private concerns and those of one's intimates" (Dyson and Moore 1983: 45). Finally, *power* "is the ability to make choices. It is the ability of a person or group of people to define goals and pursue them, even in the face of opposition from others. Power is exercised through decision-making" (Smith and Haddad 2003: 5). A decisive theme runs through the definitions of these similar concepts: decision-making. Several scholars also point out that an important part of women's power includes control over resources (Drovandi and Salvini 2004; Sen 1999b; Smith et al. 2003). These two elements frequently work in tandem, as control over resources enhances the ability to exercise choice, and decision-making often involves

resource allocation. Thus, for my purposes, gender inequality refers to inequality in decision-making and control over resources.

Complicating the definitional issue further is the fact that gender inequality is a multidimensional phenomenon, since the sexes can be unequal in more than one domain (Mason 1986). Moreover, a variety of measures of women's status may be important predictors of child health (Boehmer and Williamson 1996). Examining the effects of gender inequality through the use of multiple indicators can enhance the validity of the measurement by lessening the possible idiosyncratic effect of a single indicator (Bollen, Entwisle, and Alderson 1993) Therefore, I examine five dimensions of gender inequality: education, employment, political representation, reproductive autonomy, and life expectancy. I discuss each of these dimensions and their relation to decision-making, resource control, and child health in more detail below. Education and employment bring various types of resources to women, which in turn bolsters their decision-making capacity. Political representation, on the other hand, enhances decision-making, which subsequently brings access to more resources. Control of fertility epitomizes a definitive aspect of women's decision-making, and life expectancy represents a culmination of access to resources.

3.1.2 Education

Long-term global trends suggest that the allocation of education between girls and boys is equalizing, but substantial gender gaps still exist and are often connected to

norms regarding women's autonomy and power in society (Hannum and Buchmann 2003). Despite an otherwise lack of attention to gender inequality, women's education has received much attention in sociological studies of child health disparities. Indeed, research in this area proliferated after Caldwell's (1979) pioneering and often-cited study in which he claimed that maternal education was the single most important determinant of differences in child mortality in Nigeria. Since then, an extensive literature has reported that maternal education has a strong effect on child health (e.g., Bollen, Glanville, and Stecklov 2001; Cleland and Ginneken 1988). Martha Nussbaum (2004) writes that literacy and education enhance "women's ability to form social relationships on a basis of equality with others and to achieve the important social good of self-respect" (335). However, the precise mechanisms that link women's education to child health outcomes may be less well understood (Ware 1984).

Most hypothesized explanations for the connection between maternal education and child health revolve around resource control and decision-making. Education gives women more opportunities to work outside the home and earn an income, which gives them an economic advantage and greater bargaining power in the household (Nussbaum 2004; Sen 1999b). Some claim that reducing educational disparities is actually one of the most powerful ways to strengthen the bargaining power of women (Abu-Ghaida and Klasen 2004). Indeed, educated women often have more autonomy and more authority in the household (Heaton et al. 2005), both of which have been

linked to significant decreases in child mortality (Hossain, Phillips, and Pence 2007). Another important mechanism through which maternal education improves child well-being is simply through general access to information and greater health knowledge (Glewwe 1999; Thomas, Strauss, and Henriques 1990; Wickrama and Lorenz 2002). Education also allows mothers to utilize health care services more effectively. More educated women tend to be more likely to know where health facilities are, communicate effectively with health care providers, comply with treatment regimens, and break from tradition in adopting newer innovations in medicine and nutrition (Caldwell 1979; Hannum and Buchmann 2003; Smith and Haddad 2000). Education also enhances access to the political process, which in turn allows women to demand resources for their children (Nussbaum 2004). Through increased education, then, women gain resources in the form of income and information, which subsequently bolsters their decision-making capacity in households, clinics, and even politics.

In analyses that pool individual-level DHS data for multiple countries, Heaton and colleagues (2005) demonstrate that mother's education reduces infant mortality and stunting, and Hatt and Waters (2006) show that maternal education interacts with economic status to affect child diarrhea and respiratory illness at the individual level, finding that education has a more protective effect for children in wealthier families. Other individual-level studies are country-specific. For example, maternal education is associated with stunting in Brazil, Ecuador, and Morocco (Glewwe 1999; Larrea and

Kawachi 2005; Thomas, Strauss, and Henriques 1990), diarrhea in the Philippines (Cebu Study Team 1991), and mortality and malnutrition in Nicaragua (Sandiford, Cassel, Montenegro, and Sanchez 1995). Recent country-level studies also show that female secondary school enrollment and the ratio of female to male enrollment significantly improve child mortality and nutrition in developing countries (Abu-Ghaida and Klasen 2004; Frey and Field 2000; Hanmer, Lensink, and White 2003; KlaSen 1999b; Shen and Williamson 1997; Shen and Williamson 2001; Smith and Haddad 2000; Wickrama and Lorenz 2002). Some even claim that women's education is the strongest overall predictor of child mortality over time, even stronger than household wealth or average national income (Mogford 2004; Sastry 2004).

Despite claims such as these, a review of the literature reveals disagreement about the estimated impact of maternal education, particularly in relation to other socioeconomic variables (Bollen, Glanville, and Stecklov 2001). Knodel and Jones (1996) caution against a disproportionate emphasis on gender inequality in schooling because such a focus detracts from socioeconomic inequality that keeps girls *and* boys out of school. They stress that inequality in education based on socioeconomic background is almost universal and is more pronounced in developing countries than gender inequality. Some find that education does influence child health, but that the effect is often overstated and weaker than most scholars believe (Bhattacharya 2006; Desai and Alva 1998; Shin 2007). Others find either no effect or inconsistent effects (Folasade 2000;

Macassa, Ghilagaber, Bernhardt, Diderichsen, and Burström 2003; Wolfe and Behrman 1987). Still, women's education remains the most frequently used measure of socioeconomic status in studies of child health in developing countries, which is a testament to the widespread belief in its significance (Bollen, Glanville, and Stecklov 2001).

One relatively understudied aspect of women's education, however, is the possibility that it may have beneficial effects on child health at multiple levels. Two multi-level studies in India demonstrate that women's education and literacy at the individual *and* the community level significantly affect child mortality (Kravdal 2004) and immunization rates (Parashar 2005). As broad societal transformations take place, a large number of educated women may shape other women's capacity to seek and take advantage of better access to services, skills, and information. Furthermore, educated females may begin to transform social institutions, promote the growth of public services, and mobilize resources that could help satisfy their own and other women's needs, resulting in a dispersion effect of expanded female education on health (Burroway 2010; Parashar 2005). Thus, women's educational expansion may have a protective effect on child health not only because more women attain higher levels of education, but also because everyone, even the uneducated, benefits from the higher educational level of the community (Kravdal 2004). For this reason, the current study includes both individual- and country-level measures of education. To the author's best

knowledge, this is the first study to use a cross-national sample of developing countries to test the proposition that education at the country-level has a positive impact on child health, net of variation in maternal education at the individual-level.

3.1.3 Employment

Many scholars posit that the link between employment and autonomy exists through women's increased control over income (Heaton, Huntsman, and Flake 2005). Indeed, Smith and colleagues (2003) assert that "employment is at the root of women's economic independence from men" (22). Gainful employment outside the home, in turn, enhances the social standing of women in the household. Women become less dependent on others and their contribution to the prosperity of the family is move visible, giving them more bargaining power and greater influence in household decisions (Sen 1999b). Working also brings women more freedom of movement and increased social contact with the world outside of the home, both of which expose them to new knowledge and behavior norms (Dharmalingam and Morgan 1996; Sen 1999b; Smith et al. 2003).

Several empirical studies corroborate these hypotheses. For example, women's employment and/or control over income is associated with autonomy and decision-making power in Guatemala (Carter 2004), Mexico (Oropesa 1997), Sri Lanka (Malhotra and Mather 1997), India (Bloom, Wypij, and Gupta 2001), Nicaragua and Peru (Heaton, Huntsman, and Flake 2005). In a comparison of two villages in southern India,

Dharmalingam and Morgan (1996) find that the principal determinant of a woman's autonomy is not whether she is employed herself, but whether she lives in a village where a majority of women are employed. They suggest that employment opportunities institute new social norms at the community level that provide leverage for women to renegotiate relationships with men at both the household and community levels.

Empirical studies of the relationship between women's work and health outcomes yield mixed results. Bianchi (2000) points out that demographers have long been interested in the relationship between maternal employment and fertility, but the connection is vague and inconsistent in developing countries. Several studies focus specifically on the Indian context. Bhattacharya (2006) finds that female labor force participation reduces female child mortality, but has no effect on male child mortality in India. Similarly, others find that female employment reduces female survival disadvantage, presumably because mothers are able to allocate more resources to girl children, although the effect on overall child mortality is not as straightforward or consistent (Murthi, Guio, and Dreze 1995; Tulasidhar 1993). In the Philippines, white-collar employment increases the likelihood of using prenatal care and contraception, but blue-collar employment has no effect (Miles-Doan and Brewster 1998). Cross-national studies of developing countries also yield contradictory results. Boehmer and Williamson (1996) show that women's economic activity rate and gender parity in the economic activity rate both reduce infant mortality across 86 developing countries, but

Frongillo and colleagues (1997) find that female share of the labor force does not significantly affect stunting.

The premise of the analysis that follows is that employment enhances women's access to income and augments their decision-making capacity in the household, both of which may plausibly improve child health. However, outside employment may have contradictory effects on child health because it reduces the time available for childcare (Bhattacharya 2006; Smith et al. 2003). In addition, it is possible that female employment in developing countries reflects their impoverishment, not their greater autonomy (Drovandi and Salvini 2004; Young 2001). Because of the inconsistent results and relative lack of cross-national studies, there is still much we do not know about the effect of women's employment on child health. The analysis that follows includes measures of female employment at both the individual and country level. Thus, living with a mother who works and living in a larger social context in which many women work are both treated as explanatory variables that may affect child well-being.

3.1.4 Political Representation

Politics is a significant arena for decision-making, as those who hold government positions decide how to allocate scarce resources and what practices to codify into law (Paxton and Hughes 2007). Thus, political processes can be important for improving gender inequality and health (Pillai and Gupta 2006). Yet, during the course of the twentieth and twenty-first centuries, only about 58 women in 45 countries have

been appointed or elected as prime minister, president, or chancellor (with an additional 11 serving as acting heads of state) (Peterson and Runyan 2010). Several scholars suggest that male legislators may be less likely to initiate or pass laws that serve the interests of women or children (Paxton and Hughes 2007).

It has been hypothesized that women will have greater political decision-making power when they have greater representation in national parliament (Boehmer and Williamson 1996). Although much research examines the barriers to women's political participation and governance (Paxton, Hughes, and Green 2006; Peterson and Runyan 2010), much less is known about their actual political impact (Paxton and Hughes 2007). Research from the U.S. and Latin America suggests that female legislators are more likely to rate matters surrounding women, children, and family as high legislative priorities (Schwindt-Bayer 2006; Thomas 1991). Similarly, in the U.S., New Zealand, and Britain, female politicians have been more likely to vote for women's issue bills, even if it means crossing party lines to do so (Childs and Withey 2004; Grey 2002; Swers 1998). Women have even been more likely to introduce and sponsor women's issue bills in the U.S., Honduras, Argentina, Colombia, and Costa Rica (Bratton and Haynie 1999; Schwindt-Bayer 2006; Taylor-Robinson and Heath 2003). Women can also be just as effective as men (if not more so) at getting their bills passed into law (Paxton and Hughes 2007). In addition, women's political power has been linked to less overall poverty and inequality (Brady 2009).

In theory, then, women's political representation gives them greater decision-making power, and therefore, power to allocate resources to improve child health. Miller (2008) illustrates how the extension of suffrage to American women was highly instrumental in reducing child mortality in the U.S. Politicians responded to changes in policy preferences when women gained the right to vote, and consequently scaled up public health spending that fueled hygiene campaigns and reduced infectious disease among children. He further suggests that these results are highly relevant to challenges in developing countries today, as they show that enhancing the expression of women's preferences can lead to substantial improvements in child health (Miller 2008). Women's legal rights and political representation has also been linked to life expectancy in the U.S. and Norway (Kawachi, Kennedy, Gupta, and Prothrow-Smith 1999; Nobles, Brown, and Catalano 2010). Furthermore, evidence from an experimental study in India suggests that women's involvement in local politics increases spending on and the availability of public health goods like clean water (Chattopadhyay and Duflo 2004). In a cross-national sample of developing countries, Boehmer and Williamson (1996) find that proportion of women in parliament significantly predicts infant mortality in some models, although the effects are generally weaker than those of other gender inequality variables. Despite these few studies, little empirical research explicitly links women's political representation to child health outcomes in developing countries. The present

study contributes to this literature by evaluating the impact of percent of women in parliament on cross-national variation in child diarrhea and malnutrition.

3.1.5 Reproductive Autonomy

Fertility and contraception use are fundamental reflections of a woman's decision-making power, or lack thereof. As Sen and Batliwala (2000) explain, "The control of women's and girls' sexuality and reproduction is at the core of unequal gender relations and is central to the denial of equality and self-determination of women" (24). Fertility tends to be high in societies where women's interests are disregarded (Sen 2001). This may be due in part to a lack of access to family planning services in communities where sexual and reproductive rights are not a priority (Smith et al. 2003). It may also reflect whether a woman is able to use contraception in cases where she does not desire additional children (Morgan and Niraula 1995). In addition, lower fertility and birth control use are also linked to other aspects of gender equality, such as greater schooling and employment, which contribute to greater autonomy as well (Hannum and Buchmann 2003; Dharmalingam and Morgan 1996).

Substantial empirical research corroborates the relationship between women's autonomy and fertility decline in developing countries. Morgan and Niraula (1995) find that greater household decision-making power and freedom of movement reduce the desire for more children, increase contraceptive use, and decrease levels of unmet need for contraception in Nepal. Similarly, various other measures of women's autonomy

have also been linked with fertility in the Philippines (Upadhyay and Hindin 2005), Ethiopia (Hogan, Berhanu, and Hailemariam 1999), Bangladesh (Balk 1994), Botswana, South Africa, and Rajasthan (Drovandi and Salvini 2004).[2] Gender equality is also associated with increased reproductive rights in a cross-national study of 129 developing countries (Pillai and Gupta 2006). Of course, this relationship is not necessarily consistent across all cultures or countries. Women's autonomy does not always explain fertility differences or birth control use (Morgan, Stash, Smith, and Mason 2002; Abbasi-Shavazi, Morgan, Hossein-Chavoshi, McDonald 2009). However, fertility decline generally reflects broad improvements in gender equality, and contraceptive use typically indicates greater decision-making capacity (Nussbaum 2000; Wickrama and Lorenz 2002).

Declining fertility also has several more direct consequences for both child and adult well-being. Reduced fertility allows a society to transfer valuable health resources from routine births to other populations in need (Brady et al. 2007). Reduced fertility also directly improves women's health, which in turn, improves child health as well (Wickrama and Lorenz). Quality of child health and nutrition rises when parents can

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[2] More specifically, women with greater decision-making power have longer birth-to-conception intervals in the Philippines. Women's literacy, paid employment, and participation in family decision-making with husbands are the biggest factors in lowering fertility in Ethiopia, partially because those who participate in decision-making are more knowledgeable about family planning and more likely to use contraceptives. Mobility and leniency (whether a woman can earn money, adopt family planning, enjoy recreational activities, or take a sick child to a hospital outside the village of residence) reduce fertility in Bangladesh. Decision-making and mobility are also associated with decreased fertility and increased contraceptive use in Botswana, South Africa, and Rajasthan.

invest more of their time, energy, and money in a smaller number of children (Shen and Williamson 1997). In several cross-national studies of developing countries, fertility rates or contraceptive prevalence rates are significantly associated with improvements in maternal and infant mortality, infant and child survival, and female and male life expectancy (Boehmer and Williamson 1996; Brady, Kaya, and Beckfield 2007; Shen and Williamson 1997; Shen and Williamson 2001; Wickrama and Lorenz 2002). In some cases, the effects of fertility on well-being are even greater than the effects of economic development (Brady et al. 2007). Due to the significance of both indicators in previous research, I examine total fertility rate and contraceptive prevalence in the analysis that follows.

3.1.6 Life expectancy

Female life expectancy is a basic indicator of women's physical condition and reflects the cumulative resources invested in women over the life cycle (Smith and Haddad 2000). Sen (1998) points out that gender bias is often hard to identify because it can be subtle and covert and because it often hides in the intimacy of a family home. For this reason, he argues that comparisons of mortality (or life expectancy) between men and women can "throw light on some of the coarsest aspects of gender-related inequality" (Sen 1998: 10). Inequality in life expectancy is a manifestation of entrenched and long-term discrimination against women (Smith and Haddad 2000). It reflects women's status in society because if women have higher status, then more of an effort

will be made to enhance their longevity (Shen and Williamson 1997). Thus, longer life expectancy is a manifestation of women's resources over time. As a measure of women's basic physical condition, female life expectancy should have positive effects on child health because a mother's health is closely tied to birth weight, nutritional status through breastfeeding, and the quality of care they are able to give (Smith and Haddad 2000). In addition, longer female life expectancy reflects less maternal mortality (Jayachandran and Lleras-Muney 2009), which also increases child health.

Despite its theoretically relevant connection, very few scholars measure gender inequality in terms of female life expectancy. Smith and Haddad (2000) find that the ratio of female to male life expectancy significantly reduces the prevalence of underweight children in a sample of 63 developing countries. Similarly, Shen and Williamson (1997) show that maternal mortality reduces child survival across 86 developing countries. Thus, this study contributes to the paucity of literature on this aspect of gender inequality by examining the effects of both absolute and relative measures of life expectancy.

The analysis that follows considers individuals as embedded in and shaped by broad social structures that partially determine who faces increased health risk factors and who is protected from them (Farmer 2005). The primary focus of the analysis is on the relationship between macro-level indicators of gender inequality and child health. However, women's education and employment at the individual-level are also

considered, along with several other maternal and household characteristics that have already been shown to affect child health.

3.2 Methods

I estimate a series of HGLM logit models that predict the effects of gender inequality on child health at the individual and country levels. Refer to chapter 2 for a complete description of the estimation technique. All models are random intercept models. Individual-level data are drawn from the DHS as described in Chapter 2. Country-level data are drawn primarily from the World Development Indicators. The analysis for this chapter pools data on 285,198 children under 5 in 50 developing countries.[3]

3.2.1 Individual-Level Variables

Individual-level indicators of women's status are assessed by mother's education and employment. Maternal education is measured as a series of categorical variables including *primary*, *secondary*, and *higher*, with no education as the reference group. *Mother employed* is a dichotomous variable, coded as 1 for currently employed and 0 for unemployed.[4] Mother's marital status is included as a control variable since it is

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[3] See Appendix A for a list of all countries included in the dissertation (N=52). Haiti and Liberia are missing data on education, so the sample size is reduced to N=50 in this chapter.

[4] Recall from Chapter 2 that Bereman and Rose (1996) also code maternal employment as a dichotomous variable in their study of 11 DHS countries. They claim that this variable, along with education and urban residence, is a good measure of the socioeconomic and behavioral differences among women. The dichotomous measure of employment has the least amount of missing data in the DHS surveys. Other DHS variables that are related to maternal employment include whether the mother works in or outside the

generally assumed that single mothers are disadvantaged by limited financial resources (Lloyd and Desai 1992; Heaton et al. 2005). This is measured as a series of categorical variables including *never married*, *cohabiting*, *widowed*, *divorced*, and *not cohabiting*, with married as the reference group.[5]

Household socioeconomic status is measured as a composite *wealth index* that represents the cumulative living standard of a household. Following Heaton and colleagues (2005), this index is calculated as the percentage of household items (including clean water, flush toilet, radio, television, electricity, refrigerator, bicycle, motorcycle, car, telephone, and finished floor) present in the home.[6] Several additional

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home, whether she is employed all year or seasonally, and type of earnings received for work. However, missing data on these variables is extensive, as not all countries ask these questions. DHS does include a 9-category variable for type of occupation, but it is not used here for the sake of parsimony. Among those who work, self-employed agriculture is the biggest category by far at 39.83 percent, followed by sales (20.49), agriculture employee (10.58), skilled manual (7.50), services (7.33), professional/technical/managerial (5.73), unskilled manual (3.85), household/domestic (2.38), and clerical (2.28).

[5] "Not cohabiting" refers to having previously lived with a partner, but not currently living with a partner.

[6] I sum all of the items a respondent indicates are present in the home, divide the sum by the number of items asked about in the survey (maximum of 11), and multiply by 100. This is calculated as a percentage because different countries include different numbers of items in their questionnaires. Because of the previous focus on capability development, I analyze clean water and flush toilet as separate indicators that are not included in the household wealth index in Chapter 2. However, since that is not the substantive focus of this chapter, I include them in the wealth index here. The effects of the household wealth index remain robust and consistent, with or without clean water and flush toilet. Furthermore, in additional analyses not shown, I construct 5 other wealth indices, which include: (1) 7 wealth items as a percentage of the corresponding questions the respondent answered, (2) 11 wealth items as a percentage of the corresponding questions answered, (3) number of wealth items a respondent reports out of a possible 5 items that are common to each country in the sample, (4) a standardized scale of 11 wealth items, and (5) an unstandardized scale of 11 wealth items. The correlations among them range from r=.82 to r=.9997, and they all have significant negative effects on the outcome variables. The DHS recoded data files also include a wealth index (V190) that represents the cumulative living standard of a household. The DHS calculates this variable by using data on a household's ownership of selected assets and divides the index into quintiles

indicators of household family structure and size are included as controls: mother's age, household head's age and gender, child's age and gender, number of household members, the presence of multiple young children, and urban residence. (See Chapter 2 for details on the measurement and coding of these controls.)

3.2.2 Country-Level Variables

Recognizing its multi-dimensional nature, the analysis includes five components of gender inequality which may reduce child malnutrition and diarrhea: education, employment, political representation, reproductive autonomy, and life expectancy. Following convention, I consider both absolute and relative measures of gender inequality where appropriate (Boehmer and Williamson 1996). (1) Education is measured as gross *female secondary school enrollment* as a percentage of age appropriate children[7] and the *ratio of female to male secondary school enrollment*, expressed as a percent.[8] (2) Employment includes the *female employment rate* as a percentage of the female population ages 15 and over and the *ratio of female to male employment* (the female

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which are relative to each individual country (Rutstein and Johnson 2004). Unfortunately, missing data reduce the sample size considerably since this variable wasn't calculated until later phases of the DHS.

[7] This is in contrast to net enrollment, which is the number of children of official school age who are enrolled in school as a percentage of the population of corresponding age. Gross enrollment includes *total* female secondary school enrollment, regardless of age, as a percentage of the age group that officially corresponds to the secondary level. In other words, gross enrollment includes age-appropriate *and* age-inappropriate children in the numerator. Thus, it can exceed 100 percent.

[8] In additional analyses not shown, I consider several other measures of education, including the female literacy rate; the ratios of female to male literacy, primary school enrollment, primary and secondary school enrollment, and tertiary school enrollment; and several scales based on different combinations of these variables. Results are fairly robust, with slight fluctuations.

employment rate divided by the male employment rate, expressed as a percent).[9] (3) Political influence is assessed by percentage of seats held by *women in national parliament* and percentage of *women in democratic parliaments* only. Women in democratic parliaments is assessed in two steps. First, countries are categorized as free, partially free, or not free using the "Freedom in the World" dataset (Freedom House 2010). Second, only free countries are then assigned the values of *women in national parliament*. Countries identified as partially or not free are coded as 0 for this variable.[10] (4) Reproductive autonomy is evaluated by the *total fertility rate* and *contraceptive prevalence* (the percentage of women ages 15-49 who are practicing, or whose partners are practicing, any form of contraception).[11] (5) Women's life expectancy is determined by

[9] I also consider female labor participation, the ratio of female to male labor participation, female labor force as a percentage of the total labor force, the Cingranelli-Richards (CIRI) score for women's economic rights (Cingranelli and Richards 2008), and a scale combining all of the women's employment variables. None of these indicators are significant.

[10] In analyses available upon request, I convert the continuous measure of women in parliament into two binary variables to indicate whether a country has more than 10 percent or more than 20 percent women in parliament. Having more than 10 percent women in parliament has a marginally significant, negative effect on wasting and being underweight, but having more than 20 percent has no significant effects. Thirty percent is a common critical cutoff for demonstrating that women have meaningful influence on politics (Paxton and Hughes 2007), but only one country in the sample has more than 30 percent women in parliament. I also test the CIRI score for women's political rights, which is not significant.

[11] Other possible measures of reproductive autonomy include the adolescent fertility rate, unmet need for contraception among married women, and several scales combining various indicators of reproduction. The adolescent fertility rate and unmet need for contraception are positive in some models, but not particularly robust. The reproductive autonomy scales, however, are fairly robust and have significant positive effects on diarrhea, stunting, and being underweight.

female life expectancy at birth (in years) and the *ratio of female to male life expectancy*, expressed as a percent.[12]

In addition, each model controls for level of economic development, measured as the natural log of real *gross domestic product (GDP) per capita* in hundreds of purchasing power parity dollars.[13] As many have documented, economic development improves health by increasing food supply, physicians per capita, infant survival, and adult life expectancy (e.g., Cooper, Getzen, and Laud 2003; Firebaugh and Beck 1994; Jenkins and Scanlan 2001; Pritchett and Summers 1996). The "conventional wisdom of growth's benefits" is illustrated by the fact that many researchers control for GDP per capita and find that it significantly affects well-being (Brady et al. 2007:3). All of the country-level variables are expected to have negative effects on the health outcomes, except for total fertility rate which should be positive. Correlation matrices of all country-level independent variables and the cross-country means of each dependent variable are shown in Appendix E.

3.3 Results

Individual- and country-level descriptive statistics are presented in Table 6. On average, about one-third of mothers in the sample have completed primary school education, 26 percent have completed secondary education, and only 5 percent have

[12] The CIRI score for female social rights provides another measure of women's general well-being. In models not shown, this variable has a marginally significant, negative effect on wasting, but does not significantly affect any of the other child health outcomes.

[13] I use the natural log of GDP per capita in order to reduce skewness (see details in Chapter 2).

completed higher education. About half of the mothers are employed. There is considerable variation in the country-level indicators of women's status. For example, on average, a little less than half of women are enrolled in secondary school, but this ranges from 5 to 104 percent. Although the average total fertility rate across all countries is about 4 births per woman, this ranges from 1.6 to 7.7.

A series of HGLM logit models are displayed in Tables 7-13. Table 7 shows the effects of the individual-level characteristics without any country-level variables, and then adds GDP per capita. Because of the large N, the effects of the individual-level characteristics are relatively stable across models, with slight fluctuations. For this reason, individual-level variables are not shown in subsequent tables until the final models (although they are always included in each model). Tables 8-12 show the effects of each dimension of women's status separately, and Table 13 shows final models. In addition, Figures 1-5 graphically display several bivariate relationships between gender inequality and child health at the country level that are representative of the overall patterns. They also show the low- and high-performing countries in terms of both gender equity and child health.

In Table 7, Model 1 shows the effects of the individual-level variables only for each child health outcome. Mother's education has a robust, negative effect on all 4 measures of child health. In fact, the odds ratios for secondary and higher education are considerably larger than the odds ratios of most other independent variables. Primary

education reduces a child's odds of being malnourished by a factor of 1.19-1.29, relative to mothers with no education. Secondary education reduces the odds of being malnourished by a factor of 1.35-1.72, and higher education reduces the odds by 1.39-2.46. Higher education reduces the odds of having a recent episode of diarrhea by a factor of 1.46.

Mother's employment increases the odds of diarrhea by a factor of 1.08. Although this is contrary to expectation, recall that some scholars do caution that working mothers may spend less time at home or have less time for their children, increasing their likelihood of illness. They also caution that being employed could reflect the worse socioeconomic position of particularly impoverished women who are forced to work. Furthermore, out of those women in the sample who specify, almost 40 percent report self-employed agriculture as their occupation. Such work likely does not confer many of the benefits associated with working outside the home (e.g., more mobility, social interaction, and an independent wage). Comparatively, fewer women in the sample are employed in the types of occupations that would likely bring such benefits (see footnote 14). Still, the maternal employment effect is not particularly robust as it does not significantly affect stunting, wasting, or underweight.

Mother's marital status does not have particularly robust effects across the dependent variables, although the effects are generally positive as expected. The odds of children experiencing poor health tend to increase when mothers are anything other

than married (the reference group). Not cohabiting has the most robust effect across the outcomes, increasing the odds of children experiencing poor health by a factor of 1.10-1.26.

Household wealth has a robust negative effect on all 4 child health outcomes. For each percent increase in household wealth, the odds of a child experiencing malnutrition or diarrhea decline by a factor of about 1.0. Since the standard deviation for wealth is 24.27 (see Table 6), this translates into relatively sizable effects. A one standard deviation increase in household wealth reduces the odds of a child experiencing malnutrition or diarrhea by a factor of 1.16-1.48. Urban residence reduces the odds of stunting by a factor of 1.14, but does not significantly affect the other child health outcomes.

As expected, older mothers have significant negative effects on diarrhea and stunting, and older household heads significantly reduce stunting. However, older mothers appear to have slightly positive effects on wasting. Female-headed households significantly reduce the odds of stunting and underweight only. Heaton and colleagues (2005) also find that presence of a female head is associated with lower stunting across 42 DHS countries. Child's age has mixed effects, increasing the odds of stunting and underweight, but decreasing the odds of diarrhea and wasting.

Perhaps contrary to expectation, male children have higher odds of being malnourished and experiencing diarrhea. Other scholars using the DHS have similarly found that girls are less likely to be stunted or wasted than boys (Hill and Upchurch

1995), and others have found no difference between the sexes in height-for-age or weight-for-age (Shin 2007). Given equal care and feeding, female children actually have a substantial survival advantage over male children (Bhattacharya 2006). Girls may be less prone to disease episodes (Hill and Upchurch 1995). In addition, they are often more restricted in their activities and contact with others and less physically active. Girls are often socialized to pursue hobbies that will contribute to their adult roles as homemakers (i.e., sewing and cooking); whereas, boys are more encouraged to pursue outdoor, physical activities (Verma and Sharma 2003).

Larger households and households with multiple young children increase the odds of stunting and underweight but do not significantly affect wasting or diarrhea. The presence of multiple young children increases the odds of stunting and underweight, but surprisingly decreases the odds of diarrhea. Summarizing the effects of the individual-level characteristics in Table 7, mother's education and household wealth appear to have the biggest and most robust effects on all 4 measures of child health.

Model 2 for each dependent variable in Table 7 shows the effects of economic development at the country-level. A one unit increase in logged GDP per capita (~ $272) reduces the odds of malnutrition by a factor of approximately 1.59-2.19. As expected, this effect remains negative and robust across all subsequent tables. GDP has a near significant, negative effect on diarrhea (t= -1.98) in this model. A one unit increase in

GDP reduces the odds of diarrhea by a factor of 1.11. The effect of GDP on diarrhea is not as consistent or robust and varies with the inclusion of the gender inequality variables.

Table 8 demonstrates that both the absolute level of women's education and gender parity in school enrollment significantly affect child health, even net of GDP per capita. A one standard deviation increase in female secondary school enrollment reduces the odds of diarrhea by a factor of 1.27, the odds of stunting by a factor of 1.31, and the odds of being underweight by a factor of 1.65. These effects are particularly notable given that they are comparable to or larger than the effects of GDP. A one standard deviation increase in GDP reduces the odds of stunting by a factor of 1.30, reduces the odds of wasting by a factor of 1.34, and does not significantly influence diarrhea in this model. Furthermore, for each standard deviation increase in the ratio of female to male secondary enrollment, the odds of diarrhea are expected to decline by a factor of 1.18, wasting by 1.31, and underweight by 1.23. The latter relationship is presented graphically in Figure 1.

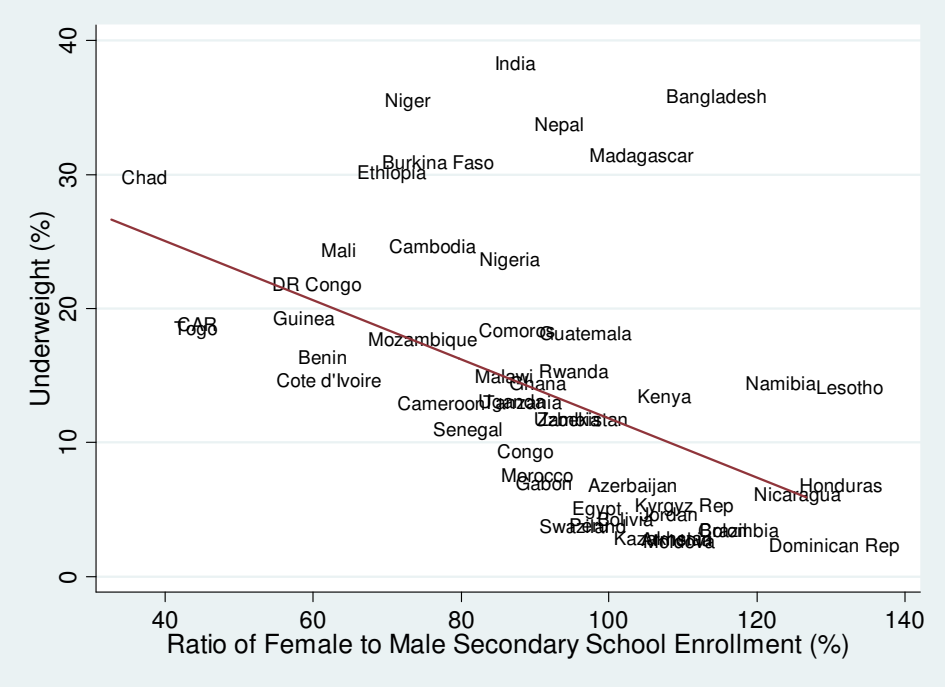

Figure 1: Underweight and Gender Parity in School Enrollment (r = -.48)

In Table 9, the female employment rate is negative and nearly reaches significance (t= -1.86) in the model predicting wasting. A one standard deviation in women's employment decreases the odds of wasting by a factor of 1.22. Neither the rate of female employment nor the ratio of female to male employment reach significance in any other models (see Figure 2). Still, the direction of the effects is negative as expected in most of the models. It is particularly difficult to ascertain the true labor force participation of women in developing countries, partially because it is difficult to develop standardized definitions of formal sector employment across countries (Smith and Haddad 2000). Thus, it is possible that this measure underestimates women's contribution to the labor force.

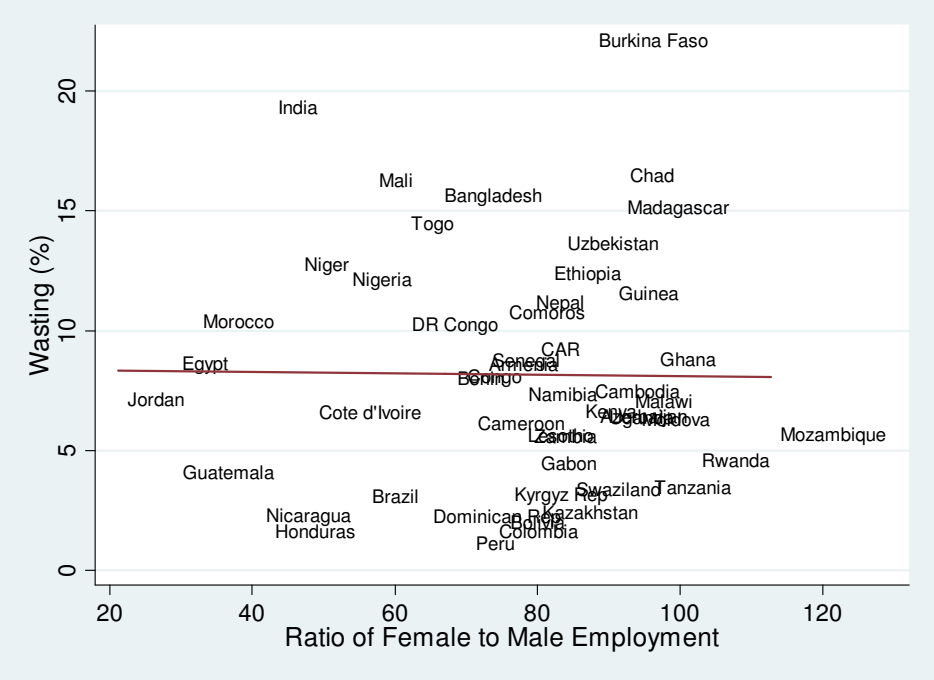

Figure 2: Wasting and Gender Parity in Employment (r = -.01)

In Table 10, one indicator of women's political influence significantly affects wasting. A one standard deviation increase in the share of women in national parliament is expected to reduce the odds of wasting by a factor of 1.17. This relationship is pictured in Figure 3. Rwanda has the highest percentage of women in national parliament by far at 48.8 percent.[14] In additional models not shown, I drop this outlier from the sample and results are relatively similar.[15] The direction of the effects in

[14] In 2003, Rwanda became the world leader in female parliamentary representation when women were elected to 48.8 percent of seats in the lower house. After the genocide in 1994, the transitional government considered women's participation in political decision-making as necessary for creating sustainable peace and instituted quotas and other mechanisms to ensure their leadership at all levels of government (Krook 2006; Paxton and Hughes 2007).

[15] Dropping Rwanda does slightly reduce the significance of the effect on wasting (OR=.979, t-ratio=-1.969, p-value=.055). However, further sensitivity analysis reveals that the coefficient remains significant at the .05 level in final models even when Rwanda is dropped from the sample (see footnote 26 and 28).

other models of Table 10 is generally negative as expected. Boehmer and Williamson (1996) similarly find that women in parliament is only significant in some models and that the effects are generally much weaker than other measures of gender inequality. Their interpretation of this finding is that other dimensions of gender inequality, such as education, may have more immediate and direct effects on child health. Women's political representation could have indirect effects on child health by expanding women's autonomy in other domains. It is also possible that women simply do not yet have enough critical mass in national legislatures for them to have significant political influence (see footnote 21).

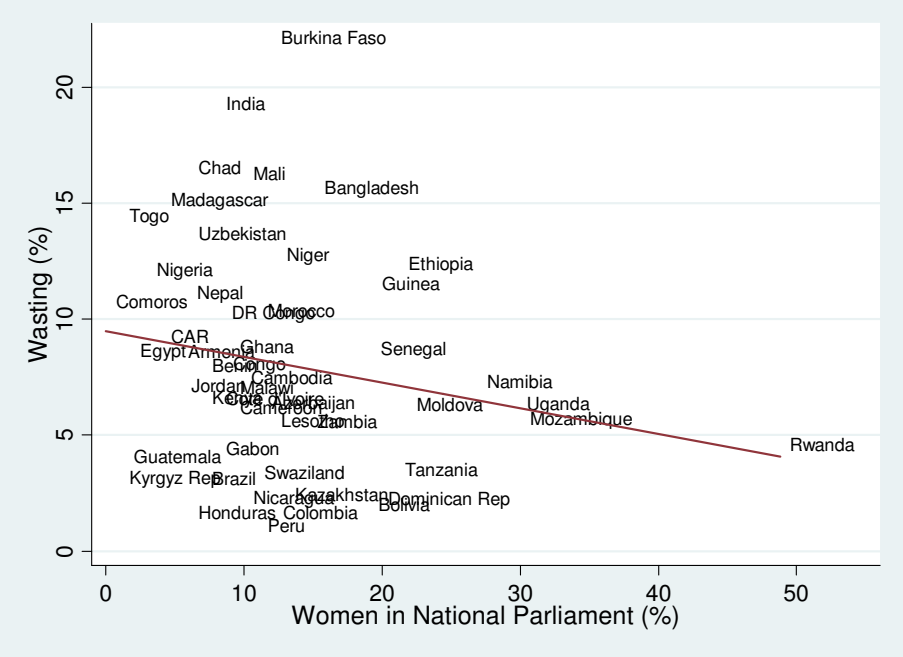

Figure 3: Wasting and Women in Parliament (r= -.20)

Total fertility rate and contraceptive prevalence both have notable consequences for improving child health in Table 11. A standard deviation increase in the total fertility

rate is expected to increase the odds of diarrhea by a factor of 1.31 and the odds of stunting by a factor of 1.17. The effect of total fertility rate on the odds of being underweight nearly reaches significance (t= 1.75). For each standard deviation increase in contraceptive prevalence, however, the odds of diarrhea decline by a factor of 1.29 (see Figure 4), stunting by 1.24, wasting by 1.33, and underweight by 1.45. Thus, increasing the percentage of women who are using contraception has robust effects on child health. In fact, this is the only gender inequality variable that has a significant effect on all 4 child health outcomes.

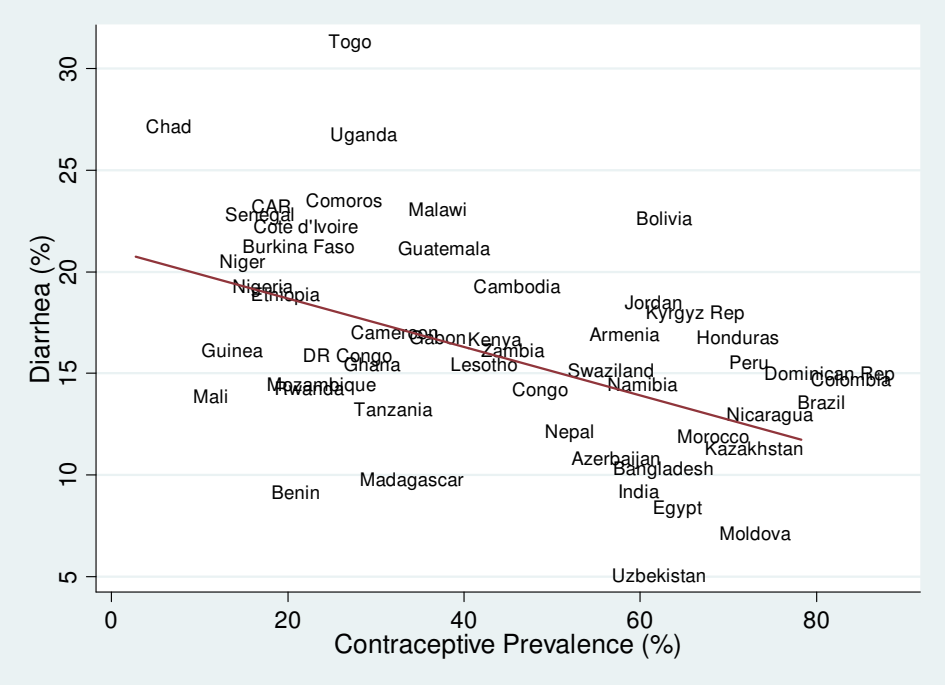

Figure 4: Diarrhea and Contraceptive Prevalence (r = -.48)

Table 12 shows that both absolute levels of female life expectancy, as well as gender parity in life expectancy significantly affect child health. A standard deviation

increase in female life expectancy is expected to decrease the odds of diarrhea by a factor of 1.16 and stunting by a factor of 1.21. The latter is displayed in Figure 5. Additionally, for each standard deviation increase in the ratio of female to male life expectancy, the odds of stunting are expected to decline by a factor of 1.22 and the odds of being underweight by a factor of 1.23.

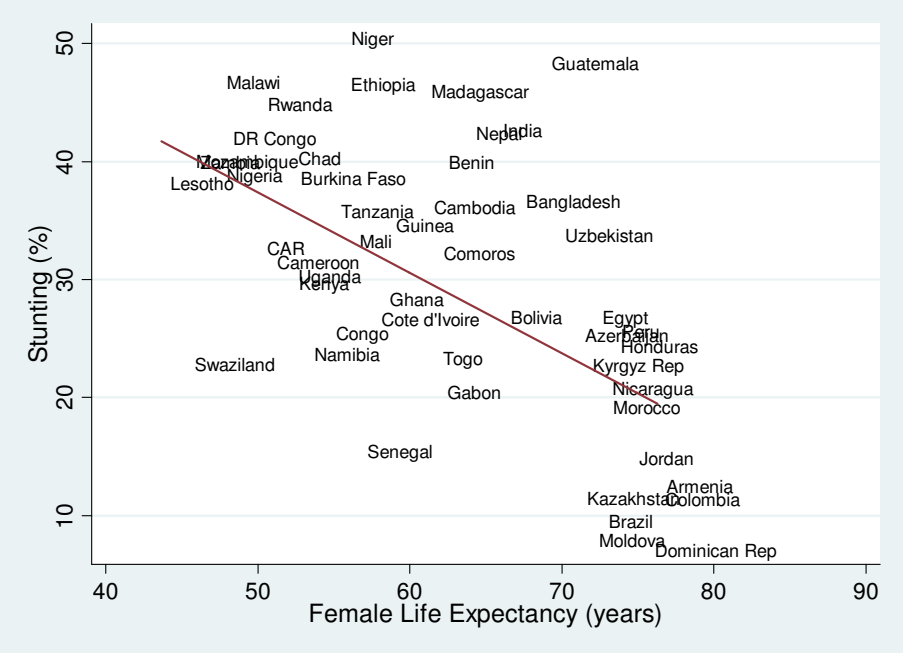

Figure 5: Stunting and Female Life Expectancy (r = -.59)

Final models are presented in Table 13. Overall, 7 country-level variables measuring education, reproduction, political representation, and life expectancy influence child health. Model 1 combines the significant country-level variables from previous models, balancing the multi-collinearity among them. Thus, Model 1 shows the effects of gender parity in school enrollment, women in parliament, contraceptive prevalence, and gender parity in life expectancy, controlling for GDP, across all 4 child

health outcomes.[16] Contraceptive prevalence significantly reduces diarrhea and has a near significant, negative effect on the odds of being underweight (t= -1.872). A one standard deviation increase in contraceptive prevalence decreases the odds of diarrhea by a factor of 1.27. Life expectancy has a significant effect on stunting only. For each standard deviation increase in the ratio of female to male life expectancy, the odds of stunting are expected to decline by a factor of 1.18. Women's political representation influences both wasting and being underweight.[17] A standard deviation increase in women in parliament decreases the odds of wasting by a factor of 1.20 and the odds of being underweight by a factor of 1.15. Although women's political influence did not significantly affect being underweight in previous models, it does have a significant effect when controlling for women's education, contraceptive use, and life expectancy. Furthermore, in additional models not shown, women in parliament has a robust negatively significant effect on the odds of stunting (see footnotes 28 and 30).

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[16] Variance inflation factors (VIF) confirm that multicollinearity is not a problem for these models. The VIF for each independent variable remains below 5 (contraceptive prevalence is the highest at 3.89), and the mean VIF is 2.22. Although there is no firm convention for the appropriate cutoff, some statisticians suggest that VIFs should be less than 5 and others suggest 10 (Studenmund 2001; Petraitis et al. 1996).

[17] As in Table 6, Rwanda is dropped in this final model in additional analyses not shown. Women in parliament continues to have a significant negative effect on wasting (OR=.979; t-ratio= -2.214; p-value=.032). The significance of the effect on the odds of being underweight is slightly reduced (OR=.982; t-ratio= -1.848; p-value=.071). However, without Rwanda in the sample, women in parliament now has a significant negative effect on stunting. For each standard deviation increase in women in parliament, the odds of stunting are expected to decrease by a factor of 1.19 (t-ratio= -2.137, p-value=.038).

In sensitivity analyses not shown but available upon request, various other combinations of the gender inequality variables are considered as well.[18] The main patterns above are relatively robust.[19] Reproductive autonomy (both contraceptive prevalence and total fertility rate) is the only dimension of gender inequality that significantly affects the odds of diarrhea, and life expectancy (both the ratio and the absolute level) is the only dimension to significantly affect stunting. Women in parliament has a robust negative effect on wasting and underweight. Contraceptive prevalence also significantly affects the odds of being underweight in some models, which is consistent with the findings above. But, in other models predicting the odds of being underweight, female secondary school enrollment is significantly negative instead. Furthermore, contraceptive prevalence, gender parity in school enrollment, and gender parity in life expectancy also significantly reduce the odds of wasting in some models. So, although the conclusions from Model 1 of Table 13 remain relatively consistent, there are some fluctuations. This may be due to the correlations among some of the gender variables (see Appendix E). For this reason, caution is warranted in

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[18] VIFs are assessed for each of these models as well. When contraceptive prevalence and female secondary school enrollment are included in models concurrently, VIFs for those variables tend to go above 5, although they are still below 10. This may not be surprising given that the correlation between these two variables is .89. Still, the mean VIFs remain below 5 in all sensitivity analyses.

[19] Once again, Rwanda is dropped in all sensitivity analyses of final models as well. Women in parliament continues to have a consistent negative effect on wasting even without Rwanda in the sample. The effect on the odds of being underweight is less consistent. Women in parliament has a nearly significant negative effect in one model, but female secondary school enrollment tends to be a more significant predictor of being underweight in most models. However, women in parliament has a robust significant, negative effect on the odds of stunting in all models.

concluding which aspects of gender inequality are most consequential for improving child health. That several dimensions of gender inequality have significant effects on child health is clear, but determining the most important of those aspects is a bit more equivocal.

Model 2 of Table 13 shows the effects of a *gender equality scale*. This is a composite measure of the 7 significant gender variables (alpha= .83), which indicates a macro, structural context of women's general empowerment and well-being. The gender equality scale has sizable significant negative effects on all 4 child health outcomes. A one unit increase in the gender equality scale is expected to reduce the likelihood of diarrhea by a factor of 1.30. This is particularly notable given that GDP per capita is not significant in this model and that the standardized effect of the gender equality scale (OR= .77) is actually a bit larger in magnitude than the standardized effect of household wealth (OR= .86) on diarrhea. For each unit increase in gender equality, stunting is expected to decrease by a factor of 1.36. In this model, the standardized effect of gender equality (OR= .74) is slightly larger than the standardized effect of GDP (OR= .78). For every standard deviation increase in the gender equality scale, the odds of wasting are expected to decline by a factor of 1.34. This effect is larger than the standardized effects of household wealth (OR = .82) and GDP (OR = .83), plus the inclusion of this variable reduces the effect of GDP to marginal significance (t= -1.859). Finally, a one unit increase in gender equality reduces the odds of being underweight by a factor of 1.55 and once

again, the size of the gender effect is slightly larger than the standardized effects of GDP or wealth (gender equality OR = .65; GDP OR = .70; wealth OR = .68).

Overall, the health enhancing benefits of the gender equality scale are a bit larger in magnitude than the benefits of GDP across all 4 models and larger than the benefits of household wealth for three out of four outcomes. This may be surprising given what Martha Nussbaum (2004) refers to as the "still-dominant economic growth paradigm" – the overwhelming focus on GDP in cross-national studies of human welfare (329). Contrary to the economic development perspective, these results suggest that broad contexts are of gender equality are just as important as GDP, if not more so, for child health.

3.4 Counterfactuals

To further illustrate the influence of these effects on child health, it is helpful to consider the difference between low, average, and high levels of gender inequality. For example, consider the health enhancing effects of contraceptive prevalence for diarrhea. Mali ranks among the lowest in the sample in contraceptive prevalence at 8.2 percent. If Mali increased its contraceptive prevalence to Kenya's levels (39.3 percent, which is close to the cross-country mean), the odds of diarrhea would be expected to decline by a factor of 1.41 (OR=.71). If Kenya increased its level to that of Vietnam (78.5 percent, the highest of the sample), then the odds of diarrhea would be reduced by a factor of 1.54 (OR=.65).

Further compare the health benefits that would result in moving from low to average or high levels of women's political representation. Nigeria has close to the lowest percentage of women in national parliament at 3 percent. If Nigeria increased women in parliament to the cross-national mean (11.63 percent), the odds of wasting could be expected to decline by a factor of 1.19 (OR=.84). The child health improvement resulting from Nigeria moving to average levels of women in parliament is larger than the effect of moving to an average level of GDP per capita (OR=.96). If Burkina Faso increased its percent of women in parliament (12 percent) to that of Mozambique (30 percent and the second highest in the sample), the odds of wasting would decline by a factor of 1.44 (OR=.70).

Finally, Table 13 suggests that life expectancy has consequential effects on stunting. Niger and Swaziland have relatively low levels of gender parity in life expectancy (96.9 and 97.54 percent respectively). Moving to the cross-national average of gender parity in life expectancy would reduce the odds of stunting in Niger by a factor of 1.47 (OR=.68) and in Swaziland by a factor of 1.43 (OR=70). In Niger, the health improvement that results from increasing life expectancy parity is comparable to the effect of increasing GDP to the cross-national mean (OR=.67).

3.5 Discussion and Conclusion

Taken together, the results demonstrate that child health is likely to be better in countries where women have more education, control over their reproduction,

representation in national politics, as well as longer life expectancy. Overall, 7 out of 10 measures of country-level gender inequality reach significance in models that examine the effects of various dimensions of gender inequality separately, even net of GDP per capita and within-country variation in individual-level factors. In these models, female secondary school enrollment, gender parity in school enrollment, and contraceptive prevalence are the most robust predictors across the different measures of child health. Female employment is the only country-level dimension of gender inequality that does not reach significance, although the direction of the effects is negative as expected in most of the models. The difficulty of establishing definitions of formal employment across developing countries makes it particularly difficult to ascertain women's labor force participation, so it is quite possible that this measure underestimates their contributions. Regardless, improving women's education, reproductive decision-making, political representation, and life expectancy have clear child health enhancing benefits. This is further illustrated by the gender equality scale, which has the most sizable effects of all the country-level gender variables and significantly reduces all four child health outcomes. In fact, the health enhancing benefits of this broad measure of gender equity are just slightly larger in size to those of economic development and household wealth. Contrary to the economic development perspective, these results suggest that broad contexts are of gender equality are just as important, if not more important, than GDP for child health.

Although it is clear that gender matters, determining which aspect of gender equity matters most is a bit more equivocal. Final models suggest that reproductive autonomy, life expectancy, and political representation have particularly robust effects. Sensitivity analyses reveal that these main conclusions are fairly consistent, although there is some fluctuation, particularly in regard to the effects of women in parliament. One limitation of the analysis is that many of the gender variables are moderately correlated (see Appendix E). Secondary school enrollment and contraceptive prevalence are particularly highly correlated. Thus, a bit of caution is warranted in making conclusions about which aspects of gender are most important. Although it is beyond the scope of the current methods to do so, future research could try to parse this out. In addition, GDP could have a causal effect on the gender variables. Still, it is notable that broad social contexts of gender equity matter to child health, even controlling for economic development and within-country variation in maternal and household characteristics.

At the individual level, maternal education is one of the strongest predictors of child health, and the size of the effects generally increases as levels of education increase. Maternal employment, however, does not have the expected influence on child health. It does not significantly affect any of the malnutrition outcomes, but it has a significant positive effect on the odds of diarrhea. Several possibilities could account for this unanticipated effect. Employment could actually reflect the disadvantaged position

of women who are forced to work because of severe impoverishment. Or, because so many women in the sample report self-employed agriculture as their occupation, they may not be gaining the benefits that work outside the home are hypothesized to bring.

Of course, economic development and household wealth are also significant predictors of child health. However, the results of this study show that they are not the only important factors in improving child well-being in developing countries. Furthermore, it is notable that the effects of GDP on diarrhea are neither consistent nor robust. It is often assumed that the effects of economic development "trickle down" to influence health and well-being (Jenkins and Scanlan 2001). But this may not be the case for particularly acute health issues like diarrhea. It is possible that women's decision-making ability and control over resources are more important for attending to immediate health needs. After all, economic development alone does not guarantee that other human needs will be improved (Nussbaum 2004). This appears to be true, particularly for the most acute child health problems examined here.

Because women bear the primary responsibility for caregiving, social contexts of gender inequality that restrict women's decision-making power and control over resources have important effects on child well-being. Yet, gender inequality at the macro level has been relatively understudied in cross-national research on child health to date. The present study fills this gap by examining the multi-dimensional effects of gender inequality on cross-national disparities in child health. Thus, this study

contributes to the global inequality, medical sociology, and population health fields in several key ways, including by bringing a more macro and a more diversified conception of gender inequality to the study of health, including both individual- and country-level explanatory variables in the analyses, focusing on less developed countries, and examining child malnutrition and diarrhea in particular. Finally, this study more broadly advances our understanding of what kinds of structural inequalities affect individual well-being. By using a cross-national, comparative perspective it illustrates how social forces that are larger than the individual shape life chances.

Table 6: Chapter 3 Descriptive Statistics

Variable	Mean	SD	Min	Max
Individual Level (N=285,198)				
Diarrhea (%)	16.44	5.37	0.00	1.00
Stunting (%)	30.07	11.55	0.00	1.00
Wasting (%)	8.19	4.90	0.00	1.00
Underweight (%)	15.08	10.16	0.00	1.00
Mother's Education				
Primary	0.33	0.47	0.00	1.00
Secondary	0.26	0.44	0.00	1.00
Higher	0.05	0.22	0.00	1.00
Mother Employed	0.49	0.50	0.00	1.00
Mother's Marital Status				
Never Married	0.03	0.18	0.00	1.00
Widowed	0.01	0.10	0.00	1.00
Divorced	0.01	0.12	0.00	1.00
Cohabiting	0.19	0.39	0.00	1.00
Not Cohabiting	0.04	0.19	0.00	1.00
Wealth	31.42	24.27	0.00	100.00
Urban Residence	0.37	0.48	0.00	1.00
Mother's Age	28.38	6.70	15.00	49.00
Head's Age	40.66	13.49	13.00	97.00
Female Head	0.15	0.36	0.00	1.00
Child's Age (months)	28.35	17.14	0.00	59.00
Male	0.51	0.50	0.00	1.00
Household Size	6.86	3.57	1.00	36.00
Multiple Children	0.66	0.47	0.00	1.00
Country Level (N=50)				
GDP per capita (logged)	2.93	0.84	1.06	4.89
Female secondary school enrollment (%)	44.53	29.77	5.48	104.35
Ratio of female to male secondary school enrollment (%)	85.10	22.16	32.75	126.65
Female employment rate (%)	52.07	17.02	12.80	82.60
Ratio of female to male employment rate (%)	71.15	20.50	21.16	112.69
Women in national parliament (%)	11.63	8.97	0.00	48.80
Women in democratic parliaments (%)	2.24	5.84	0.00	26.90
Total fertility rate	4.37	1.60	1.27	7.67
Contraceptive prevalence (%)	38.90	21.73	2.80	78.20
Female life expectancy	60.69	9.95	43.63	76.28
Ratio of female to male life expectancy (%)	106.32	4.04	96.90	117.74

Table 7: HGLM Logit Models of Child Health on Individual-Level Characteristics and Economic Development

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Individual Level								
Mother's Education								
Primary	1.003	1.003	0.838***	0.838***	0.844***	0.844***	0.773***	0.773***
Secondary	0.909	0.909	0.638***	0.638***	0.741***	0.741***	0.582***	0.582***
Higher	0.686***	0.686***	0.472***	0.472***	0.719***	0.719***	0.406***	0.406***
Mother Employed	1.082***	1.082***	1.005	1.005	0.982	0.982	1.004	1.004
Mother's Marital Status								
Never Married	1.003	1.003	1.051	1.051	1.118	1.119	1.138**	1.138**
Widowed	0.980	0.980	1.000	1.000	1.166*	1.166*	0.945	0.945
Divorced	1.119*	1.119*	1.026	1.026	1.056	1.056	1.095	1.095
Cohabiting	1.097**	1.096**	0.997	0.997	0.995	0.994	1.022	1.022
Not Cohabiting	1.258***	1.258***	1.099*	1.099*	1.190**	1.189**	1.125**	1.125**
Wealth	0.994***	0.994***	0.983***	0.983***	0.992***	0.992***	0.984***	0.984***
Urban Residence	1.023	1.023	0.877**	0.877**	1.057	1.057	0.903	0.903
Mom's Age	0.989***	0.989***	0.994***	0.994***	1.005**	1.005**	1.000	1.000
Head's Age	1.000	1.000	0.997***	0.997***	1.000	1.000	0.999	0.999
Female Head	1.034	1.034	0.939***	0.939***	0.981	0.981	0.933***	0.933***
Child's Age	0.977***	0.977***	1.027***	1.027***	0.976***	0.976***	1.016***	1.016***
Male	1.111***	1.111***	1.185***	1.185***	1.211***	1.211***	1.133***	1.133***
Household Size	1.009	1.009	1.015***	1.015***	1.004	1.004	1.011**	1.011**
Multiple Children	0.871***	0.871***	1.133***	1.133***	1.001	1.001	1.095***	1.095***
Country Level								
GDP per capita (ln)		0.900		0.582***		0.627**		0.457***

*p<.05 **p<.01 ***p<.001. Note: Odds ratios displayed for individual- and country-level. Constants and t-scores not shown.

Table 8: HGLM Logit Models of Child Health on Women's Education

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
GDP per capita (ln)	1.110	1.005	0.734**	0.609***	0.747*	0.749*	0.705**	0.522***
	1.092	***1.005***	***0.771***	***0.659***	***0.782***	***0.784***	***0.746*****	***0.579***
	(1.187)	(0.087)	(-2.802)	(-5.463)	(-2.384)	(-2.542)	(-2.947)	(-5.302)
Female secondary	0.992*		0.991*		0.993		0.983***	
school enrollment	***0.786***		***0.766***		***0.819***		***0.607***	
	(-2.491)		(-2.433)		(-1.542)		(-4.958)	
Ratio of female to male		0.992**		0.997		0.988**		0.991*
school enrollment		***0.845***		***0.933***		***0.764***		***0.816***
		(-2.742)		(-0.969)		(-3.197)		(-2.187)

*p<.05 **p<.01 ***p<.001

Note: Odds ratios displayed for country-level variables only. Standardized odds ratios in bold and italics. T-scores in parentheses. Constants and individual-level variables not shown.

Table 9: HGLM Logit Models of Child Health on Women's Employment

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
GDP per capita (ln)	0.923	0.890*	0.585***	0.567***	0.555***	0.595***	0.443***	0.432***
	0.935	***0.906***	***0.637***	***0.621***	***0.610***	***0.646***	***0.504***	***0.494***
	(-1.400)	(-2.158)	(-5.465)	(-5.920)	(-4.982)	(-4.992)	(-6.287)	(-6.613)
Female employment	1.002		1.000		0.989		0.997	
rate	***1.041***		***1.008***		***0.823***		***0.952***	
	(0.632)		(0.110)		(-1.856)		(-0.490)	
Ratio of female to male		0.999		0.997		0.994		0.993
employment rate		***0.971***		***0.938***		***0.876***		***0.870***
		(-0.485)		(-0.762)		(-1.391)		(-1.392)

*p<.05 **p<.01 ***p<.001

Note: Odds ratios displayed for country-level variables only. Standardized odds ratios in bold and italics. T-scores in parentheses. Constants and individual-level variables not shown.

Table 10: HGLM Logit Models of Child Health on Women's Political Representation

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
GDP per capita (ln)	0.895	0.901	0.576***	0.588***	0.607***	0.616***	0.448***	0.446***
	0.911	***0.916***	***0.629***	***0.640***	***0.658***	***0.666***	***0.509***	***0.508***
	(-1.982)	(-1.922)	(-6.436)	(-6.391)	(-5.081)	(-4.742)	(-7.234)	(-7.804)
Women in national parliament	0.996		0.994		0.978**		0.987	
	0.967		***0.944***		***0.822***		***0.888***	
	(-0.584)		(-0.757)		(-3.041)		(-1.474)	
Women in democratic parliaments		0.999		0.991		1.016		1.020
		0.995		***0.946***		***1.096***		***1.120***
		(-0.127)		(-0.646)		(1.299)		(1.203)

*p<.05 **p<.01 ***p<.001

Note: Odds ratios displayed for country-level variables only.Standardized odds ratios in bold and italics. T-scores in parentheses. Constants and individual-level variables not shown.

Table 11: HGLM Logit Models of Child Health on Women's Reproductive Autonomy

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
GDP per capita (ln)	1.119	1.112	0.715**	0.697**	0.649***	0.795*	0.568**	0.621**
	1.099	***1.093***	***0.754***	***0.738***	***0.695***	***0.825***	***0.622***	***0.670***
	(1.651)	(1.420)	(-2.992)	(-3.336)	(-3.516)	(-2.084)	(-3.411)	(-3.369)
Total fertility rate	1.184***		1.173*		1.027		1.184	
	1.310		***1.291***		***1.043***		***1.310***	
	(3.744)		(2.364)		(-.381)		(1.749).	
Contraceptive		0.988***		0.990*		0.987*		0.983**
prevalence		0.775		***0.804***		***0.751***		***0.690***
		(-3.588)		(-2.070)		(-2.582)		(-2.962)

*p<.05 **p<.01 ***p<.001

Note: Odds ratios displayed for country-level variables only. Standardized odds ratios in bold and italics. T-scores in parentheses. Constants and individual-level variables not shown.

Table 12: HGLM Logit Models of Child Health on Women's Life Expectancy

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
GDP per capita (ln)	1.004	0.911	0.669***	0.626***	0.629***	0.654***	0.509***	0.493***
	1.004	***9.924***	***0.713***	***0.675***	***0.678***	***0.700***	***0.567***	***0.552***
	(0.057)	(-1.591)	(-5.002)	(-6.532)	(-4.256)	(-4.113)	(-4.518)	(-6.434)
Female life expectancy	0.985*		0.981**		1.000		0.985	
	0.859		***0.825***		***0.996***		***0.861***	
	(-2.197)		(-2.817)		(-0.039)		(-1.176)	
Ratio of female to male		0.992		0.952**		0.972		0.950*
life expectancy		***0.969***		***0.820***		***0.892***		***0.812***
		(-0.586)		(-3.196)		(-1.490)		(-2.075)

*p<.05 **p<.01 ***p<.001

Note: Odds ratios displayed for country-level variables only. Standardized odds ratios in bold and italics. T-scores in parentheses. Constants and individual-level variables not shown.

Table 13: HGLM Logit Models of Child Health on Individual-Level Variables and Gender Inequality

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Individual Level								
Mother's Education								
Primary	1.003	1.003	0.838***	0.838***	0.844***	0.844***	0.773***	0.773***
Secondary	0.909	0.909	0.638***	0.638***	0.741***	0.741***	0.582***	0.582***
Higher	0.685***	0.685***	0.471***	0.471***	0.719***	0.719***	0.406***	0.406***
Mother Employed	1.082***	1.082***	1.005	1.005	0.982	0.982	1.004	1.004
Mother's Marital Status								
Never Married	1.003	1.003	1.051	1.051	1.118	1.118	1.138**	1.138**
Widowed	0.980	0.980	1.000	1.000	1.166*	1.166*	0.945	0.945
Divorced	1.119*	1.119*	1.026	1.026	1.056	1.056	1.095	1.095
Cohabiting	1.097**	1.097**	0.997	0.997	0.995	0.995	1.022	1.022
Not Cohabiting	1.258***	1.258***	1.099*	1.099*	1.189**	1.189**	1.125**	1.125**
Wealth	0.994***	0.994***	0.983***	0.983***	0.992***	0.992***	0.984***	0.984***
Urban Residence	1.023	1.023	0.877**	0.877**	1.057	1.057	0.903	0.903
Mom's Age	0.989***	0.989***	0.994***	0.994***	1.005**	1.005**	1.000	1.000
Head's Age	1.000	1.000	0.997***	0.997***	1.000	1.000	0.999	0.999
Female Head	1.034	1.034	0.939***	0.939***	0.981	0.981	0.933***	0.933***
Child's Age	0.977***	0.977***	1.027***	1.027***	0.976***	0.976***	1.016***	1.016***
Male	1.111***	1.111***	1.185***	1.185***	1.211***	1.211***	1.133***	1.133***
Household Size	1.009	1.009	1.015***	1.015***	1.004	1.004	1.011**	1.011**
Multiple Children	0.871***	0.871***	1.133***	1.133***	1.001	1.001	1.095***	1.095***

Table 13 continued from previous page

Country Level								
GDP per capita (ln)	1.107	1.115	0.703***	0.748**	0.789*	0.799	0.622***	0.654**
	1.089	***1.096***	***0.744***	***0.784***	***0.819***	***0.828***	***0.671***	***0.700***
	(1.308)	(1.441)	(-3.823)	(-2.973)	(-2.027)	(-1.859)	(-3.542)	(-2.953)
Ratio of female to male	0.999		1.003		0.993		1.001	
school enrollment	***0.975***		***1.077***		***0.859***		***1.014***	
	(-0.272)		(0.766)		(-1.181)		(0.114)	
Women in parliament	0.997		0.990		0.980**		0.985*	
	0.970		***0.918***		***0.833***		***0.871***	
	(-0.571)		(-1.145)		(-3.078)		(-2.333)	
Contraceptive	0.989*		0.990		0.994		0.985	
prevalence	***0.789***		***0.796***		***0.869***		***0.714***	
	(-2.323)		(-1.478)		(-0.845)		(-1.872)	
Ratio of female to male	1.001		0.960*		0.972		0.959	
life expectancy	***1.003***		***0.846***		***0.891***		***0.845***	
	(0.059)		(-2.623)		(-1.294)		(-1.560)	
Gender equality scale		0.693***		0.650**		0.661**		0.542***
		0.771		***0.737***		***0.746***		***0.647***
		(-3.462)		(-3.158)		(-2.688)		(-3.788)

*p<.05 **p<.01 ***p<.001

Note: Constants not shown. For individual-level variables, t-scores not shown. For country-level variables, standardized odds ratios in bold and italics and t-scores in parentheses.

4. The Effects of Democracy on Child Malnutrition and Diarrhea Across 52 Developing Countries

> The past hundred years are not lacking in important events. Nevertheless, among the great variety of developments that have occurred in the twentieth century, I did not, ultimately, have any difficulty in choosing one as the preeminent development of the period: the rise of democracy. This is not to deny that other occurrences have also been important, but I would argue that in the distant future, when people look back at what happened in this century, they will find it difficult not to accord primacy to the emergence of democracy as the preeminently acceptable form of governance.
>
> -Amartya Sen (1999a: 3-4)

Historically, there has never been a famine in a functioning multi-party democracy, and Nobel Prize winner Amartya Sen asserts that this relationship is causal, not simply coincindental. Without elections, opposition parties, and uncensored public criticism, ruling groups do not suffer political consequences from their failure to prevent famines. However, ruling groups in a democracy face penalties from such failures, and the threat of those penalties gives leaders the necessary incentives to prevent them (Sen 1999b). Thus, for Sen, the global expansion of democracy is important because of its potential to enhance well-being. The rise of democracy across the world, from 30 countries in 1974 to 117 today, has indeed been a remarkable feature of the twentieth century (State Department 2011). Many politicians and policymakers share Sen's optimism that this growth of democracy will foster peace and security, economic development, human rights, and general well-being and prosperity. In fact, the U.S.

State Department (2011) posits that "democracy is the one national interest that helps to secure all the others."

Scholars share this optimism also, as evidenced by the proliferation of research documenting the positive effects of democracy in the last several decades. An interest in the beneficial effects of democracy has risen across multiple academic disciplines including sociology, economics, political science, and even public health. The paramount theme throughout much of this scholarship is that democracy improves health and well-being, both directly and indirectly through a variety of intervening mechanisms. Franco and colleagues (2004) go so far as to claim that "The way societies organise themselves through their political regimes and their egalitarian policies could have a more important role in health than structural variables such as wealth…Increasing democratisation may be a way to counteract the deleterious effect on health of the unequal distribution of economic resources on a global scale" (1421).

The present study contributes to this literature by testing the effects of democracy on child diarrhea and malnutrition across 52 developing countries. This is the first study to explore how democracy affects child diarrhea and one of the few to analyze child malnutrition. Using a multi-level modeling strategy, it examines the country-level effects of democracy on child health, while also controlling for within-country variation in household and maternal characteristics at the individual level. Whereas many previous studies limit their analyses to one or two popular indicators of

democracy, I examine a wide array of democracy measures in order to provide a more comprehensive test of its effects. Finally, much extant literature includes large cross-national samples of countries at various stages of economic development. The sample for this analysis is limited to developing countries only so that results are not biased by rich countries that also tend to be more democratic. Regression lines are sensitive to influential observations that, when removed, can change the line considerably (Moore and McCabe 2006). Thus, the removal of highly developed, highly democratic countries from the sample could have a substantial effect on the slope of the regression line.

4.1 How Does Democracy Improve Well-Being?

Several noted scholars offer useful definitions with which to begin. Seymour Martin Lipset (1981) defines democracy as " a political system which supplies regular constitutional opportunities for changing the governing officials, and a social mechanism which permits the largest possible parts of the population to influence major decisions by choosing among contenders for political office" (27). Robert A. Dahl (1971) further explains that the key characteristic of democracy is the "continuing responsiveness of the government to the preferences of its citizens, considered as political equals" (2). Finally, Charles Tilly (2007) argues that "*a regime is democratic to the degree that political relations between the state and its citizens feature broad, equal, protected and mutually binding consultation*" (13-14, original emphasis). These definitions point to two

principal features of democracy that are typically connected to improved well-being: political participation and competitive elections.

Political participation gives policymakers much-needed information about the preferences of the general population (Frey and Al-Roumi 1999). Political rights augment the capacity for people to assess social problems, identify basic needs, express their claims through public discussion and debate, and demand an appropriate governmental response (Sen 1999b). Furthermore, civil participation is important because it guarantees that power won't accumulate in the hands of a few, but that the general population can exert political influence (Lipset 1981). Policy preferences then have an impact on the size and scope of public policies, particularly in regard to social spending (Brooks and Manza 2006). Thus, democratization enhances health and social welfare by creating an avenue for people to press their government to make public investments in nutrition, education, and health care (Sorensen 1991; Goldsmith 1986).

As issues come into public debate and confrontation, authorities are more likely to respond. When the people vote, they exert their political influence, and democratic governments tend to redistribute public resources according to the general public's preferences (Tsai 2006). Competitive elections ensure this is the case by keeping state authorities accountable to their citizens (Frey and Al-Roumi 1999). Elected officials have incentives to listen to what their constituents want and need because they have to face their criticism and seek their support (Sen 1999b). Because democratic political markets

are contestable, politicians must develop platforms that attract adherents in order to maximize their chances of election (or re-election). The more contestable the political market, the more responsive to popular demands the government will be, resulting in larger quantities of public spending and services to improve health (Lake and Baum 2001).

If democratic governments are not appropriately responsive, political rights and civil liberties guarantee the ability to criticize authority, oppose policy, and mobilize for change (Frey and Al-Roumie 1999). In this way, political participation and competitive elections work in tandem and form a kind of feedback loop. Citizens express their interests for the provision of social services that improve health and well-being. Elected officials are more accountable and responsive to the demands of their constituents and thus more committed to striving for improved quality of life (Lee 2005). If citizens are not satisfied, they have the opportunity to express their dissatisfaction through the electoral process.

In addition to these general theories, there are several pathways through which democracy is hypothesized to improve health. Although these specific pathways will not be tested empirically here, they contribute to the theory that links democracy with health. The first has already been alluded to: the provision of social services. Democracies are generally associated with higher levels of social spending on health (Przeworski et al. 2000). More than 20 cross-national empirical studies since the late

1990s have tested the impact of democracy on various indicators of social sector spending (see Nelson 2007 for a review). Although the samples, time periods, and social spending indicators are quite varied, the findings are not. All but one find that democracy is associated with higher levels of spending on such social services as education, social security, and health. Democracy has also been linked to access to mother and child health services, increased primary and school enrollment, access to improved water sources, and increased child immunizations (Brown 1999; Lake and Baum 2001; McGuire 2002). Thus, democracies should foster better child health because they invest more money in social services.

A second mechanism through which democracy might improve child health is through improved gender equality. Democratic regimes open the possibility of addressing gender-based asymmetries in access to power and resources by allowing and encouraging women's political participation (Goets and Hassim 2003). Democracy promotes the growth of women's collective organization and allows women to promote their interests through mobilization and the electoral process (Beer 2009; Pillai and Gupta 2006). Democratic societies typically have a much higher percentage of women in parliament, compared to their authoritarian counterparts (Inglehart, Norris, and Welzel 2002). In South Africa and Uganda, in particular, unprecedented numbers of women have entered the legislature and local government, asserted leverage in electoral

struggles, and promoted gender equality in new legislation (Goetz and Hassim 2003).[1] Consequently, women in democracies tend to experience better health as a result of increased reproductive rights, lower fertility, and higher life expectancy (Beer 2009; Cooper et al. 2004; Pillai and Gupta 2006). Such benefits should also improve child health, since we have already seen in Chapter 3 that women's political representation, reproductive autonomy, and life expectancy all contribute to better child health.

Third, democracy may improve child health through reduced income inequality and increased economic development. At least since Aristotle, many have claimed that democracy reduces wealth inequality by reducing asymmetries in the distribution of political power (Bollen and Jackman 1985). Competitive elections serve as sites of class struggle in which the poor and working classes can vote for parties that appeal to their interests, giving the "have nots" an effective mechanism for political power (Key 1949; Lipset 1980). In other words, "democracy brings more people with below-average income to the polls, and they collectively force the government to redistribute income downwards" (Ross 2006: 862). Several cross-national studies provide empirical support for this hypothesis, showing that democracy has a significant, negative effect on economic inequality (e.g., Huber et al. 2006; Muller 1988; Weede 1982), although others find no effect (e.g., Bollen and Jackman 1985; Weede 1989). Furthermore a large (but also

[1] Of course, democracy does not guarantee women's mobilization or gender equality, and there is much cross-national variation in the gendered outcomes of democratic transitions. Mobilization and participation are contingent on such factors as a country's history of women's activism, cohesiveness of women's movements, timing of the democratic transition, and the ideology behind it (Viterna and Fallon 2008).

contested) literature suggests that income inequality is bad for population health (e.g., Wilkinson 1992, 1996; Kawachi and Kennedy 1999; Beckfield 2004). Thus, it is possible that democracy improves child health by curbing income inequality.

Democracy purportedly contributes to economic growth and development by promoting property rights, faster wage growth, free markets, and investment. This relationship has been contested for decades, resulting in mixed and inconclusive empirical evidence (see Gasiorowski 2000, Sirowy and Inkeles 1990, and Przeworski and Limongi 1993 for reviews). At the same time, many scholars find evidence for reverse causality: economic development increases democracy (e.g., Jackman 1979; Bollen 1979, 1983; Bollen and Jackman 1985). Burkhart and Lewis-Beck (1994) claim that economic development "causes" democracy, but democracy does not "cause" economic development. However, it is more likely that the two work together and are mutually reinforcing. As Boutros-Ghali (2002) explains, "the interlinking of democratization and development helps both of them take root durably. For if political democracy, in order to consolidate itself, needs to be complemented by economic and social measures that encourage development, similarly any development strategy needs to be ratified and reinforced by democratic participation in order to be implemented" (12). Still, stable democracies tend to have higher levels of GDP (Przeworski et al. 2000; Wejnert 2005).

4.2 Evidence for Direct Effects of Democracy on Well-Being

A considerable literature finds that democracy increases social spending, gender equality and economic development, and decreases income inequality. In theory, all of these could explain the link between democracy and health. However, these mechanisms have not typically been used in empirical tests of the relationship between democracy and health. Instead, most studies on this topic show independent, direct effects of democracy on well-being, controlling for economic development and other relevant variables. In fact, almost all large cross-national studies regarding this topic in the past several decades suggest that democracy reduces infant and child mortality and leads to better overall welfare outcomes (e.g., Moon and Dixon 1985; Lena and London 1993; Jenkins and Scanlan 2001).

Several studies based on samples of developed and developing countries combined show that democracy is a strong predictor of improvements in physical quality of life and the provision of basic needs (London and Williams 1990; Moon and Dixon 1985; Moon 1991; Young 1990; Frey and Al-Roumi 1999). Moore and colleagues (2006) suggest that the extent to which a country's citizens participate in selecting their political representatives reduces infant mortality (Moore et al. 2006). Democracies significantly outperform dictatorships in infant mortality at every level of economic development (Zweifel and Navia 2000, 2003). In fact, a move from complete autocracy to complete democracy could reduce infant mortality by 5 deaths per thousand (Lake and

Baum 2001). Citizens of democratic regimes also have longer life expectancies compared to their counterparts under dictator regimes (Przeworski et al. 2000). Franco and colleagues (2004) go so far as to claim that the effects of democracy on life expectancy and infant and maternal mortality surpass those of economic development.

Although they have been less frequent, other studies focus their analyses solely on developing countries. They similarly report that democracy consistently and significantly affects life expectancy and infant mortality (Wickrama and Mulford 1996). High levels of democracy and strong left-wing regimes are generally associated with positive health outcomes in developing countries, whereas repressive regimes have populations with lower life expectancies and higher mortality (Lena and London 1993). Tsai (2006) finds a significant divergence in infant mortality between democratic and nondemocratic governments, with liberal democracies achieving much more favorable levels of infant mortality. In addition, low-income democracies dramatically outperform low-income autocracies on other measures of well-being including access to clean drinking water, literacy rates, agricultural fields, and quality of public health services. As a result, people living in poor democracies live nine years longer, on average, than their counterparts in poor autocracies. Moreover, poor democracies have 20% fewer infant deaths than poor autocracies (Siegle et al. 2004).[2]

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[2] Boone (1996) estimates this figure at 30%, although the composition of his analytic sample is unclear.

There are comparatively few studies on the relationship between democracy and other measures of child health in developing countries. Jenkins and Scanlan (2001) find that the expansion of political and civil rights reduces the number of children under 5 who are undernourished. Smith and Haddad (2000) similarly claim that if all countries were able to reach high levels of democracy, the worldwide prevalence of underweight children would decline by 29.4 million. Other than these two studies, extant research on the relationship between democracy and health typically operationalizes health as infant and child mortality or life expectancy. Thus, this is the first study to test the effects of democracy on child diarrhea and one of the few to examine malnutrition.

Of course, not every scholar finds a strong, positive relationship between democracy and well-being (e.g., Weede 1993; Williamson 1987.) In what is perhaps the most famous critique of this literature, Ross (2006) claims that past studies of democracy and welfare suffer from serious selection biases. Cross-national studies often exclude nondemocratic states that perform well on social and economic indicators, which leads to the mistaken conclusion that non-democracies have worse records than democracies. They also fail to control for country-specific fixed effects. If country-specific factors (e.g., culture, colonial legacy, past leadership, or other historical peculiarities that are hard to measure) influence both regime type and well-being, then their absence could produce considerable omitted variable bias. Ross (2006) attempts to mitigate these issues by adding country-specific fixed effects to the models and by using multiple imputation to

estimate missing values of democracy for all 168 states that were sovereign between 1970 and 2000. Once these issues are corrected, Ross (2006: 860) claims that, "democracy has little or no effect on infant and child mortality."[3] In a recent review of the literature on democracy and social services, Nelson (2007) also claims that evidence on the link between democracy and various indicators of social well-being is mixed. Even so, the evidence in favor of a relationship between democracy and improved well-being far outweighs the evidence that calls this relationship into question. The paramount theme of the literature is that democracy is good for health.

4.3 Measuring Democracy

The attempt to accurately measure democracy has a long history. Scholarship in the late 1950s and1960s used objective measures such as the composition of legislative bodies or voter turnout statistics. However, recent research has relied much more heavily on subjective measures that are determined by expert judges who assign ratings to countries (Bollen and Paxton 2000). Certain widely used datasets such as Freedom House and Polity have almost reached canonical status (Herrera and Kapur 2007). But, several scholars have also written extensively on the distinct challenges of measuring democracy, how such measures are conceptualized, and the inherent measurement

[3] It is notable, however, that Ross (2006) does find a significant direct effect of democracy on child mortality before he adds the imputed data and before he adds country-specific fixed effects to the model.

errors and weaknesses that arise from subjective indices (e.g., Bollen 1980, 1990, 1993; Munck and Verkuilen 2002a; 2002b).

My goal here is not to reiterate or contribute to the debate surrounding the technical measurement of subjective democracy indices. Instead, I wish to point out the variety of ways in which these indicators have been used and then empirically test their effectiveness for improving child health in a sample of developing countries. Most scholars utilize one dataset and base their findings on one or two measurements. I consider several datasets as well as multiple ways of operationalizing democracy indicators, including level of democracy at one time point, the dichotomous presence of democracy (or not), stock of democracy over time, and stability and change. This provides a more comprehensive examination of democracy and all of the ways in which it might affect child health.

Perhaps the most common method of operationalizing democracy is to use a continuous scale that represents a country's level of democracy at a certain point in time. This considers democracy as a measure of degree and addresses questions about whether different increments are associated with improved well-being (Brown 1999). Democracy scales are often measured in the same year as the outcome variable of interest. However, they might also be lagged by several years (Tsai 2006; Lake and Baum 2001). The specification of a lag structure considers the fact that the health-enhancing effects of democracy may take several years to fully manifest (Finkel 1995).

Others find it more useful to treat regime type dichotomously. As Zweifel and Navia (2000) put it, "As in the proverbial case of pregnancy, countries are either democratic or they are not" (103). In this case, democracy is not considered as a matter of degree. Rather, the condition of being democratic (versus not democratic, or authoritarian) is what matters. In addition, because countries are often concentrated in the upper or lower extremes of continuous democracy indices, some researchers dichotomize such measures due to the distribution of the data (Brown 1999).

The use of cross-sectional levels of democracy makes an implicit assumption that democracy is related to well-being, regardless of the length of time that democratic regimes have existed in a particular country. Democracy scores at one point in time ignore the fact that democracy could have a long-term incremental effect over time (Muller 1988). Moreover, newer democracies may not perform as well as those that are long-established (McGuire 2006). Measures that reflect the stock of democracy over time reflect the possibility that a cumulative history of democracy might be more important for influencing health (Gerring and Thacker 2002; McGuire 2002; Ross 2006). Thus, an average democracy score over time or a count of the years a regime has been democratic may be a better way to capture the effect of democracy. Conversely, democracy could also have nonlinear effects over time. It is possible that over many years the benefits of democracy could reach a plateau and then diminish (Ross 2006). Such nonlinearities

could be captured by the quadratic of the average democracy score over time (Lake and Baum 2001).

Finally, the change and stability of a political regime could also affect child health. Generally, regime instability could have negative consequences for well-being because it is often associated with volatility, unrest, and conflict. Thus, the number of years since a regime transition (which captures stability) should improve child health. However, the benefits of stability may be conditional on level of democracy. In other words, the stability of an authoritarian regime likely doesn't confer the same health benefits as the stability of a democratic regime. Thus, an interaction effect of democracy level * stability would determine if stability is more consequential in democracies.

On the other hand, Lake and Baum (2001) claim that short-term regime change may have beneficial effects on health, provided of course that the change is moving in the direction of democracy. They further argue that the production of public goods and services that improve health is likely to reach equilibrium in a stable regime. However, if regimes have recently become more democratic, they might prioritize well-being and invest more in social spending, for fear of being voted out of office for failing to improve their constituents' welfare (Lake and Baum 2001: 598). Thus, regime change would produce larger effects on child health as countries democratize. If such is the case, an interaction effect of democracy level * short-term change would improve child health.

Over time, scholars have continually debated the most appropriate way to empirically measure democracy. In recent years, most have relied on subjective scales and indices of democracy that are determined by expert judges. Even so, there are multiple data sources that provide democracy scales, and there are multiple ways in which such scales can be used in quantitative analyses. Cross-sectional levels, dichotomous indicators, cumulative stock of democracy over time, as well as change and stability could theoretically have differing effects on child health. Most studies do not consider this fact, since they concentrate on one or two measures (and one or two data sources) at a time. The analysis that follows uses multiple data sources and tests a wide variety of democracy measures in order to examine a fuller range of possible effects on child health.

4.4 Interactions with Economic Development and Household Wealth

In addition to changing with regime stability, the impact of democracy could be different for less affluent developing countries as opposed to the more affluent. In other words, the effect of democracy may be conditional on development. A binary measure of democracy would test whether "being democratic" affects child health as countries develop economically. A continuous measure of democracy would test whether incremental changes in democracy have the same affect on child health at all levels of development (Brown 1999). If Boutros-Ghali (2002) is right, then the interaction of democracy * GDP on child diarrhea and malnutrition should be negative. If economic

development and democracy each reduce diarrhea and malnutrition and they are mutually reinforcing, then the interaction of the two should be even more ameliorative. This implies that democracy will have a stronger effect at higher levels of economic development.

However, Brown (1999) claims the opposite. In very low-income countries, citizens are more reliant on the state to provide public services like health care, education, or housing. In cases such as these, democratic regimes (with their capacity to increase social service provisions) can have a considerable impact on well-being. More developed economies enjoy the choices of private alternatives and do not have to rely as heavily on public goods, making a democratic regime less consequential for well-being (Brown 1999: 687). This implies that the democracy * GDP effect would be positive, and that democracy would have a lesser effect on health at higher levels of economic development. Thus, the question of whether democracy is more or less important as countries develop economically is an empirical one.

Democracy could also have a cross-level interactive effect on household wealth at the individual level. Although it has not been tested, this seems to be a logical extension of the literature that connects democracy to reduced income inequality. In that literature, inequality is typically measured at the population level and often operationalized as the Gini coefficient. However, if the claim of that literature is correct and democracy has a redistributional impact, then individual wealth should be less

consequential to health in a context of expanded democracy. If household wealth has a negative effect on diarrhea and malnutrition, then the cross-level interactive effect of democracy on wealth should be positive. In other words, democracy would dampen the slope of household wealth. The multi-level modeling strategy of this study allows for a test of such an interaction.

4.5 Hypotheses

Previous literature on the relationship between democracy and well-being and the wide variety of ways to measure democracy lead to the following set of hypotheses:

- H_1: Level of democracy will have a negative effect on diarrhea and malnutrition.
- H_2: The binary condition of being democratic will have a negative effect on diarrhea and malnutrition.
- H_3: Stock of democracy will have a negative effect on diarrhea and malnutrition.
- H_{4a}: Regime stability will have a negative effect on diarrhea and malnutrition.
- H_{4b}: The interaction effect of current democracy level and regime stability will be negative.
- H_{5a}: Short-term change toward democracy will have a negative effect on diarrhea and malnutrition.
- H_{5b}: The interaction effect of current democracy level and short-term change will be negative.

- H_6: The interaction of democracy and economic development may be either positive or negative.
- H_7: The cross-level interaction of democracy on household wealth will be positive.

4.6 Methods

I test these hypotheses in a series of HGLM logit models that predict the effects of democracy on child health while controlling for variation in maternal and household characteristics at the individual level. All models are random intercept models, except for 2 random coefficient models that estimate the cross-level interactive effect of democracy on the slope of household wealth. Refer to chapter 2 for a complete description of the estimation technique.

4.6.1 Data

The analysis pools data on 292,204 children in 52 developing countries.[4] See Appendix A for a complete list of the countries in the sample.[5] Individual-level data are drawn from the DHS as in previous chapters. Following convention, I rely heavily on Polity IV and Freedom House for data on democracy. The Polity IV database contains coded annual information on regime and authority characteristics for all independent

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[4]N=52 across all models except for one that tests "freedom status for 15 years." In those 4 models, N=49 because data are missing for Uzbekistan, Kazakhstan, and Kyrgyz Republic. These countries did not gain independence until 1991, thus data on democracy are not available before that year. (Other cumulative measures of democracy used in the analysis are based on proportions and use whatever data are available for each particular country. However, the "freedom status for 15 years" variable counts the number years a country has been free, which prevents countries with missing data to be included in this measure.)

[5] Haiti and Liberia are excluded from both previous chapters due to missing data. However, because data on democracy are available for these countries, they are included in this chapter.

states (with greater than 500,000 total population) from 1800-2009. The Polity coding scheme records qualities of executive recruitment, constraints on executive authority, political competition, and changes in the governing authority (Marshall and Jaggers 2010). Freedom House is a nongovernmental organization (NGO) that has published surveys detailing the state of civil liberties and political rights in 193 countries since 1972. The ratings are determined by a list of 25 questions addressing such issues as the electoral process, political participation, government functioning, freedom of expression, freedom of association, rule of law, and personal autonomy (Freedom House 2010).

I also supplement the analysis of democracy levels with data from Worldwide Governance Indicators (WGI), and the Cingranelli-Richards Human Rights Dataset (CIRI). WGI aggregates data from a variety of NGOs, public sector organizations, commercial business information providers, and surveys of households and firms for 213 countries from 1996-2009. This dataset includes indicators for 6 dimensions of political regimes: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufman, Kraay, and Mastruzzi 2010). The CIRI dataset includes coded information on government respect for 15 internationally recognized human rights for 195 countries from 1981-2009. Among the topics included are freedom of speech, freedom of association, electoral self-determination, and women's rights (Cingranelli and Richards 2010).

4.6.2 Measures

The measurement of all individual-level variables is replicated from Chapter 3. The effects of the household and maternal characteristics remain very stable despite different model specifications at the country level. Because these effects have already been assessed, the coefficients are not displayed in the results that follow. However, the full set of individual-level variables is controlled in each model. Given the importance of economic development as discussed in Chapters 2 and 3, GDP per capita is also included as a country-level control variable in each model, but not displayed.[6] The patterns of previous chapters remain the same: GDP has a consistent, negative effect on malnutrition but its effects on diarrhea are less robust.

4.6.2.1 Level of Democracy

Because democracy levels have figured so prominently in extant research, I explore a wide range of measures in order to provide a comprehensive test of their effects. First, the *Polity* score combines scores for democracy (the general openness of political institutions) and autocracy (the general closedness of political institutions). This combined score is an interval variable that ranges from -10 (high autocracy) to 10 (high democracy).[7] The *3-Year Lagged Polity Score* considers the possibility that the effects of

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[6] As in previous chapters, GDP per capita is measured in hundreds of purchasing power parity dollars and logged to correct for skewness.

[7] I considered separate scales for democracy and autocracy; however, convention is to use the combined scale. In addition, data are missing in the separate scales. (The combined Polity score imputes data so there are no missings.)

democracy may take several years to fully manifest. Although there is no definitive lag structure, Lake and Baum (2001) find that a 2-3 year lag is optimal. I also include a *Freedom House* score that combines political rights and civil liberties. Freedom House assigns 2 separate numerical ratings for political rights and civil liberties to each country on a scale from 1 (highest degree of freedom) to 7 (least amount of freedom). I sum the 2 ratings and reverse the scale so that higher scores correspond with higher freedom.[8] This creates an interval variable that ranges from 2 to 14 (highest degree of freedom).[9]

The CIRI *Electoral Self-Determination* variable measures the extent to which citizens have the right and ability to change laws and officials through a free and fair electoral process.[10] Countries are rated as 0 (no right to self-determination), 1 (legal right to self-determination but limitations to its practice), or 2 (full right to self-determination through free and fair elections in law and practice).[11] The *Empowerment Index* is an additive index of 7 rights indicators: Foreign Movement, Domestic Movement, Freedom of Speech, Freedom of Assembly and Association, Workers' Rights, Electoral Self-

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[8] In sensitivity analyses, I examine the political rights and civil liberties ratings separately, as well as the product of the two. Results are consistent with those presented here.

[9] In additional analyses, I also create a composite standardized scale of political rights, civil liberties, and the combined Polity score (alpha = .92), but it does not have a significant effect on any of the child health outcomes.

[10] Among all of the CIRI variables, *Electoral Self-Determination* most closely captures the definition of democracy as used in this study. However, in additional analyses, I test the effects of two other CIRI measures: *Freedom of Speech* and *Freedom of Assembly and Association*. I also create a composite CIRI scale of all 3 of these indicators (alpha = .78). Results are mostly consistent, with slight fluctuations. Details are available upon request.

[11] I also considered a binary form of this variable, coded as 1 if *Electoral Self-Determination* = 2, and 0 otherwise. Results are consisted with those presented here.

Determination, and Freedom of Religion. It ranges from 0 (no government respect for any of these rights) to 14 (full government respect for all of these rights).

The WGI *Voice and Accountability* scale measures perceptions about the extent to which citizens are able to participate in selecting their government, plus freedom of expression and association and a free media. This variable ranges from -2.5 to 2.5, with higher scores indicating more government accountability and individual freedom. [12] I also create a *WGI scale* using each of the 6 dimensions of political regimes measured in the WGI dataset (listed above). This is a standardized composite scale (alpha = .86) that broadly represents the process through which governments are selected and replaced and the capacity to implement sound policies. Higher values of the scale represent better, more effective governance.[13]

4.6.2.2 Binary Measures

Freedom House averages its political rights and civil liberties ratings to create an overall "freedom status" for each country that includes 3 categories coded as Free (1), Partly Free (.05), and Not Free (0). I collapse these categories to create a dichotomous variable where *Free* is coded as 1 and both Partly Free and Not Free are coded as 0.[14] In

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[12] I present the results for *Voice and Accountability* because this particular WGI indicator most closely adheres to the theoretical basis of the study. But in sensitivity analyses not shown, I also test the effects of each WGI indicator separately. The main results and conclusions are consistent.

[13] The Bollen (2001) index of political democracy would be another alternative, but data are only available through 1990.

[14] I also created a dichotomous variable for *Partly Free* (versus Free or Not Free) and for *Not Free* (versus Partly Free or Free). Results did not change.

addition, a country is *Democratic* if it scores 1 or above on the Polity scale and 0 otherwise.[15]

4.6.2.3 Stock of Democracy

I use Polity to create 2 measures of long-term history of democracy and Freedom House to create a measure of shorter-term history. Using Polity, I measure the *proportion of years a country has been democratic since 1960*. "Democratic" in this case is defined as above. These dichotomous scores are summed and then divided by the number of years for which data are available since 1960 (including the year of observation). Other scholars (e.g., Ross 2006; Gerring and Thacker 2002) simply sum the years a country has been democratic since 1900. I use a proportion both because the year of observation varies slightly in the sample and because the number of years for which data are available also varies. Furthermore, I use 1960 because that is the earliest year for which data are available for many sub-Saharan African countries in the sample that were newly gaining independence around that time. *Years Since*^{2} is the quadratic form of this variable and is meant to capture any nonlinear effects of democracy over time.

Following McGuire (2002), I also include the *average polity score* over all years for which data are available since 1960 (including the year of observation). McGuire (2002) claims that the average is a more appropriate indicator of stock of democracy over time

[15] The widely-cited ACLP classification, in which all countries are categorized as either democracies or dictatorships, would be another alternative (Alvarez et al. 1996). Unfortunately, this data source only provides classifications of political regimes from 1950-1990. A more recent update of this source still only provides data through 2002 which is not sufficient for the sample used in this study.

because it is sensitive to different degrees of both authoritarianism and democratization. Because Freedom House covers a more recent time period than Polity, I use it to measure short-term stock of democracy. This measure is the sum of a country's *freedom status for 15 years* preceding the year of observation.[16]

4.6.2.4 Stability and Change

Measures of stability and change come from Polity. *Stability* is measured by the number of years since a country's most recent regime change or the end of a transition period. (This variable is called "Durable" in the Polity dataset.)[17] The interaction term *Polity * Stability* measures the possibility that democracy could have differential effects at varying levels of stability.

Change is measured as the Polity score in the year of observation minus the 3-year lagged polity score. I also include an interaction term that multiplies the Polity score by the 3-year change score. However, the interaction terms uses the absolute value of the change score in order to preserve directionality (Lake and Baum 2001: 607).[18] Thus, the interaction effect is actually *Polity * |3-Year Change|*.

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[16] In additional sensitivity analyses, I test 10-year additive scores for several CIRI measures, including Electoral Self-Determination, Freedom of Speech, Freedom of Assembly and Association, and the Empowerment Rights Index. Results are largely consistent with those presented here.

[17] WGI provides another alternative indicator of political stability that measures perceptions of the likelihood that the government will be destabilized or overthrown. In analyses not shown, this variable has no effect on child health.

[18] Without using the absolute value of the change score, the interaction term would lose directionality. For example, a country with a Polity score of -4 and a change score of -4 would rate the same as a country with a Polity score of 4 and a change score of 4.

4.6.2.5 Interactions with Economic Development and Household Wealth

Following Brown (1999), interaction terms use continuous and dichotomous indicators of democracy.[19] The economic development interactions are measured as *GDP * Freedom House* (the continuous scale) and *GDP * Free* (the binary freedom status). Cross-level interactive effects are similarly measured as the *Wealth Index * Freedom House* and the *Wealth Index * Free*.[20]

4.7 Results

First, I examine the descriptive patterns between democracy and child health through bivariate correlations and scatter plots. Then, I estimate the size and significance of democracy's effect on child health in multivariate models. Descriptive statistics are presented in Table 14, and the correlations between each democracy indicator and each child health outcome are displayed in Table 15. Table 16 shows HGLM logit models of democracy on child health, controlling for economic development at the country level and for maternal and household characteristics at the individual level. Finally, interaction effects are displayed in Table 17.

According to Table 14, no countries score on the extreme ends of either the Polity or Freedom House indices. Furthermore, the mean Polity and Freedom House scores of

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[19] These effects should be interpreted with caution because of the potential for interaction effects in logistic regression to be confounded with differences in residual variation across groups (heteroskedasticity). Relative differences in the residual variation could bias the coefficient estimates, as observed differences between groups could be driven by this heteroskedasticity with no "true" differences between the groups (Allison 1999).

[20] See Chapter 2 for a more detailed description of the household wealth index.

the sample fall relatively in the middle of the distributions, although the Polity scores are more variable. Only 15% of the sample is "free" according to the binary Freedom House indicator, but 62% are "democratic" according to the binary Polity indicator.[21] On average, countries have been democratic for about one-third of the period since 1960, but again this is quite variable. They have been free for a little less than half (6.15) of the last 15 years. Regimes have been relatively stable in the short term, as evidenced by the mean 3-year change in Polity score (1.10). Moreover, countries have not experienced a regime change for about 10 years on average, although this ranges widely from 0 to 56 years.

Among the 68 correlation coefficients shown in Table 15, only 6 are significant at the .05 level. Moreover, all of the correlations are surprisingly low. The largest correlations are between the WGI scale and stunting (r = -.33) and between years free in the previous 15 and diarrhea (r = -.30). None of the others reach above .30, and a considerable number are less than .10. Thus, the bivariate relationships alone suggest that the relationship between democracy and child health is relatively weak in this sample of developing countries. This is quite contrary to previous literature that suggests democracy is associated with improved well-being.

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[21] This considerably lower than the Freedom House world average. Freedom House's latest estimates for 2010 report that 45 per cent of the 194 countries in their dataset are "free." This figure has remained relatively stable, with slight fluctuations for the last decade. However, this figure also varies widely across regions: Americas (69%), Asia-Pacific (41%), Central and Eastern Europe (45%), Middle East and North Africa (6%), Sub-Saharan Africa (19%), and Western Europe (96%). Unfortunately, Polity does not report comparable world or regional averages (since I created the dichotomous measure used here).

These patterns are demonstrated in Figures 6-9. Each figure shows the relationship between a country's Freedom House score and its prevalence of diarrhea, stunting, wasting, and underweight respectively.[22] The same general pattern is evident in each figure. Fitted lines showing the direction and strength of the relationship are surprisingly flat, particularly for wasting (Figure 8). A slightly negative slope is discernible for the other 3 outcomes, but the relationship is weaker than expected. This reflects the fact that there is considerable variation in child health at all levels of democracy. For instance, Egypt and Togo both score 5 on the Freedom House scale, but Egypt's diarrhea prevalence is only 8.46%, compared to Togo's diarrhea prevalence of 31.37% (see Figure 6). Similarly, India and Senegal share democracy scores of 11, but India's diarrhea prevalence (9.25%) is considerably lower than that of Senegal (22.88%). Benin follows the expected pattern of high democracy and low diarrhea prevalence, with a Freedom House score of 12 and diarrhea prevalence of 9.18%. However, Uzbekistan is far from what we would expect with both the lowest democracy score in the sample (3) and the lowest diarrhea prevalence in the sample (5.13%).

[22] All dependent variables are measured at the individual level in the HGLM models. However, I use country averages in Figures 1-4 for illustration. I calculate the mean of each dependent variable separately for each country using sample weights provided by DHS, then multiply by 100 to yield a percent.

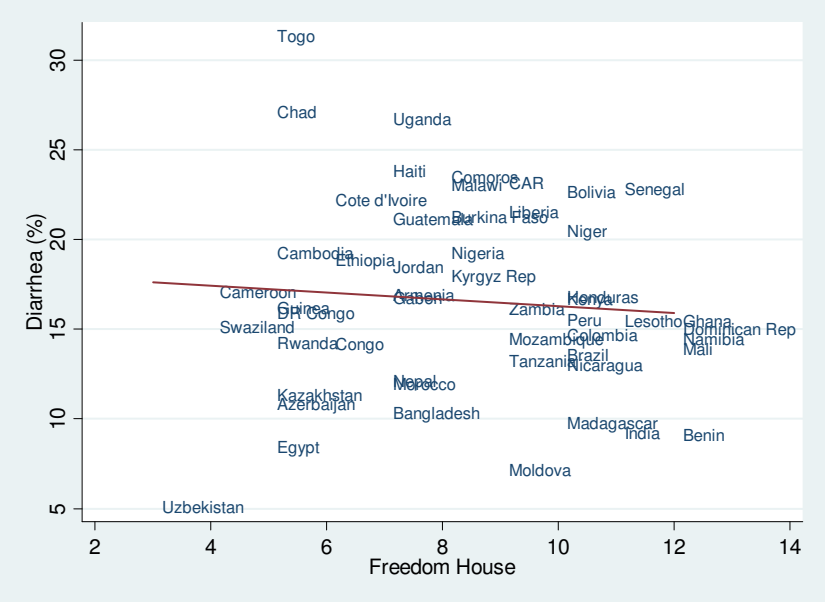

Figure 6: Diarrhea Prevalence and Freedom House Score (r = -.08)

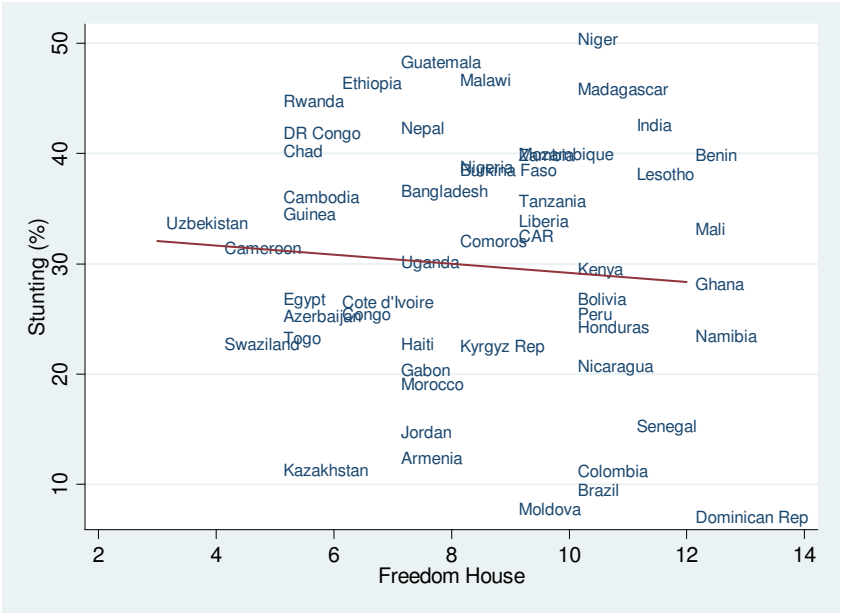

Figure 7: Stunting Prevalence and Freedom House Score (r = -.09)

Stunting exhibits similar variation across levels of the Freedom House scale (Figure 7). Armenia and Guatemala are both close to the sample average on democracy

(7). However, Armenia has a stunting prevalence of 12.44% versus 48.34% in Guatemala. Brazil and Niger both score 10 on the Freedom House scale. But, Brazil's stunting prevalence (9.52%) is among the lowest in the sample, whereas Niger's rate of stunting is the highest in the sample (50.49%). These patterns (or lack thereof) are replicated in the scatter plots for wasting (Figure 8) and underweight (Figure 9). Overall, bivariate scatter plots do not show a clear pattern of high democracy and low diarrhea/malnutrition as expected.

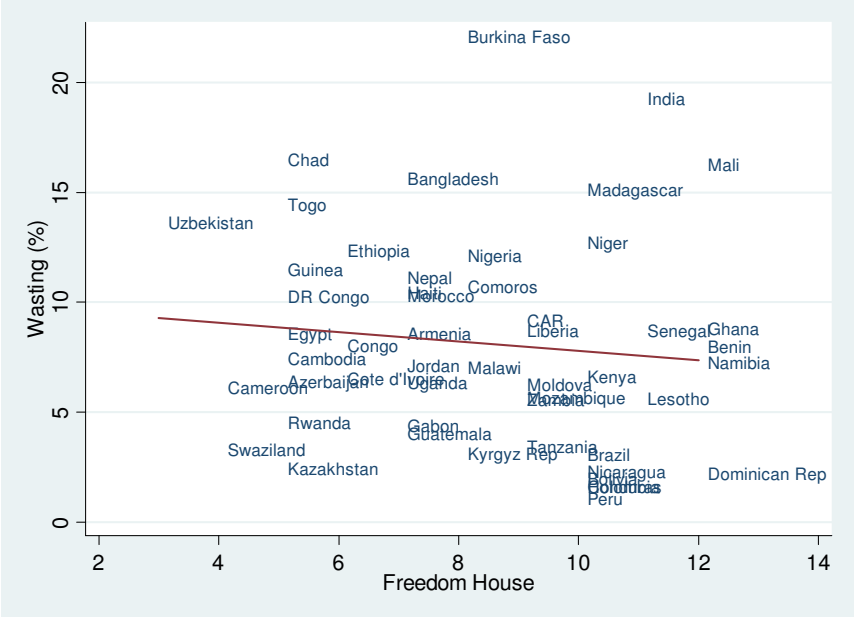

Figure 8: Wasting Prevalence and Freedom House Score (r -.11)

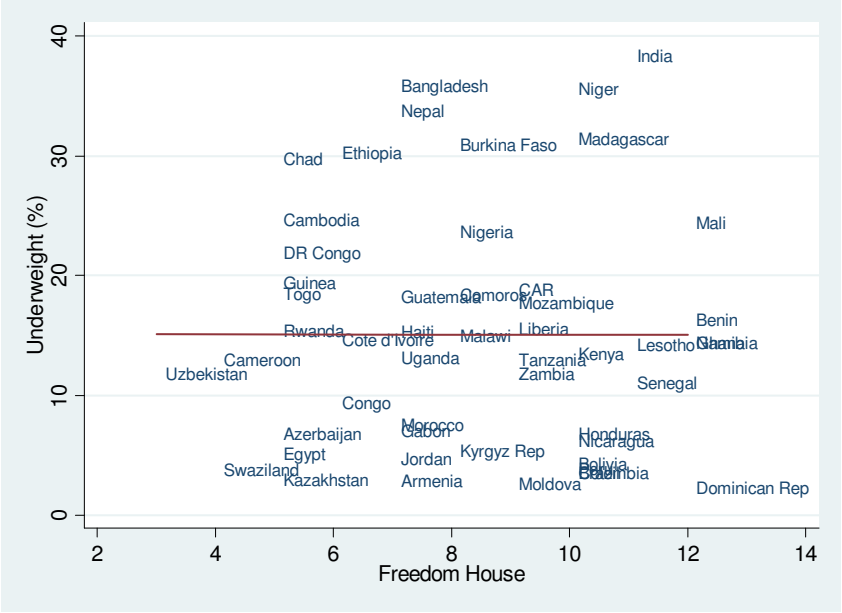

Figure 9: Underweight Prevalence and Freedom House Score (r = -.0006)

The results of HGLM logit models are presented in Table 16. Each cell represents one model, displaying the odds ratio and t-score for each democracy indicator across the four child health outcomes. Recall that each model controls for GDP per capita and all of the individual-level variables as described in Chapter 3, although these coefficients are not displayed. Several continuous measures, representing levels of democracy, are shown at the top of Table 16. Two are marginally significant at the .10 level. For every one unit increase in the Electoral Self-Determination score, the odds of wasting are expected to decline by a factor of 1.24 (OR = .808). A one unit increase in the Empowerment Index reduces the odds of wasting by a factor of 1.05 (OR = .951). These coefficients are only significant at the .10 level and are not robust across any of the other health outcomes. Furthermore, none of the 28 models testing democracy levels yield

significant results at the .05 level or less. This does not provide much evidence in support of H_1. Contrary to the findings of much previous literature, then, levels of democracy do not appear to significantly improve child well-being.

Two binary measures of democracy are presented next, in order to determine whether the condition of being democratic is more important than the level of democracy per se. However, neither the condition of being "free" (versus partially free or not free) nor the condition of being "democratic" (versus autocratic) have significant effects on diarrhea or malnutrition. The t-scores for these 8 models are fairly low, and none of the models reach marginal significance. The results of these models do not support H_2.

Regardless of the preceding results, a cumulative history of democracy could theoretically be more important for influencing health. For this reason, the next several models in Table 16 consider the fact that democracy could have an incremental effect over time. Among the 12 models of the stock of democracy on child health, none are significant at the .05 level. The t-scores for all other models of the stock of democracy are extremely low and do not approach statistical significance. The quadratic term also does not reach significance, thus there is no evidence that beneficial effects of a history of democracy reach a plateau and then diminish over time. Thus, this group of models does not provide much support for H_3.

Turning to the models of stability and change, regime stability has a marginally significant effect on diarrhea. For each additional year of regime stability, the odds of diarrhea decline by a factor of about 1.01 (OR = .993). This provides very limited support for H_{4a}. However, not only does regime stability fail to reach significance in the malnutrition models, but the direction of the effects is positive, which contradicts H_{4a}. Moreover, H_{5a} does not find support as short-term change in democracy fails to reach significance for any of the health outcomes.

The final two models in Table 16 test the interactions between democracy level and stability and change. Each of these models is represented by 3 cells: the main effect of democracy, the main effect of stability (or change), and the interaction effect. Contrary to the expectation of H_{4b}, the stability interaction effect has a significant positive effect on the odds of being underweight. This effect is not particularly robust, as it does not significantly affect any of the other health outcomes. Democracy does not seem to be more beneficial for child health when the regime has been stably democratic for a longer period of time.

Limited support is found for H_{5b}, as the change interaction effect significantly reduces the odds of being underweight. This is suggestive evidence that democratization improves child health particularly among regimes that have experienced a recent trend toward democracy. However, the change interaction effect does not significantly affect any of the other health outcomes.

Table 17 presents models of the interaction effects between democracy and economic development and household wealth. These models allow for (1) the possibility that democracy could have differing effects across levels of economic development or (2) the possibility that democracy could have a dampening effect on the slope of individual-level household wealth. Each model is represented by 3 cells: the main effect of economic development (or wealth), the main effect of democracy, and the interaction effect. H_6 and H_7 are both tested using a continuous measure of democracy and a binary measure. The main effects of economic development and household wealth are the most robust in Table 17. For each standard deviation increase in GDP per capita, the odds of diarrhea and stunting are expected to decline by a factor of 1.11 to 1.93 (OR = .466 to .887). Similarly, a one standard deviation increase in the wealth index reduces the odds of diarrhea by a factor of 1.16 to 1.59 (OR = .981 to .994). However, the main effects of democracy are not significant in any of the models of Table 17, regardless of whether they are measured continuously or dichotomously. The interaction between democracy and economic development fails to reach significance in all 8 models in which it is included, providing no support for H_6. The cross-level interactive effect of democracy on household wealth is marginally significant in 1 out of 8 models. The condition of being "free" has a positive effect on the slope of wealth in a model predicting the odds of being underweight, providing very limited support for H_7. The effect of household

wealth may be less consequential for the odds of being underweight in countries that are "free."[23]

Overall, results are not as consistent or robust as previous literature would predict. In fact, democracy exhibits very little association with child diarrhea and malnutrition. Bivariate relationships displayed in Table 15 are surprisingly weak. The majority of correlations between democracy and each child health indicator are between -.20 and .20. Figures 6-9 show great variation in child health across all levels of democracy. Although some countries follow the expected pattern of high democracy and low diarrhea and malnutrition, others have relatively low democracy but also low diarrhea and malnutrition (e.g., Dominican Republic versus Swaziland in Figures 8 and 9). As a result, the 84 multivariate models presented in Tables 16-17 yield only two significant democracy coefficients at $p<.05$ and another 4 that are marginally significant at $p<.10$. Electoral Self-Determination and the Empowerment Index have marginally significant negative effects on the odds of wasting. Number of years since a regime transition has a marginally significant negative effect on diarrhea. The interaction terms for change and stability reduce the odds of being underweight ($p<.05$), although the direction of the effect is not as expected for the stability interaction term. Finally, the

[23] In additional analyses not shown but available upon request, I replicate Table 4 using the continuous and binary Polity indicators. Neither of the interactions with GDP reaches significance in any of the 8 models. One out of 8 cross-level interactive effects is marginally significant. The effect of the continuous Polity score on household wealth is negative and marginally significant for stunting only (OR = .9996, p = .092, t-score = -1.715).

binary measure "free" has a marginally significant positive effect on the slope of household wealth for the odds of being underweight. In other words, household wealth is less important for predicting the odds of being underweight in "free" countries. Although this is only suggestive evidence, this is the first study to test the cross-level interactive effect of country-level democracy on individual-level household wealth. Still, these democracy effects are neither consistent nor robust. A number of sensitivity analyses, described in the footnotes, reveal similar patterns. Democracy does not appear to be a significant predictor of child diarrhea or malnutrition.

4.8 Discussion and Conclusion

The worldwide trend toward rising democratization over the last several decades has contributed to growing optimism that democracy might literally change the world by securing peace and deterring aggression, opening markets, promoting development, upholding human rights, protecting the environment, and improving health (State Department 2011). Rising democratization brought with it expectations that competitive elections would make governments more attentive and responsive to the welfare of their people, creating better services and better health (Nelson 2007). Scholarly attention to the topic has grown in tandem, as researchers and policymakers alike seek to understand the consequences of this rising trend. As a result, a rather considerable body of literature in Sociology and Political Science claims that democracy

has significant, direct effects on multiple measures of well-being, particularly life expectancy and infant and child mortality.

It is perhaps quite surprising, then, that this study does not find such effects on child diarrhea and malnutrition in a sample of 52 developing countries. The bivariate correlations between democracy and all 4 measures of child health are surprisingly weak. The multivariate models do not yield consistent or robust democracy effects. This could be due, in part, to the concentration on developing countries only. Much of the research on the democracy-health link uses analytic samples of both developed and developing countries combined. Yet, the positive association between democracy and economic development is well-established (Przeworski et al. 2000). Consequently, developed countries that are also highly democratic could be biasing the democracy coefficient and driving the regression line. Even controlling for level of economic development would not eliminate that bias, since the two are conflated. Regression lines are sensitive to influential observations that, when removed, can change the line considerably (Moore and McCabe 2006). Thus, the removal of highly developed, highly democratic countries from the sample could have a substantial effect on the slope of the regression line. Of course, some studies have found democracy effects on health in samples of developing countries as previously described. However, more recent studies do not find a robust direct effect (e.g., Shandra et al. 2004, 2005). Thus, there is less evidence for the democracy-health link in developing countries.

The findings of this study could also differ from previous research because of the concentration on child diarrhea and malnutrition, rather than the more commonly studied infant and child mortality. Diarrhea, stunting, wasting, and being underweight are just several of the proximate causes of mortality. Although they are large proximate causes that account for a large share of infant and child mortality, there are still many other causes. It is possible that other proximate causes could be more responsive to democracy than those studied here. Democracy works, in theory, because people press the government for health services and policies that they want and need. It is possible that diarrhea and malnutrition are perceived as commonplace, so they are overlooked in favor of fighting other health crises that are perceived as more severe, like HIV/AIDS, tuberculosis, or malaria. Especially in light of the extensive international attention that has been brought to these three issues by the United Nations and numerous NGOs, it seems feasible to expect that voters might advocate for such health interventions as antiretroviral drug treatments for HIV, vaccines for TB, or bed nets. As international organizations bring such issues to the spotlight, the everyday suffering from diarrhea and malnutrition may seem more routine and therefore receive less attention. In this way, other more proximate causes of mortality may be more responsive to the mechanisms of the democratic process than diarrhea or malnutrition. Thus, the intervening variables between democracy and mortality deserve more attention in order to truly understand what drives the democracy-health link. As the first to examine

diarrhea and one of the few to examine malnutrition, the results of this study point to the need to incorporate a wider range of health outcomes in studies of democracy, rather than limit the analysis to the conventional measures of life expectancy or mortality.

On a broader level, the results of this study call into question some of the theoretical assumptions linking democracy to health. Does democracy really benefit the masses? Who participates and who benefits? The theory behind the democracy-health link rests on the supposition that citizens get their needs met by exerting pressure on the government through the electoral process. However, this assumes that citizens have (1) an understanding of the issues on which they are voting, (2) information about the candidates who will best implement desired policies, and (3) political will to participate in this process. It is possible that parents of sick children in developing countries do not have the time, information, or will to engage in the electoral process. Democracy is obviously not an automatic remedy, but must be practiced in order to achieve the desired effect (Sen 1999b). Furthermore, the preferences of the median voter are the ones that determine government policy (Ross 2006).[24] If the parents of sick children are uninformed, unengaged, or don't exercise their suffrage rights, then their preferences will be underrepresented in policymaking. If such is the case, the presence of legal

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[24] Of course, policy preferences alone do not govern distributional outcomes. According to power resources theory, cross-national differences in government social policies are determined by working class capacity for collective action. In other words, distributive outcomes are a product of power, not preferences (Bradley et al. 2003). Thus, it is also possible that working class parents do not have the collective power necessary to translate their policy preferences into social policy.

democracy would not have an effect on child health. As Sen points out (1999b): "In a democracy, people tend to get what they demand, and more crucially, do not typically get what they do not demand" (156).

In addition, theories about democracy and social spending in particular assume that democracies will have a redistributional impact that will be beneficial for well-being. However, as Nelson (2007) explains, "Increased spending does not automatically buy higher quality or more equitable social services. Better outcomes also require reallocating resources and institutional reforms – changes in sector organization, administration, and incentive systems" (80). It is possible that democracies spend more money on public services that subsidize middle- and upper-classes who can already afford to buy public services privately (Ross 2006). In this case, the benefits of democracy might not trickle down to the children who need them the most.

This is not to say that democracy is not important for well-being. Democracy improves human rights, equality, and women's empowerment. These things certainly provide intangible benefits that are more conducive to living the kind of life that one values, as Sen suggests (1999b). However, this analysis suggests that the tangible benefits of democracy might not be so tangible – democracy doesn't appear to improve the physical health of young children suffering from acute and chronic illness in developing countries.

It should also be noted that non-democratic regimes sometimes produce healthy populations. Some countries might not allow political freedom, but they promote economic and social rights that enhance the physical quality of life. At the same time, some democracies might support political rights, but not guarantee the kind of economic and social environment that truly improves well-being (Owens 1987; Young 1990).

Although several interaction effects were considered here, future research could explore this possibility even further. In two more recent studies of the democracy-health linkage, Shandra and colleagues (2004, 2005) also find no *direct* effect of democracy on infant and child mortality in a sample of 59 developing countries. However, they find that levels of democracy condition the effects of other potentially deleterious international, economic forces. Although it might not have a direct effect, democracy improves child health by moderating the harmful effects of multinational corporations and international lending institutions (Shandra et al. 2004, 2005). Wickrama and Mulford (1996) similarly find that democracy moderates the adverse effects of disarticulation on well-being.[25] Others find that democracy significantly moderates the effects of government size (Lee 2005) and development aid (Kosack 2003; Navia and

[25] Disarticulation refers to the uneven technological and production disparity between industrial and agricultural sectors that results from foreign capital penetration and export dependency. Disarticulation leads to a more prosperous and powerful industrial elite, at the expense of traditional agriculture and small businesses. Such inequality has negative consequences for the well-being of the majority of rural people (Wickrama and Mulford 1996).

Zweifel 2003).[26] Such studies are few and far between, given the preponderance of literature that examines direct effects of democracy. But this growing body of literature may prove to be a fruitful way to better understand the nuances of the democracy-health link.

[26] Although Boone (1996) claims that the impact of aid is not moderated by type of political regime.

Table 14: Chapter 4 Descriptive Statistics

	Mean	St. Dev.	Min	Max
Child Health				
Diarrhea (%)	16.68	5.41	5.13	31.37
Stunting (%)	30.01	11.38	7.07	50.49
Wasting (%)	8.24	4.82	1.12	22.13
Underweight (%)	15.10	9.96	2.39	38.39
Level of Democracy				
Polity	2.33	5.24	-9.00	9.00
Freedom House	7.96	2.46	3.00	12.00
Electoral Self-Determination	1.21	0.67	0.00	2.00
Empowerment Index	7.65	2.85	3.00	13.00
Voice and Accountability	-0.51	0.52	-1.52	0.53
WGI Scale	0.00	0.77	-1.54	1.78
3-Year Lagged Polity Score	1.23	5.31	-9.00	9.00
Binary Measures				
Free (Binary Freedom House)	0.15	0.36	0.00	1.00
Democratic (Binary Polity)	0.62	0.49	0.00	1.00
Stock of Democracy				
Proportion of Years Democratic since 1960	0.29	0.30	0.00	1.00
Average Polity Score since 1960	-2.62	4.12	-9.00	8.53
Freedom Status for 15 Years	6.15	4.18	0.00	15.00
Years Democratic^2	0.17	0.28	0.00	1.00
Stability and Change				
Stability (Years Since Regime Transition)	10.25	11.61	0.00	56.00
Polity * Stability	24.98	111.88	-306.00	504.00
3-Year Change in Polity	1.10	3.42	-12.00	12.00
Polity * |3-Year Change|	5.33	20.55	-72.00	80.00

Table 15: Correlation of Democracy Measures and Child Health

	Diarrhea	Stunting	Wasting	Underweight
Level of Democracy				
Polity	.08	.04	-.08	.11
Freedom House	-.08	-.09	-.11	-.0006
Electoral Self-Determination	.19	.03	-.08	.08
Empowerment Index	.06	-.08	-.13	-.09
Voice and Accountability	-.05	-.11	-.11	-.02
WGI Scale	-.16	-.33*	-.19	-.27*
3-Year Lagged Polity Score	-.07	-.01	-.05	.09
Binary Measures				
Free (Binary Freedom House)	-.18	-.06	.12	.08
Democratic (Binary Polity)	.02	.12	-.09	.13
Stock of Democracy				
Proportion of Years Democratic since 1960	-.24	-.16	-.11	-.02
Average Polity Score since 1960	-.22	-.24	-.13	-.05
Freedom Status for 15 Years	-.30*	-.20	-.11	-.10
Years Democratic^2	-.28*	-.28*	-.09	-.10
Stability and Change				
Stability (Years Since Regime Transition)	-.27	-.19	-.06	-.11
Polity * Stability	-.11	.03	.06	.18
3-Year Change in Polity	.23	.09	-.04	.03
Polity * |3-Year Change|	.14	.07	-.09	-.01

Notes: *p<.05

Table 16: HGLM Logit Models of Child Health on Democracy

	Diarrhea	Stunting	Wasting	Underweight
Level of Democracy				
Polity	1.006	0.985	0.972	0.994
	(0.398)	(-1.221)	(-1.658)	(-0.353)
Freedom House	0.995	0.978	0.955	1.004
	(-0.167)	(-0.900)	(-1.340)	(0.126)
Electoral Self-Determination	1.137	0.943	0.808+	1.032
	(1.385)	(-0.571)	(-1.740)	(0.246)
Empowerment Index	1.015	0.979	0.951+	0.976
	(0.782)	(-1.059)	(-1.880)	(-1.011)
Voice and Accountability	1.018	0.966	0.877	1.139
	(0.129)	(-0.308)	(-0.755)	(0.769)
WGI Scale	0.982	0.953	0.976	0.982
	(-0.205)	(-0.629)	(-0.206)	(-0.145)
3-Year Lagged Polity Score	0.995	0.989	0.983	1.000
	(-0.341)	(-0.876)	(-1.053)	(0.015)
Binary Measures				
Free (Binary Freedom House)	0.841	0.978	1.376	1.451
	(-1.214)	(-0.109)	(1.454)	(1.438)
Democratic (Binary Polity)	1.014	0.952	0.760	0.978
	(0.106)	(-0.375)	(-1.438)	(-0.123)
Stock of Democracy				
Proportion of Years	0.789	0.892	0.888	1.184
Democratic since 1960	(-1.078)	(-0.333)	(-0.322)	(0.354)
Average Polity Score since	0.984	0.979	0.982	1.002
1960	(-0.918)	(-0.900)	(-0.633)	(0.055)
Freedom Status for 15 Years	0.978	0.995	0.991	1.009
	(-1.416)	(-0.347)	(-0.412)	(0.428)
Years Democratic^2	0.715	0.749	1.070	1.099
	(-1.504)	(-0.675)	(0.167)	(0.154)
Stability and Change				
Stability (Years Since Regime	0.993+	1.003	1.004	1.007
Transition)	(-1.737)	(0.525)	(0.305)	(0.596)
3-Year Change in Polity	1.026	0.992	0.976	0.984
	(1.655)	(-0.713)	(-1.307)	(-0.556)

Table 16 continued from previous page				
Stability Interaction				
Polity	1.020	0.972+	0.952*	0.958+
	(0.949)	(-1.752)	(-2.325)	(-1.904)
Stability	0.996	1.001	1.000	0.998
	(-0.942)	(0.195)	(0.009)	(-0.260)
Polity * Stability	0.999	1.001	1.001	1.002*
	(-1.327)	(1.435)	(1.038)	(2.446)
Change Interaction				
Polity	1.002	0.983	0.976	1.002
	(0.132)	(-1.158)	(-1.256)	(0.092)
|3-Year Change in Polity|	0.998	0.995	1.018	1.051**
	(-0.090)	(-0.410)	(1.086)	(2.902)
Polity * |3-Year Change|	1.002	1.001	0.996	0.993*
	(0.820)	(0.552)	(-1.564)	(-2.347)

+p<.10 *p<.05 **p<.01

Note: Each cell contains odds ratios and t-scores in parentheses. Each model controls for maternal and household characteristics at the individual level and GDP per capita at the country level.

Table 17: HGLM Logit Models of Child Health on Economic Development and Household Wealth Interaction Effects

	Diarrhea	Stunting	Wasting	Underweight
GDP per capita	0.887*	0.602***	0.641***	0.477***
	(-2.355)	(-6.768)	(-5.058)	(-7.300)
Freedom House	0.993	0.982	0.959	1.005
	(-0.249)	(-0.801)	(-1.242)	(0.142)
Freedom House * GDP	1.029	0.959	0.951	0.995
	(1.277)	(-1.406)	(-1.305)	(-0.114)
GDP per capita	0.878*	0.615***	0.636***	0.466***
	(-2.417)	(-5.869)	(-4.502)	(-7.260)
Free (Binary Freedom	0.827	1.001	1.386	1.435
House)	(-1.316)	(0.003)	(1.542)	(1.539)
Free * GDP	1.151	0.820	0.941	1.103
	(1.426)	(-0.708)	(-0.214)	(0.250)
Wealth Index	0.997	0.989**	0.992+	0.982***
	(-0.686)	(-2.869)	(-1.984)	(-3.910)
Freedom House	0.994	0.977	0.955	1.003
	(-0.196)	(-0.956)	(-1.333)	(0.096)
Freedom House * Wealth	0.9997	0.999	0.99998	0.9999
	(-0.792)	(-1.464)	(-0.041)	(-0.258)
Wealth Index	0.994***	0.983***	0.992***	0.981***
	(-5.191)	(-13.934)	(-7.180)	(-14.375)
Free (Binary Freedom	0.841	0.987	1.387	1.490
House)	(-1.232)	(-0.064)	(1.490)	(1.504)
Free * Wealth	1.000	1.002	1.002	1.004+
	(0.169)	(0.973)	(1.242)	(1.957)

+p<.10 *p<.05 **p<.01 ***p<.001

Note: Each cell contains odds ratios and t-scores in parentheses. Each model controls for all individual-level variables. Household wealth models also control for GDP per capita at the country level.

5. Conclusion: Lessons Learned and Avenues for Future Research

Diarrhea and malnutrition are responsible for the majority of deaths among children under five in developing countries today. Commenting on the unnecessary suffering that results from preventable illness, Sen (2005) asks,

> How can we come to terms with the extensive presence of such adversity…? Do we see it simply as a human predicament – an inescapable result of the frailty of our existence? That would be correct had these sufferings been really inescapable, but they are far from that. Preventable diseases can certainly be prevented, curable ailments can certainly be cured…Rather than lamenting the adversity of nature, we have to look for a better comprehension of the social causes of horror. (xii)

As Sen points out, diarrhea and malnutrition are not only preventable, but they are patterned according to social factors that shape the risk and experience of illness. Global health inequalities, both within and between countries, result from a variety of socioeconomic factors like poverty and lack of access to education, clean water, and adequate medical care (Marmot 2005). This dissertation examines such factors, and more, in an effort to understand global patterns and vast inequalities in health. I assess the multi-level sources of cross-national variation in child diarrhea and malnutrition. In

the process, I ask how structural characteristics of countries shape individual health outcomes.

The results are unequivocal. Child health is better in countries with greater economic development, school enrollment, sanitation facilities, and health care. Child health is also likely to be better in countries where women overall have more education, control over their reproduction, representation in national politics, as well as longer life expectancy. Wealthier households and better educated mothers further reduce the risk of illness. These results suggest that macro, structural factors partially determine who faces increased health risks and who is protected from them.

5.1 Structural Violence as an Orienting Framework

The concept of "structural violence" provides an orienting perspective for the analyses by contending that a child's likelihood of experiencing malnutrition or diarrhea is shaped in party by social and economic forces larger than the individual. The term refers to social relations that become embodied as individual, physical experience (Farmer 1996). These relations are *structural* because they are embedded in large-scale historical processes of social and economic inequality that combine to constrain agency (Farmer 2005). They are *violent* because they prevent human beings from realizing their full mental and physical potential (Galtung 1969). According to this perspective, no specific actor is responsible for committing injury or impairment (Lane et al. 2004). Rather, violence is built into the structure of society and manifests as unequal power and

resources, and consequently, as unequal life chances (Galtung 1969). Thus, *structural violence* is harm that results from inequalities entrenched in social, political, and economic systems (Mukherjee 2007).

Of course, sociologists have long recognized that individuals are shaped by social facts, or collective realities that are external to individuals (Durkheim 1951). The concept of structural violence underscores Mills' (1959) classic assertion that there are forces larger than the individual that affect individual biographies. Medical sociologists more specifically recognize the ways in which social structures mould individuals' risk and experience of illness (e.g., House 2002; Link and Phelan 1995). Pointing to the connections between sociology and structural violence, Galtung (1969) notes that "the science of social structure, and particularly of stratification, [is] indispensable for the understanding of structural violence" (175).

What structural violence adds to the sociological description of the relationship between structure and individual health is the explicit connection to human rights and an emphasis on cross-national comparison. Farmer contends that illness and disease due to social and economic inequality are violations of human rights. According to this view, health disparities are social justice issues:

> Although the quandaries of the sick in industrialized countries are important and should never be dismissed, the failure of ethics to grapple with the tragedy of the modern era's *destitute* sick is nothing short of obscene…Surely it is an

> ethical problem, for example, that in the coming year an estimated six million people will die of tuberculosis, malaria, and AIDS – three treatable diseases that reap their grim harvest almost exclusively among populations without access to modern medical care. These deaths are reflections of structural violence and should be a central concern for the human rights community. (Farmer 2005: 22)

Farmer (2005) further remarks that continued inattention to remedying health disparities constitutes human rights abuse.

In addition, Farmer claims that any analysis of structural violence "must, first, be *geographically broad*. The world as we know it is becoming increasingly interconnected. A corollary of this fact is that extreme suffering – especially when on a grand scale…is seldom divorced from actions of the powerful" (42). A comparative, cross-national perspective helps elucidate the complex ways in which institutions and power relations affect within- and between-country variance in health. Yet, much of American medical sociology (including applications of fundamental cause) is dominated by a principal focus on the nature of health disparities within the U.S.

Social scientists often withdraw from the ethical judgments that are overtly displayed by structural violence scholars like Farmer. Yet, over 26,000 children under the age of five die every day on average, mostly from preventable causes and mostly in the developing world. Such statistics are far from unavoidable. The fact that children die from preventable illness like diarrhea and malnutrition is indeed violence, as well as a

human rights and social justice issue. For this reason, although I do not explicitly invoke the concept of structural violence in the empirical chapters of this dissertation, it provides an overall theoretical framework for the project and informs my scholarship more generally.

5.2 Summary of Results

Overall, the results of this study demonstrate that macro-level, social contexts shape the distribution of well-being in society. I decompose the idea of structural violence into three specific dimensions that are tested empirically in chapters 2-4: development, gender inequality, and democracy. The results generally suggest that development and gender equality are particularly advantageous for improved child health, although democracy is not as beneficial.

Chapter 2 integrates several theoretical frameworks that explore the SES-health link. Fundamental cause, economic development, and the capability approach have, until now, been deployed by scholars in separate bodies of literature that are not in conversation with each other. Yet, in many ways they are parallel theories that complement each other. Fundamental cause emphasizes individual-level wealth and education, but has rarely been applied to cross-national contexts. Conversely, the economic development perspective is typically used to explain cross-national differences in well-being, but at the neglect of inequality within countries. The capability approach suggests that clean water, sanitation, health care, and education are more important for

well-being than individual wealth or country-level GDP per capita. However, this perspective often overlooks the fact that wealth, GDP, and capabilities work in tandem.

Indeed, the results of this analysis suggest that an integration of the frameworks best explains within- and between-country heterogeneity in child health. At the individual-level, household wealth and maternal education are the most robust and consistent predictors of child diarrhea and malnutrition. In fact, these social factors are more important than intervening mechanisms like clean water or improved sanitation, providing evidence for fundamental cause. At the country-level, GDP per capita has large negative effects on all three malnutrition indicators, which supports the economic development perspective. However, the standardized effects of improved sanitation and secondary school enrollment are larger in magnitude than those of GDP for the odds of being underweight, supporting the capability approach. Furthermore, GDP does not have robust effects on diarrhea. Indeed, physicians per 1,000 and secondary school enrollment are more important for reducing the odds of diarrhea than GDP. Each of the theoretical frameworks adds important explanatory components to the SES-health link. A synthesis of the perspectives contributes to a fuller understanding of the complexities of within- and between-country heterogeneity in child health.

Chapter 3 focuses on gender inequality as a multi-level, multi-dimensional phenomenon that embodies decision-making and control of resources. At the individual-level, autonomous women are better able to care for their children through

increased knowledge, mobility, bargaining power, and allocation of household income. As more individual women gain autonomy, societal norms governing women's behavior begin to change. Women gain opportunities to transform social institutions and invest more public resources in social welfare, benefitting their own and other women's children. This results in a dispersion effect of improved women's autonomy on child health.

The findings of Chapter 3 show that gender equality is generally advantageous for child health. At the individual-level, maternal education has large negative effects on diarrhea and malnutrition, although maternal employment does not have robust effects. At the macro-level, child health is better in countries with increased women's education, political participation, reproductive autonomy, and life expectancy. Notably, the standardized effects of the gender equality scale are larger than those of GDP per capita and household wealth. Gender clearly matters for child health. In fact, broad contexts of gender equality are just as important, if not more so, than GDP and wealth for enhancing child well-being.

A considerable body of literature finds that democracy consistently reduces mortality and increases life expectancy, but these findings have largely not been extended to other health indicators. The final empirical chapter tests the purported hypothesis that democracy has direct effects on child diarrhea and malnutrition. Recognizing that democracy can be operationalized in numerous ways, I consider a

variety of indicators from multiple data sources to provide a comprehensive test of its effects. These include cross-sectional levels of democracy, dichotomous measures of democracy, stock of democracy over time, stability and change in democracy, and interactive effects of democracy with economic development and household wealth.

Bivariate correlations between the democracy indicators and the set of child health outcomes are surprisingly weak (between -.20 and .20). Descriptive scatter plots show that there is great variation in child health across all levels of democracy. Some countries follow the expected pattern of high democracy and low diarrhea and malnutrition, but others have relatively low democracy and also low diarrhea and malnutrition. As a result, the 84 multivariate models presented in Chapter 4 yield only two significant democracy coefficients at the .05 level. Whereas development and gender inequality exhibit robust relationships with child health, democracy does not appear to have similar effects.

5.3 Limitations and Contributions

Cross-national data on child diarrhea and malnutrition remain imperfect. The analyses are constrained to DHS countries with surveys since 1995 to make them relatively comparable in time and content. This, along with missing data on relevant independent variables, limits the sample size to approximately 50 countries. With a sample size of 50, restricted variance in the independent variables could provide less statistical power to find robust effects. But given the fact that I do still find significant

effects suggests that those relationships are powerful. The sample size also limits the number of covariates one can add at level two. However, compared to other studies using DHS data, the present study provides a large-N analysis of child diarrhea and malnutrition in developing countries that broadens the scope of comparison. Moreover, the sample appears to be comparable to the larger population of low and lower-middle income countries (see Appendix B).

Of course, the cross-sectional nature of the analyses limits the ability to observe trajectories in child health outcomes. The independent variables could have differing effects on changes in diarrhea and malnutrition prevalence over time. Although democracy does not predict diarrhea or malnutrition at one time point, it could plausibly influence increasing or decreasing rates of these conditions over time. Furthermore, the analyses estimate prevalence rather than incidence. Differential mortality due to diarrhea and malnutrition could bias the estimates of prevalence. If children are developing the conditions at a similar rate, but dying from them at a higher rate in certain countries, then prevalence will be underestimated. However, this is will only bias the coefficient estimates if differential mortality due to these conditions is highly correlated with the independent variables, which is unlikely.

Some of the independent variables are moderately correlated with each other. It is likely that GDP per capita contributes to increased secondary school enrollment, improved sanitation, more doctors, and greater gender equality. However, it is also

plausible that all of these factors bring about healthier children who grow up to be more productive citizens and contribute to growing GDP per capita. In reality, economic development, capability development, and gender equality likely work in tandem to produce healthier children. Although it is beyond the scope of the current methods to do so, future research could try to parse this out. Still, it is notable that the gender inequality and capability development variables have significant effects on child health, even net of GDP and net of variation in household and maternal characteristics.

Despite these limitations, this dissertation contributes to the fields of medical sociology, demography, and global inequality in several key ways. American medical sociology has typically neglected developing countries in its prevailing focus on health disparities within the U.S. This dissertation expands the focus of extant medical sociology literature and calls for more consideration of the ways in which health disparities are concentrated in certain areas of the world. Although demographers have demonstrated more scholarly interest in health in developing countries, they have typically used the DHS to study one country or region at a time. The present study contributes to a burgeoning literature in demography that uses multi-level models to estimate community-level effects on well-being. However, it expands this literature by using multi-level models to estimate within- and between-country heterogeneity in child health across a large sample of developing countries.

The social predictors of infant and child mortality have been well studied among sociologists. Yet, the influence of macro-level contextual factors on child malnutrition and diarrhea has been understudied in the social science literature to date, despite the fact that they remain two of the largest causes of child mortality in developing countries. These conditions may more specifically approximate the aspects of well-being that child mortality typically represents (e.g., access to nutrition, clean water, and sanitation). For this reason, they deserve to be studied in their own right if we want to more fully understand child well-being in LDCs. As more direct measures of general well-being, they may help us better identify ways to increase child health, and therefore, survival.

Finally, the dissertation as a whole offers a broad assessment of the macro-structural factors that contribute to better life chances for children in developing countries. Chapter 2 integrates three theoretical frameworks that have previously been deployed in separate literatures in order to more broadly capture the complexities of within- and between-country heterogeneity in child health. Chapter 3 offers a more comprehensive evaluation of gender inequality by testing multiple indicators that capture education, employment, political participation, reproductive autonomy, and life expectancy. Chapter 4 also offers a more comprehensive test of the effects of democracy by examining an extensive set of indicators from multiple data sources. Thus, this study more generally advances our understanding of what kinds of structural inequalities affect individual well-being. Using a multi-level, comparative perspective, I illustrate

how social forces that are larger than the individual manifest as unequal life chances for children.

5.4 Future Research

As previously mentioned, Farmer is admittedly vague in his definition of structural violence. I concentrate on development, gender inequality, and democracy here because of Farmer's own emphasis on economics, gender, and politics in various writings. There are, of course, other macro-level factors that significantly affect cross-national variation in child health that could plausibly be considered as "structural violence," including but not limited to debt and globalization. One particular innovation of this dissertation is that I have built an extensive dataset of both country- and individual-level variables. I plan to continue using DHS data and multi-level modeling techniques to examine the possible effects of debt and globalization on various aspects of women's and children's well-being. Extant sociological literature on these topics is rather dated. Thus, my approach could shed new light on classic debates using understudied dependent variables, more recent data, and a new methodological approach.

"Structural adjustment" refers to policies that are imposed on borrowers by international financial institutions (typically the International Monetary Fund or IMF) in order to facilitate debt repayment. This is achieved through such measures as currency devaluation, wage freezes, increased privatization, tariff removals and increased

exports, and overall government spending reductions (Bradshaw and Huang 1991). The need to negotiate debt often weakens the ability of governments to distribute resources and alleviate poverty (Hoffman and Centeno 2003). Structural adjustment programs and their corresponding domestic austerity measures hamper well-being by eliminating food subsidies and allocating fewer resources for publicly provided social welfare and health maintenance programs (Kanji, Kanji, and Manji 1991; Peabody 1996). For this reason, debt and structural adjustment directly or indirectly have been linked to a range of health-related outcomes, such as mortality, immunization, health care, and nutrition (e.g., Bradshaw et al. 1993). The debt crisis took a heavy toll on low-income countries in the 1980s and continued into the 1990s. But since the mid-1990s, many countries have achieved steady economic growth and no longer return to the IMF for debt restructuring. As the debt crisis is resolved, IMF structural adjustment programs are being replaced by country-led poverty reduction and development strategies (Radelet 2010). Thus, whether current structural adjustment programs or a legacy of involvement with the IMF continue to affect well-being is an empirical question.

Another plausible avenue for research concerns the effects of globalization, i.e. integration with the global economy through trade and foreign investment. Research in the dependency/world-systems tradition suggests that unequal exchange relationships between core and non-core nations result in underdevelopment in developing countries. Many scholars conclude that economic linkages with developed countries through trade

and foreign investment have harmful influences on mortality and the physical quality of life in developing countries (e.g., Stokes and Anderson 1990; Wimberley 1990). Shandra and colleagues (2004, 2005) more recently demonstrate that multinational corporate penetration increases infant and child mortality in developing countries. However, much of the literature in this tradition is quite dated, ranging from the 1980s to the early 1990s (e.g., Dixon 1984; London and Williams 1988, 1990; Stokes and Anderson 1990; Wimberley 1990; Wimberley and Bello 1992; Bradshaw et al. 1993; Firebaugh and Beck 1994). Thus, the question of whether integration with the global economy continues to affect well-being in developing countries today remains an empirical one.

In addition to revisiting these classic concerns, I would also like to pursue several research questions that are more directly tied to this dissertation. Given the discrepancy between previous literature and the results of Chapter 4, the democracy-health link deserves further scrutiny. Previous literature finds significant democracy effects on mortality and life expectancy, but I do not find similar effects on child diarrhea and malnutrition. What about other health outcomes? More specifically, the DHS includes measures of malaria, respiratory infection, and anemia, as well as number of immunizations received. Because democracy is conceptualized as a proxy for investment in social services and health care, it may be a better predictor of immunization status. Moreover, the other dissertation chapters could also be expanded to examine alternative health outcomes, both for children and their mothers. Such an

agenda would contribute to building theory about how different health measures represent dimensions of inequality and are influenced by various dimensions of structural violence.

Future research could also explore the possible interaction effects of democracy further. Shandra and colleagues (2004, 2005) find no *direct* effect of democracy on infant and child mortality in a sample of 59 developing countries. However, they find that levels of democracy condition the effects of other potentially deleterious international, economic forces. Although it might not have a direct effect, democracy improves child health by moderating the harmful effects of multinational corporations and international lending institutions (Shandra et al. 2004, 2005). Wickrama and Mulford (1996) similarly find that democracy moderates the adverse effects of disarticulation on well-being. Others find significant interaction effects between democracy and government size (Lee 2005) or development aid (Kosack 2003; Navia and Zweifel 2003). Given the preponderance of literature that examines direct effects of democracy, studies of its interaction effects are rare. But this growing body of literature demonstrates that the benefits of democracy may only manifest in combination with other contingencies. An analysis of interaction effects may prove to be a more fruitful way to better understand the nuances of the democracy-health link.

Finally, in an effort to synthesize the themes of all three empirical chapters presented here, future research could explore the connections between gender

inequality, economic development, and democracy. Feminist perspectives on economic development point out that women are often excluded from the development process or that unequal power relations between men and women prevent women from reaping the same benefits as men. Thus, growing economies do not benefit everyone equally (Bose and Acosta-Belen 1995; Parpart et al. 2000). Feminist perspectives on democratization similarly point out that democracy does not guarantee gender equality. Women's mobilization and participation are contingent on historical and institutional factors and power relations that shape the gendered outcomes of democratic transitions (Viterna and Fallon 2008). This leads to a number of research questions, including: How do increasing GDP per capita, capability development, and democratization influence women's health? Does gender inequality have varying effects across different levels of development or democracy on women's and children's health? Conversely, do the effects of economic development or democracy differ across varying levels of gender inequality?

Overall, this dissertation contributes to a broader research agenda that utilizes a comparative, cross-national perspective to examine the impact of social structural forces on health and poverty, with an emphasis on women and children. Health is a productive site for studying inequality as it is one of the most fundamental indicators of life chances and is integrally related to many other aspects of disadvantage. Thus, my research is motivated by several key questions: What explains global patterns and vast inequalities

in health and well-being? How do macro structures shape individual life chances? How do contexts of gender inequality manifest as unequal power and resources, and consequently, as unequal life chances for women and their children? Drawing on theories of comparative institutions, feminism, democracy, and development, I use cross-national and multi-level research designs to illustrate the ways in which political, institutional, economic, and policy contexts influence the lives of women and children. While recognizing the role of individual characteristics, my work underscores the importance of social structures for shaping the distribution of well-being across societies.

Appendix A

Weighted Average of Dependent Variables by Country (%)					
Country	Survey Year	Stunting	Wasting	Underweight	Diarrhea
Armenia	2005	16.99	12.44	8.61	2.89
Azerbaijan	2006	10.84	25.29	6.44	6.84
Bangladesh	2007	10.38	36.65	15.67	35.87
Benin	2006	9.18	39.94	8.04	16.41
Bolivia	2003	22.67	26.84	2.02	4.35
Brazil	1996	13.62	9.52	3.10	3.55
Burkina Faso	2003	21.31	38.58	22.13	30.97
Cambodia	2005	19.34	36.14	7.50	24.73
Cameroon	2004	17.09	31.44	6.19	13.04
Central African Republic	1995	23.24	32.61	9.24	18.91
Chad	2004	27.18	40.26	16.52	29.80
Colombia	2005	14.75	11.30	1.67	3.54
Comoros	1996	23.53	32.15	10.75	18.46
Cote d'Ivoire	1999	22.26	26.66	6.61	14.71
Democratic Republic of the Congo	2007	15.97	41.92	10.29	21.93
Dominican Republic	2007	15.07	7.07	2.28	2.39
Egypt	2008	8.46	26.83	8.65	5.16
Ethiopia	2005	18.92	46.51	12.42	30.29
Gabon	2000	16.80	20.42	4.45	7.07
Ghana	2003	15.50	28.27	8.83	14.45
Guatemala	1995	21.18	48.34	4.09	18.26
Guinea	2005	16.22	34.59	11.55	19.40
Haiti	2006	23.90	22.76	10.49	15.33
Honduras	2005	16.81	24.32	1.66	6.85
India	2006	9.25	42.65	19.32	38.39
Jordan	2007	18.56	14.85	7.15	4.73
Kazakhstan	1999	11.35	11.42	2.46	2.96
Kenya	2003	16.71	29.62	6.66	13.55
Kyrgyz Republic	1997	18.05	22.65	3.17	5.42
Lesotho	2004	15.50	38.18	5.65	14.21
Liberia	2007	21.59	33.95	8.73	15.57
Madagascar	2004	9.84	45.90	15.16	31.53
Malawi	2004	23.12	46.75	7.07	15.00
Mali	2006	13.92	33.24	16.31	24.42
Moldova	2005	7.22	7.83	6.31	2.72
Morocco	2004	11.96	19.14	10.37	7.62

Appendix A continued from previous page					
Mozambique	2003	14.49	40.01	5.70	17.74
Namibia	2007	14.51	23.58	7.34	14.46
Nepal	2006	12.17	42.38	11.19	33.80
Nicaragua	2001	13.07	20.82	2.34	6.21
Niger	2006	20.54	50.49	12.76	35.64
Nigeria	2003	19.35	38.90	12.17	23.74
Peru	2000	15.56	25.54	1.12	3.92
Republic of the Congo	2005	14.27	25.46	8.08	9.44
Rwanda	2005	14.29	44.89	4.61	15.41
Senegal	2005	22.88	15.39	8.75	11.10
Swaziland	2007	15.19	22.82	3.39	3.83
Tanzania	2004	13.27	35.77	3.51	13.07
Togo	1998	31.37	23.36	14.50	18.54
Uganda	2006	26.80	30.24	6.38	13.18
Uzbekistan	1996	5.13	33.76	13.68	11.85
Zambia	2007	16.19	39.91	5.62	11.80

Appendix B

Comparison of average sample characteristics to other aggregate groups of developing countries

						Study Sample		
	Least developed	Low income	Lower middle income	Middle income	Low & middle income	**25th percentile**	**Mean**	**75th percentile**
GDP per capita (dollars)	960.08	997.59	2986.07	4233.83	3694.20	990.49	2670.53	3664.41
Female secondary school enrollment (%)		35.20	54.20	61.29	56.40	21.00	44.53	82.11
Female employment rate (%)	57.58	59.71	48.07	46.67	48.60	39.70	52.07	64.70
Women in national parliament (%)	11.83	13.54	12.38	13.76	13.70	6.00	11.63	14.60
Contraceptive prevalence (%)	27.86	36.62	63.59	64.35	59.83	17.40	38.90	57.10
Female life expectancy (years)	55.77	58.34	68.06	69.31	67.47	52.07	60.69	71.00

Notes: Values for the first 5 columns are averages of each aggregate group in 2003 (the average survey year of the study sample). According to the United Nations Statistics Division, there is no established convention for determining the designation of "developed" and "developing" countries. Generally, Japan, Canada, the US, Australia, New Zealand, and Western Europe are considered "developed" (United Nations 2010). Thus, there is considerable variation in the countries that are termed "developing." Least developed is a United Nations classification that refers to the most disadvantaged economies of the world. The World Bank classifies countries in income groups based on gross national income per capita. Low income = $995 or less, lower middle income = $996-$3,945, middle income = $996-$12,195. Although there is great variation in the study sample, on average, it is fairly comparable to low and lower middle income countries.

Appendix C

Chapter 2 Correlation Matrix of Country-Level Development Variables (N=47)						
	1	2	3	4	5	6
(1) GDP per capita (ln)	1.00					
(2) Improved water source	.69	1.00				
(3) Improved sanitation facilities	.57	.65	1.00			
(4) Physicians per 1,000 (ln)	.70	.71	.80	1.00		
(5) Secondary school enrollment	.70	.70	.80	.90	1.00	
(6) Capability development scale	.73	.85	.90	.94	.94	1.00

Appendix D

Logistic Regression Models of Child Health on *Individual-Level* Access to Improved Water Sources and Sanitation Facilities (N=47)

	Diarrhea		Stunting		Wasting		Underweight	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Piped Water	0.890		0.580***		0.658***		0.466***	
Well Water	1.066		0.972		1.203		1.010	
Flush Toilet		0.712***		0.367***		0.558***		0.317***
Pit Latrine		1.023		0.718***		0.565**		0.476***

*** p<0.001, ** p<0.01, * p<0.05

Notes: Odds ratios displayed only. Standard errors are adjusted for country clusters.

Appendix E

Chapter 3 Correlation Matrix of Country-Level Gender Inequality Variables (N=50)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
(1) Diarrhea	1.00														
(2) Stunting	.12	1.00													
(3) Wasting	.06	.47	1.00												
(4) Underweight	.13	.78	.79	1.00											
(5) GDP per capita (logged)	-.26	-.70	-.48	-.64	1.00										
(6) Female school enrollment	-.44	-.68	-.46	-.66	.73	1.00									
(7) Female to male enrollment	-.45	-.44	-.51	-.48	.55	.71	1.00								
(8) Female employment rate	.19	.38	.09	.28	-.52	-.51	-.34	1.00							
(9) Female to male emp. rate	.02	.17	-.01	.07	-.33	-.27	-.16	.87	1.00						
(10) Women in parliament	-.08	.04	-.20	-.05	-.13	-.16	.09	.44	.47	1.00					
(11) Women in democ. parliament	-.07	-.19	.01	-.02	.16	.04	.22	-.15	-.01	.24	1.00				
(12)Total fertility rate	.51	.66	.35	.51	-.67	-.84	-.68	.41	.15	.12	-.07	1.00			
(13) Contraceptive prevalence	-.48	-.63	-.49	-.58	.69	.89	.78	-.47	-.29	-.10	.02	-.86	1.00		
(14) Female life expectancy	-.34	-.59	-.24	-.41	.61	.74	.46	-.50	-.45	-.27	-.08	-.73	.72	1.00	
(15) Female to male life expectancy	-.12	-.47	-.24	-.39	.31	.46	.14	-.09	-.04	-.13	-.17	-.47	.36	.61	1.00

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Biography

Rebekah Burroway was born in Aurora, IL. She received her B.A. in Sociology and English from Aurora University (2000), M.A. in International Relations from the University of Chicago (2002), and M.A. in Sociology from Duke University (2007). Her current publications include the following: "Schools Against AIDS: Secondary School Enrollment and Cross-National Disparities in AIDS Death Rates" (solo-authored in *Social Problems*); "Factors Associated with Awareness and Utilization of a Community Mobilization Intervention for Female Sex Workers in Andhra Pradesh, India" (with Kim Blankenship and Liz Reed in *Sexually Transmitted Infections*); "Sector, Size, Stability and Scandal: Explaining the Presence of Women Executives in Fortune 500 Firms" (with David Brady, Katelin Isaacs, Martha Reeves, and Megan Reynolds in *Gender in Management*); and "Targeting, Universalism and Single Mother Poverty: A Multi-Level Analysis Across 18 Affluent Democracies" (with David Brady forthcoming in *Demography*). She was honored to receive the 2010 Vorsanger-Smith Scholar Award, presented annually by the Duke University Department of Sociology to recognize overall excellence in the graduate program.