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# HUMAN DEVELOPMENT IN POOR COUNTRIES: BANGLADESH IN COMPARATIVE PERSPECTIVE

Nafisa Halim

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**HUMAN DEVELOPMENT IN POOR COUNTRIES:  
BANGLADESH IN COMPARATIVE PERSPECTIVE**

**BY**

**NAFISA HALIM**

M.A., Sociology, University of New Mexico, 2003  
M.A., Economics, University of New Mexico, 2007

DISSERTATION

Submitted in Partial Fulfillment of the  
Requirements for the Degree of

**Doctor of Philosophy in Sociology**

The University of New Mexico  
Albuquerque, New Mexico

**May, 2010**

## **DEDICATION**

*To the “needlessly hungry” children in Bangladesh*

## ACKNOWLEDGEMENTS

A dissertation starts, matures, and ends with help from many. Mine is no exception. Therefore, a series of acknowledgments is in order. But, first, I thank the World Bank for making public their datasets, called, Household Survey to Conduct Micro-Credit Impact Studies: Bangladesh, 1991-92 and 1998-99.

I thank my *guru* and Dissertation Chair, Andrew Schrank. Of course, Andrew's role in my growth as a scholar goes above and beyond the dissertation. Yet, the dissertation provides me with a solid ground to acknowledge his wise judgment and mastery in guiding empirical research. My dissertation topic saw its first light in Andrew's Comparing Nations seminar in the fall of 2005. Perhaps, as a part of class preparation, he recognized a notable and rapid child mortality decline in Bangladesh since late 80s. As a comparative sociologist—whose knowledge moves well beyond Central and Latin America and to South Asia—Andrew was convinced that Bangladesh is all-in-all a human-developmental paradox. And, as a mentor, he was convincing to me that by studying the Bangladeshi paradox, I should be able to enmesh my native heritage with twin-interests in sociology of development and quantitative methods. Of course, the dissertation turned out to be more puzzling than we anticipated—“a puzzle within the puzzle” as my Chair sums up. Yet, carrying it on for multiple years and carrying it out with enough methodological rigor and substantive vision were always a team—never a solitary—effort. In fact, Andrew's substantive, stylistic, and methodological mentorship led to as good answers to the “why's” and the “how's” of my dissertation puzzles as empirical research often permits. But, the fact that I was critiqued—never judged, motivated—never managed, intrigued—never intimidated by the scholarship of

Andrew's stature, and learning in an environment that never stopped me from asking him even the stupidest questions led me to begin thinking more substantively, arguing more coherently, and taking my academic effort to great lengths so I can answer his "how do you know" questions. In the process, I believe I have made the professional leap towards becoming the scholar I aspire to become in life. And, I attribute that to Andrew.

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## **ABSTRACT**

My dissertation addresses the “developmental paradox” of rapid gains in human development in Bangladesh against the backdrop of a social scientific literature that portrays two of the country’s endemic features—Islam and illiberal politics—as inveterate obstacles to their achievement. I use data from household surveys conducted by the Bangladesh Institute of Development Studies in collaboration with the World Bank in 1991-2 and 1998-9, and identify the distal determinants of the Bangladeshi mortality decline. I find female education has a linear effect and household income has a curvilinear effect on infant and child mortality. Why is the relationship between income and child mortality curvilinear (quadratic)? And why is female education improving in an allegedly hostile Muslim environment? The survival analysis of infant and child mortality in Bangladesh finds that the very poor and rich households are relatively more successful than their middle-income counterparts in suppressing deaths among children. Results suggest that by targeting transfers of nutrition and health services at very poor households, state redistributive programs might have offset poverty-induced threats to human development among beneficiary families but left the non-beneficiaries—many of whom are still poor—to fend (or in many cases not fend) for themselves. Welfare gains

from these “pro-poor” redistributive programs are thus ambivalent. Furthermore, the Bi-variate Probit analysis of female educational attainment finds that educational attainment is possible with female educational subsidies as long as the process of attainment delays but does not deny the importance of marriage and reproduction in Bangladesh’s pronatalist culture. The impact of educational subsidies is mediated by birth order, however. While subsidies appear to have little effect upon first-born girls, who face overwhelming pressure to marry and reproduce at a young age, they seem to have a profound effect on offspring of later parities, who tend to stay at school while their older female sibling(s) await marriage—and thereby raise the prospects for human development down the road. Overall, I conclude that Bangladesh’s gender-sensitive redistributive development policies have contributed to rapid infant and child mortality decline. Ultimately, my dissertation reveals that Muslim societies and cultures are more permeable than the standard portrait allows.

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## CHAPTER I: INTRODUCTION

Despite substantial reductions in child mortality in the late 20<sup>th</sup> century, infant and child mortality remains a critical human development challenge for low and middle-income developing countries. UNICEF, for instance, estimates that globally 9.7 million children died in 2006 alone, almost all in developing countries (UNICEF, 2007). Nonetheless, children from developing countries do not all share parallel threats to mortality. Gaps in mortality prospects are staggering—and widening—among low-income countries as well as between low- and high-income countries,<sup>1</sup> and, worse still, between income-groups within low-income countries (Victora et al., 2003). A challenge to economic as well as human development at large, academicians and practitioners debate the alternatives in order to prevent 120 deaths from diarrhoea, pneumonia, measles, malaria, or HIV/AIDS for every 1000 children in low-income countries before their fifth birthday.

Why do poor countries differ in how many infants and children per 1000 live births they are able to save? For instance, despite seemingly comparable socio-economic attributes, why does Pakistan fail to save as many children per 1000 live births as Bangladesh?<sup>2</sup> And, why do mortality gaps between children born to rich and poor households differ among poor countries? Are children from poor households face as much (low) risks of premature deaths as those from rich households? Scholars identify different causes, and broadly alternate between economic growth and redistribution of income with public provisioning of social services being the principal determinant of child mortality reduction in poor countries.

---

<sup>1</sup> Six and 88 of every 1000 children die in high- and low-income countries respectively before their 5<sup>th</sup> birthday. This rate is 120 per 1000 in the world's poorest countries.

<sup>2</sup> In 2004, under-5 child mortality rate (infant mortality rate) is 100.8 (80.2) and 77 (56.4) per 1000 live births in Pakistan and Bangladesh respectively (WDI, 2004).

The market-based, growth-induced accounts for reducing childhood deaths maintain that rising national income increases private spending on goods and services that directly or indirectly improve health (McKeown and Record, 1962; McKeown, 1983; Pritchett and Summers, 1996; Easterly, 1999; Filmer and Pritchett, 1999; Filmer, Hammer and Pritchett, 2000, 2002; Dollar and Kraay, 2004). Following this view, the causal implication behind the empirical regularity that children die in higher rates in low-income countries and lower rates in high-income countries is that economic growth reduces childhood mortality by increasing individuals' ability to purchase health inputs—food, health care, medical services, and basic education. The key policy focus is to increase individuals' command over goods and services assuming that greater purchasing power of health inputs leads to improved health and nutrition, and thereby lowers rates of childhood mortality. Pritchett and Summers (1996) predict that as many as 33,000 infants and 53,000 children could be saved if developing countries raised income by 1 percent (p. 844).

Alternatively, others argue that redistribution of income with public provisioning of health inputs – primary health care, sanitation, clean drinking water, and especially female education—helps reduce childhood deaths regardless of national economic prosperity or adversity (Caldwell, 1986; Hill and Pebley, 1989; Anand and Ravallion, 1993; Dreze and Sen, 1991). The growing dissociation between economic growth and childhood mortality, and the striking success in reducing childhood deaths in low-income countries, such as, Sri Lanka, Costa Rica, and Kerala of India challenge the market-based, economic deterministic explanation of childhood deaths, and thereby suggest that child health can be achieved at a low cost. In fact, scholars in this alternative camp

maintain that economic growth is instrumental in reducing childhood deaths only when growth translates into (a) high public expenditures on health and education (Ranis, Stewart, and Ramirez, 2000), and (b) reduction of poverty (Anand and Ravallion, 1993). Caldwell (1986) further argued that state's redistributive policies manifested in public programs fostered optimal results only when implemented in an egalitarian structural context that values participation, equity, education, and women's autonomy. He maintained that traditional Muslim societies were ill disposed toward such values and therefore tended to underperform in terms of human development in general, and child mortality in particular.

Does economic growth or redistribution of income save infant's and children's lives in Bangladesh? Perhaps not as linearly as either of these paradigms tends to predict. At the aggregate level, Bangladesh has reduced child mortality despite slow growth and relatively low levels of redistribution. The country has halved mortality in infancy and childhood by saving, on average, 5 more lives per 1000 live births than the baseline rate thirty year ago.<sup>3, 4</sup> Since then, infant mortality has dropped from 158 to 66 per 1000 live births—a 58% reduction in nearly three decades since Bangladesh won independence in 1971. Similarly, child mortality has dropped from 237 to 90 per 1000 live births—a 62% reduction during the same time period.

Bangladesh thereby appears as a paradoxical case with regards to the key alternative explanations of human development. Few countries in the world match the

---

<sup>3</sup> Infant mortality rate (IMR) is defined as the probability of dying within the first year since birth. IMR refers to the death counts per 1000 live births of under-12 months old babies.

<sup>4</sup> Under-five mortality rate (U5MR) is defined as the probability of dying within the first five years since birth. U5MR refers to the death counts per 1000 live births of under-12 months old babies, 1-4 years old children, and >4 and <6 years old children.

pace at which Bangladesh has reduced mortality, and few share the long—often interrelated—list of cultural, structural, and institutional disadvantages that are the potential bottlenecks against the country’s adoption and implementation of the human development policies. The country has reduced mortality despite (a) economic stagnation of in the 1980s, (b) a high level of absolute poverty, (c) relatively low public investment in health, (d) low female literacy rates, (e) histories of authoritarian, and fragile democratic regimes, and (f) unaccountable bureaucracy. And, Bangladesh is a Muslim-majority country with an established patriarchy. In 1988, the country transformed from secularism to Islam as the state religion, and Bangladesh adheres to Muslim (*Sharia*) laws of inheritance, family, marriage, divorce, custody of children, etc.

Why do cultural, structural, and/or institutional disadvantages seem not to be as binding in child mortality decline in Bangladesh as pertinent literature so vividly suggests? How has the country managed to reduce mortality despite its inhospitable political culture?

I consider the micro-implications of some of these macro questions in this dissertation. I address these questions by using data from household surveys conducted by the Bangladesh Institute of Development Studies in collaboration with the World Bank in 1991-2 and 1998-9. In essence, I reassess (well-documented) socio-economic determinants of child mortality in Bangladesh’s “new” developmental context. I find that gender-sensitive redistributive developmental policies can develop in an inhospitable culture of Islam and patriarchy and can yield human development payoffs.

My dissertation consists of 5 additional chapters. Chapter 2 identifies, and elaborates on the Bangladeshi paradox that during the past three decades, Bangladesh has

been transformed from an international “basket case” into one of the fastest reducers of infant and child mortality in the world. Chapter 3 uses panel data from household surveys to identify the distal determinants of the Bangladeshi mortality decline and finds that female education has a linear effect and household income has a curvilinear effect on infant and child mortality.

This merely pushes the puzzle back a step, however, so the next two chapters address the new puzzles I have identified: Why is the relationship between income and child mortality curvilinear (quadratic)? And why is female education improving in an allegedly hostile Muslim environment? Chapter 4 addresses the first question by examining the ambivalent impact of targeted anti-poverty programs (e.g., Food for Education). By deploying an overly conservative, land-based targeting principle, the Bangladeshi government is excluding many poor families, and is thereby raising the likelihood that the very poor—who benefit from the programs—experience lower levels of infant and child mortality than the everyday poor, who do not qualify for the subsidies. Chapter 5 addresses the second question by examining the impact of female educational subsidies and finds that their impact is mediated by birth order. While subsidies appear to have little effect upon first-born girls, who face overwhelming pressure to marry and reproduce at a young age, they seem to have a profound effect on offspring of later parities, who tend to stay in school while their older female sibling(s) await marriage—and thereby raise the prospects for human development down the road. Chapter 6 concludes.

## CHAPTER II: THE BANGLADESHI PUZZLE

Despite a significant reduction in child mortality in recent years, the global account of child deaths is still high. Every year, more than 10 million children die worldwide before their fifth birthday (Ahmad et al., 2000; WHO, 2002). There is substantial variation, however, in child mortality across continents, sub-continent, and countries. While Africa and Asia account for a large share of child deaths, about 34% of child deaths occur in South Asia—second only to sub-Saharan Africa’s 41% in 2000 (Black et al., 2003). Only five countries—2 of them in South Asia—account for 50% of global child deaths in absolute numbers,<sup>5</sup> and Bangladesh along with 41 low- and middle-income developing countries account for 90% of child deaths worldwide. One in ten children in South Asia dies from preventable and curable diseases before their fifth birthday (Black et al., 2003).

What explains low-income developing countries’ varied success in reducing childhood mortality? Is there any uniform way to reach mortality breakthrough? Scholars disagree, and alternate primarily between two key competing explanations, namely, economic growth and redistribution of income with public provisioning of social services accounts. In addition, some other scholars believe economic growth provides only a partial explanation of cross-national variation in health, and suggest that health researchers should adopt a social determinants framework.

Proponents of this market-based thesis hold that income growth in households and the state reduces child mortality, and thus raising per capital incomes ought to be a key strategy towards child mortality reduction in low-income developing countries (McKeown and Record, 1962; McKeown, 1983; Pritchett and Summers, 1996; Easterly, 1999; Filmer and Pritchett, 1999; Filmer, Hammer and Pritchett, 2000, 2002; Dollar and

---

<sup>5</sup> These five countries are: India, Nigeria, China, Pakistan, D R Congo, and Ethiopia.

Kraay, 2004). Child mortality decline, typically viewed as a natural byproduct of economic growth, decreases with income under the assumption that public and private spending on health inputs increases with income. In particular, with a rising real national income per capita the state increases its expenditure on health care and its correlates, and households are better able to suppress premature deaths by increasing individual purchases of health inputs, broadly defined to include food, health care, medical services, and basic education.

The influence of economic conditions on mortality has the oldest legacy among alternative accounts—dating back to the late 18<sup>th</sup> century or older. Thomas Malthus (1798) in *An Essay on the Principal of Population* proposed a relationship between food supply and mortality, as mediated by population growth. Malthus argued that the population grew exponentially until stopped by famine, plague, war, or other forms to “natural” checks; food supply and the demand for it among people returned to a reasonable balance as a result. Thomas McKeown, in the post-Malthus era, reconsidered the relationship, and argued that mortality responded to improved nutrition more than it did to other correlates of economic growth, such as advancement in medical technologies. McKeown (1976) in this famous book, *The Modern Rise of Population* (1976), compared epidemiological records from England and Wales since the mid-nineteenth century, and essentially endorsed the Malthusian argument after nearly two centuries.

After nearly 20 years, Pritchett and Summers (1996) revitalized the market-based, economic deterministic explanation of childhood deaths by expanding the reference base to developing nations. The authors claimed that “wealthier is (indeed) healthier,” and invoked causal arguments that rising national income—proxied by GDP per capita—

increased private and public health inputs spending and suppressed child mortality as a result. Pritchett and Summers (1996) predicted that as many as 33,000 infants and 53,000 children in developing countries could be saved each year if countries were to raise income by 1 percent (p. 844). In more recent years, scholars have further shown that higher economic growth moves countries towards greater income equality and less poverty, and thereby ousts the structural predicaments against child mortality (Filmer and Pritchett, 1999; David and Kraay, 2001).

How does the relationship between economic development and child mortality change, at least in theory, when (a) the economy grows but the absolute poverty does not improve, i.e., income improves for some but all, the absolute poverty remains the same as before economic growth, and income-inequality grows, or (b) the economy grows but income-inequality does not improve, i.e. income grows for all, the absolute poverty declines, but income-inequality remains the same as before economic growth in that the relative difference in income between the highest and the lowest economic strata remains intact. While proponents of the market-based thesis would be concerned only with the former, some scholars who study the *Social Determinants of Health* would argue that child health deteriorates from the relative poverty in the latter as much as it does from the absolute poverty in the former hypothetical economic context (Marmot 2004, 2005; Marmot et al., 2006; Wilkinson, 1996, 2005; Wilkinson and Pickett, 2009; WHO, 2008).

Despite being low across high-income developed countries, the mortality rate between the low- and the high-income groups within a developed country varies substantially. For example, mortality rates at most ages after infancy were higher in Harlem than those in not only other areas of New York but also rural Bangladesh

(Wilkinson, 1996). Given the fact that Harlem residents' income is significantly higher than rural residents' income in Bangladesh, the *Social Determinants of Health* scholars bring attention to relative and absolute as opposed to only absolute income as a health determinant. These scholars argue the psychosocial effects from individuals' relative economic status influence health in more ways than were previously recognized especially in high-income developed countries which have attained basic minimum standards for the vast majority of the population and gone through the epidemiological transition (infectious diseases give way to cancers and degenerative diseases as the main causes of death).

*Social Determinants of Health* scholars talk about health both at the aggregate and the individual levels. In doing so, these scholars emphasize on the social meanings of economic status, and identify those as mediating the relationship between individual's economic status and health. They argue conditions at home, work, and leisure, access to health care, education, life in communities, towns, and cities as a set constitute the social determinants of health (WHO, 2008). As such, scholars talk about social hierarchy and individual's position in social hierarchy as the key explanatory variables for the societal health condition and individuals' health. And, the casual mechanisms are social disintegration and social stress.

At the aggregate level, the social determinant scholars argue that population health is sensitive to the wider social structure and environment (Wilkinson, 2005; Wilkinson and Pickett, 2009). Less hierarchical and more egalitarian—not the richest—countries have the best health, when we conceptualize health with higher life expectancy. Income, goods, and services are more equally distributed in egalitarian societies. And,

low inter- and intra-group income difference paves the way for social capital, cohesion, inclusion, a strong community life, and high civic engagement in social and voluntary activities in societies (Wilkinson, 1996, 2005). Conversely, Wilkinson (2005) argues that greater income inequality promotes competition, dominance, subordination, and discrimination and leads to greater social distance among groups and poor social relationships. He further argues that socioeconomic inequalities lead to social prejudice against and exclusion of racial and ethnic minorities, and health disparities along racial and ethnic lines emerge as a product of this process. In sum, any form of socioeconomic inequalities leads to ill-health, and people with more social contacts and involvements in local activities seem to have better health, even after controlling for a number of other possibly confounding factors (Wilkinson, 1996).

What is the micro counterpart of the association between egalitarian social structure and health as mediated by social cohesion? The social determinant scholars look at (a) his/her absolute social position, and (b) his/her social hierarchical position—how his/her social position deviates from the positions most members of his/her reference group maintain. And, they assess individuals' (c) psychosocial stress from their absolute as well as relative social positions, and (d) adoption of health-deteriorating behaviors (smoking, drinking, poor diet, being overweight, etc.) to predict how healthy an individual is expected to be.

To elaborate, at the individual level, one's position in social hierarchy determines how much economic and social stress he/she faces. Those at the bottom of social hierarchy suffer from not only material deprivation but also social, psychological, and emotional deprivations. The former often determines the latter forms of deprivation in

that an individual's low economic status means that h/she has poor education, works in a poor working condition, and lives in an unsafe neighborhood (Marmot, 2005). Wilkinson (1996), for example, cites numerous studies in Europe that have linked low economic status and health via material deprivation. For example, financial strain was the strongest mediating factor between unemployment and reported ill health in the UK and USA; and anticipated financial problems, as well as, loneliness, were found to be major mediating factors between individual's unemployed status and reported health problems in both Dutch men and women.

While material deprivation explains why an unemployed individual is more likely than his/her employed counterpart to suffer from a poor health or experience premature mortality, the fact that, in an occupational hierarchy, the high-status individuals are healthier than their low-status counterparts calls for a more nuance understanding of the relationship between socio-economic status and health. The *Social Determinants of Health* scholars argue that the social organization of work is particularly instructive in that regard. The social organization of work determines whether one's occupation provides him/her with the opportunities for (a) personal growth and development, (b) gathering positive experiences (self-efficacy and -esteem), and (c) building extra-primary group social networks (Marmot et al., 2006). And, (a), (b), or (c) has considerable health implications. First, employees tend to suffer from a poor health when their work is organized in a way that leaves them with low levels of decision-making and skill-utilizing authority and opportunity yet high levels of psychological pressure. Second, employee-health suffers when a high psychologically-pressured worker works in a static work environment in that he/she has a limited scope to garner a new set of skills, and for

professional growth. The employee has limited control over his/her work and feels less self-efficacious at work and life outside work. Third, employee-health suffers from a failed social reciprocity in an employment relation. When an employer does not value an employee's effort with remunerated and/or non-remunerated rewards, the employee perceives this as though the employer is breaching trust and expectancy and is likely to experience strong negative emotions and stress (Marmot et al., 2006). Finally, employee-health suffers from the lack of social support at work; workers in a high demand yet low social support employment have worse health than those in a high demand and social support employment.

Moreover, the *Social Determinants of Health* scholars argue that both home's and neighborhood's economic, social, and physical conditions influence health in the following ways (Marmot et al., 2006). First, while bad housing is commonly considered as being health-deteriorating, a low-quality domestic life maintains greater health ill-consequences than low-quality housing. Poor families suffer from a poor domestic life because they not only worry about money, jobs, and housing but also lack space to accommodate family needs, activities, etc. This often results in stress, conflicts, and subsequent health deteriorating behaviors. Second, neighborhood environment moderates this effect in that health ill-consequences are far reaching when poor families live in a neighborhood with sparse civic and recreational amenities, and low-level of social-capital.

Poor employment and housing conditions increase psychosocial stress, and psychosocial stress affects health by (a) weakening the immune system and thereby making individuals more susceptible to ill health and/or (b) leading individuals to adopt

health-damaging behaviors such as smoking, drinking, poor diet, binge eating, etc. Invoking the incidences of smoking as an indicator of health-damaging behaviors and increased income inequality in the US between 1976 and 1990, Wilkinson (1996) wrote, while the individuals from the poorest income quintile continued smoking at the same rate throughout this period, the individuals from higher income quintiles smoked at the lower rate than they used to. Wilkinson found a positive correlation between income inequality and smoking incidences, and argued that as the individuals from the poorest income quintile had become both absolute and relatively poorer, they smoked as frequently—if not more—as before (Wilkinson, 1996). Alcohol is widely used to counter psychosocial stress from poor employment or housing conditions. Cross-national evidence suggests a positive association between income inequality and alcohol-related deaths (Wilkinson, 1996). And, finally, prolonged exposure to psychosocial stress increases risks for diabetes and cardiovascular diseases (Marmot et al., 2006).

While the *Social Determinants of Health* explanation is more relevant for adult-health differentials in high-income countries, the *Social Determinants of Health* scholars' proposition that social protection relieves psychosocial stress from any form of deprivation has child- and adult- health implications. As such, income security and entitlements to non-income social transfers such as food, health care, and education benefit child- as well as adult-health in low- as well as high-income countries (Van Ginneken, 2003).

Alternatively the redistribution account of child mortality argues that the public provisioning of social services—primary health care, sanitation, clean drinking water, and especially female education—is responsible for improved health and literacy

outcomes in poor countries (Anand and Ravallion, 1993; Anand and Barnighausen, 2004; Caldwell, 1986, 1993; Dreze and Sen, 1991; Hill and Pebley, 1989; Preston, 1980; Bohkhari et al., 2006; Gupta et al., 2002; McGuire, 2001; Wagstaff, 2003; Jalan and Ravallion, 2003; Soares, 2007; Schultz, 2002; Frost et al., 2005; Ravallion, 2006). Child mortality decline, typically viewed as orthogonal to economic growth, is possible with public provisioning of basic social services that is found to often benefit the poor in particular yet are available to ALL. The redistribution account is more consistent than the economic growth account with respect to rapid child mortality declines experienced in low-income countries—Costa Rica, Sri Lanka, and Kerala (India).

The redistribution account thus challenges the “Wealthier is Healthier” account of mortality reduction, and questions its premise based on (a) the historical and contemporary empirical evidences, and (b) over-assumption about market effectiveness in health. Scholars argue that McKeown did not present any direct evidence on nutrition of individuals to test this thesis (McKeown 1976, p: 130; Easterlin, 1999), and the age-old association between growth-induced nutritional improvement and mortality reduction remains open. Stolnitz (1965) highlighted a seemingly unrelated trend between economic development and mortality in Asia, Latin America and Africa, but it is Samuel Preston whose analysis posed the biggest challenge to the economic deterministic explanation of mortality. In what is commonly known as the “Preston Curve”, the author showed that at a fixed income, its association with mortality showed temporal variation, and at a fixed period in time, the association changed spatially. Considering the presence of a potential third factor behind precipitation across time and space, Preston argued that economic

development and mortality were far from being causally related.<sup>6</sup> Among the more contemporary scholars, Anand and Ravallion (1993) showed that the association between economic growth and child mortality depended on public policies to reduce poverty and/or improve health and health correlates.

In more recent years, using data from countries in all regions of the world, numerous studies have demonstrated a robust inverse relationship between public social spending and child mortality. Jalan and Ravallion (2003) show that public investments in anti-poverty programs, water infrastructure, and health knowledge promotion have reduced the prevalence and duration of diarrhea among children under five in rural India. Soares (2007) shows that public investments in education and water and sanitation infrastructures have increased life expectancy in Brazil between 1970 and 2000. Wagstaff (2003) finds that higher levels of per capita public health investments are associated with significantly lower levels of mortality and malnutrition among poor children. Bokhari et al. (2007) find that public investments on health are important contributors to under-five mortality reduction in developing countries. Gupta et al. (2002) show that public investments on health care improves health among the poor in low-income developing countries. And, based on empirical evidence that women education increases human welfare, Schultz (2002) argues that the disproportionate allocation of public expenditures towards women's education is justified for countries seeking to increase child welfare.

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<sup>6</sup> In particular, Preston (1975) shows that (a) individuals lived longer in 1960s than 1930s at comparable levels of economic development, and (b) at a given year, economic development has a closer association with mortality in the countries with per capita GDP \$400 or less than those with per capita GDP of \$600 and above. Preston believes that that mortality increasingly dissociates with economic growth (p. 231), and that only 16% of the increase in life expectancy between 1938 to 1963 can be attributable to GDP growth (p. 238).

Perhaps the most comprehensive critique of the “wealthier is healthier” account is Caldwell’s (1986) correlation analysis between GDP per capita and child mortality rates, and his comparative historical analysis of Sri Lanka, Kerala (of India) and Costa Rica to show that economic development was not a necessary condition for mortality breakthrough. Caldwell (1986, 1993) deepened redistribution arguments by directing attention to cultural and structural preconditions for allocation and governance of resources devoted to health and its correlates. His analytical building blocks, though interrelated, were (a) religion (Islam) and the position of women in society, (b) religion (Islam) and the role of modern, formal education, (c) egalitarian class structure, and (b) democratic political system and populism. In sum, Caldwell argued that female autonomy and education led to low mortality in democratic institutional contexts embedded in an egalitarian class structure.

With regards to child mortality reduction, Caldwell singled out female education and autonomy as the most significant determinants, and argued that mortality reduction was more likely in “pro-women” societies. In particular, Caldwell argued that non-Islamic societies with women’s superior social status did better in saving children’s lives than Islamic societies where women were socially inferior. Islamic societies allegedly value a woman’s ascribed qualities (such as age or beauty) more than her achievements such as formal education. Formal education often parallels Islam’s Quranic education, and males as well as females in Islamic societies are equally affected by such aversion. Moreover, female education is lower than male education since formal secular schooling is often at odds with Islamic norms and values of *purdah* (seclusion), physical separation between males (teachers/service providers) and females (students/clients), etc. As such,

girls come in physical proximity of male teachers or fellow students while in school. And, even when a girl acquires education, she is not more autonomous than before in a significant way if her role as a decision maker does not have social or religious approval. Children in Islamic societies suffer from lack of maternal health know-how and societal “child-friendly” health services. As such, an Islamic society lacks an effective rural health service since education among Muslim women is low and without education among women a stronger pool of nurses, midwives, and other health human resources is less likely to take place. And, a Muslim mother without education lacks the knowledge to prevent diseases, or the ability to access/process health services/ information as well as her educated counterparts even when services are accessible.

Why do social reform programs emerge in some but all societies? Caldwell traced universal access to quality health and education services back to societies’ egalitarian economic and political structures, to a great extent. Political ideology for equality precedes land (wealth) and income redistribution and improves access among the poor to not only physical but also human capital. Access does not necessarily mean quality, and Caldwell argued that civic political participation made possible efficiency of health and education services especially to the poor.

In sum, the above three perspectives deliver the following testable hypotheses:

*HYPOTHESIS 2. 1: Children born to high-income parents are less likely to die before they turn five years old than those born to low-income parents.*

*HYPOTHESIS 2. 2: Children born to high-social status parents with are less likely to die before they turn five years old than those born to low-social status parents.*

HYPOTHESIS 2. 3: *Children born to high- and low-income parents are equally likely to live/die if their parents have equal access to publicly provided social services.*

While both economic determinism and redistribution are plausible alternative explanations of child mortality in low-income developing countries, and both find considerable empirical support, exceptions are numerous however. First, some countries have combined attributes of both growth-determined and redistribution-induced routes to child mortality reduction, and have succeeded in reducing child mortality. For example, growth combined with massive public investment in education in South Korea and Taiwan contributed to child mortality decline. Second, several countries have reduced child mortality by attributing to neither in its *purest* form. A burning example is Bangladesh.

No other countries have reduced child mortality as fast as Bangladesh has in the midst of a long list of deep cultural and structural constraints (Stern, 2002; Dreze, 2004). Bangladesh thus poses an empirical puzzle for both the economic deterministic and the public provision accounts of childhood mortality decline. In particular, the country defies both (a) the economic determinist explanation of child mortality reduction by reducing childhood deaths amidst economic stagnation of 1980s, slow growth in 1990s, and high level of absolute poverty, and (b) the universal redistribution argument with low public investment in health and education, low female literacy rates, 1980s' authoritarian regime, and a religious context that shows a tenuous commitment to women's autonomy.

Table 1 further underscores Bangladesh's performance in reducing infant and under-5 child mortality rates. It does so by way of comparison to Pakistan and Sri Lanka – countries with similar colonial legacies and religious traditions, and is influenced by

Caldwell's analysis of health performance relative to economic development. Caldwell (1986), in an effort to screening out the superior and the poor health achieving countries relative to economic development, carried out what appears to be a simple yet instructive analysis. Caldwell (a) regressed infant mortality rates on the level of economic development for 99 developing countries in 1982, (b) obtained the residuals – the difference between the actual infant mortality rates and the mortality rate that countries' level of economic development predicts, and based on the residuals, (c) identified as well as ranks the countries having prevented or failed to prevent, on average, 25 or more infants' deaths per 1000 live births given their respective level of economic development. Kerala and Sri Lanka, Caldwell showed, save, on average, 75 and 62 more infants' lives per 1000 live births, respectively, given their level of economic development, and therefore rank in the top 1% of the superior health achieving countries. Caldwell's (1986) analysis of the residuals is particularly instructive in that it helps to show that Bangladesh's recent gain in reducing deaths exceeds its economic expectations, whereas Pakistan and Sri Lanka continue to, respectively, under and over-perform relative to economic growth (Table 1).

Table 2.1: Percentile Positions for IMR and U5MR Residuals Relative to Economic Development

	i <sup>th</sup> percentile for residuals of IMR relative to GDP per capita			i <sup>th</sup> percentile for residuals of U5MR relative to GDP per capita		
	1980	1990	2000	1980	1990	2000
Bangladesh	16	22	51	17	24	43
Pakistan	29	19	21	35	29	32
Sri Lanka	91	98	98	91	98	99

Source: World Development Indicators (various years). The measure of economic development is GDP per capita (2000 constant US\$)

While Sri Lanka continues to surpass expectations, and Pakistan races backward, Bangladesh has transformed from a hopeless under-performer into an incipient success story by substantially reducing infant and child mortality in only 20 years (1980-2000). Table 1 shows that Bangladesh placed in the bottom 16<sup>th</sup> percentile in 1980, indicating that only 16% of the developing countries around the globe performed worse than Bangladesh in preventing infant-deaths given their level of economic development in 1980. Based on the actual residual, I further find that Bangladesh failed to prevent, on average, 42 infant-deaths per 1000 live births, given its level of economic development. In only 20 years, however, Bangladesh has progressed to the 51<sup>st</sup> percentile, indicating that more than half of the developing countries performed more poorly than Bangladesh in preventing infant-deaths in 2000. The similar trend holds for Bangladesh's performance in preventing death of children five years old or younger. Whereas only 17% of the developing countries performed worse than Bangladesh in preventing under five children's deaths in 1980, almost half of the developing countries performed less well than Bangladesh in 2000. In more substantial terms, Bangladesh failed to prevent, on average, 72 under five children deaths per 1000 live births in 1980 given its level of

economic development; but it saved, on average, 11 more children's lives per 1000 live births, relative to its level of economic development in 2000.

Nonetheless, one needs to go beyond the cursory statistical preview and into substance to fully appreciate the Bangladeshi human development puzzle in comparative context.

Bangladesh is all in all a poor, populous country. With nearly 1070 people per square mile, Bangladesh is the most densely populated country in the world. The country fits firmly within the bracket of the least developed countries even with an average GDP growth of 4.91% during the 1990s, and ranks 34 (37) from the bottom among 166 countries with per capita GDP of US \$416 (US \$1797) in nominal (purchasing power parity) terms (BBS, 2000; WDI, 2004).<sup>7</sup> Despite economic growth, 40% of Bangladeshi people still live on less than \$1 a day, and the poverty rate jumps to 82% if poverty is referred to as living on less than \$2 a day. Let's note, the rates at which infant and child mortality reduced have reached to double-digits and remained so since 1980s, whereas the Bangladeshi economy has started to grow since early 1990s (see Figure 2.1), and poverty is widespread all along in the contemporaneous or temporal terms. This suggests that economic growth and poverty reduction are poor independent predictors of mortality reduction among infants or children under 5.

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<sup>7</sup> The World Bank's groups countries into the following four categories of development: low income, \$975 or less; lower middle income, \$976 - \$3,855; upper middle income, \$3,856 - 11,905; and high income, \$11,906 or more.

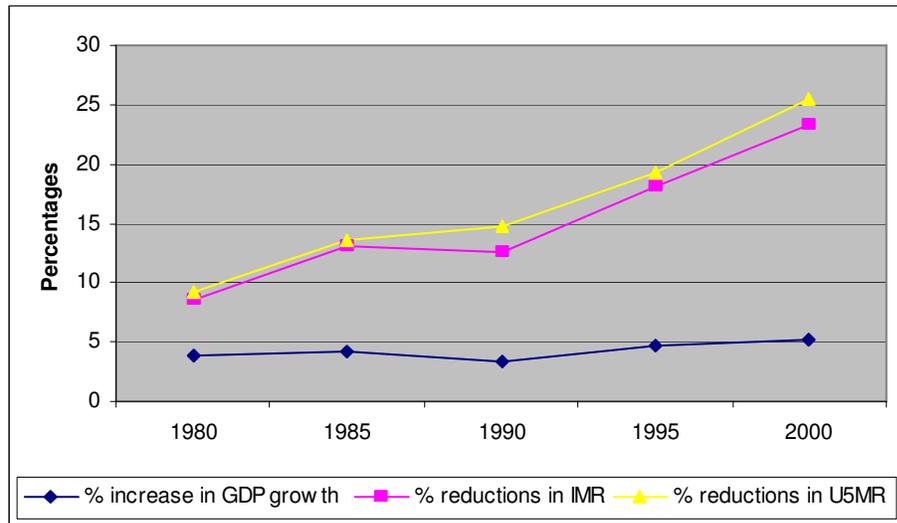


Figure 2.1: GDP Growth and IMR and U5MR Reduction in Bangladesh, 1980-2000

The state’s political system is as fragile, if not more so, as its economic system. Bangladesh is currently a struggling democracy with weak checks and balances against government misconduct. Since gaining independence in 1971, the country has endured 20 years of authoritarian rule. Although the country ascended to democracy in 1991, Bangladesh has yet to institutionalize democratic rule of governance beyond elections. Even the “free and fair” election to political power is hardly consensual among stakeholders, and often results in a series of violent political conflicts and instability. It should not then surprise, that, electoral checks and balances have not held government officials as accountable as is expected in a democratic political context. Evidence is widespread of mis-governance in service delivery. Even foreign business leaders recognize signs of corruption among government officials, and the country is ranked at or near the bottom in surveys to gauge the pervasiveness of corruption across countries.

This might be more than a speculation that dysfunctional political institutions, and inadequate public policies have some legitimacy in structural and cultural contexts – Islamic beliefs and practices, economic structure, clientelistic social relations, and patriarchy. Though not as closed as a caste-based society, Bangladesh is hierarchically organized, with an allegedly rigid class structure, based on production relations. Distribution of income, status, and power is closely related to the distribution and control of arable land (Cain, 1977). Foreign anthropologists often portray Bangladesh as the antithesis of an equal or egalitarian society (Cain, 1977; Cain et al., 1979; Arthur and McNicoll, 1978). And, the poor and the women are the most vulnerable.

First, the poor and the poorest face threats to their survival and must rely on patron-client ties to avoid destitution (Blair, 2005). Patron-clientelistic relations perpetuate in rural Bangladesh where economic opportunities are land-based, agrarian, economic-diversification is low, and credit markets fail to provide financial services to the poor, especially in times of personal, or (periodic) natural calamities. And, patron-client relations often act as a medium—and barrier—between government and the poor (Khan, 2005; Bhaduri, 1973). Anecdotal evidence shows adverse effects of clientelism on antipoverty projects. Hartman and Boyce (1983) talk about how rich local farmers captured a publicly provided local irrigation facility intended for poor farmers. Un Nabi (1999) talks about the local power structure and how local elites are often consulted when a development project is undertaken in community.

Second, women in general, and poor women in particular face as much structural and institutional constraints as poor men do. But, their economic disadvantages are aggravated by Islamic and patriarchal traditions in Bangladesh. Norms of seclusion and

*pardah* go hand in hand with limits on ownership of wealth and formal education after puberty. For instance, according to the Islamic law of inheritance, a girl receives half as much property as her brother receives, and according to patriarchal custom, she gives up her right to (inherited) property when she gets married and leaves her parents' household. Moreover, patriarchy at times overrules Islamic customs to girls' further disadvantage. As such, girls, especially, in rural Bangladesh are expected to pay dowry at marriage to their husbands or in-laws. This is opposite to the Islamic practices of *mehr* or the bride-price where the ritual dictates that girls are entitled to receive a "price" from her prospective husband.

In this context of tenuous social and religious commitment to women's welfare, as defined traditionally, it is unusual for the state to enact gender-sensitive, pro-poor redistributive development policies or for women to indeed access them when available. How is it possible then that Bangladesh has overcome these obstacles to improved child survival? A vast majority of Bangladeshi women's social (status)- and economic (food)-insecurities from man-made and natural disasters are among the strongest candidates for Bangladesh's adoption of gender-sensitive, pro-poor redistributive development policies.

The history of the country's origin provides relevant context. In 1947, at the end of British colonial rule, the Indian sub-continent was divided into India and Pakistan, and Pakistan was comprised of five provinces—Punjab, Baluchistan, Sind, the North-West Frontier, and East Pakistan. The division of the Indian sub-continent into India and Pakistan was based on religion—"the Hindus belonging to India and the Muslims to Pakistan" (Bhatnagar, 1971, p. 27). Following this, East Pakistan was made a part of Pakistan despite the in-between geographic separation by more than 1,000 miles (see the

map below), and differences in language, cultural heritage, physical appearance, and climate. But, East and West Pakistan commonly shared Islamic beliefs and practices among its people because 80% of the populations were Muslims. The division of the sub-continent also resulted in massive inter-country migrations in that a large number of Hindus/Muslims of East Pakistan/India's West Bengal migrated to India's West Bengal/East Pakistan (Williams, 1972; Kuper, 1981).



Figure 2. 2: The Map of South Asia

Bangladesh, the then East Pakistan, became an independent state in 1971 after a nine-month long war with (West) Pakistan. The reasons for Bangladeshi's independence

range from their relative economic and political deprivations to their ethnic and cultural differences. Yet, independence came at the expense of massive human and physical casualties. One to three million people were killed during the nine-month long war (Chaudhury, 1972). There were also systematic killings of the Bangladeshi professionals and intellectuals (doctors, engineers, civil servants, college professors, writers, etc.) right before the war ended on December the 16<sup>th</sup>. The country's development prospects were bleak following the massive human and physical casualties in 1971 and the famine, population displacement, and extreme political instability of the 1970s in addition to the country's limited natural resource base, mounting population pressure, and periodic natural calamities. Thus, Bangladesh was labeled as "the test case of development," an "international basket case", etc. (Faaland and Parkinson, 1975).

Table 2.2 lists casualties following Bangladesh's 1971 liberation war and major natural disasters since its colonial era. Notably, loss of social and economic protection from deaths, displacements, or "dishonor" among the consequences of natural or man-made disasters is gendered in that disasters in Bangladesh have affected women and men differently. Massive female casualties in Bangladesh's war with Pakistan in 1971 elaborate the point. Despite possible under-reporting, an estimated 400,000 women were reportedly raped during the nine-months' wartime in 1971, and 250,000 rape victims became pregnant (Brownmiller, 1975; McGinn, 2000; Smith, 1994). In other words, up to 12 for every 1,000 adult women were raped, and journalist's reports show that the rape victims were of all ages, ranging as low as 8 to as high as 75 years, of all social classes and religion, and incidences occurred at home, public places, or military barracks where the women were held (Brownmiller, 1975).

Table 2.2: Major Disasters in Bangladesh (or then East Pakistan)

Year	Event	Casualties
1769-76	Great Bengal Famine	“Eliminated almost a third of Bengal’s population” (A. Ahmed 1962, p. 140), although impact was less severe in East Bengal (N. Ahmed, 1968, p. 327)
1784-88	Floods and famine; radical shift in course of the <i>Brahmaputra</i> (1787)	Unknown (N. Ahmed, 1968, pp. 33, 101)
1873-74	Famine	Unknown (A. Ahmed, 1962, p. 141)
1876	<i>Barakganj</i> Cyclone and tidal wave	400,000 deaths (N. Ahmed, 1968, p. 51)
1884-85	Famine	Unknown (Bhatia, 1967, p. 164)
1897	<i>Chittagong</i> Cyclone	175,000 deaths (N. Ahmad, 1968, p. 51)
1918-19	Influenza epidemic	400,000 deaths (M.R.Khan, 1972b, p. 384)
1943	Bengal Famine	2-2.5 million deaths (A. Ahmed, 1962, p. 141; M. R. Khan, 1972b, p. 384)
1947	Partition of India	Unknown; total deaths of Partition one million, but most were in West (Davis, 1951, p. 197)
1970	Cyclone and tidal wave	200,000-500,000 deaths (L. C. Chen, 1973)
1971	War of Independence	500,000 deaths (Curlin, Chen and Hussain, 1976, p. 31), although some estimates are much higher (e.g. one to three million deaths—Choudhury, 1972, p. 22) 200,000—400,000 women raped (Brownmiller, 1975, p. 79) causing 25,000 pregnancies (Smith, 1994, p. 3)
1974	Famine	Officially 30,000 deaths (Majlis, 1977), although some estimates are much higher (e.g. 500,000—Baldwin, 1977; 80,000 in Rangpur district alone—Haque et al., 1977)
1987	Flood	Officially 1657 deaths (Brammer, 1990)
1988	Flood	Officially 2379 deaths and 45 millions affected (Brammer, 1990)
1991	Cyclone	138,000 deaths (Bern et al., 1993)
1996	Flood	Officially 1,000 deaths and 30 millions affected (Shah, 1999)

The sheer number of rapes of Bangladeshi women makes this a rare event even by the historical comparison. Aydelott (1993) wrote, “two cases of mass rapes remain the

most horrendous examples of this practice [method of warfare]: the Japanese invasion of Nanking China.... and the Pakistani invasion of Bangladesh in 1971” (p. 591-592). However, Bangladeshi women’s physical assault is perhaps more consequential if we take into account the country’s economic, social, religious, and legal institutional contexts, and how physical assaults of women is perceived by others in the Islamic, patriarchal cultural context, and affect the prospects for women’s status attainment by marriage and childbearing. First, a rape victim loses her rights as a wife to a large extent if she is married, and her demand in the (arranged) marriage market if she is unmarried. Eighty percent of the rape victims in the 1971 war were Muslims, and, following the Islamic values of female chastity and *purdah*, no Muslim men/husbands would agree to marry a women/take back a wife who had been touched by another man (Brownmiller, 1975). Families reportedly abandoned the rape victims as well. An estimated 3 million deaths during Bangladesh’s war against Pakistan also affected women in that, for women, the loss of the husband, son, or both means the loss of social status, socio-economic protection, and old-age insurance. When women’s education and labor force participation is low, and rights to property are limited, loss of traditional support networks is consequential. According to the Muslim inheritance laws, a daughter receives one-half the share of a son in theory, though she receives less or none in practice. Also, women tend to relinquish their share of inheritance to their brothers (Cain et al., 1977). When she follows *purdah*, and has restricted physical mobility, she misses out on the employment opportunities, if available, even in extra-ordinary circumstances.

Second, Bangladesh confronts yet another food crisis in 1974—nearly 30 years since the Great Bengal Famine in 1943 under the British Colonial Rule, and three years

since independence from Pakistan. Though allegedly less catastrophic with regards to the lives lost, the 1974 Famine is comparable to the 1943 Bengal Famine when nearly 4.35 million people—more than 6 percent of the total population died from prolonged starvation (Sen, 1981). Estimated deaths in the 1974 Bengal Famine range from the government's estimate of 30,000 to the nongovernmental estimate of 500,000 deaths. For example, the Rangpur district in Bangladesh alone faces 80,000 to 100,000 during 2-3 months of an acute food shortage (Haque et al., 1977). Another estimate suggests the national account of one million deaths from August 1974 to February 1975, and an additional half a million in the following year (Alamgir, 1980).

Women experience an abrupt decline in status following death of the husband or son, and “dishonor,” and fall from the family and community networks to potentially become the state's “burdens.” As early as 1972, Bangladesh has seen political reservations, i.e., institutionalized support for women's economic and social empowerment. For instance, in Bangladesh, fifteen parliamentary seats were reserved for women; a five percent quota of government employment was reserved for rape victims (Kibria, 1991; Huda, 1987). Bangladesh is one of the pioneers among the developing countries to establish a full-fledged ministry for women affairs in 1978. Such an institutionalized support for women in Bangladesh, and their absence in Pakistan or any other Muslim majority country in the world suggest that female casualty in 1971 had a role to play. Second, massive mortality due to prolonged, involuntary hunger had paved the way of restructuring of the country's food distribution system in that the government's food management in the post-famine period was different from that in the pre-famine period. Regardless of whether the famine occurred due to (a) Food

Availability Decline (FAD)—“a sudden, sharp reduction in the food supply in any particular geographic locale has usually resulted in widespread hunger and famine” (Brown and Eckholm, 1974, p. 25), or (b) Entitlement Failure (EF)—a sudden reduction in purchasing power when food supply is constant (Sen, 1981), or (c) a combination of both, the Bangladeshi governments’ role in ensuring food security had changed since then. In particular, if 1.5 million deaths from starvation in the infamous Great Bengal famine in 1943 reinforced public regulation of production, marketing, and distribution of food, the 1974 Famine—under public regulation—founded its eventual reform to become targeted food distribution programs.

To reiterate, the immediate need for rehabilitation of those hardest hit by the natural or man-made disasters—the poor and the women—was pressing. In the early 1970s the Bangladeshi government initiated a number of social safety net programs, initially as relief efforts in a war-wrenched country, and for seasonal calamities, unemployment, loss of primary income earners and other sustained needs (Deolalikar, 2005). These social programs evolved as part of the country’s poverty reduction strategy (Sen et al., 2004) (see below). Overall, the goals of these social programs are to enhance (a) capital accumulation among the poor, (b) nutrition/food security, and (c) human development (education, in particular). The state provides food and/or cash incentives to eligible demographic groups in poor areas to encourage primary and secondary education among children from poor households. Examples include Food-for-Education, Food-for-Work, Vulnerable Group Feeding, Female Secondary School Assistance Program, microfinance programs, etc.

A discussion detailing origin, goals, eligible beneficiaries, size, and mode of delivery of the major social safety net programs follows.<sup>8</sup> But first, let's note, the social safety net programs work independently of the state's health and education programs and are expected to increase uptakes of health and education services. Second, it is not clear how the state's expenditures on safety net programs, health and education programs or both are associated with its economic growth. Are the state's social expenditures made possible by economic growth or vice versa? Evidence indicates simultaneous upward movement of social expenditures and growth, but is insufficient to suggest the direction of causality between them. As such, the state's expenditures on education and health are low even by the South Asian standards though they have been growing since early the 1980s (see below). In 2000, Bangladesh spent \$11 per capita on health—57% lower than the South Asian average health expenditure of \$26 per capita (WB-HNP, 2008). Similarly, the country spent 2.1 percent of GDP on education—lower than the South Asian average of 3.7 percent. However, the government's development policy emphasizes on the social safety net programs as the key to enhancing progress in education, health, and economic growth (World Bank, 2006).

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<sup>8</sup> Social safety net programs in Bangladesh include Food-for-education, Female Secondary School Assistance Program (FEMALE SECONDARY SCHOOL ASSISTANCE PROGRAM), Vulnerable Group Development (VGD), Food-for-Work (FFW), Rural Maintenance Program (RMP), Test Relief (Rural Infrastructure Maintenance Program (RIMP), Old Age Allowance, Vulnerable Group Feeding (VGF), Gratuitous Relief (GR), Fund for Mitigation of Risk of Natural Disaster, Allowance to the Widowed, Deserted, and Destitute Women, Honorium Program for Insolvent Freedom Fighters, Fund for Housing for the Distressed, Fund for Rehabilitation of Acid Burnt Women and the Physically Handicapped.

Table 2. 3: Bangladesh’s Health and Education Expenditures as Percentages of GDP

	1980/81— 1984/85	1985/1986— 1989/90	1990/91— 1994/95	1995/96— 1999/00
Health (and population planning)	0.66	0.70	0.90	0.97
Education	1.00	1.33	1.81	2.11

**Food-for-Education (FFE):** In 1993, the government of Bangladesh launched Food-For-Education, whose overall aim was to encourage schooling for primary school age children from poor households with in-kind food incentives. In particular, the program lists four objectives: increased school enrollment among children from poor households, better school attendance and completion, lower dropout rates, reduced child labor, and higher quality primary education (Murgai and Zaidi, 2005; The World Bank, 2004). Food-For-Education is rural-based, and poor-focused. First, one of more economically backward unions from each rural *thana* (sub-district) participates in Food-For-Education. Second, all schools—government, non-government, satellite, and low-cost primary schools, and one *madrassa* from a selected union are eligible for Food-For-Education participation. Third, all children enrolled in Food-For-Education participating schools are eligible to receive food (and recently cash) stipends, in addition to free primary-school education, as long as their families meet one or more of the following criteria: (a) functionally landless (families that own 0.50 acres of land or less), (b) distressed female-headed (widowed, separated from husband, or divorced), and (b) household head is a day laborer. A child must maintain an 85 percent attendance rate in school in order to continue participation to Food-For-Education. On average, A family receives 114 kg of rice per year, which translates into an average monetary value of Taka 100 or 125 per

month if, respectively, one or more than one child attends primary school.<sup>9</sup> The Government of Bangladesh estimates over 5.3 million beneficiaries of Food-For-Education per year, and spends US \$100 million per year (The World Bank, 2004). The government of Bangladesh finances Food-For-Education, and its Ministry of Education is responsible for its execution. Food-For-Education is a decentralized program where the Ministry of Education assigns the program across unions (within *thanas*), but the community selects the actual beneficiaries (using eligibility criteria) (Galasso and Ravallion, 2005).

***Female Secondary School Assistance Program (FSSAP):*** Launched in 1993, Female Secondary School Assistance Program is one of a very few female secondary school-enrollment subsidy programs available in developing countries.<sup>10</sup> Female Secondary School Assistance Program aims to (a) increase the number of female students in secondary school, and (b) reduce incidence of under age marriage. The program is primarily rural-based, and serves close to four million girls (Chaudhury and Devarajan, 2006). Districts are chosen based on pervasiveness of poor households, and low literacy and attendance rates among girls from those households. Schools within these districts voluntarily participate in Female Secondary School Assistance Program and, upon participation schools receive a stipend based on the number of girls they enroll. Girls who have successfully graduated from primary school and reside in eligible districts qualify for participation in Female Secondary School Assistance Program. To qualify, a girl needs to maintain 75 percent attendance in school per academic year, passing grades, and

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<sup>9</sup> This suggests that FFE stipend is about 13% of the average monthly earnings of boys and 20% of that for girls, according to the Bangladesh Bureau of Statistics Survey in 1996 about the average monthly income for boys and girls of primary-school age in rural areas (Galasso and Ravallion, 2005; BBS, 1998).

<sup>10</sup> Secondary schooling in Bangladesh refers to Grades 6—10.

remain unmarried while in secondary school. Eligible girls receive tuition, book allowances, and examination fee waivers, and a stipend of Taka 300 while enrolled in Grade 6, Tk. 360 in Grade 7, Tk. 420 in Grade 8, and Tk. 720 in Grades 9 and 10. The Ministry of Education is in charge of Female Secondary School Assistance Program. The program is financed by the Government of Bangladesh, USAID, Asia Foundation, NORAD, World Bank, and ADB.

***Vulnerable Group Development (VGD):*** The VGD programme started in 1986. VGD transfers food while providing its beneficiaries with the following services: skill and literacy, credit and savings mobilization, and health and nutrition education. The program is rural-based and women-focused, and its objectives are: (a) to increase employment opportunities for women, and (b) to build awareness of disaster management and nutrition. VGD thanas are of high food insecurity, and to qualify participants must be: (a) owning 0.15 acres of land or less, (b) of low or no permanent family income, (c) day laborers, and who (d) lack productive assets. Upon participation, beneficiaries receive 30 kilograms of wheat per month. The Ministry of Women and Children Affairs is in charge of VGD. The Government of Bangladesh spends US\$40 million for VGD and claims to serve nearly 500,000 beneficiaries per year (The World Bank, 2004).

***Vulnerable Group Feeding (VGF):*** VGF began in 1975. VGF is the government's program to provide short-term relief to disaster victims. The VGF program transfers food or other in-kind aids. Only disaster-affected thanas qualify to participate in the VGF program, and food aid is distributed based on popular demand in those thanas following natural disasters or overall food insecurity in general. To qualify, victims of natural calamity must be: (a) household head earning less than Taka 300 per month, (b)

functionally landless, and (c) household heads who are day-laborers. The Ministry of Food and Disaster Management is in charge of VGF. The Government spends US\$30 million per year on VGF, and claims to provide food transfers to 240,000 people per year.

***Food-for-Work (FFW):*** FFW in Bangladesh started in 1975, and is the government's effort to generate employment in the infrastructure development sector for the poor especially during the dry season. Beneficiaries include households that are (a) functionally landless, (b) lack productive assets, (c) are female headed, (d) are day laborers, and (e) earn monthly incomes of less than Taka 300 per month. The amount of food transfer is not specified in the government documents. The Department of Local Government Engineering Department is in charge of the program. The Government spends US\$40 million per year in FFW, and claims to serve about 1,000,000 participants per year.

***Microfinance Institutions (MFI):*** Microfinance institutions are characterized by group-based, small-scale, often collateral-free credit and savings services to especially low-income and traditionally unbankable households. These institutions were born—if not in their current organizational structure—in Bangladesh soon after the liberation war in 1971, began their credit program in early-to-mid 1980s, and expanded considerably since early 1990s. The Grameen Bank and Bangladesh Rural Advancement Committee (BRAC) lead microfinance programs in Bangladesh in regards to the number of client they serve and the amount of loan they disburse per year. The Grameen Bank was born in 1976, and became a bank in 1983. In 1983, Grameen had 36,000 members and a portfolio of \$3.1 million, and in 1997 it had 2.3 million members and a portfolio of \$260 million. In 2009, the Grameen Bank in Bangladesh made loans totaling Taka 75 billion (US

\$1,091 million) to 7.93 million borrowers—97% of them women. And, BRAC was born in 1972, under its original name—Bangladesh Rehabilitations Assistance Committee. Though originally established to assist the people displaced during the country’s war against Pakistan, BRAC transformed into a microfinance institution and began its service-delivery role in early 1980s. In 1980, BRAC’s annual expenditure was less than \$1 million (\$0.78), and in 2000, its expenditure rose to \$152. In 2007, BRAC lent Taka 27 billion (US \$576 million) to 7.37 million borrowers—90% of them women.

Households owning half an acre or less are eligible to participate to the Grameen Bank, BRAC, or similar microfinance programs in Bangladesh. MFIs in Bangladesh provide credit to thus defined functionally landless rural poor after they form groups of five. Each individual member is eligible to receive credit, but if one defaults the whole group fails to receive further credit. The groups are required to meet weekly with a credit officer to make repayments on their loans as well as mandatory contributions to savings and insurance funds. Groups are gendered in that the females meet with other female members and the males with fellow male members, thus abiding with gender norms in Bangladesh; but if a female member interacts with, say, a male credit officer in the presence of other females, this does not necessarily challenge norms of seclusion (*pardah*) in rural Bangladesh. Contrary to traditional financial institutions, micro-finance institutions have gained unprecedented success in repayment rates. Group-based lending and peer monitoring as substitutes for collateral and as mechanisms for enforcing contracts are the obvious candidates for MFI’s successful banking with a seemingly unbankable population.

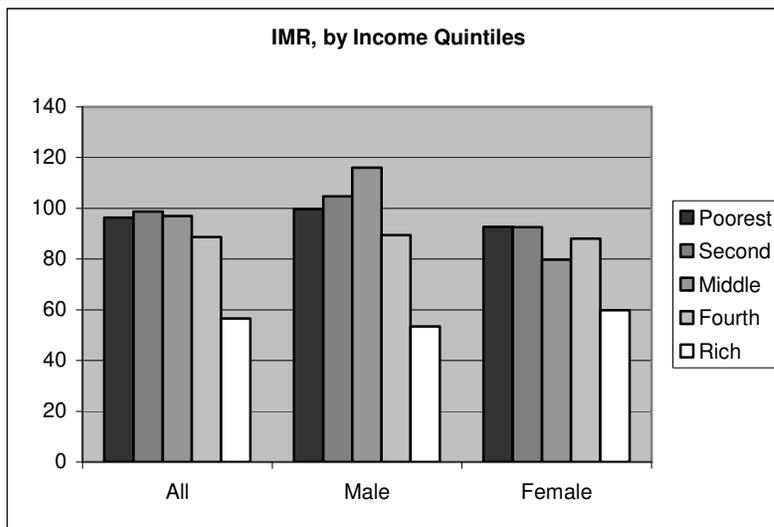
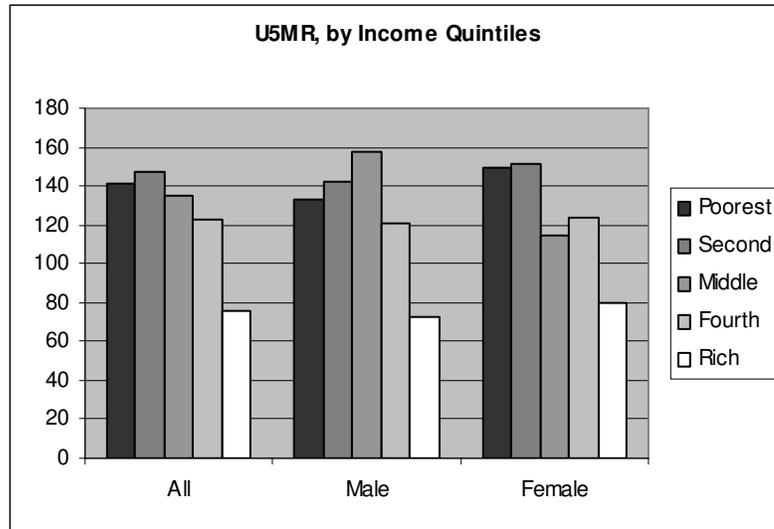
Have these programs worked? If so, how? And why have they proven viable in a less than hospitable social and political context? The next three chapters attempt to shed some empirical light to this question, and identify the distal determinants of child mortality reduction in Bangladesh. In particular, among the distal determinants, I examine income effects on child mortality in Chapter 3, and reexamine this effect after considering the fact that Bangladesh's redistribution policy targets poor households to transfer social services in Chapter 4. I examine the effect of another robust distal determinant—female education—on child mortality in Bangladesh in Chapter 5.

### **CHAPTER III: DISTAL CAUSES OF MORTALITY DECLINE IN BANGLADESH**

Over the course of the past three decades Bangladesh has been transformed from an “international basket case” into the “fastest reducer of infant mortality” in the world (Stern, 2002). Infant mortality in Bangladesh has dropped from 145 to 88 per 1000 live births—a 55% reduction in nearly three decades since independence in 1971. Similarly, child mortality has dropped from 239 to 88 per 1000 live births—a 63% reduction during the same period. Bangladesh has done well in comparative context as well. Between 1990 and 2000, Bangladesh reduced infant and child mortality rates by 34% and 48% respectively, and the reduction rate is 19% (30%) in infant (child) mortality in countries of comparable economic development—2000 per capita national incomes between \$300 and \$400. Bangladesh has nearly halved mortality in infancy and childhood by saving, on average, 5 more lives per 1000 live births from the baseline per year for the past thirty years.

In addition to aggregate mortality trends, Figure 1 presents how infant and child mortality is distributed across income-groups in Bangladesh. Evidence further shows all income groups have progressed in saving lives relative to their respective initial mortality states. Figure 1 plots male, female, and both genders’ rates of infant and child mortality per 1000 live births. The figure shows that the (often urban) rich tend to avoid death in Bangladesh as in all countries; but the poorest of the poor (the poorest quintile) have not experienced disproportionately high incidences of death. In particular, the poorest of the poor have fared equally well or better than the relatively less, but still, poor income

groups (the 25<sup>th</sup> and the 50<sup>th</sup> income quintile: the second and the third income quintile in the Figure 1).



**Figure 3.1: U5MR and IMR in 2004 across Income Quintiles**

Source: Gwatkin et al. (2000); I present data in graphical form.

Our current understanding of child mortality in Bangladesh does not explain its recent “breakthrough.” Caldwell (1986) referred “breakthrough” to the period of exceptional advances against mortality (p. 172). Bangladesh reduced child mortality rate in double digits since 1985, and, by only accelerating this rate of child mortality

reduction, Bangladesh entered a breakthrough period since 1990. Bangladesh reduced infant and child mortality by 56% and 63% respectively between 1980 and 2000 and 13% and 17% respectively between 1960 and 1980. Moreover, if we look away from these trends within Bangladesh over time, and look at Bangladesh from comparative perspective, the country's breakthrough is more apparent. For instance, the countries with 2000 per capita national incomes between \$300 and \$400 have reduced infant and child mortality rates, on average, by 19% and 30% respectively between 1990 and 2000, and Bangladesh with a 2000 per capita national income of \$365 has reduced 34% and 48% infant and child mortality respectively.

To date, prior studies have studied determinants of overall child mortality decline in Bangladesh. It has yet to attend to the distributional differences in mortality decline—perhaps due to that the data is not widely available. Second, research is more focused on unraveling proximate causes, such as health technologies and interventions, than distal determinants. And, third, household data on social transfer programs have appeared on national surveys only recently, and access to surveys is often restricted to pertinent institutions. As a result, gaps remain concerning distal determinants of child mortality in Bangladesh; and, we don't know how distal determinants respond in affecting child mortality when social transfers are available.

The bulk of child mortality research is evaluative in design, and primarily focuses on the effectiveness of immunization, oral rehydration therapy, or other health interventions. Bangladesh has a world-renowned experimental site for numerous fertility and mortality interventions. The Matlab *thana* (sub-district) is an example of such a

research site, and the Matlab<sup>11</sup> Demographic Surveillance System (MDSS) has supplied data to almost all public health and social science research. Since 1966, MDSS has contained data on births, deaths, migration, and changes in marital status from a population of approximately 200,000. This is a particularly demanding source of population data because of its quasi-experimental set-up. In 1977 a family planning and health services program was introduced to half of the Matlab area, leaving the other half for comparison.

Child mortality research uses MDSS data to a large extent to evaluate the effectiveness of a number of health interventions, namely, immunization, oral rehydration therapy, etc (Ali et al., 2001; Koenig et al., 1991; Amin and Li, 1997; Legrand and Phillips, 1996; Blum et al., 2009; Baqui et al., 2008; Mercer et al., 2006a; Mercer et al., 2006b). Koenig et al. (1991) evaluate how effective measles vaccination has been for mortality decline in rural Bangladesh. Comparing immunization coverage between treatment and control areas in Matlab, the authors find that measles immunization accounts for mortality reduction among children ages 1-4 years. In particular, immunization suppresses between 16 and 19 deaths per thousand births from a baseline neonatal mortality of 69 per thousand (p. 96). Findings are consistent with earlier findings by Keonig et al. (1990) and Clemens et al. (1988). Using the same MDSS data from 1988 to 1993, Ali et al. (2001) compare infant and child mortality between areas with acute lower respiratory infection (ALRI) program interventions, and finds that ALRI mortality rate among very young children was 54% lower in the treatment than the comparison area where there were no interventions.

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<sup>11</sup> A rural thana (sub-district) in Bangladesh.

A parallel strand of child mortality research has studied health governance as a potential determinant of child mortality. Availability of health technologies does not ensure adoption, and scholars debate the efficiency of alternative health governance—government, non-government and other stakeholders—in influencing health technology adoption.<sup>12</sup> Scholars argue that public-private partnerships in home- and community-based health services speed up technology adoption and thereby reduce mortality (Baqui et al., 2008; Ensor et al., 2002; Zafar Ullah et al., 2006; Mercer et al., 2004, 2006; Sen et al., 2006). They recommend that the long-standing partnerships between Bangladesh’s Ministry of Health and Family Welfare and non-governmental organizations (NGOs) in family planning and immunization services should be scaled up to cover more health services.

Ali et al. (2001) evaluate whether educating community health workers about detection, diagnosis, and management of pneumonia cases reduces mortality due to pneumonia among children, and show that the pneumonia mortality rate was 54% lower in the areas with community-based health care provisioning than in those that lacked such services. Using a clustered-randomized controlled trial, Baqui et al. (2008) find home-based health intervention to be more effective in reducing neonatal mortality rates than either community-based or no special service delivery interventions. Scholars believe that governmental and nongovernmental community health workers reduce proximity to

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<sup>12</sup> Ensor et al. (2006) nicely sums up Bangladeshi health delivery system by identifying its decentralized and community-based dimensions. Ensor et al. write, “Bangladesh has a comprehensive network of health facilities serving much of the population. The country is divided into 64 districts (*zilas*) in each of which there is a hospital with between 50 and 200 beds. In turn, these districts are divided into sub-districts (*upazilas*), each with a Health Complex (31 beds), and into unions, most of which have a Health and Family Welfare Center. Below union level the system has to depend heavily on community workers, who dispense family planning supplies and provide health advice. Controversially this door-step approach is being phased out in favor of services delivered through newly built community clinics serving a population around 6000. The country is served by medical colleges (650 beds) serving district groups, and referral facilities of at the national level. All facilities at *upazila* and below are regarded at primary level” (p. 248).

health services and modern health facilities in rural areas by providing health services at their clients' doorstep, and female NGO community health workers have higher acceptability than male health workers among (female) clients. A female health worker is acceptable not only to her female clients but also to the male members in households and villages, who often make health decision for their mothers and children (Simmons et al., 1988).

However, with regards to distal child mortality determinants in Bangladesh, our knowledge is neither context-sensitive nor as deep as it is with health technologies. Using similar “umbrella” categories—(a) economic, (b) social/cultural, and (c) demographic—prior studies explain variation in child mortality in Bangladesh (Muhury 1995; Muhury and Preston, 1985; Majumder et al, 1997; Amin, 1988; Edmonston, 1983). However, operationalization of variables following the global practice often defies empirical reality in rural Bangladesh, and therefore is not as context-sensitive as it needs to be. Second, global practices for framing the analysis in prior studies are questioned with regards to their ability to explain mortality variation. This is particularly relevant considering the fact that evidence is mounting that children in Bangladesh die from local reasons as much as from global reasons. Third, the current analytical framework to assess distal determinants under expansive social transfer programs for the poor and the women might fall short, if traditional relationships between explanatory and outcome variables differ in the presence of social transfer programs, as they do otherwise. And, finally, a more complete understanding of distal determinants is needed not only because of prior grounds but also considering inter-relations between distal-proximate determinants. As such, distal determinants verify whether technology's effectiveness on mortality

reduction is site-specific, and whether it will not produce similar results if exported to *thanas* or districts beyond Matlab.

A discussion is warranted from the outset, however, about household surveys in Bangladesh. Available surveys from Bangladesh make it difficult to include developmental and health intervention variables in a single analytical framework. Among the available surveys, Demographic Health Survey, Household Income and Expenditure Survey, Bangladesh Fertility Survey, and Child Nutrition Survey are commonly used in the health literature, more broadly; and each limit empirical framing in an interesting way. For instance, DHS is a national survey and samples a large segment of rural and urban populations. But DHS is not disaggregated into the districts in Bangladesh, and provides limited information about income, wealth, and recent development practices in Bangladesh. Researchers settle for proxy measures of income. Similar limitations apply to the remaining demographic surveys (BFS and CNS). The Household Income and Expenditure Survey, on the other hand, makes available information about households' income and participation in recent development programs, but provides data on proxy measures of mortality or other health status (such as morbidities, nutrient intakes, anthropometrics, etc.).

With regard to distal child mortality determinants, existing research examines three categories of variables: (a) economic (land-ownership, income, expenditure), (b) socio-cultural (religion, education, maternal age at marriage, maternal care), and (c) demographic attributes (birth-spacing, parity, sib-size/fertility, maternal age at marriage/at times of childbirths, prior child death). Generally researchers find that socio-cultural and demographic attributes are strong predictors—often stronger than economic

counterparts—of neonatal and infant mortality (Muhury, 1995; Muhury and Preston, 1985; Majumder et al., 1997; Amin, 1999; Edmonston, 1983).

Among them, maternal attributes are especially pertinent in Bangladesh, considering predominant Islamic beliefs and practices and patriarchal kinship and economic systems (Islamic inheritance law, dowry practices, etc.) that limit female education and autonomy (Caldwell, 1979; 1986). Yet, current research has not examined this association as thoroughly as the relationship between women's low status and fertility in the Bangladeshi context (Balk, 1994). Also, studies do not differentiate between status and autonomy/ empowerment/decision making ability, and often use education as a common proxy (Muhury, 1995; Muhury and Preston, 1985; Majumder et al., 1997; Amin, 1999; Edmonston, 1983). While authors endorse a strong association between maternal education and child mortality, neither their efforts in the context of Bangladesh, nor those of others elsewhere, separate, or even recognize, the potential correlation-in-disguise in the posited causal association. As such, studies do not control for the full list of community and household variables—perhaps due to inadequacies in the data available from household surveys—which would be needed to disentangle the strong association between maternal education and household income, and cultural attributes (Desai and Alva, 1999).

The preceding discussion leads to two questions, and three hypotheses (Hypotheses 3.1, 3.2 and 3.3). First, do the aforementioned distal determinants account for Bangladesh's rapid child mortality decline during 1990s? I propose that Bangladesh's rapid child mortality decline has been made possible due to the fact that more Bangladeshi households have (a) better absolute income per capita and (b) higher levels

of maternal education in 1990s compared to preceding decades. And, I set up the initial—rather exploratory—Hypotheses 3.1 and 3.2.

In 3.1, I hypothesize that household income decreases child mortality likelihood as such children born to poor households die in a higher frequency than those born to rich households. I reiterate the causal mechanisms by the “wealthier is healthier” scholars (reviewed in Chapter II), and state that, with higher income, households are better positioned to purchase preventive (food, nutrition, water, sanitation, education, etc.) and curative (health care services, immunization, etc.) goods and services to fight disease and death. And, without adequate income, poor parents can neither prevent child’s exposure to disease environment nor treat disease by purchasing care.

**HYPOTHESIS 3. 1:** All else equal, household-income diminishes child mortality likelihood.

Figure 3.2 depicts in a diagram the hypothesized relationship between household-income and child mortality.



Figure 3.2: Household Income Effects on Child Mortality

In 3.2, I hypothesize maternal education diminishes child mortality likelihood as such children born to uneducated mothers have a higher likelihood to die prematurely than those born to educated mothers. Maternal education is often correlated with (a) a higher socioeconomic status, (b) a greater ability to learn about the causation, prevention, recognition, cure of disease, and nutritional requirement, (c) a greater receptivity to rational explanations of diseases and modern medicine, (d) a higher autonomy and decision-making power within the family network and (e) a greater control over reproduction, such as lower fertility, longer birth intervals, etc. And, each of these correlates can link maternal education's inverse affect on child mortality since health among children born to educated mothers benefit from educated mothers' better ability to (a) purchase preventive (food, nutrition, water, sanitation, education, etc.) and curative (health care, immunization, etc.) goods and services, (b) understand health messages and recommendations, (c) go beyond traditional practices related to pregnancy and exercise autonomy in seeking maternal- and child-health care from modern health organizations,

and (d) take care and breast-feed their children adequately as they often opt longer birth-intervals and lower fertility.

HYPOTHESIS 3. 2: All else equal, maternal education decreases child mortality likelihood.

Figure 3.3 depicts in a diagram the hypothesized relationship between maternal education and child mortality.

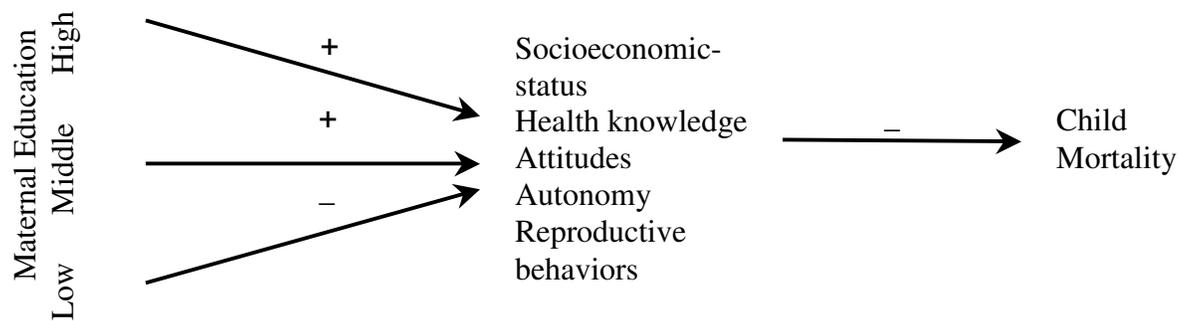


Figure 3.3: Maternal Education Effect on Child Mortality

However, Bangladesh’s expansion of social transfer programs puts Hypotheses 3.1 and 3.2 to test and I consider Hypotheses 3.3 as I consider the second question: How do the posited effects of distal determinants—especially household-income—of child mortality change in the context of expansive social programs? Let’s note, even though Bangladeshi social transfer programs do not include health services (see Chapter II), their broader aim is to suppress child mortality by transferring food, income and education.<sup>13</sup>

Our knowledge in this regard is limited, however, and based on a very few systematic studies to date. Recent efforts find support between household’s participation in nongovernmental development program in village and child health. At inception,

<sup>13</sup> The fact that health services is not listed among Bangladesh’s social safety net programs differs from social safety net programs in countries in Latin America (Ravallion, 2006).

nongovernmental programs started out as either to providing microfinance or community organizing service to clients, but began to provide non-financial as well as financial services to their clients since mid-1980s. For example, the Grameen Bank started out as to providing microfinance services to its poor clients, but the Bank now provides health services to its clients. And, BRAC started out as to providing non-financial primary health and education services to its poor clients and now provides those and microfinance services to its clients. By doing so, the Grameen Bank has incorporated in its model elements of Bangladesh Rural Advancement Committee's (BRAC) model as well as transferred elements of Grameen Model to BRAC, and vice versa. Furthermore, BRAC approaches health and education as means to reduce poverty, and has received wide recognition for this approach. BRAC recruits female health workers and teachers to deliver health and education services especially to its female clients. And, BRAC's Oral Rehydration Therapy (ORT) program among available child health interventions has been credited to substantially improve child health since 1980 as BRAC's model to deliver ORT service has facilitated its rapid adoption among largely illiterate mothers in rural Bangladesh.

While health benefits from household's access to nongovernmental health and education services are not systematically analyzed, studies find a strong association between microfinance program participation and several indicators of child health and its correlates (Hossain, 1988; Hashemi et al., 1996; Deolalikar, 2005; Pitt et al., 2003; Bhuiya and Chowdhury, 2002; Khandker, 2006; Pitt, Khandker and Catwright, 2006). Studies show that the presence of microfinance institutions in a village in Bangladesh appears to have reduced child underweight rates by nearly 20% among the poor

(Deolalikar, 2005); that micro-credit lending to women has a large and statistically significant impact on the nutritional status of both boy and girl children (Pitt et al., 2003), and that mothers' participation in micro-credit programs increases the probability that their children will survive childhood (Bhuiya and Chowdhury, 2002). Results, however, are anything but conclusive. Further studies need to show that (a) the observed association is not driven by NGOs' strategic program placement (Fruttero and Gauri, 2005), and thereby (b) knowledge generated from controlled social experiments exports well to all regions across the country. Moreover, there is a mismatch in prior studies between the trends in which explanatory variables change and child mortality declines.

Evaluation of social transfer programs is not as relevant for child mortality research as it is for, say, education (the effect of Food-for-Education on educational attainment, for instance). This is because the Bangladeshi social transfer programs do not include health per se as do Conditional Cash Transfers/PROGRESA in Latin America.<sup>14</sup> Under Conditional Cash Transfer (CCT) the state transfers money to the targeted groups in an effort to popularize their demand for public social services, such as education, health care, and nutrition. The targeted groups are those who are "needy" and can refer to a particular demographic (young, old, women) and/or economic (poor) group. And, transfers of cash are conditional in that Conditional Cash Transfer recipients must conform to the state's certain expectations. With Conditional Cash Transfer, the state intervenes on the demand side of public social services, and Conditional Cash Transfer is often perceived as playing a complementary role to the state's interventions into the supply of public social services.

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<sup>14</sup> Evaluations are easier said than done. Methods of program evaluation are hotly debated among scholars, and robust evaluation as an empirical practice is rare, if not entirely absent (Strauss and Thomas, 1995; Pitt et al., 1995; Rosenzweig and Wolpin, 1986; Deolalikar, 1995).

Lomeli (2008) lists the following Conditional Cash Transfer premise, logic, and aims:

- (a) “A fundamental reason for the reproduction of poverty over various generations is the lack of investment in human capital in the areas of education, health and nutrition” (Villatoro, 2004).
- (b) “Conditional Cash Transfer raises the income of poor households through transfers of cash, goods, and services in the short run, and encourages investment in human capital formation by offering economic incentives and conditional rewards for continued schooling among children in the long run” (p. 479).
- (c) “Conditional Cash Transfer programs concentrate their interventions at carefully chosen points in the life cycle, focusing particularly on nutrition and health during pregnancy and the first years of life, on the continuation of education during transitions from primary to secondary school.” (p. 479).
- (d) “Because social programs are always subject to budget constraints, Conditional Cash Transfer generally channels their benefits to the neediest cases in order to achieve the greatest effect with the budget on a determined relief of poverty, or to use alternative terms, to produce a determined effect at the lowest cost” (p. 480; Coady et al., 2004).

Bangladesh’s conditional transfers conform to the general models of Conditional Cash Transfer except that Bangladeshi Conditional Cash Transfer does not provide health incentives. Thus, what we need is not necessarily social program evaluation per se—we know evaluations are easier said than done. But we can take advantage of the presence of social programs in villages, and reassess “old” distal determinants of child mortality in a

new light. There are reasons to assume that the relationships between the “old” distal determinants and child mortality outcomes are not the same with and without social transfer programs. First, Rosenweig and Wolpin (1982) show that public social programs directed towards achieving a single target might have unanticipated consequences in other sectors. This suggests that relationships between social transfers might affect child mortality through a cross-program effect. And, social transfer programs (old-age-pension program) in developing country context (South Africa) are shown to improve health indicators (Duflo, 2004).

Based on the preceding discussion of Bangladesh’s expansive social programs, I alternatively consider how household-income effect on child mortality alters with the advent of social transfer programs in Hypotheses 3.3. I hypothesize household-income neither increases nor decreases child mortality likelihood. As such, children born to poor households maintain as high/low survival likelihood as those born to rich households do. I invoke the causal mechanisms by not only the “wealthier is healthier” (reviewed in Chapter II) but also the redistribution scholars and state the following. While rich households are better positioned to purchase preventative (food, nutrition, water, sanitation, education, etc.) and curative (health care, immunization, etc.) goods and services to fight disease and death, poor households have access to similar preventative (food, nutrition, water, sanitation, education, etc.) and curative (health care, immunization, etc.) goods and services due to their participation to social transfer programs.

**HYPOTHESIS 3. 3:** Household-income neither increases nor decreases child mortality likelihood, all else equal.

Figure 3.2 depicts in a diagram the hypothesized relationship between household income and child mortality in the context of expansive social transfer programs.



Figure 3.4: Household Income Effects on Child Mortality

Let's consider the table below. Table 3. 1 records temporally (a) Bangladesh's "breakthrough" period in infant and child mortality reduction, (b) government's initiation of social transfer programs, and (c) the years for which the Bangladesh-Institute of Development Studies and World Bank (BIDS-WB) survey data is available. Please see below as I discuss how the BIDS-WB fits my study.

Table 3. 1: Timeline Indicating Years of IMR and U5MR Reduction, Redistributive Policy, BIDS-WB Surveys

		'80	'81	'82	'83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Mortality	IMR						Gray															
	U5MR						Gray															
Redistributive Policies	VGF	Gray																				
	VGD						Gray															
	FFW	Gray																				
	FFE														Gray							
	FSS AP														Gray							
	MFI						Gray															
Survey	BIDS-WB												Gray	Gray							Gray	Gray

Note: Gray area Indicates Years of IMR and U5MR Reduction, Redistributive Policy Operation, BIDS-WB Surveys

IMR: Infant Mortality Rate; U5MR=Under 5 Mortality Rate; VGF=Vulnerable Group Feeding; VGD=Vulnerable Group Development; FFW=Food-for-Work; FEMALE SECONDARY SCHOOL ASSISTANCE PROGRAM=Female Secondary School Stipend Program; MFI=Microfinance Institutions; BIDS-WB=Bangladesh Institute of Development Studies-World Bank

## **Research Methods**

### ***Data, Variables, and Measurements***

I employ surveys conducted by the Bangladesh Institute of Development Studies and the World Bank (BIDS-World Bank) in 1991/92 and 1998/99. In addition to providing detailed information on employment, income, and expenditures, the surveys include a module on marriage and pregnancy history for all women between 12 and 50 years; land ownership; food and non-food expenditures; participation in agricultural or nonagricultural employment; as well as data on participation in rural financial services and the amount of credit borrowed. Information on family planning program participation, religion, and education in governmental and non-governmental educational institutions is also available. The survey also documents a diverse set of village-specific attributes—i.e., prices of staple food items, wage rates for male, female, and child labor, availability of state-led employment programs (food-for-work, road construction), government and non-governmental food programs, NGOs, formal financial institutions, markets/*haat* in the village, and health and education facilities—that allow me to understand the interrelationships of community-level and household characteristics. Of the village-specific attributes, food and health program availability is particularly important for child health, and while surveys include questions to gauge their availability, these questions in the first round differ to those in the last round. For example, the 1991/92 survey asks, “Is there any government run food programs in the village?” The 1991/92 survey therefore does not differentiate among the available government food programs by early 1990s (VGF, VGD, FFW), and the respondents were likely to answer positively to this question if VGD, VGF, or FFW is available in village—however small

its scale and scope of operation might be at the time of survey. And, the 1998/99 survey asks: “Is there any Food-for-Education project in any of the village schools?” The 1998/99 survey thereby asks about government’s specific food program which started in 1993, after the 1991/92 survey, and the respondents were likely to answer to this question positively if ONLY Food-For-Education is available in the village. Nonetheless, these all are government food programs, and I can crudely compare health status among children living in village with food program with those living in village where n food program is available.

The surveys include 1,798 and 2,599 households—1,638 of which were surveyed in both periods—from 87 villages of 29 *thanas* across Bangladesh. Data from the same households over time allow for a better understanding of “causal” variation in child survival prospects due to variations in explanatory variables than cross-sectional evidence can offer.<sup>15</sup> Notably, parental and village attributes typically change only slowly, if at all, and prior literature on child health or its indicators, more broadly, reports findings using the survey data from a single year (Strauss, 1990; Thomas et al., 1996; Lavya et al., 1996; Barrera, 1990; Frankenberg, 1995; Maitra, 2004, Rosenzweig and Schultz, 1982; Thomas et al., 1986; Haughton and Haughton, 1997; Jalan and Ravallion, 2003; Suwal, 2001; among others; See Rosenzweig and Wolpin, 1988; Edmonds, 2004; Katz et al., 2003; Fedorov and Sahn, 2005; Cebu Study Team, 1992; O’Donnell et al., 2008; Wagstaff and Nguyen, 2002 for exceptions). However, based on review, targeted social transfer programs in villages are likely to change in scale and scope, and intergenerational effects

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<sup>15</sup> A thana is an administrative unit, which is smaller than a district but bigger than a village; a thana consists of a number of villages. Bangladesh’s administrative units are divided into: Divisions (N= 6), Districts (N= 64), Thanas (N=507), Unions (N=4484), Villages (N=59,990), and Households (N=25,362,321).

of parental attributes on child mortality can alter with or without targeted social transfers. Panel data is thus more valid and reliable for this analysis.

The households sampled in both periods are overwhelmingly poor. More than half of the households in both waves are functionally landless with an average income per capita per week of 81/127.5 *taka* (equivalent to \$1.5/\$2) and mean landholding of 0.68/0.66 acres in 1991/92/1998/99.<sup>16,17</sup>

### **Variables**

I estimate household determinants of child mortality using households' economic status, social status, religion, and demographics, and control for child's gender. I measure income alternatively in terms of expenditure per capita and land ownership.

***Child mortality:*** I measure child mortality with survival status at the time of survey among the children born during the ten years preceding the surveys. I use respondents' answers to these following questions. In both rounds, the surveys ask a woman respondent to: (a) list her pregnancy order, (b) identify if pregnancy resulted into a child-birth or otherwise, (c) identify the gender of the child if born alive, (b) state date of birth of the child, (d) state if the child is still alive. Given that mortality is a rare event, and the BIDS-World Bank survey data on mortality is sparsely distributed. To deal with this, I select ten years preceding the surveys to allow the mortality measure to (a) contain enough variation for meaningful inferential analyses, and (b) allow the current data on mortality's structural covariates to represent as much as possible the data on those when mortality occurred in the past.

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<sup>16</sup> The 1998/99 measure for income is not adjusted for inflation.

<sup>17</sup> Households spending 117.28 *taka* and 158.62 *taka* or less per person per week are considered poor in 1991/92 and 1998/99 respectively.

***Income (in Taka):*** The BIDS-World Bank survey asks about expenditures on specific food and non-food items in the last week and year, respectively. I calculate food expenditures by adding all expenses on food items during the prior week, four times a week. Also, I calculate the non-food expenditures by adding all expenses on nonfood items during the last week, divided over twelve months. I calculate food and non-food expenditure as normalized to be a monthly estimate of total expenditures. I divide the sum by the total number of household members, and I find per capita expenditure. I logarithmically transformed per capita expenditure. The survey uses a comprehensive (i.e. standardized for all) matrix of usual food and nonfood items (and allows respondents to specify “other” expenditures). This should suppress recall bias.

***Land (decimals):*** I measure land-ownership by adding the irrigated and non-irrigated land households own. I include the logarithm of land ownership in the analysis.

***Maternal education (years):*** Maternal education is based on years of completed formal education.

***Education among the oldest male member in the household (years):*** The oldest male in the household is typically, but not necessarily, the child’s father. This is thus a proxy for paternal education, and should be a close correlate. The survey does not ask, and thus readily provide, information about children’s fathers since the child health module in the survey asks questions only about mothers and children. I could approximate parental education by matching mothers’ information from the child health module to her information in the background module, but this would be a difficult endeavor with a limited gain, considering the role of paternal education on child health or mortality. And, because households as opposed to individuals typically make decisions in rural

Bangladesh, I don't expect paternal education to resume effects different from this proxy measure.

**Demographics:** I include (a) the logarithm of household size as a quantitative attribute of demographic profile of households, and (b) ratios of male and female members in certain age-brackets to the total household size as a qualitative attribute of demographic profile.

While household size is straightforward in concept and measurement, the ratios are motivated by (a) shortcomings in the traditional calculation of the dependency ratio in the context of Bangladesh, and (b) economic role across age and gender groups has special significance in the development context of Bangladesh. First, the measurement of dependency ratio (DR) as commonly referred to as:

$$DR = \frac{\text{Population} \leq 14 \text{ years} + \text{Population} \geq 65}{\text{Population } 15 - 64 \text{ years}} \times 100$$

does not really capture dependency

and therefore defies the purpose since children in rural Bangladesh village are economically active from the age of six (Cain, 1977). Jacoby and Skoufias (1997) find a similar trend in South Asia at large where, child labor is found to help supplement the income of rural Indian families. Scholars commonly disaggregate male and female household members into numerous age groups (less than 5 years, between 5 and 9, 10 and 16, 17 and 40, and above 40) and calculate the ratios of each group to the total household size (Ravallion and Wodon, 2000; Wodon, 2000). Alternatively, I calculate

$$DR = \frac{\text{Population} \leq 6 \text{ years} + \text{Population} \geq 65}{\text{Population } 15 - 64 \text{ years}} \times 100$$

and expect

this ratio to capture the nature of dependency in the context of rural Bangladesh.

Table 3.2 presents the descriptive statistics or stylized facts of the variables discussed above.

Table 3. 2: Summary Statistics

Variables	Year	N	Mean	Standard Deviation	Minimum	Maximum
Child Mortality	1991/92	3478	0.146	0.353	0	1
	1998/99	4245	0.095	0.294	0	1
Child gender (Male=1)	1991/92	3478	0.512	0.499	0	1
	1998/99	4245	0.503	0.500	0	1
Income per capita (Taka)	1991/92	3478	81.129	46.735	20.640	710.677
	1998/99	4245	127.463	93.00	22.807	1574.808
Land ownership (in decimal)	1991/92	3478	67.566	211.433	1	4575
	1998/99	4245	66.207	125.043	0.500	2108
Maternal Education	1991/92	3478	1.1263	2.280	0	14
	1998/99	4245	1.706	2.836	0	14
Education among adult male	1991/92	3478	2.330	3.234	0	16
	1998/99	4245	2.379	3.424	0	16
Dependency ratio	1991/92	3478	38.076	31.053	0	300
	1998/99	4245	32.946	29.827	0	200
Household size	1991/92	3478	6.244	2.464	2	19
	1998/99	4245	6.300	2.541	2	20
Religion (Islam=1)	1991/92	3478	0.890	0.312	0	1
	1998/99	4245	0.892	0.310	0	1

### *Estimation Strategy*

I estimate a linear relationship between household income, education, and demographics and child mortality outcomes (Equation 1). Both theoretical motivation (reviewed previously) and practical constraints guide variable selection in this rather exploratory analysis.<sup>18,19</sup>

<sup>18</sup> While prior explanations motivate the selection of income and maternal education as the most robust socioeconomic determinants of child mortality, I select demographic controls based on practical considerations. First, as opposed to a continuous indicator with potentially “large” variations across the sample, mortality is a binary outcome, often with insufficient variability. For instance, a 10 percent not alive (0) translates into a modest 423.6 when the sample size is 4263, and 4026.3 when the sample size is 40263. Second, this poses additional restrictions when (a) the overall sample size is not as big as household surveys usually entail, and (b) explanatory variables are also binary. Cross-tabulation of binary explanatory and outcome variables often results in insufficient cell entries. Let’s consider, female headship; it is variable of considerable interest in pertinent study, I opt not to include this variables as chi-sq analysis of association between female household head and mortality is not significant. However, this result can be an

$$[1] Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \varepsilon_{it}$$

where  $Y_{it}$  is the mortality outcome of the child  $i$  at time  $t$ , and  $X_{it}$  is household income in which child  $i$  is born,  $Z$  is a vector of control variables—parental education and dependent children in households, and  $t$  is the years of the surveys, namely, 1991/92 and 1998/99.

To present robust parameter estimates, I (a) run cross-sectional and panel models using data from each survey year and over time; and (b) correct for the possibility of heteroskedasticity in standard errors in order to conduct meaningful significance tests.

The Weibull model estimates the probability of mortality among children born during the ten years preceding the surveys conditional on the covariates in Equation 1. For all children, the surveys include the age at death or age at the survey date if the child is still alive and are therefore right censored. The Weibull functional form makes sense theoretically as well as empirically since hazard for death is a decreasing function of age among children, and the model estimates independent variables using a proportional

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artifact of data-structure. I have no certain way of telling whether this result is a sampling artifact or not, considering that only 3 percent of cells/observations (138 cases in the 1998/99 data) contain the Yes-Yes matching in the mortality-female headship cross-tabulation and are compared against 97 percent alternative matching and hence 0 value. But, since female headship is highly correlated with household landownership and income, it is likely not to add to further explanation of variation in child mortality, but can aFood-for-Educationct the magnitude of land or income variable.

<sup>19</sup> Ideal estimation of child mortality is quite demanding of data. Similar to alterative child health indicator—anthropometric outcomes (child’s health-for-age, weight-for-age, or weight-for-height), child mortality is ideally modeled with (observable) stocks (child, parent, and village fixed attributes/endowments) and flows (health inputs/processes), and with recognition of child, parental, and/or village level unobserved disturbances. Child attributes include gender, age, parity, etc.; parental attributes include parental education, income (land, productive assets or nonlabor income), healthiness, stature, weight, etc.; community characteristics include health, education, income infrastructures; and finally health inputs include the child’s diet (such as nutrient intake, the length of breastfeeding, age at which supplementary foods were introduced, activity level, amount of time spent caring for the child (both in and out of the home), the utilization of clean water, the level of sanitation in the home, and the utilization of health care services (such as pre- and postnatal care). Ideal estimation is thus possible with only a few socioeconomic surveys (for example, Vietnam Living Standard Survey and Indonesia Living Standard Survey).

hazards specification. I also present Probit estimates of the probability of child mortality as an alternative to Weibull Estimates.

The standard errors are robust, and the significance tests are therefore based on heteroskedasticity-consistent estimates of the variance-covariance matrix. In particular, variance-covariance matrix is corrected for (a) heteroskedastic and (b) clustered (within 104 villages) residuals.<sup>20</sup> Although children are the units of analysis, the fact that (sampled) children live in households, and households are available in villages, and failure to adjust for this hierarchical structure in data could plague analysis. Random sampling of clusters implies that clusters are “independently and identically distributed” (*iid*) (inter-cluster correlations = 0), yet random sampling of households does not eliminate the fact that households within clusters somehow correlate (due to unobserved cluster effects). Jackknife variances are clustered over villages, and I use those to tackle some sources of *iid* violation.<sup>21</sup>

Nevertheless, the following methodological constraints could confound findings. Firstly, errors almost always plague measures of household income using survey data from developing countries like Bangladesh, and a consequent systematic difference between actual and observed household income poses a credible threat to the analysis. I use total household expenditures per capita per week and land ownership as alternative

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<sup>20</sup> Both are common in the survey data, and clustered residuals are more common in rural Bangladesh. Heteroskedasticity occurs from deviation of each household from (aggregate/all) household mean due to that particular household's unique conditions, known to households, unknown to researchers. Clustered residuals occur when households living in a same cluster behavior similarly among household living within that cluster and differently from households living outside clusters due to cluster-specific attributes, unknown to researchers through survey instruments.

<sup>21</sup> Studies identify several routes to inter-household correlation within villages: (a) household exposure to identical amenities in villages, (b) households' selective migration to villages with certain amenities, and/or (c) households seeking community approval adapt behavior and utilization of village amenities.

measures to estimate the income effect.<sup>22</sup> While both are commonly used as indicators or predictors of *permanent* household income, land ownership captures household wealth, which is a key predictor of income and is often the basis of targeting for redistribution programs.<sup>23</sup> I have logarithmically transformed both variables to correct for possible skewness and to attain normalcy in the distribution of income, and identify effects on child mortality as income increases by a percent regardless of initial income.

More fundamental problem perhaps is the fact that income measures are from the survey years, and mortality occurred in years preceding the surveys. With this, I assume household's income in the years when children died to stay statistically unchanged until the years when the BIDS-World Bank conducted the surveys in 1991/92 and 1998/99. I therefore make an assumption, which may or may not hold true in the empirical reality

## **Regression Results**

Tables 1-4 present the Weibull parameter estimates of the household determinants on the mortality outcome for the children born during the ten years preceding the surveys.<sup>24</sup>

Households' income, education, demographic characteristics, religious affiliation, and child's gender constitute the baseline specification in this analysis largely because of robustness as distal determinants of child mortality or its proximate correlates in general,

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<sup>22</sup> In addition, I conduct a descriptive analysis of the distribution of the key income correlates across income groups and check for external validity in income measures. I find that the average years of education among mothers, fertility rates, etc. are of expected magnitude across income quintiles.

<sup>23</sup> Especially where the credit market is absent or inaccessible

<sup>24</sup> The analysis includes children aged 10 years or less at times of surveys. By doing so, I respond to the constraint I face from not having enough variability in the outcome variable as I use the survey that provides rich information on the explanatory variables of my interest but is not primarily intended to assess child mortality as thoroughly as DHS, for instance. I therefore stretch the population from its actual space—children aged 5 or less (infants and children under 5). However, I follow the fix, commonly practiced in empirical research on child mortality in low-income developing countries facing similar constraints (Lavya et al., 1996).

and Bangladesh, in particular (Sen, 2003; Wodon, 2000; Nargis and Hossain, 2006).

Income and demographic structure are measured, alternatively, with per capita income and land ownership, and with household size and dependency ratio.

Tables 1 and 2 report estimated effects of these determinants using cross-sectional evidence from 1991/92 (Columns 1 and 2) and 1998/99 (3 and 4), and panel evidence (Columns 5 and 6). Overall, with regards to household determinants, results comply with conventional wisdom as much as they tend to defy it.

Income, maternal education, dependency ratio, and Islamic belief have significant association with the child probability of death in rural Bangladesh in the 1990s. With regards to association based on the 1991/92 survey data on each of these household characteristics, maternal education confirms the prior finding in that maternal education has a negative and significant association with child mortality (Column 1 in Table 1). If I were to make a “causal” prediction based on this association, I can say, an additional year of maternal education reduces median time to a child’s death by 0.4 percent.<sup>25</sup> Education of adult male members in the household has no significant association with child mortality, however. Household size has a significant and negative association with child mortality. As such, a 10 percent increase in household size reduces the median time to child death by 2 percent. In substantive terms, between the two same-gender children whose parents have similar levels of income and education, one would have a lower mortality likelihood than the other if the child lives in a household with more members. Finally, household’s Islamic belief has a negative but insignificant association with the child probability of death. This suggests Islamic belief neither accelerates nor delays

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<sup>25</sup> We know,  $S(x)=\exp[-h(x)]$ , where  $S(x)$  is the time-to-event(mortality) function and  $h(x)$  is the hazard rate. The STATA output indicates that the hazard rate for education is 0.952, and based on that I calculate this coefficient.

death. Among the child-specific attributes, I include only child's gender due to its availability in survey data. And, I find child's gender coefficient to take on a positive but statistically insignificant coefficient. This suggests preferential treatment, if there is any, towards male children in the household is not high enough, and female as well male children face comparable likelihood to live or die.

Let's note, the 1991/92 Weibull income estimate maintains a positive sign, and this estimate is significant. This suggests household income has a *positive* association with child mortality after I control for variation in household's education attainment, demographic attribute, and religious affiliation. And, income's positive association with child mortality is significant at  $\alpha=0.01$  (Column 1 in Table 1). The magnitude of the effect is also sizeable. A causal prediction based on this association suggests, a 10 percent increase in household income, for example, speeds up the median time to child mortality by 2.4 percent.

Household income coefficient retains its positive sign when I re-estimate the baseline specification in Equation 1 with the Probit modeling technique (Column 2 in Table 1). With regard to associations based on the 1991/92 survey data of household characteristics, I find maternal education and both household demographic characteristics, namely, household size and dependency ratio have negative associations with child probability to death. Weibull and Probit parameter estimates are therefore consistent with respect to the explanatory variables' directions of, and statistically significant associations with child mortality.

Table 3. 3: Parameter Estimates of Child Mortality Determinants

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Income per capita	0.344*** (0.106)	0.202*** (0.063)	0.210** (0.100)	0.106* (0.062)	0.381 (0.066)	0.019 (0.040)
Maternal education	-0.048* (0.025)	-0.026* 0.014	- 0.076*** (0.024)	-0.044*** (0.013)	- 0.065*** (0.018)	- 0.038*** (0.009)
Education among adult male	0.001 (0.016)	-0.001 (0.009)	- 0.063*** (0.019)	-0.033*** (0.010)	-0.028** (0.012)	-0.008 (0.007)
(Log of) Household size	- 0.153*** (0.028)	- 0.075*** (0.011)	- 0.110*** (0.029)	-0.052*** (0.012)	-0.133 (0.020)	- 0.064*** (0.008)
Dependency ratio	-0.002* (0.001)	- 0.002*** (0.000)	- 0.004*** (0.001)	-0.003*** (0.001)	-0.002** (0.001)	- 0.002*** (0.000)
Child gender (Male=1)	0.079 (0.089)	0.049 (0.052)	-0.169* (0.095)	-0.104* (0.054)	-0.029 (0.066)	-0.014 (0.037)
Religion (Islam=1)	-0.064 (0.137)	-0.031 (0.082)	- 0.579*** (0.131)	-0.303*** (0.078)	- 0.271*** (0.095)	- 0.168*** (0.056)
Constant	- 4.437*** (0.528)	- 1.337*** (0.294)	- 5.109*** (.574)	-0.931*** (0.321)	- 4.920*** (0.359)	-0.560** (0.201)
Obs	3478	3478	4245	4245	7723	7723
Log pseudo likelihood ratio	- 2567.515	- 1417.817	- 1856.767	- 1292.4031	- 4523.054	- 2752.523

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Heteroskedasticity adjusted robust standard errors are in parentheses.

Columns 3 and 4 in Table 1 present Weibull and Probit parameter estimates using the 1998/99 survey data. Overall, the results show surprising directions of associations. Maternal education has a negative and significant association with child mortality (Column 2 of Table 1). A casual speculation based on this association suggests that an additional year of maternal education reduces median time to a child's death by a 0.9

percent—0.5 percentage points higher than 1991/92.<sup>26</sup> Education of adult male members in the household becomes significant as I use the 1998/99 survey data. Household size has a significant and negative association with child mortality. A 10 percent increase in household size reduces the median time to child death by 0.9 percent. Similarly, household dependency ratio has a significant and negative association with child mortality. Surprisingly, household's Islamic belief has a negative association, and is statistically significant at  $\alpha=0.01$ . In substantive terms, a Muslim child has a 56% less likelihood than a non-Muslim child to die before its fifth birthday. And, no less surprisingly, a male child has a higher likelihood to die prematurely than a female child.

As before, the 1998/99 Weibull income estimate maintains a positive sign, and this estimate is statistically significant. This suggests household income has a *positive* association with child mortality after I control for variation in household's education level, demographic attributes, and religious affiliation. Income effect is robust to alternative estimations in that the Probit income estimates are consistent with the Weibull income estimates and show income's positive association with child mortality. In substantive terms, children in poor households have higher survival likelihood than those in rich households.

Columns 5 and 6 in Table 1 present Weibull and Probit parameter estimates using household survey data from both 1991/92 and 1998/99. Parameter estimates based on these panel evidence are consistent to those based on the each round of cross-sectional evidence in 1991/92 and 1998/99. Supporting our current understanding, while education is negatively associated with child mortality, child's gender, household's religious

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<sup>26</sup> We know,  $S(x)=\exp[-h(x)]$ , where  $S(x)$  is the time-to-event(mortality) function and  $h(x)$  is the hazard rate. The STATA output indicates that the hazard rate for education is 0.952, and based on that I calculate this coefficient.

affiliation, and income and income's demographic covariates maintain counterintuitive directions in their associations with child mortality.

What does explain household income's positive effect on mortality? Respondents' bias in recalling data on income could play a role. Therefore, I re-estimate the baseline specification in Equation 1 with household's land ownership as an alternative, and perhaps more robust, measure of income. As such, Ravallion and Sen (2006) find a strong correlation between landownership and poverty in that landless households have high levels poverty in rural areas in Bangladesh (Ravallion and Sen, 2006). I present these results in Table 2

Table 2 presents land ownership's estimated associations with the child probability of mortality in addition to other explanatory variables' associations using the cross-sectional data from the 1991/92 survey (Columns 1 and 2), the 1998/99 survey (3 and 4), and the household survey data from both rounds, namely, 1991/92 and 1998/99 (Columns 5 and 6). With respect to the associations of household characteristics, maternal education retains its consistently negative and significant association with child mortality in the cross-sectional and the panel models. Education of adult male members has a less systematic association than maternal education in that the male education coefficient is not significant in the 1991/92 cross-sectional estimation; yet it is significant in the 1998/99 estimation; and it is significant only in Weibull estimation using the panel data. Household's Islamic belief has a negative association with child probability of death, but Islamic belief's association is not consistent in that the coefficient is not significant in the 1991/92 cross-sectional estimation. Child's gender coefficient takes on both a positive and a negative sign, and is significant in a less systematic fashion.

Household demographic characteristics, namely, household size and dependency ratio maintain a negative and significant association with child mortality. Household demographic characteristics are household income's close and inverse covariates, and the fact that the significant land coefficients are positive while demographic coefficients are negative in Table 2 might suggest that the counterintuitive income association is mediated by household demographic characteristics and vice versa. In particular, land coefficients are positive when they are significant (Columns 1, 2, 5, and 6). In substantive terms, children from land-rich households have a higher likelihood to die prematurely than those from land-poor households. Land association with child probability to death is robust to the alternative Weibull and Probit estimation techniques.

Table 3. 4: Parameter Estimates of Child Mortality Determinants, Alternative Measurement of Income

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Land	0.073*** (0.021)	0.047*** (0.013)	-0.009 (0.022)	-0.002 (0.013)	0.037** (0.015)	0.027** (0.009)
Maternal education	-0.044* (0.024)	-0.026* (0.014)	- 0.070*** (0.024)	- 0.040*** (0.013)	- 0.052*** (0.017)	-0.042 (0.009)
Education among adult male	0.001 (0.016)	-0.001 (0.009)	- 0.053*** (0.020)	- 0.029*** (0.010)	-.022* (0.012)	-0.009 (0.007)
(Log of) Household size	-1.224*** (0.140)	-0.674*** (0.076)	- 0.929*** (0.165)	-.464*** (.080)	- 1.097*** (0.110)	- 0.566*** (0.054)
Dependency ratio	-0.002*** (0.001)	-0.002*** (0.001)	- 0.005*** (0.001)	- 0.003*** (0.001)	- 0.002*** (0.001)	- 0.002*** (.001)
Child gender (Male=1)	0.080 (0.089)	0.050 (0.053)	-0.181* (0.095)	-0.107** (0.054)	-0.035 (0.066)	-0.018 (0.037)
Religion (Islam=1)	-0.062 (0.135)	-0.021 (0.082)	- 0.574*** (0.131)	- 0.303*** (0.079)	- 0.274*** (0.095)	- 0.157*** (0.056)
Constant	-1.931*** (0.283)	0.140 (0.156)	- 3.170*** (0.394)	0.062 (0.162)	- 2.157*** (0.218)	0.059 (0.111)
Obs	3478	3478	4245	4245	7723	7723
Log pseudo likelihood ratio	-2553.241	-1404.089	- 1850.353	- 1286.564	- 4513.128	- 2728.526

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Heteroskedasticity adjusted robust standard errors are in parentheses.

While I find counterintuitive patterns of association between several explanatory variables and child mortality, nothing seems to be as surprising as income's positive association with child mortality. Household income's positive coefficients are nearly impossible to explain in substantive terms in that it is difficult to imagine why children from rich households should die at higher rates than those from poor households.

Additionally, even an insignificant income association is no less important especially in the context of rural Bangladesh where poverty is widespread and any increase in income should retain a significant and *negative* association with child mortality (Anand and Ravallion, 1993; Preston, 1975; Deaton, 2002).

What could be behind this positive income coefficient? I investigate this association in further detail in Tables 3 and 4. I examine if the linear association I specify in Equation 1 is misspecified, and do so by altering the functional form between income and child mortality relation from a linear to nonlinear. In particular, I introduce a quadratic income term, and thereby explore the possibility of a NONLINEAR and an inverted-U relationship between income and child mortality.<sup>27</sup> I estimate:

$$[2] Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 X_{it}^2 + \beta_3 Z_{it} + \beta_4 J_{it} + \varepsilon_{it}$$

where  $Y_{it}$  is the mortality outcome of the child  $i$  at time  $t$ , and  $X_{it}$  is presumably time-invariant income of the household where child  $i$  is born, and  $X_{it}^2$  is the polynomial construction of income,  $Z_{it}$  is a vector of presumably control variables—child  $i$ 's parental education, household's demographic characteristics at time  $t$ ,  $J_{it}$  is availability of food and health redistribution programs in the village child  $i$  lives in at time  $t$ , where  $t$  is 1991/92 and 1998/99.

First, let's consider Figure 2. Figure 2 presents survival status among children aged ten years or less in 1991/92 and 1998/99. It further shows how children's survival differs by their households'/parents' economic status. Children from very poor and rich households survive at a higher rate than those born in "middle-income" households in the early 1990s. By way of contrast, the middle class appears to outperform the upper and

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<sup>27</sup> Basu et al. (2010) find that the relationship between land-holding and child labor is indeed an inverted-U in India. This suggests greater as well as meager land wealth leads to higher child labor.

lower classes in saving children’s lives in late 1990s. The fact that income and child survival in the 1990s appears to have all but a strictly linear association offers a contrasting picture to some anthropologists’ portrayal of this association in rural Bangladesh in the late 1970s and the early 1980s. Those scholars stated that child mortality rates for the poor nearly doubled those of the well-off (Arthur and McNicoll, 1978).

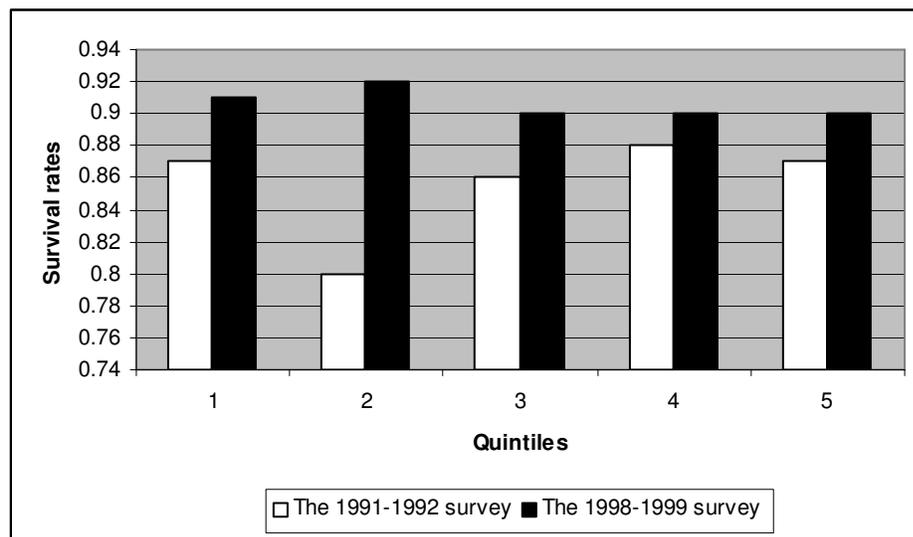


Figure 3. 2: Trends in Child Mortality, by Consumption Quintile

Table 3 presents Weibull and Probit parameter estimates of income and income-squared as well as parental education, household’s demographic characteristics, religious affiliation, and child’s gender. Using the 1991/92 survey data, I find maternal education, household size and dependency ratio are inversely associated with child mortality. This finding is consistent with my previous findings in Table 2, and a causal speculation based on this association suggests while maternal education reduces child probability of mortality as do household’s size and dependency ratio. And, when income enters the

model in the first-order monotonic and second-order polynomial functional forms (as the level and the squared terms), income coefficient remains positive but its squared-term takes on a negative coefficient value (Columns 1-2 in Table 3). While the Weibull and Probit estimates of income and its square are individually insignificant, a chi-square test of joint significance of income and its square has a probability of 0.026 (Column 1 of Table 3), and 0.021 (Column 2 of Table 3). This suggests (a) as a set, income and income-square are associated with child mortality, and (b) household income maintains a concave, nonlinear relation with child mortality. In other words, a child from a poor household has a higher likelihood than a child from a “middle-income” household and as high likelihood as a child from a rich household to avoid premature death.

Table 3. 5: Parameter Estimates of the Income-Child Mortality Relationship

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Income per capita	1.148 (1.097)	0.593 (0.754)	1.691 (1.259)	1.030 (0.714)	2.366 *** (0.780)	0.631 (0.436)
(Log of) Income per capita <sup>2</sup>	-0.094 (0.119)	-0.047 (0.084)	-0.153 (0.127)	-0.096 (0.072)	-0.214** (0.081)	-0.067 (0.046)
Maternal education	-0.046* (0.025)	-0.025* (0.014)	- 0.078*** (0.025)	- 0.045*** (0.013)	- 0.064*** (0.018)	- 0.038*** (0.009)
Education among adult male	0.002 (0.016)	0.001 (0.009)	- 0.058*** (0.020)	- 0.031*** (0.010)	-0.025** (0.012)	-0.006 (0.007)
(Log of) Household size	- 1.092*** (0.140)	- 0.586*** (0.073)	- 0.901*** (0.164)	- 0.451*** (0.079)	- 0.998*** (0.107)	- 0.529*** (0.053)
Dependency ratio	-0.002* (0.001)	- 0.002*** (0.001)	- 0.005*** (0.001)	- 0.003*** (0.000)	- 0.002*** (0.001)	- 0.002*** (0.000)
Child gender (Male=1)	0.073 (0.089)	0.047 (0.053)	-0.180* (0.095)	-0.106** (0.054)	-0.037 (0.066)	-0.017 (0.037)
Religion (Islam=1)	-0.069 (0.136)	-0.034 (0.082)	- 0.560*** (0.131)	- 0.293*** (0.079)	- 0.263*** (0.095)	- 0.165*** (.056)
Constant	-5.184** (2.567)	-1.582 (1.690)	- 7.768*** (3.174)	-2.674 (1.769)	- 8.567*** (1.895)	-1.409 (1.024)
Obs	3478	3478	4245	4245	7723	7723
Log pseudo likelihood ratio	- 2554.789	- 2511.942	- 1848.536	- 1821.021	- 4499.717	- 2731.873
$\chi^2$ test of joint significance	7.25	7.71	3.98	3.67	26.50	2.10
$p > \chi^2$	0.026	0.021	0.136	0.159	0.000	0.350
Inflection point: per capita total expenditure per month (in Taka <sup>1</sup> )	180.93	184.19	170.95	167.98	170.98	159.95

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$ 

Note: Heteroskedasticity adjusted robust standard errors are in parentheses.

Columns 3 and 4 of Table 3 present Weibull and Probit parameter estimates of Equation 2 using the 1998/99 survey data. While maternal education, household's size and dependency ratio maintain negative association with child mortality, I find a female child and a Muslim child to have a higher likelihood to live than a male and non-Muslim child (Columns 3 and 4 of Table 3). And, when income enters the model in the first-order monotonic and second-order polynomial functional forms, income coefficient remains positive but its squared-term takes on a negative coefficient value. But these coefficients are neither independently nor jointly significant (Columns 3 and 4 of Table 3). A chi-square test of joint significance of income and its square has a probability of 0.136 (Column 3), and 0.159 (Column 4). In other words, a child from a poor, middle-class, or rich household has the similar likelihood to live or die.

Columns 5 and 6 of Table 3 present Weibull and Probit parameter estimates of Equation 2 using the survey data from 1991/92 and 1998/99. I find chances are significantly low that children would die prematurely when their mothers are educated, they live in households with large number of dependent members, and are Muslims. And, when income enters the model in the first-order monotonic and second-order polynomial functional forms, income coefficient remains positive but its squared-term takes on a negative coefficient value. These coefficients are independently and jointly significant in the Weibull estimation (Column 5), but not in the Probit Estimation (Column 6). A chi-square test of joint significance of income and its square has a probability of 0.000 (Column 5). This finding confirms those from the 1991/92 survey data that children in very poor and rich households have a lower probability to die prematurely than those born in middle-income households.

I re-estimate Equation 2 and present in Table 4 Weibull and Probit estimates of household land ownership as an alternative measure of household income. Across estimations and samples from the 1991/92 and the 1998/99 cross-sectional survey data, I find maternal education, household size and dependency ratio are inversely associated with child mortality. Islamic belief reduces the child probability of mortality in more estimations than not. And, when household land ownership enters the model in the first-order monotonic and second-order polynomial functional forms (as the level and the squared terms), land coefficient remains positive but its squared-term takes on a negative coefficient value (Columns 1-6 of Table 4). While the Weibull and Probit estimates of income and its square are individually insignificant, a chi-square test of joint significance of income and its square has a probability of less than 0.05 using data from 1991/92 (Columns 1 and 2) and those from both 1991/92 and 1998/99 (Columns 5 and 6). This suggests (a) as a set, land and land-square are associated with child mortality, and in substantive term (b) household land ownership maintains a concave, nonlinear relation with child mortality. In other words, a child from a land-poor household has a higher likelihood than a child from a “land middle-range” household and as high likelihood as a child from a land-rich household to avoid premature death.

Table 3. 6: Weibull Parameter Estimates of the Income-Child Mortality Relationship, Alternative Measurement of Income

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Land	0.121* (0.071)	0.073* (0.041)	0.048 (0.091)	0.038 (0.050)	0.084 (0.056)	0.050 (0.031)
(Log of) Land <sup>2</sup>	-0.009 (0.014)	-0.005 (0.008)	-0.012 (0.019)	-0.008 (0.010)	-0.009 (0.011)	-0.004 (0.006)
Maternal education	-0.044* (0.024)	-0.026* (0.014)	- 0.069*** (0.024)	- 0.040*** (0.013)	- 0.051*** (0.017)	- 0.041*** (0.009)
Education among adult male	0.009 (0.016)	-0.001 (0.010)	- 0.053*** (0.020)	- 0.029*** (0.010)	-0.021* (0.012)	- 0.009*** (0.007)
(Log of) Household size	-1.211*** (0.142)	- 0.665*** (0.077)	-.918*** (0.168)	- 0.456*** (0.081)	- 1.086*** (0.111)	- 0.560*** (0.055)
Dependency ratio	-0.002* (0.001)	- 0.002*** (0.000)	- 0.005*** (0.001)	- 0.003*** (0.001)	- 0.002*** (0.001)	- 0.002*** (0.000)
Child gender (Male=1)	0.081 (0.089)	0.051 (0.053)	-0.179* (0.095)	-0.107** (0.054)	-0.034 (0.066)	-0.018 (0.037)
Religion (Islam=1)	-0.068 (0.135)	-0.025 (0.083)	- 0.575*** (0.131)	- 0.302*** (0.079)	- 0.278*** (0.096)	- 0.158*** (0.056)
Constant	-1.960 (0.286)	0.121 (0.159)	- 3.198*** (0.398)	0.042 (0.164)	-2.183 (0.220)	0.045 (0.113)
Obs	3478	3478	4245	4245	7723	7723
Log pseudo likelihood ratio	-2552.982	- 1403.871	- 1850.152	- 1286.205	- 4512.755	- 2728.254
$\chi^2$ test of joint significance	12.37	13.56	0.58	0.74	6.43	9.41
$p > \chi^2$	0.002	0.001	0.749	0.689	0.040	0.009
Inflection point: total land (in acre <sup>1</sup> )	0.82	0.86	0.30	0.37	0.67	0.79

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Heteroskedasticity adjusted robust standard errors are in parentheses.

<sup>1</sup> 100 decimals = 1 Acre

To elaborate, I estimate with Weibull and Probit estimation techniques the distal and household determinants of child mortality using households' economic status, social status, religion, and demographic characteristics after controlling for child's gender. Results show that the income per capita coefficient is positive, and this suggests that the household income has a *positive* association with the child probability of mortality after I control for variation in parental education, demographic structures, religious affiliation, and child's gender. In substantive terms, the positive and significant ( $\alpha=0.01$ ) coefficient on income per capita suggests that children born in poor households have a higher likelihood for survival than those born in rich households. A possible explanation for this rather counter-intuitive income association is that survey responses can be plagued with recall bias, and that income measure poorly captures household's actual economic status. In order to verify this speculation, I re-estimate the baseline specification with household's land ownership as an alternative measure of income. And, the results are fairly consistent across alternative income measures. What does explain the positive income coefficient? I investigate this association in further detail. I introduce a quadratic income term, and thereby explore the possibility of a NONLINEAR and an inverted-U relationship between income and child mortality. When income enters the model in the first-order monotonic and second-order polynomial functional forms (as level and squared terms), the coefficients on income remain positive and its squared-transformation retains a negative coefficient. This suggests that income maintains a concave, nonlinear relation with the probability of child mortality.

Among the non-economic indicators of child mortality, the fact that I find children born in Muslim households to live longer than those born in Non-Muslim

households is no less surprising. I can safely state that Muslim household's effect is not driven by their relative well-off economic status, since I control for income in estimations. This hints to the possibility that, Muslim households, due to their religious identity, have differential access to particular social services, i.e. some social services are not available to Non-Muslims households but are beneficial for children's good health. The Female Secondary School Assistance Project (FSSAP) among all governments' social transfer programs can benefit Muslim girls and households more than it does Non-Muslim girls and households. Because, Female Secondary School Assistance Program gives a stipend to the secondary school based on the number of girls it enrolls. This has motivated even all-male religious schools in Bangladesh to have become co-educational and enrolled female students in large number (Chowdhury and Devrajan, 2006). A Muslim girl has a higher access to not only education but also monetary benefits than her Non-Muslim counterpart in rural Bangladesh after the advent of the Female Secondary School Assistance Program. So, one speculation of Islam's beneficial effect on child mortality could be that Muslim children are benefiting from the opportunities for the Muslims in particular.

In sum, empirical evidence supports Hypotheses 3.2 and 3.1, and 3.3 substantially, partially, and negligibly. First, maternal education is negatively associated with child mortality likelihood as such children born to uneducated mothers have a higher likelihood to die prematurely than those born to educated mothers (Hypothesis 3.2). And, second, household-income is negatively associated with mortality likelihood of the children born to rich as well as poor households; household-income is positively associated with the mortality likelihood of the children born to middle-income

households. While I support Hypothesis 3.1 partially as I reject Hypothesis 3.3, I concur with the redistribution scholars and argue that the direction of household-income effect and the mechanisms by which income affects mortality are likely to deviate from “wealthier is healthier” scholars’ rather uni-dimensional arguments, and are contingent on countries’ redistributive development policies. In particular, the household-income effect can range from a linear to a nonlinear direction and the mechanisms can range from a greater purchasing ability to accessibility of health goods and services depending on the scale and the scope of the social transfer programs in society.

Why is the relationship between income and child mortality curvilinear? I answer this question in the next chapter. One plausible explanation is the poorest of the poor and the rich households’ differential access to health inputs. But as opposed to the rich who purchase them with private income, the poor get access to them by being social transfer program targets. A few studies—none in Bangladesh—have attempted to establish the relationship between social transfer programs and child health. However, a careful exploration of targeting criteria is warranted to (a) make sense of the inverted U-relationship I find in my analysis and (b) get better understanding of the income-child mortality dynamic in social contexts with targeted social transfers and those without. I tackle targeted social transfers or targeting in Chapter IV.

## CHAPTER IV: THE TROUBLE WITH TARGETING

Targeted transfers are among the most contemporary antipoverty programs in Bangladesh and many low-income developing countries. Typically defined as the inability to afford consumption needs, poverty perpetuates across generations due to poor parents' limited investment in children's education, health, and nutrition (Ravallion, 2006; Villatoro, 2004; Lomeli, 2008). Social transfers are a state-subsidized, non-contributory, regular, and predictable aid to fill the ability and necessity gap among the poor. They aim to help the poor reach the "threshold" to not only ensure a minimum living standard but also invest in human resources development (Lomeli, 2008; DFID, 2006).

Transfers take the form of food, cash, or (human resources building) services, and are directed to narrowly defined "target" groups within society (van de Walle, 1998). As such, target groups are entitled to transfers—whatever they might be—as long as they meet certain selection criterion(a). Bangladesh's Vulnerable Group Feeding (VGF) and Vulnerable Group Development (VGD) are among the examples of such *unconditional* social transfers where groups receive transfers as long as they are "vulnerable". Transfers are often conditional, however, upon behavioral changes among recipients. Parents' receipt of food/cash transfers is conditional on children's school attendance, performance, and health. Latin American Conditional Cash Transfer (CCT), and Bangladesh's Food-for-Education (FFE), the Female Secondary School Stipend Program Assistance (FSSAP) are the examples of conditional transfer programs.

Who are the "targets"? Simply put, targets are those demographic or economic groups left behind by the market (economic growth). Women, children, elderly, and landless rural poor often make potential targets using a more formal set of principals: the

indicator- or self-targeting. Indicator targeting identifies an observable economic or non-economic covariate of poverty, and uses that as a proxy for income to identify poor people. Indicator targeting replaces income- or means test-based targeting practices under the assumption that observing non-economic covariates of income is less problematic than observing income itself (Ravallion, 2006; van de Walle, 1998; Besley and Kanbur, 1993; Ravallion and Sen, 1994). Gender, age, landlessness, area of residence, or combinations of these are common indicator-targets in Bangladesh and many developing countries. For example, the Grameen Bank in Bangladesh combines gender and landlessness to target clients, and transfers small loans to rural women from landless or near landless households. Indicator-targeting differs from self-targeting, where households—as opposed to state bureaucrats—select themselves as potential transfer recipients.

What are the conditions? As I mentioned before, targeted social transfers demand either (a) their recipients conform to certain behavioral changes, and therefore are conditional, or (b) none, and therefore are unconditional. Among the targeted conditional social transfer programs in Bangladesh, two require that their recipients should maintain a certain level of educational performance and recipients' parents' should conform to certain behavioral changes. For example, the Food-for-Education program requires that primary school age children should maintain regularity and perform well in school. And, the Female Secondary School Assistant Program requires that the secondary school age girls maintain regularity and perform well in school, and remain unmarried until they graduate from the secondary school

Targeted social transfers have stirred up excitement—even among neoliberal institutions—as an alternative to transfers to all or universal transfers to best reduce intergenerational poverty and income inequality. And, in the process, scholars and development practitioners engage themselves to the following, long-debated question: should only the poor be qualified to receive transfer benefits, or should every citizen be assured as a social right of “government-protected minimum standards of income, nutrition, health and safety, education, and housing” (Wilensky, 1975: xii). While non-economists in general support universal transfers on the ground of greater equality, economists, development practitioners and policy makers support targeted social transfers on the grounds that “a comprehensive approach to poverty reduction...calls for a program of well-targeted transfers and safety nets” (World Bank, 1990: 3) and that universal social transfers negatively affect labor supply and savings, and are therefore detrimental to economic growth. However, universalism is often critiqued even among its supporters as they believe equality via universalism is less likely to take hold as long as universalism ensures earnings-related—as opposed to flat-rate—benefits (Castles and Mitchell, 1992). And, its critiques argue that universalism is best suited to maintain—instead of reduce— income inequality and poverty. The critiques argue that the non-poor’s participation is not only a waste of resources but also counterproductive in that “the more non-poor benefit, the less redistributive (or, hence, egalitarian) the impact of the welfare state will be” (Goodin and Le Grand, 1987: 215).

On practical (empirical) grounds, targeted social transfers are believed to be as equitable as universal provisioning, and more efficient than either universal or market transfers (Ravallion, 2006; World Bank, 2004). Transfers for all have far-reaching human

developmental gains; yet scholars doubt gains in actuality as the big administration is often plagued by maintenance costs, local capture, leakage, and absenteeism among other metrics of inefficiency. Unannounced visits to primary schools and health clinics in Bangladesh, Ecuador, India, Indonesia, Peru and Uganda show that 19 percent of teachers and 35 percent of health workers were absent. Moreover, one-quarter of government primary school teachers in India were absent from school, but only about one-half of the teachers were actually teaching when enumerators arrived at the schools (Chaudhury et al., 2006; Banerjee and Duflo, 2006). Anecdotal evidence from Bangladesh suggests local captures of redistribution programs. Hartman and Boyce (1983) talk about how rich local farmers captured a publicly provided local irrigation facility intended for poor farmers. Un Nabi (1999) talk about the local power structure and how local elites are often consulted when a development project is undertaken in community. This says that transfers can often bypass the poor considering imbalances in economic, social, and political power between service providers and recipients, and the poor lack ability to hold public officials accountable.

Efficiency might still be possible if those bureaucrats at work, or those refraining from leaks generate enough human development gains to offset absenteeism or leakage among fellow bureaucrats. But, speculations such as these remain just so, and comparability across cases does not necessarily offer robust understanding.

Nonetheless, targeted transfers have gained traction on the grounds of higher efficiency, and lower leakage than the alternatives (Ravallion et al., 2006; van de Walle, 1998; Besley and Kanvur, 1993). Even the World Bank sidetracks from only economic growth to social transfers in addition to economic growth as a route to poverty reduction

(The World Bank, 1990, 1997; 2000, 2004; Lyn Squire, 1993; Birdsall and Londono, 1997; Besley and Kanbur, 1993; Mosely et al., 2002; van de Walle 1998). Scholars argue that the poor are not homogeneous—some are more poor and vulnerable to personal and natural calamities than others. Cost-effectiveness in targeted transfers is made possible by channeling limited state resources to those in the greatest need. Targeting does not necessarily solve leakage, absenteeism or other institutional failures, and decentralized, community based service delivery is proposed as an institutional check. As such, partnerships between public and private (not-for-profit) organizations are believed to be able to prevent leakage, absenteeism, and poor quality of service among public officials serving targeted beneficiaries (Shleifer, 1998; Besley and Ghatak, 2001; Besley and Ghatak, 2007).

Targeted transfers have generated considerable debate about prospects for human resource development. Targeted transfers are more than only supply-side interventions (like transfers for all); the most common forms of transfers create parental demand for children's human resources development (for example, Food-For-Education, Conditional Cash Transfer). Transfers thereby combine various components of human capital into a single transfer mechanism (education with nutrition in Food-For-Education, education with income in Female Secondary School Assistance Program, and education, nutrition, and health in Conditional Cash Transfer). Their interventions at particular points in the life-course have far-reaching human development consequences. For example, Female Secondary School Assistance Program in Bangladesh makes cash stipends available for secondary school-age girls and thus discourages girls from dropping out of school and perhaps getting married. Finally, demographic and social externalities are sizeable in

(conditional) targeted transfers. Food-For-Education not only increases schooling but also suppress child labor; Female Secondary School Assistance Program increases girls' age of marriage and child-bearing as well as schooling levels.

Nonetheless, "Targeting is almost never costless" (Van de Walle, 1998: 232). Wilensky (1975) argued that the debate about how effective social transfers are goes beyond whether or not targeted social transfers are more efficient and/or equitable than its universal counterpart. Wilensky argued targeted social transfers could have a more fundamental and often political implication in that transfers can serve to meet public officials' political aims. Citing France's Family Allowance Program to increase fertility, he talked about how the program had produced a pronatalist clientele organized to lobby for benefits (p. 114). Second, some argue that gender-based targeted social programs tend to disadvantage women. As such, spouse and widow benefits may justify unpaid domestic work, and transfers can reduce the capacity to form or maintain personal autonomy by insulating women from the pressure of the labor market (Harrington Meyer, 1996; O'Connor, 1993; Orloff, 1993). Moreover, transfers to the poor are often viewed as a structural adjustment of social policies. They are criticized as a broader continuation of economic reforms in developing countries in the 1980s and 1990s, and that social transfers to the poor are "compatible with the logic of the market" as the state interventions are restricted to the neediest section of the population to avoid "distortions in relative prices" (Lomeli, 2008).

On practical grounds, targeted transfers share similar critiques as its universal counterparts, and some more with regards to "targeting". Perhaps the biggest drawback of targeted transfers is their high reliance on the "successful" targeting of the poor, and

especially when broad-based survey responses—as opposed to context-specific local knowledge—are utilized. As such, Ravallion (2006) cautions against using conventional poverty covariates to target the poor in actuality. He fails to explain more than half the variance in consumption or income across households using even the most comprehensive, high quality survey. When income proxies err in assessing the actual income, the basis of targeting is questioned.

Second, targeted transfers share similar criticisms as universal transfers. Skeptics worry that transfers discourage labor supply and savings, which negatively affects economic growth. Institutional inefficiency does not wither away with targeted transfers. Moreover, evaluations of targeted transfers are rarely embedded in the broader developmental contexts. Do targeted transfers work by themselves? Do they depend on universal targets to take effect? For example, in addition to universal primary education, Bangladesh initiates Food-For-Education program. And, educational payoffs from Food-For-Education without universal primary education are open to empirical scrutiny, especially if Food-For-Education model were to export elsewhere.

Finally, even when targeting reaches those in the greatest need, universal welfare might be an issue due to not only alleged quality-quantity tradeoff, but also possible welfare contraction among those who are not living in absolute poverty but are poor nonetheless. As such, transfers are criticized to achieve less in quality in pursuit of achieving more in numbers among the targets. Ahmed and Arends-Kuenning (2006) find that, as intended, food-for-education in Bangladesh has increased enrollment, especially among primary-school age girls. However, performance, measured with test scores, has

not corroborated the rate of enrollment especially among Food-For-Education non-beneficiaries.

To sum, let's consider Table 1. Table 1 divides social transfers in terms of their (a) targeting and (b) conditionality criteria. The table also shows how Bangladesh's social transfer programs fit in this distribution.

Table 4. 1: Distribution of Bangladesh’s Social Transfer Programs according to Targeting and Conditionality Criteria

		Targeting criteria	
		Universal	Targeted
Conditionality	Unconditional	Primary Education Primary Health Care	Vulnerable Group Feeding (VGF) Vulnerable Group Development (VGD) Rural Maintenance Program (RMP) Food-for-Works Rural Infrastructure Maintenance Program (RIMP) Old Age Allowance Gratuitous Relief Fund for Mitigation of Risk of Natural Disaster Allowances to the Widowed, Deserted, and Destitute Women Honorarium Program for Insolvent Freedom Fighters Fund for Housing for the Distressed ( <i>Grihayan Tahabil</i> ) Fund for Rehabilitation of Acid Burnt Women and the Physically Handicapped
	Conditional	?	Food-for-Education (FFE) Female Secondary School Assistant Project (FSSAP)

### **Non-Linearity between Income and Child Mortality in Bangladesh**

Few countries sharing as many structural disadvantages as Bangladesh have as many targeted social transfers as Bangladesh. Despite Islamic tradition, patriarchy, slow growth, young democracy, and social inequality, Bangladesh runs fourteen cash and in-kind social transfers programs. Among them, Food-For-Education, Vulnerable Group Feeding, Vulnerable Group Development, and Female Secondary School Assistance Program have recognition beyond the host country. Bangladesh has one of the pioneer

primary schooling-subsidy programs—its Food-for-Education program was one of many school-enrollment subsidy programs now found in both developing and developed countries (Ravallion, 2006). Bangladesh runs one of the largest systems of targeted food transfer programs in the world (Murgai and Zaidi, 2005); and it runs a secondary school subsidy programs designed especially for women. Bangladesh spends about 10 percent of its public expenditure budget to serve nearly 4-5 million households a year with its targeted social transfer programs (The World Bank, 2006).

Can the relation between income and child mortality be nonlinear due to targeted transfers? As noted in the preceding chapter, I found that income affects child mortality positively in that child survival prospects shrink as households gain more purchasing power. Further analysis show that the income-child mortality dyad is indeed nonlinear, and the poor and the rich do better to suppress children's lives than the middle-income households in the contexts of rural Bangladesh. Why is this relationship nonlinear? Do targeted transfers explain non-linearity between economic status and child mortality? In other words, does the typical poor household's access to cash and/or food transfers help them attain as many health inputs as the typical rich household so that both income groups are equally successful in suppressing child mortality?

I investigate this question in Chapter IV. The direction between the income-child mortality relationship can range from a negative (income $\uparrow$   $\rightarrow$  child mortality $\downarrow$ ) to nonexistent based on the scope or scale of transfers for all. However, this relationship is non-linear only when the rich and the poor are similarly likely to prevent child mortality, and more likely than those not-so-poor-or-rich. While the rich can buy health inputs with private income, the poor can get access to health inputs via targeted transfers and thereby

safeguard children's deaths from nutritional deficiency, ignorance, and other difficulties. This assumes that the middle-income households with neither enough private income nor access to transfers generally fail to suppress child deaths as well as the targeted poor or the rich.

Do the poor households in Bangladesh have access to the social transfers, which are beneficial to health directly, or beneficial to health indirectly via social transfers' effect on health correlates? The targeting principals that social transfer programs follow would suggest so.

In Bangladesh, targeting is land-, gender-, and/or age-based. Land is the most robust poverty covariate in Bangladesh and South Asian at large, and is used to select the poorest among the poor in all social transfer programs in Bangladesh (Sen and Ravallion, 1994). In particular, households that own up to half an acre of land are considered functionally landless and poor, and household becomes a target to receive social transfers if it owns half an acre of land or less. For example, households' participation in (a) Vulnerable Group Development (VGD) program requires that households own up to 0.15 acres of land, (b) Food-for-Work (FFW) program requires that households own up to 0.50 acres of land, (c) Rural Maintenance Program (RMP) requires that households own up to 0.30 acres of land, and (d) Food-for-Education (FFE) requires that households own up 0.50 acres of land. In sum, a household that owns upto 0.15 acres of land can participate in any of these four targeted-food transfer programs. In addition, these social transfer programs target women (the widow, destitute, separated, or divorced) or children (The World Bank, 2006). And, while program documents do not clearly state if the recipients must conform to all as opposed to one of the selection criteria in order to

qualify as the recipient, a female-headed household that own up to 0.50 acres of land with primary-age old children is eligible to participate in Food-for-Work and Food-for-Education programs. And, a child's health could benefit from increased nutritional supply as its mother's and/or sibling(s) participate in targeted social transfer programs.

Alternative explanations of income-mortality non-linearity include poor households' access to a microfinance program and the state's universal education, and maternal and child health services. The state spends 2.2 percent of GDP or 15 percent of the public budget on education, and 40 percent of education spending is devoted to primary education (Glinskaya, 2005). And, the maternal and child health components of the state's health policy appear beneficial to the poor in that 20 and 23 percent of public expenditures on, respectively, maternal health (pre-natal, post-natal, and family planning services) and child health (Oral Rehydration Therapy, immunization) has been spent on the poorest single quintile of the income distribution in 2000 (Glinskaya, 2005). However, considering universality in access among the poor and non-poor, health and education services cannot explain children's differential propensity to die across different income-groups. And, if any, the poor should do worse considering that the poor usually receives worse public services (Keefer and Khemani, 2004) Finally, poor households' participation in the microfinance programs as an alternative explanation is contested on the ground that microfinance programs are often criticized for bypassing the poorest of the poor (Rahman and Razzak, 2004).

Based on the preceding discussion, I examine if household-income maintains a nonlinear association with child mortality because of the rich and the poor households' differential—and perhaps comparable—access to preventive and curative health goods

and services (Hypothesis 4.1). While the rich, with private income, spend more money on nutritional food, better housing with proper sanitation and clear water, medicine and health care services, the poor with targeted transfers get access to greater supply of food, exposure to health messages, recommendations, and services, or perhaps are enforced to conform to certain behavioral changes that benefit maternal- and child-health (such as, sanitation, clean water usage, delaying girls' marriage etc.), and thereby safeguard children's deaths from nutritional deficiency, ignorance, and other difficulties. And, the middle-income households with neither enough private income nor access to social transfers generally fail to suppress child deaths as well as the targeted poor or the rich.

HYPOTHESIS 4.1: Children in the very poor and rich households have higher likelihood of survival than those born in poor but perhaps non-targeted households because of the very poor and rich households' differential access to health goods and services.

Figure 4.1 depicts in a diagram the hypothesized non-linear relationship between household-income and child mortality.

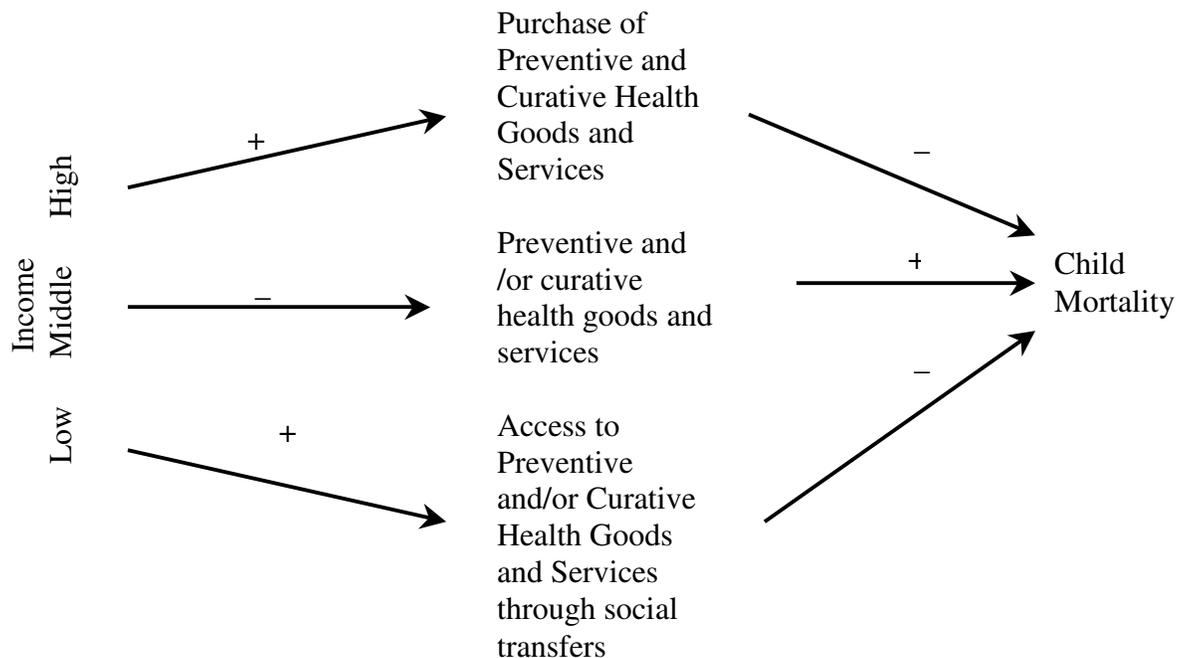


Figure 4.1: Household Income Effects on Child Mortality

## Research Methods

I use the BIDS-World Bank surveys for data analysis in Chapters III and IV. This suggests that the sections on Data, Variables, and Measurements and Estimation Strategy are almost identical in both chapters.

### *Data, Variables, and Measurements*

I employ surveys conducted by the Bangladesh Institute of Development Studies and the World Bank (BIDS-World Bank) in 1991/92 and 1998/99. In addition to providing detailed information on employment, income, and expenditures, the surveys include a

module on marriage and pregnancy history for all women between 12 and 50 years; land ownership; food and non-food expenditures; participation in agricultural or nonagricultural employment; as well as data on participation in rural financial services and the amount of credit borrowed. Information on family planning program participation, religion, and education in governmental and non-governmental educational institutions is also available. The survey also documents a diverse set of village-specific attributes—i.e., prices of staple food items, wage rates for male, female, and child labor, availability of state-led employment programs (food-for-work, road construction), government and non-governmental food programs, NGOs, formal financial institutions, markets/*haat* in the village, and health and education facilities-- that allow me to understand the interrelationships of community-level and household characteristics. Of the village-specific attributes, food and health program availability is particularly important for child health, and while surveys include questions to gauge their availability, these questions in the first round differ to those in the last round. For example, the 1991/92 survey asks, “Is there any government run food programs in the village?” The 1991/92 survey therefore does not differentiate among the available government food programs by early 1990s (VGF, VGD, FFW), and the respondents were likely to answer positively to this question if VGD, VGF, or FFW is available in village—however small its scale and scope of operation might be at the time of survey. And, the 1998/99 survey asks: “Is there any Food-for-Education project in any of the village schools?” The 1998/99 survey thereby asks about government’s specific food program which started in 1993, after the 1991/92 survey, and the respondents were likely to answer to this question positively if ONLY Food-For-Education is available in the village. Nonetheless, these all

are government food programs, and I can crudely compare health status among children living in village with food program with those living in village where n food program is available.

The surveys include 1,798 and 2,599 households—1,638 of which were surveyed in both periods—from 87 villages of 29 *thanas* across Bangladesh. Data from the same households over time allow for a better understanding of “causal” variation in child survival prospects due to variations in explanatory variables than cross-sectional evidence can oFood-for-Educationr.<sup>28</sup> Notably, parental and village attributes typically change only slowly, if at all, and prior literature on child health or its indicators, more broadly, reports findings using the survey data from a single year (Strauss, 1990; Thomas et al., 1996; Lavya et al., 1996; Barrera, 1990; Frankenberg, 1995; Maitra, 2004, Rosenzweig and Schultz, 1982; Thomas et al., 1986; Haughton and Haughton, 1997; Jalan and Ravallion, 2003; Suwal, 2001; among others; See Rosenzweig and Wolpin, 1988; Edmonds, 2004; Katz et al., 2003; Fedorov and Sahn, 2005; Cebu Study Team, 1992; O’Donnell et al., 2008; Wagstaff and Nguyen, 2002 for exceptions). However, based on the review of targeted social transfer programs in villages are likely to change in scale and scope, and the effects of parental attributes on child mortality can alter with or without targeted social transfers. Panel data is thus a better option for accessing valid and reliable data.

The households sampled in both periods are overwhelmingly poor. More than half of the households in both waves are functionally landless with an average income per

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<sup>28</sup> A thana is an administrative unit, which is smaller than a district but bigger than a village; a thana consists of a number of villages. Bangladesh’s administrative units are divided into: Divisions (N= 6), Districts (N= 64), Thanas (N=507), Unions (N=4484), Villages (N=59,990), and Households (N=25,362,321).

capita per week of 81/127.5 *taka* (equivalent to \$1.5/\$2) and mean landholding of 0.68/0.66 acres in 1991/92/1998/99.<sup>29,30</sup>

#### Variables

I estimate household determinants of child mortality using households' economic status, social status, religion, and demographics, and control for child's gender. I measure income alternatively in terms of expenditure per capita and land ownership.

***Child mortality:*** I measure child mortality with survival status at the time of survey among the children born during the ten years preceding the surveys. I use respondents' answers to these following questions. In both rounds, the surveys ask a woman respondent to: (a) list her pregnancy order, (b) identify if pregnancy resulted into a child-birth or otherwise, (c) identify the gender of the child if born alive, (b) state date of birth of the child, (d) state if the child is still alive. Given that mortality is a rare event, and the BIDS-World Bank survey data on mortality is sparsely distributed. To deal with this, I select ten years preceding the surveys to allow the mortality measure to (a) contain enough variation for meaningful inferential analyses, and (b) allow the current data on mortality's structural covariates to represent as much as possible the data on those when mortality occurred in the past.

***Income (in Taka):*** The BIDS-World Bank survey asks about expenditures on specific food and non-food items in the last week and year, respectively. I calculate food expenditures by adding all expenses on food items during the prior week, four times a week. Also, I calculate the non-food expenditures by adding all expenses on nonfood items during the last week, divided over twelve months. I calculate food and non-food

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<sup>29</sup> The 1998/99 measure for income is not adjusted for inflation.

<sup>30</sup> Households spending 117.28 taka and 158.62 taka or less per person per week are considered poor in 1991/92 and 1998/99 respectively.

expenditure as normalized to be a monthly estimate of total expenditures. I divide the sum by the total number of household members, and I find per capita expenditure. I logarithmically transformed per capita expenditure. The survey uses a comprehensive (i.e. standardized for all) matrix of usual food and nonfood items (and allows respondents to specify “other” expenditures). This should suppress recall bias.

***Land (decimals):*** I measure land-ownership by adding the irrigated and non-irrigated land households own. I include the logarithm of land ownership in the analysis.

***Maternal education (years):*** Maternal education is based on years of completed formal education.

***Education among the oldest male member in the household (years):*** The oldest male in the household is typically, but not necessarily, the child’s father. This is thus a proxy for paternal education, and should be a close correlate. The survey does not ask, and thus readily provide, information about children’s fathers since the child health module in the survey asks questions only about mothers and children. I could approximate parental education by matching mothers’ information from the child health module to her information in the background module, but this would be a difficult endeavor with limited gain, considering the role of paternal education on child health or mortality. And, because households as opposed to individuals typically make decisions in rural Bangladesh, I don’t expect paternal education to resume effects different from this proxy measure.

***Demographics:*** I include (a) the logarithm of household size as a quantitative attribute of demographic profile of households, and (b) ratios of male and female members in certain age-brackets to the total household size as a qualitative attribute of demographic profile.

While household size is straightforward in concept and measurement, the ratios are motivated by (a) shortcomings in the traditional calculation of the dependency ratio in the context of Bangladesh, and (b) economic role across age and gender groups has special significance in the development context of Bangladesh. First, the measurement of dependency ratio (DR) as commonly referred to as:

$$DR = \frac{\text{Population} \leq 14 \text{ years} + \text{Population} \geq 65}{\text{Population 15 - 64 years}} \times 100$$

does not really capture dependency and therefore defies the purpose since children in rural Bangladesh village are economically active from the age of six (Cain, 1977). Jacoby and Skoufias (1997) find a similar trend in South Asia at large where, child labor is found to help supplement the income of rural Indian families. Scholars commonly disaggregate male and female household members into numerous age groups (less than 5 years, between 5 and 9, 10 and 16, 17 and 40, and above 40) and calculate the ratios of each group to the total household size (Ravallion and Wodon, 2000; Wodon, 2000). Alternatively, I calculate dependency ratio with  $DR = \frac{\text{Population} \leq 6 \text{ years} + \text{Population} \geq 65}{\text{Population 15 - 64 years}} \times 100$  and expect this ratio to capture the nature of dependency in the context of rural Bangladesh.

***Participation in targeted social transfer programs:*** Among targeted transfer programs, the survey asks questions about the food programs, and I consider whether the village has a food program in 1991/92 and 1998/99. I therefore use food-program availability in villages to proxy transfer program participation among households. The village module of the surveys shows that the question about the availability of food program has been modified in the 1998/99 questionnaire; the 1991/92 survey asks: “Are there any

government run food programs in the village?” and the 1998/99 survey asks, “Is there any Food-for-Education project in any of the village schools?” Social transfers have grown targeted and conditional by the end of the decade. This is consistent with the anecdotal accounts suggesting that targeted and conditional Food-for-Education has grown out of Bangladesh’s universal and unconditional Rural Rationing Program—a food subsidy program for the poor, which is not linked to education (Ahmed and Arends-Kuenning, 2006).

***Health infrastructure in villages:*** I use if health services are available in villages in 1991/92 and 1998/99.

### ***Estimation Strategy***

The objective of this analysis is to test the hypothesis that the poorer households benefit from targeted redistribution programs (e.g., food-programs, health programs), and thereby suppress mortality as much as relatively rich households. Accordingly, I estimate:  $Y_{iht} = \beta_0 + \beta_{it} X_{it} + \beta_{ht} X_{ht} + \beta_{vt} X_{vt} + \beta_{hvt} X_{ht} \times X_{vt} + \varepsilon_{iht}$ , where  $Y_{iht}$  is the mortality outcome of the child  $i$  in the household  $h$  at time  $t$ ,  $X_{it}$  denotes gender of the  $i$ th child at time  $t$ ,  $X_{ht}$  is the vector of characteristics of household (income/land, income-/land-squared, parental education, demographic structures, and religion) in which the child  $i$  is born,  $X_{vt}$  denotes the availability of targeted transfer programs—specially food and also health programs—in the village  $v$  at the time  $t$  is the time of the interview, namely, 1992 and 1999. And,  $X_{ht} \times X_{vt}$  denotes interactions between household income indicators and the binary outcome for village participation in health- and targeted food-transfer programs. The coefficient for this interaction term is a core focus for this

analysis, and I test if this coefficient is greater than zero,  $\beta_{hvr} > 0$ . Additionally, I examine the joint effects of income indicators (per capita income and land-ownership) and program variables (food and health-programs in villages).

About 12% (16%) and 6% (21%) of households in 1991/92 (1998/99) live in villages where targeted food and health programs are available, respectively. The fact that data on targeted transfer programs is available by village, whereas data on potentially targeted households' actual program participation is not, prevents optimal assessment of the mechanisms explaining non-linearity between income and child mortality. The optimal estimation requires an interaction effect between household income and program participation when income correlates are controlled and household and village (perhaps selective) participation in redistribution programs is accounted for. Results are suggestive, nonetheless. Although, although availability does not necessarily demonstrate participation, the latter is more probable when programs are available in villages (program is conditional on availability). And, when households qualify to be targeted (based on land-ownership and/or demographic attributes), their odds of participation in are likely to be high in a poor rural economy under the assumption that (pecuniary or non-pecuniary) returns from sending kids to school are higher than those from engaging them in in-house chores and, in cases of male kids, outside labor (Ravallion and Wodon, 2000; Cain, 1977).

To present robust parameter estimates, I (a) run cross-sectional and panels models using data from each survey year and over time; and (b) correct for the possibility of heteroskedasticity in standard errors and therefore conduct meaningful significance tests. The Weibull model estimates the probability of mortality among children born during the

ten years preceding the surveys conditional on covariates. For all children, the surveys include the age at death or age at the survey date if the child is still alive and are therefore right censored. The Weibull functional form makes sense theoretically as well as empirically since hazard for death is a decreasing function of age among children, and the model estimates independent variables using a proportional hazards specification. The standard errors are robust, and the significance tests are therefore based on heteroskedasticity-consistent estimates of the variance-covariance matrix.

Nevertheless, the following methodological constraints could confound findings. First, errors almost always plague measures of household income using survey data from developing countries like Bangladesh, and a consequent systematic difference between actual and observed household income poses a credible threat to the analysis. I use total weekly household expenditures per capita per week and land ownership as alternative measures to estimate the income effect.<sup>31</sup> While both are commonly used as indicators or predictors of *permanent* household income, land ownership captures household wealth, which is a key predictor of income and is often the basis for targeting for redistribution programs.<sup>32</sup> I have logarithmically transformed both variables to correct for possible skewness and to attain normalcy in the distribution of income, and identify effects on child mortality as income increases by a percent regardless of initial income.

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<sup>31</sup> In addition, I conduct a descriptive analysis of the distribution of the key income correlates across income groups and check for external validity in income measures. I find that the average years of education among mothers, fertility rates, etc. are of expected magnitude across income quintiles.

<sup>32</sup> Especially where the credit market is absent or inaccessible

## Regression Results

Tables 2 and 3 present Weibull and Probit parameter estimates of targeted social transfer programs in village and their possible role in mediating the non-linear association between income and mortality. Tables 2 and 3 report these estimates using the 1991/92 cross-sectional data (Columns 1 and 2), the 1998/99 cross-sectional data (3 and 4), and the panel data from 1991/92 and 1998/99 (Columns 5 and 6). I include in specifications targeted transfer programs' availability in village, their interactions with income, include as controls the similar set of variables I have specified in Equation I of Chapter 3—education, household size and dependency ratio, Islamic belief, and child's gender. As previously, I have measured household income and demographic characteristics with, respectively, per capita income and land ownership, and household size and dependency ratio. To reiterate, I use mortality outcome for the children born during 10 years preceding surveys.<sup>33</sup>

Results from interaction analyses are revealing, and, despite methodological constraints, suggest that targeted social transfers can explain the non-linear association between income and child mortality (Tables 2 and 3). Coefficients for the interactions between households' income and residence in village having a food-program are positive and significant at  $\alpha=0.01$  using the 1998/99 cross-sectional survey (Columns 3 and 4 in Table 2), and panel evidence (Columns 5 and 6 in Table 2). A positive coefficient suggests that, for all villages, the income-mortality association is not the same, and this

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<sup>33</sup> The analysis includes children aged 10 years or less at times of surveys. By doing so, I respond to the constraint I face from not having enough variability in the outcome variable as I use the survey that provides rich information on the explanatory variables of my interest but is not primarily intended to assess child mortality as thoroughly as DHS, for instance. I therefore stretch the population from its actual space—children aged 5 or less (infants and children under 5). However, I follow the fix, commonly practiced in empirical research facing similar constraints on child mortality in low-income developing countries (Lavaya et al., 1996).

association is “more” positive in village with a food program than that in village without a food program. In other words, income effect on child mortality depends on availability in village of the food program. Children born to very poor households have a higher probability of avoiding untimely deaths than those born to relatively less poor households *when* very poor households live in a village where the food-program is available. Food transfers seem to have been effective in offsetting the economic constraints very poor households face in child mortality. Let’s note that interaction coefficients in the 1998/99 cross-sectional models are statistically significant, whereas those in 1991/92 are not. This might speak to a possible food-program’s lagged effect on reducing child mortality since social transfer programs are often placed in the relatively poorer villages.

Positive interaction effects might seem rather counterintuitive. However, they make sense under the following assumptions/empirical grounds. First, poorer households receive food whereas relatively less yet absolutely poor households are left out from the food-programs. Second, local capture, or leakage of food-subsidies to non-targeted households seems not to take place as often as ethnographic evidence from the early 1980s’ rural Bangladesh or more recent quantitative accounts suggest (Ravallion and Wodon, 2000; Ahmed and Del Ninno, 2002; Murgai and Zaidi, 2005; Hartmann and Boyce, 1983). And, third, less poor households in food- program villages are perhaps still poor in absolute terms (Ravallion and Wodon, 2000; Ravallion, 2006). I find support of prior assessment that food programs are generally available in impoverished villages using the 1998/99 evidence, and I find partial support using the 1991/92 evidence. As such, in food-program villages, households’ average per capita expenditure is Taka 113.5 per week, which is significantly lower than the average per capita expenditure of Taka

130.2 per week among households living in non-food program villages ( $t = 5.49$ ;  $p$ -value  $< 0.001$ ). The 1991/92 evidence shows that households' average per capita expenditure is significantly higher in villages with food programs ( $t = 3.79$ ;  $p = 0.01$ ). However, standard deviations for per capita income are higher among households living in program compared to non-food program villages (49.20 vs. 46.29 in non food-program villages). And, the maximum per capita income is higher among households in “No” compared to “Yes” food-program villages (353.9 vs. 710.7 in non food-program villages). Taken together, the 1991/92 descriptive trends suggest that although households' maximum per capita income is lower in inter-group comparison, but “high” enough in comparison to neighbors' average per capita income to have inflated the average, and, via that, its dispersion from the average. High average income among households living in food-program villages thereby under-represents a low average income among households in food-program villages, and provides a “revealed” endorsement that food programs tend to be available in relatively poor villages.

Income attributes and exposure to targeted social programs jointly determine child mortality differentials, and explain a significant portion of variation in child mortality in the 1990s. An inverted-U relationship still holds across estimations in that income maintains a positive sign in its level and a negative sign in its quadratic form (Columns 1-6), and is significant even when interactions enter as a control in panel specifications (Columns 1, 5 and 6). Also, a chi-sq test of joint significance shows that probability values are low for this block of variables—income, income-squared, food and health programs, and their interactions.

Notably, mortality is considerably lower among children whose parents reside in the village with targeted food- or health- programs. In particular, children born to the households living in food-program villages have a lower likelihood of mortality than those born to households living in non food-program villages. This effect is significant using cross-sectional evidence in 1998/99 and panel evidence. Considering that food programs are available in impoverished villages, programs' negative coefficients are notable. This suggests, these programs seem to have a rather immediate as opposed to the similar lag—and positive—effect prior studies identified between village-level availability of social programs (placement based on endogenous/low human development conditions) and human development (Rosenzweig and Wolpin, 1986). And, food program's large and more significant effect in late than early 1990s is attributable to the shift from all to land-, and demography-based targeting criteria in food program (Columns 1-2 vs. Columns 5-6).

Interactions between households' per capita income and residence in villages having health programs maintain a positive direction of association. However, this interaction secures less statistical support than interactions between income and village availability of food program. Village health programs are not targeted towards particular income- or demographic-groups. Village availability of health programs maintains a consistent negative effect in direction of association across specifications using alternative cross-sectional and panel estimations (Columns 1-6 in Table 2). However, health program effects are never statistically insignificant. A similar pattern is evident when income interacts with village availability of health program. In particular, these interactions do not secure enough statistical power to suggest that income effects are

mediated as much by the availability of health programs as they are by the availability of food-programs (Columns 1—6 in Table 2). A crude comparison of child survival prospects between villages with and without food and health programs is warranted, and this suggests that targeted food program seems to have a greater and more immediate impact on child survival than health program in rural Bangladesh (Table 2).

Table 4. 2: Suggestive Causal Mechanisms-1

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Income per capita	1.13 (1.11)	0.52 (0.75)	1.43 (1.27)	0.88 (0.73)	2.54*** (0.80)	0.94** (0.45)
(Log of) Income per capita <sup>2</sup>	-0.09 (0.12)	-0.04 (0.08)	-0.15 (0.13)	-0.09 (0.07)	-0.24*** (0.08)	-0.10** (0.04)
Maternal education	-0.04* (0.02)	-0.02* (.01)	-0.07*** (0.02)	-0.04*** (0.01)	-0.06*** (0.01)	-0.03*** (0.01)
Education among adult male in HH	0.01 (0.01)	0.01 (0.01)	-0.05*** (0.02)	-0.03*** (0.01)	-0.02** (0.01)	-0.01 (0.01)
(Log of) Household size	-1.07*** (0.14)	-0.57*** (0.07)	-0.89*** (0.16)	-0.44*** (0.07)	-0.99*** (0.10)	-0.51*** (0.05)
Dependency ratio	-0.01* (0.01)	-0.01*** (0.00)	-0.01*** (0.01)	-0.01*** (0.01)	-0.01 (0.01)	-0.01*** (0.01)
Child's gender (Male=1)	0.07 (0.08)	0.04 (0.05)	-0.18** (0.09)	-0.10** (0.05)	-0.03 (0.06)	-0.01 (0.03)
Religion (Islam=1)	-0.07 (0.13)	-0.03 (0.08)	-0.57*** (0.13)	-0.30*** (0.07)	-0.27** (0.09)	-0.16*** (0.05)
Government food program in village (Yes=1)	-0.31 (1.51)	-0.17 (0.86)	-2.31** (1.03)	-10.12** (0.58)	-1.29* (0.74)	-1.04** (0.43)
Health center in village (Yes=1)	-0.99 (1.40)	-1.02 (1.26)	-1.49 (1.30)	-0.96 (0.76)	-0.84 (0.90)	-0.71 (0.55)
(Log of) Income per capita (×) Government food program in the village (Yes=1)	-0.09 (1.40)	0.01 (0.19)	0.51** (0.22)	0.24** (0.12)	0.29* (0.16)	0.20** (0.09)
(Log of) Income per capita (×) Health center in the village (Yes=1)	0.22 (0.33)	0.23 (0.30)	0.29 (0.27)	0.19 (0.16)	0.18 (0.19)	0.13 (0.12)
Constant	-5.15 (2.63)	-1.42 (1.70)	-6.51 (3.17)	-1.99 (1.80)	-8.75*** (1.94)	-2.01 (1.06)

Table 4. 2: Suggestive Causal Mechanisms-1 (cont.)

Obs	3478	3478	4245	4245	7723	7723
Log Likelihood	-2552.80	-1404.99	-1844.23	-1281.25	-4497.49	-2721.73
Joint significance test 1: $\chi^2 (p > \chi^2)$	5.82(0.05)	5.95(0.05)	1.72(0.42)	2.02(0.36)	15.56(0.00)	4.91(0.08)
Joint significance test 2: $\chi^2 (p > \chi^2)$	12.17(0.06)	11.13(0.08)	13.69(0.03)	10.27(0.11)	33.48(0.00)	21.35(0.00)

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Robust standard errors are in parentheses.

I re-estimate in Table 2 interactions between households' land ownership as an alternative income measure and residence in food- and health-program villages. Direction of associations remains consistent regardless of the fact that I have used alternative income measures. The coefficients for the interactions between households' income and residence in village having food-program are positively significant in the 1991/92 cross-sectional model (Columns 1 and 2 in Table 3), and are positively significant at  $\alpha=0.10$  in the panel model (Columns 5 and 6 in Table 3). A positive coefficient suggests that the land-mortality association depends on the food program availability in villages, and is "more" positive in village with food program than in village without food program. In other words, children born to households with less land have a higher probability of avoiding untimely deaths than those born in households with relatively more land *when* households live in village with food-program. This hints to the fact food subsidy is targeted to the poor households, and food transfers seem to have been effective—though seemingly intermittently—in attenuating economic constraints the land-poor households face in suppressing child mortality.

The assumption that food programs are available in impoverished villages finds more direct support in the 1998/99 survey evidence than it does in 1991/92 survey evidence. Difference is considerable in the average land-ownership between households living in villages with food program and households living in villages without food program. In 1998/99 average land-size among households living in village with and without food-programs is 60.7 and 67.2 decimals, respectively.<sup>34</sup> However, this difference is not statistically significant at the conventional level ( $t = 1.57$ ;  $p$ -value=0.12).

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<sup>34</sup> 100 decimals=1 acre

The 1991/92 survey evidence shows that households' average land ownership is higher in food-program than non food-program villages. Also, the average deviation from households' mean landownership is higher in food-program villages. In particular, households' average land-size is 101.6(63.10) decimals with a standard deviation of 445.2(156.4) decimals in food-program (non food-program) villages in 1991/92. Overdispersion (i.e. the standard deviation exceeds the mean) in land distribution among households in food-program village is clear. This suggests that the parametric measure of the average land-size (a) does not represent the bulk of land-poor households in food program-villages, and (b) is swayed by a few households owning a large amount of land. In sum, land-ownership is not normally distributed.

Village availability of food and health program effect remains largely indeterminate with regard to saving lives among children born to households living in those villages. Table 3 shows that village availability of food program is negatively associated with child mortality in 1991/92 (Columns 1 and 2), but this association is not significant in the 1998/99 cross-sectional model (Columns 3 and 4) and panel model (Columns 5 and 6). Village availability of food program seems to have a relatively larger impact than village availability of health program. This is suggested by statistical significance of program coefficients. As such, having a health program in village is negatively associated with the child probability of mortality but this association is never significant (Columns 1—6).

Overall, land-ownership maintains a nonlinear association in that an inverted-U relationship holds across specifications (Columns 1-6 in Table 3). Prospects for child mortality are lower among land-poor and land-rich households and relatively higher

among landed middle-range households. This association is statistically significant—though intermittently. However, a chi-sq test of joint significance shows that probability values ( $p$ -values) are small when I consider joint significance of land and land-squared terms. And, a chi-sq test of joint significance shows that probability values are also small for a block of variables—income, income-squared, food and health programs, and their interactions (Joint Significance Test 1 in Table 3). In substantive terms, this suggests that households' land-ownership and residence in food- and health-program village jointly determine how effectively they succeed in saving children's lives (Joint Significance Test 2 in Table 3).

Table 4. 3: Suggestive Causal Mechanisms-2

	1991/92		1998/99		Panel	
	(1) Weibull	(2) Probit	(3) Weibull	(4) Probit	(5) Weibull	(6) Probit
(Log of) Land	0.10 (0.07)	0.06 (0.04)	0.01 (0.09)	0.01 (0.05)	0.07 (0.05)	0.04 (0.03)
(Log of) Land <sup>2</sup>	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Maternal education	-0.04 (0.02)	-0.02* (0.01)	-0.07*** (0.02)	-0.04*** (0.01)	-0.05*** (0.01)	-0.04*** (0.01)
Education among adult male in HH	0.00 (0.01)	-0.01 (0.01)	-0.05*** (0.01)	-0.02*** (0.01)	-0.02* (0.01)	-0.01 (0.01)
(Log of) Household size	-1.18*** (0.14)	-0.65*** (0.07)	-0.91*** (0.16)	-0.45*** (0.08)	-1.09*** (0.11)	-0.55*** (0.01)
Dependency ratio	-0.01* (0.00)	-0.01*** (0.01)	-0.01*** (0.00)	-0.01*** (0.01)	-0.01*** (0.00)	-0.01*** (0.01)
Child's gender (Male=1)	0.07 (0.09)	0.04 (0.05)	-0.18** (0.09)	-0.10** (0.05)	-0.03 (0.06)	-0.01 (0.03)
Religion (Islam=1)	-0.09 (0.13)	-0.04 (0.08)	-0.57*** (0.13)	-0.30*** (0.07)	-0.28*** (0.09)	-0.16*** (0.05)
Government food program in village (Yes=1)	-0.62*** (0.22)	-0.35*** (0.12)	-0.05 (0.12)	-0.04 (0.07)	0.04 (0.09)	-0.14*** (0.05)
Health center in village (Yes=1)	-0.25 (0.27)	-0.19 (0.16)	-0.12 (0.15)	-0.05 (0.09)	0.00 (0.13)	-0.09 (0.07)
(Log of) Income per capita (×) Government food program in the village (Yes=1)	0.17*** (0.06)	0.11*** (0.03)	0.09** (0.04)	0.04 (0.02)	0.05 (0.03)	0.02 (0.01)
(Log of) Income per capita (×) Health center in the village (Yes=1)	0.07 (0.09)	0.04 (0.05)	-0.01 (0.05)	0.01 (0.03)	-0.02 (0.04)	-0.01 (0.02)
Constant	-1.90 (0.28)	0.17 (0.16)	-3.15*** (0.39)	0.07 (0.16)	-2.19 (0.22)	0.09 (0.11)
Obs	3478	3478	4245	4245	7723	7723

Table 4. 3: Suggestive Causal Mechanisms-2 (cont.)

Log Likelihood	-2548.13	-1398.58	-1847.27	-1284.61	-4509.93	-2721.49
Joint significance test 1: $\chi^2 (p > \chi^2)$	5.22(0.07)	5.89(0.05)	2.48(0.28)	2.08(0.35)	2.93(0.23)	4.47(.11)
Joint significance test 2: $\chi^2 (p > \chi^2)$	21.52(0.01)	22.93(0.00)	6.72(0.34)	3.87(0.69)	12.90(0.04)	22.47(0.00)

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Robust standard errors are in parentheses.

### *Supplementary Analysis*

Interaction analyses in Tables 2 and 3 suggest that targeted government (food) programs *substitute* economic effects on child mortality for the targeted households. Targeted and poor households with food-subsidies can save nearly as many children's lives as rich households without subsidies. And, the observed inverted-U, non-linear direction of association between household income and prospects of child mortality is no longer a puzzle but rather a pattern when targeting is the new institution to organize social transfers.

Let's note, village organizational demography could lead to an upward bias in governments' food program (Tables 2 and 3). This could happen if government- and NGO- programs are jointly available in village. Failure to recognize village availability of NGOs could overstate food program's independent effect. The geographic targeting criterion dictates that government food programs provide subsidies to households in impoverished villages in Bangladesh. And, NGOs target those villages as well. NGOs can have independent (such as microfinance, etc.) and/or collaborative projects with Bangladeshi government (such as, health services—immunization, tuberculosis, etc.). The village- or *thana*-level statistics are not readily available endorsing the assumption of organizational co-existence (i.e.,  $x$  number of villages contain  $y$  and  $z$  number of government and non-governmental (GO-NGO) programs respectively). However, prior studies talk about organizational coexistence as those studies evaluated GO-NGO collaboration in anti-poverty programs, health service provisioning, controlling tuberculosis, primary health care and neonatal care service provisioning (Zafarullah et al., 2006; Mercer et al., 2004; Mercer et al., 2006).

I find modest support for organizational coexistence in my study, however. In food program and non-food program villages, I calculate numbers of NGOs and the frequency for household's participation in Grameen Bank, BRAC, and Bangladesh Rural Development Board (BRDB)—the state-run microfinance (MFI) program. A higher number of NGOs in some but not all villages would suggest a “herding” behavior by NGOs, and if so, can cloud the estimate for government food program's independent effects on child mortality. The 1998/99 cross-sectional evidence shows that government food program villages have an average of 3.64 NGOs (an average of 3.58 NGOs are available in non-food-program villages); 31% of its households participate in the GRAMEEN microfinance program (23% participate in the GRAMEEN microfinance program in non-food-program villages); however, 4% of its households participate in the BRAC microfinance program (9% participate in the BRAC microfinance program in non-food-program villages); and 2% of its households participate in the BRDB microfinance program (7% participate in the BRDB microfinance program in non-food-program villages). The 1998/99 pattern of organizational coexistence aligns with the 1991/92 pattern. However, data on the number of NGOs is not available in 1991/92. The 1991/92 evidence shows that 30% of households in food-program villages participate in the GRAMEEN microfinance program (17% participate in the GRAMEEN microfinance program in non-food-program villages); however, 10% of its households participate in the BRAC microfinance program (17% participate in the BRAC microfinance program in non-food-program villages); and 15% of its households participate in the BRDB microfinance program (17% participate in the BRDB microfinance program in non-food-program villages).

Nonetheless, I re-examine food-program effect after taking into account village NGO availability. I examine if non-linearity in the income and mortality association is made possible when NGOs—as opposed to food programs—are available in village. I thereby provide further evidence of food program effects on the child probability of mortality, and, in the process, offer a rather crude comparison of government and NGO programs in explaining this non-linearity. In particular, I re-estimate the specification in Equation 2 by adding (a) households' participation in GRAMEEN, BRAC, or BRDB microfinance program and (b) interactions between income and microfinance program participation. I examine joint effects of income, microfinance program participation, and their interactions to suggest whether these variables conjointly explain variation in child mortality outcome.

I report these results in Tables 4 and 5. As for alternative income measures, Table 4 utilizes household's income and Table 5 utilizes household's land-ownership. Government food program maintains prior direction and significance when I consider its association (a) independently and (b) as interaction with household income using the 1998/99 and panel evidence (Columns 2 and 3 of Table 4). As such, child mortality is low when households live in food program village. Also, poverty does not hinder, but rather helps, to save children's lives if poor households live in food-program village and poor households are food subsidy targets. Among controls for NGO programs, neither MFI participation nor its interaction with household's income appears statistically significant at the conventional level. This suggests NGO program effects do not offset and/or substitute income effect on child mortality.

Table 4. 4: Supplementary Interaction Analysis-I with NGO Programs in Village

	1991/92 (1)	1998/99 (2)	Panel (3)
(Log of) Income per capita	1.220 (1.148)	1.803 (1.297)	2.621*** (0.813)
(Log of) Income per capita <sup>2</sup>	-0.114 (0.124)	-0.206 (0.135)	-0.267*** (0.087)
Government food program in the village (Yes=1)	-0.237 (1.508)	-2.203** (1.033)	-1.457** (0.755)
Health center in the village (Yes=1)	-1.133 (1.451)	-1.780 (1.360)	-0.939 (0.920)
Grameen membership (Yes=1)	-0.894 (1.256)	-1.569 (1.161)	-1.183 (0.781)
BRAC membership (Yes=1)	-0.914 (1.251)	-0.653 (1.990)	-1.145 (0.967)
BRDB membership (Yes=1)	-2.553* (1.567)	-4.775 (3.230)	-2.414* (1.290)
(Log of) Income per capita (×) Government food program in the village	-0.019 (0.339)	0.4931** (0.219)	0.320** (0.162)
(Log of) Income per capita (×) Health center in the village	0.260 (0.344)	0.354 (0.287)	0.199 (0.199)
(Log of) Income per capita (×) Grameen Membership	0.224 (0.288)	0.348 (0.244)	0.271 (0.170)
(Log of) Income per capita (×) BRAC Membership	0.211 (0.287)	0.177 (0.421)	0.259 (0.215)
(Log of) Income per capita (×) BRDB Membership	0.500 (0.355)	0.916 (0.669)	0.443 (0.286)
Constant	-5.233** (2.708)	-7.465** (3.197)	-8.748*** (1.947)
Obs	3478	4245	7723
Log Likelihood	-2548.006	-1843.923	-4488.807
Joint significance test 1: $\chi^2 (p > \chi^2)$	2.00(0.367)	3.03(0.219)	11.09(0.003)
Joint significance test 2: $\chi^2 (p > \chi^2)$	22.60(0.031)	25.32(0.013)	53.73(0.000)

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Robust standard errors are in parentheses.

Specifications include the following controls: Maternal education, education among adult male in HH, (log) of household size, child's gender, and religion.

Table 5 shows village availability of governments' food program retains a significant negative association with the child probability of mortality (Columns 2 and 3).

And, land-based, income effect is still mediated by food program availability in village in that poor households do relatively better in suppressing deaths than relatively less poor households if poor households reside in food program village and are food-subsidy targets. The fact that government food program offsets the poor's economic constraint is robust when I control for poor households' microfinance program participation. MFIs or NGO programs receive greater support in land-based income specification using panel data in Column 3. As such, MFI participation suppresses child mortality—as does village availability of food programs, and its interactions with land are as statistically significant as food programs' interaction with land (Column 3). Overall, panel evidence shows that government or NGO programs that target land-poor households can offset the economic constraints rural poor households face in saving children's lives. Also, based on the findings that government food program retains its negative association with the child probability of mortality in the face of alternative income measures, sample, and estimation techniques (Columns 2 and 3 in Tables 4 and 5), it is safe to conclude that government targeted food programs have been more effective than NGO programs in offsetting economic constraints of child mortality.

Table 4. 5: Supplementary Interaction Analysis-II with NGO Programs in Village

	1991/92 (1)	1998/99 (2)	Panel (3)
(Log of) Landholding	0.115 (0.072)	0.052 (0.090)	0.084 (0.056)
(Log of) Landholding <sup>2</sup>	-0.012 (0.014)	-0.015 (0.019)	-0.0012 (0.011)
Government food program in the village (Yes=1)	-0.465 (1.393)	-1.583** (0.825)	-1.106* (0.602)
Health center in the village (Yes=1)	-1.469 (1.311)	-1.751 (1.226)	-1.236 (0.789)
Grameen membership (Yes=1)	-1.403 (1.121)	-0.709 (0.869)	-1.442** (0.597)
BRAC membership (Yes=1)	-1.416 (1.065)	0.114 (1.717)	-1.534** (0.776)
BRDB membership (Yes=1)	-2.962** (1.398)	-4.182 (2.945)	-2.862** (1.113)
(Log of) Landholding (×) Government food program in the village	0.040 (0.313)	0.361** (0.173)	0.254** (0.128)
(Log of) Landholding (×) Health center in the village	0.337 (0.313)	0.350 (0.259)	0.264 (0.171)
(Log of) Landholding (×) Grameen Membership	0.344 (0.256)	0.161 (0.180)	0.332** (0.129)
(Log of) Landholding (×) BRAC Membership	0.339 (0.242)	0.009 (0.362)	0.352** (0.172)
(Log of) Landholding (×) BRDB Membership	0.607** (0.316)	0.789 (0.609)	0.550** (0.246)
Constant	-2.146*** (0.283)	-3.599*** (0.393)	-2.433*** (0.217)
Obs	3478	4245	7723
Log Likelihood	-2545.587	-1845.071	-4493.281
Joint significance test 1: $\chi^2 (p > \chi^2)$	7.26(0.026)	1.13(0.569)	3.56(0.168)
Joint significance test 2: $\chi^2 (p > \chi^2)$	31.22(0.001)	25.36(0.013)	58.73(0.000)

\*\*\* $p < 0.01$ ; \*\* $p < 0.05$ ; \* $p < 0.10$

Note: Robust standard errors are in parentheses.

Specifications include the following controls: Maternal education, education among adult male in HH, (log) of household size, child's gender, and religion.

But, how? The finding that government's social transfer programs have been more effective for child mortality decline than the country's world-renounced

microfinance programs is puzzling. This in turn implies (a) efficient government's social transfers to the poor: transfer leakages to non-targeted groups or local elite- or administrative- capture of social transfers seem not to be as prevalent; (b) effectiveness of government's social transfers programs in poverty reduction, broadly speaking; and (c) inadequate—if no inefficient—microfinance programs' coverage. While the BIDS-World Bank survey data does not permit that I systematically unravel any of these possible mechanisms via which government social transfer programs have achieved so, I elaborate on those in the following.

First, although both government's social transfer and microfinance programs target the poor, the actual participants might represent different poverty groups in that the poorer group participates in government's programs and the less poor groups participate in microfinance programs (Rahman and Razzak, 2004). Second, while the data on (a) total participants in social transfer programs or total expenditures on social transfer programs and (b) total participants in microfinance programs and total expenditures on credit is not readily available, it is plausible that the government spends more on social transfers than microfinance institutions do on credit, and government thereby extends those transfers to more poor households. These hypotheses still do not explain why government's social transfers to the poor should be efficient given that poor elsewhere receives poor services from their governments (Keefer and Khemani, 2004). I hypothesize that governmental and nongovernmental organizational co-existence bolsters the efficiency of service provision via "competition" between public and (non-governmental) private providers of social services to the poor. Microfinance programs in the village might be critical for government's efficient social transfers to the poor.

Let's note, findings differ when I use, alternatively, income- and land-based economic indicators. This questions the assumption that (a) income per capita and land are alternative indicators of income, and (b) land as a robust indicator of income fair poorly even in rural agrarian economy in Bangladesh (Ravallion and Sen, 2004).

Chapter 4 sheds light to the puzzle of nonlinear income and child mortality relationship. Nonlinear relationship between income and child mortality is possible only when the rich and the poor are equally likely to prevent child mortality, and they are more likely to prevent death than the middle-income group. While the rich can buy health inputs with private income, the poor can get access to health inputs with social transfers and thereby safeguard children's deaths from nutrition deficiency, ignorance, and other difficulties. And, the middle-income households with neither enough private income nor transfers fail to suppress child deaths as well as the targeted poor, or the rich. Do the poor households in Bangladesh have access to the social transfers, which are beneficial to health directly, or beneficial to health indirectly via social transfers' effect on health correlates? The targeting principals that social transfer programs follow would suggest so. And, I test this hypothesis within the limit of the data. Results are suggestive, nonetheless. Income effect on child mortality depends on the availability of food program in villages in that children born to very poor households have a higher probability to avoid untimely deaths than those born to relatively less poor households *when* very poor households live in the villages with the food-program. The fact that data on targeted transfer programs is available by village whereas that on potentially targeted households' actual program participation is not prevents optimal assessment of the mechanisms explaining non-linearity between income and child mortality. The optimal estimation

requires an interaction effect between household income and program participation when income correlates are controlled and household and village (perhaps selective) participation in redistribution programs are accounted for.

In the midst of examining the puzzle of income-mortality nonlinearity, I find female education to have a robust effect in reducing child mortality. In other words, when women in Bangladesh become educated, their children do not die in premature age. Let's consider the facts that (a) I find women's education effect is stronger in late than early 1990's BIDS-WB sample, and (b) women's education remains significant when I control for income and education among male adults household suggest the following. First, a child born to a poor mother with X level of education has the same probability to live on as a child born to a rich mother with the same level of education. And, second, evidence suggests that education is no longer confined to only "rich" women but also has been extended to those, non-rich. This thus poses another piece of a puzzle in the Bangladeshi context. What does explain female educational attainment in predominantly Muslim Bangladesh? I answer this question in Chapter 5.

## CHAPTER V: THE SOURCES OF SCHOOLING

Existing literature says Islam is inveterately patriarchal, and therefore inimical to human development. Patriarchy inducts men to protect their womenfolk, and restricts women's access to secular—also religious—education among the available routes to status attainment (Caldwell, 1986; Ammar, 1954). Raphael Patai (1971) wrote, “in the traditional Muslim view the education of girls was considered not merely unnecessary and superfluous but positively wrong” (p. 462; quoted from Caldwell, 1986).

However, Bangladesh—predominantly Islamic with 83% Muslim population—has made some of the greatest women's education and human development strides of any country of late, especially after controlling for levels of economic development. Bangladeshi women's secondary school (gross) enrollment has more than tripled within a decade. Female secondary school enrollment has increased from 13.6% in 1990 to 47.2% in 2000, and this corresponds to a staggering 247% increase in female secondary school enrollment just within a decade. Female secondary education growth is (a) 173 percentage points higher than male secondary education growth for the same period, and (b) 220, 163, 32, 49, and 33 percentage points higher than female secondary education growth rates in India, Pakistan, South Asia, low-income countries, and predominantly Muslim countries.

Islamic belief or patriarchal culture seems not be as constraining for Bangladeshi female educational attainment as the existing literature suggests. But, what does explain Bangladesh's rapid secondary female educational attainment? Development practitioners attribute much of this rapid female secondary educational attainment to Bangladesh's replacement of gender-neutral secondary education policies with its gender-sensitive

counterpart since early 1990s. The rationale for such a policy experiment was simple. Pro-male gender-gaps in the face of gender-neutral education policies and programs call into question their effectiveness for increasing gender equality in education. As such, despite much investment in education, the ratio of girls to boys is 85% and 81% in primary and secondary schools in South Asia; and 86% and 75% in Africa (Lewis and Lockheed, 2006; UNESCO, 2006; Glick, 2008). Feminization of education is believed critical for reducing pro-male gender gaps, and for hastening otherwise lagging access to female education and economic and human development at large by breaking intergenerational social mobility (Glick, 2008; Schultz, 1993, 2002). Similarly, Bangladeshi pro-female secondary education policy is believed to improve its historically low rates of education among “adult” girls especially in rural areas. And, in the process, Bangladesh joins a few Latin American developing countries, which have experimented with pro-female education policy and have subsidized tuition-free instruction, cash rewards, and merit-based scholarships for girls in school (Bellew and King, 1993; Khandker, Pitt and Fuwa, 2003; Filmer and Schady, 2006).

Bangladesh poses a two-fold puzzle. First, in absence of social requisites, what does explain pro-female education policy adoption in predominantly Muslim, Bangladesh? And, second, does the feminization of education policy in and of itself ensure gender equality in education where inequality is historically high? If so, how does it compete with or complement the intergenerational effects on female educational attainment? How does it interact with structural determinants? And, could the educational effects of this gender-targeted policy intervention mask the impact of more fundamental social transformation?

I shed some empirical light on some of these questions in this chapter. And, I do so by using the 1998/99 BIDS-World Bank household surveys from Bangladesh. In particular, I study (a) how gender affects educational attainment as Bangladeshi government expands schooling opportunities to girls; we do not know as completely as we should how the relationship between gender and educational attainment changes in the onset of education policy changes, such as universal education, feminization of education policy, etc. (Beutel and Axinn, 2002); (b) when all secondary school age girls are eligible for free education—who among them actually continue on to the secondary school?, and (c) does the feminization of education policy in and of itself ensure female educational attainment and gender equality in education?.

### **The Feminization of Education Policy in a Predominantly Muslim Country**

Bangladesh is an Islamic country in that 83% of its population is Muslim. Following the Islamic beliefs and traditions, Bangladeshi parents and society are more likely than not to be “deeply apprehensive of girls who were approaching puberty being involved in schooling or other forms of participation in public life” (Caldwell 1986: p. 177). It is unclear, however, how much of such an apprehension is due to the fact that (a) girls are attaining secular education per se, or that (b) girls are breaching the norm of seclusion (*purdah*), and are coming in a closer physical proximity of opposite gender teachers or students. Additionally, the Bangladeshi state adheres to the Islamic, *Sharia* law. The socio-economic institutional context is pro-male than pro-female in that the state assigns women’s rights to property, marriage, and divorce according to the *Quranic* injunctions. Following the Islamic marriage and family laws, the state assigns far greater rights with

regards to marriage and divorce to men than to women. Only men have unilateral and unconditional right to divorce (*talaq*), and while the Bangladeshi Muslim married women do not have rights to initiate divorce, they face divorce threats. Furthermore, following the Islamic inheritance law, a Bangladeshi woman is allowed to inherit one-half the share her brother receives.

Despite void in social requisites, Bangladesh is one of the pioneer countries, which have subsidized girls' schooling costs in addition to increasing their access to quality schooling. In 1994, Bangladeshi government in collaboration with the World Bank began to subsidize girls' secondary education costs by launching the Female Secondary School Assistant Program (FSSAP). The Female Secondary School Assistance Program intervenes in the supply- and demand-aspects for increasing girls' secondary education in the following ways. First, Female Secondary School Assistance Program provides tuition-free education and a monthly stipend to secondary school (Grades 6—10) age girls as long as they maintain regular attendance, passing grades, and remain unmarried until they graduate from secondary school. Second, Female Secondary School Assistance Program provides secondary schools with a stipend based on the number of girls schools enroll (Chowdhury and Devrajan, 2006). Secular as well as religious schools have responded to this intervention at a historic rate. As such, religious schools (*Madrassa*) have switched from being all-male to co-educational institutions. By late 1990s, female student population made up a staggering 47 percent of total *Madrassa* school enrollment. Such a high female *Madrassa* enrollment, especially in secondary level, is unique to Bangladesh and unparalleled in any other Muslim country (Chowdhury and Devrajan, 2006).

## **Economic Incentives to Female Educational Attainment**

Do monetary incentives increase female education? Does the Female Secondary School Assistance Program's tuition-free education and cash-transfers sway parental decisions to send girls to schools? In its simplest form, the economic argument to this question is: the Female Secondary School Assistance Program and similar cash transfer programs raise household income in absolute term, and should motivate parents to educate their daughters (Schultz, 2002).

Gary Becker's (1981) and Becker and Tomes' (1976; 1979; 1984) model is a common point of departure in the income-education research. Becker maintains that parents are altruists, and garner satisfaction from the success of their children. Parents invest monetary and non-monetary resources to educate children. Education is expected to enhance children's human capital and earning potential in the labor market.<sup>35</sup> How much parents invest depends on their ability and preferences and absolute and relative costs of education, which reflects the number of children in the household. So, when parents have higher income, they invest more in children's education. And, when education costs less due to cash transfer or other education stipends, parents can afford more of children's education for their income.

The Beckarian model assumes that parents treat children impartially along the birth-order and gender-divide. Yet, parents might invest differently—and “efficiently”—between two otherwise identical children for reasons related to the economic institutional context within which parents operate. In particular, parents might invest more and/or for

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<sup>35</sup> Children, especially from well-off families, inherit gifts, bequests, and other forms of non-human capital, which can also enhance quality.

a longer period on a particular child if the child has (a) “endowed luck”—endowments that help him/her perform better in school, and (b) “market luck”—endowments that help him/her perform better in the labor market. Such allocation of parental resources is “efficient” as well as equitable under the assumption that hence abler children will look after their “less able” siblings due to the abler children’s altruistic beliefs and practices. The Beckerian model further predicts that parents tend to invest more in sons’ than daughters’ education even when a son and a daughter are identically endowed because market returns for male labor are higher than those for female labor.

Would parents in rural Bangladesh allow their daughters to participate to the Female Secondary School Assistance Program? If female education is a normal consumption good in this model (i.e. its consumption increases linearly with income) and the parents can bear the direct<sup>36</sup> and opportunity costs<sup>37</sup> of female education, the Beckerian model would more likely than not to predict a positive outcome. Parents in all likelihood would take advantage of the price-break in educational and income-augmenting opportunities reflecting girls’ participation to the Female Secondary School Assistance Program, and let them attend school. The Female Secondary School Assistance Program reduces relative costs of educating a secondary-school age girl in rural Bangladesh. Fertility reduction and market opportunities for women also help. The opportunity costs of sending girls to school are lower than before (girls skip school and look after young siblings at home and/or help with household chores Deolalikar, 1998; Glick and Sahn, 2000; Levison and Moe, 1998; Pitt and Rosenzweig, 1990). In

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<sup>36</sup> Direct costs of attending school include such as, texts, materials, special school clothing or uniforms, and transportation costs.

<sup>37</sup> Costs incurred upon attending school and withdrawal from the activities a girl would have performed otherwise.

contemporary Bangladesh, the demand for female labor is *ahistorically* high in microfinance institutions, apparel industries, and elsewhere. However, whether educational attainment among adolescent girls increases with income depends on non-economic cultural factors (below), and the question is open to empirical scrutiny.

### **Cultural (Dis)Incentives to Female Educational Attainment**

Culture defines a unique set of incentives and disincentives to female educational attainment, and it is unclear whether they remain intact following the advent of the Female Secondary School Assistance Program. Despite vagueness in definition and difficulties in operationalization, the framework that considers the relevance to females of (a) ascribed vs. achieved status, (b) the institutions of marriage, family, and reproduction, and (c) living in a pronatalist value system vs. otherwise, is important to this discussion. In combination, these facts explain when stipend program participation and female educational attainment are (a) “rational,” and (b) not so “rational.” Costs are defined in social (latent) as well as economic (manifested) terms in what follows. What are the social, latent costs of female education? Do subsidies erode the latent costs of female education? Are they significant enough to offset monetary incentives for female education? Do parental role in educating girls accepted in the community?<sup>38</sup>

Non-economic, cultural understanding of girls’ stipend program participation and educational attainment is particularly insightful on at least two grounds. First, target families are not the poorest of the poor, and while money always helps, these particular

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<sup>38</sup> “Certain women have in likelihood always been vulnerable to loss of protection. These include infertile women and women who “for one reason or another have run afoul of the structures of dependence in which their genderual birthright places them—widows; spinsters too old, ugly, or black to marry; unmarried mothers; divorcees, etc.”

families may or may not be economically constrained to send girls to school. The program targets families that can afford at least primary schooling for their daughters but debate whether to let their daughters continue on to secondary school. Second, target pupils are adolescent, “adult” girls who would otherwise assume rather the more important role of female adult life—a wife and a mother—in the context of rural Bangladesh.

Cost elimination and immediate monetary rewards might be more effective in bringing to school girls of pre-puberty as opposed to post-puberty age from very poor, as opposed to less poor, families. As such, in pushing the female education ceiling from primary to secondary school, it is plausible that education increases with cash transfers (income) but does so up to the threshold that is justifiable by the existing norms of marriage, female adult roles, etc.

When marriage and reproduction assume centrality in female adult roles, her parents decide rationally between education and marriage. Parents ought to choose between daughter’s education and marriage because her age in attending secondary coincides with that of marriage in rural Bangladesh. And, parents are likely to favor education *only if* postponing marriage now does not defy the norms of marriage and thereby *hurt* its prospect to happen later.

Marriage is mostly arranged in Bangladesh. Parental reliance on networks of primary and secondary social relations makes it more likely that parents conform to the norms of arranged marriage. And, education is not as desirable or important as her youth, virginity, or physical appearance to help girls secure a nuptial contract. For arranging a marriage, the family and the community follow a set of informal norms, and consider

girls' physical attributes, the family she is born into, and the family she relocates to upon marriage, among others. The practice is to arrange marriage for a girl as soon she becomes an "adult" where adulthood is biologically determined and commences at the age a girl attains menarche.<sup>39</sup> Parents, however, maintain the order she is born in arranging marriage for daughters. High emphasis on ascribed qualities and that educational attainment often attenuates marriage-friendly qualities often discourages parents to allow girls to attend school. As such parents take into consideration that by staying in secondary school, a girl (a) grows too "old" for marriage, (b) receives too much education to be matched with a suitable (i.e. more educated) groom, and (c) is exposed to social situations that might limit her ability to retain her virginity.

Thus, stipend program participation might prove necessary among the parallel government interventions or as opposed to none as long as educational attainment does not curb her prospects for a "good" marriage *in time* to a groom who is more educated than she is. Educational attainment depends on the supply-side factors as well. The way the Female Secondary School Assistance Program participating secular schools operate matter as well in that if the latter maintains the (Islamic) social and religious norms of seclusion, separation, dress code, the girls do not "look bad" by entering the public sphere by commuting to and from school, coming in a closer physical proximity of fellow class-mates of opposite gender, being taught by male teachers at school. Furthermore, if education-contingent economic roles and statuses become more socially acceptable,

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<sup>39</sup> In particular, education is not as important as her virginity, (young) age, physical appearance, and networks by birth with male members of high social and economic status—father's occupation, land ownership, number of male siblings, their occupation, etc. (Arends-Kuenning and Amin, 2004).

stipends might increase educational attainment even in the context favoring marriage, reproduction, and childbearing.

## **Research Methods**

### ***Data, Variables, and Measurements***

For this analysis, I use data from the survey conducted by the Bangladesh Institute of Development Studies and the World Bank (BIDS-WB) in 1998/99. The BIDS-WB survey employs a multi-clustered stratified-random sampling design to generate data, and interviewed 2,599 households in 104 villages from 29 in rural Bangladesh in 1998/99.<sup>40</sup> I construct the sample using 1635 households for this analysis and, from those, I include 2742 individuals aged 12—20 in 1999. I use this wide age range because individuals as young as 12 and as old as 20 were enrolled in what is considered secondary school in Bangladesh (Grades 6, 7, 8, 9, and 10) during the time of survey in 1998/99.

The BIDS-World Bank survey is more appropriate than the most available secondary data sources from Bangladesh for this study. The survey makes available village-, household-, and individual- levels information on the socio-economic and demographic attributes despite the fact that the purpose of the BIDS-World Bank survey was to assess changes in household's income from their microfinance program participation. The BIDS-World Bank includes a separate module to record each member's history of education attainment. The survey provides data on respondents' (a) enrollment in, performance in, and completion of school, (b) participation in the Female

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<sup>40</sup> A *thana* is an administrative unit, which is smaller than a district but bigger than a village; a thana consists of a number of villages. Bangladesh's administrative units are divided into: Divisions (N= 6), Districts (N= 64), Thanas (N=507), Unions (N=4484), Villages (N=59,990), and Households (N=25,362,321).

Secondary School Assistance Program, (c) receipt of the Female Secondary School Assistance Program stipends, and (d) receipt of other forms of educational rewards, such as free textbooks, etc. The BIDS-World Bank survey also includes data on marriage and pregnancy history for all women between 12 and 50 years; land ownership; food and non-food expenditures; participation in agricultural or nonagricultural employment; as well as data on participation in rural financial services and the amount of credit borrowed. Information on family planning program participation, religion, and education in governmental and non-governmental educational institutions is also available. And the survey documents a diverse set of village-specific attributes –i.e., prices of staple food items, wage rates for male, female, and child labor, availability of state-led employment programs (food-for-work, road construction), government and non-governmental food programs, NGOs, formal financial institutions, markets/*haat* in the village, and health and education facilities—that allow me to understand the interrelationships of community-level and household characteristics.

Let's note, I will consider the sample of this study in two ways: (a) unrestricted, and includes all individuals aged 12-20, and (b) restricted to only girls aged 12-20 who are eligible to participate into Female Secondary School Assistance Program. And, with this split, I attempt to gain some analytical traction I discuss below. Let's also note, the sample contains an unequal number of households from villages. As such, 1635 (733) households from 104 villages comprise the unrestricted (restricted) sample, and the unrestricted (restricted) sample includes as low as 7(2) and as high as 51(2) with an average of 26(9) households from these villages. Finally, household members vary in

number by which they enter the sample: the unrestricted (restricted) sample includes as low as 1(1) and as high as 6(4) with an average of 1.7(1.2) members from households.

***Estimation Strategy***

I estimate Equations (1) and (2) below to examine whether female secondary educational attainment can be made possible with targeted enrollment subsidies, namely, Female Secondary School Assistance Program. Let’s note, Female Secondary School Assistance Program makes previously absent educational opportunity available to *all* secondary-school age girls in rural Bangladesh at the same time. Yet girls’ Female Secondary School Assistance Program participation is voluntary, and therefore self-selective. So, the question—whether female secondary educational attainment is possible with a targeted enrollment subsidy must be fore-fronted by a more fundamental question—“Who among those eligible actually participate into the Female Secondary School Assistance Program stipend program?” And, I specify Female Secondary School Assistance Program stipend program (*Stipend*) as a function of girls’ age (*Age*) and birth-order (*Birth*) along with controls.

$$[1] \text{ Enroll}_i = \alpha + \beta \cdot \text{Stipend}_i + \beta'X_i + \varepsilon_i,$$

$$[2] \text{ Stipend}_i = \alpha + \beta_1 \cdot \text{Birth}_i + \beta_2 \cdot \text{Age}_i + \beta_3 \cdot \text{Age}_i^2 + \beta'X_i + v_i$$

The vector *X* includes households’ demographic and socio-economic attributes—father’s and mother’s education, household’s land ownership, religion, and a number of village-fixed attributes.

My identification strategy, therefore, is to use an instrumental variable approach to predict girls’ Female Secondary School Assistance Program stipend program participation, and use the predicted Female Secondary School Assistance Program

participation values to capture Female Secondary School Assistance Program participation's independent effect on female secondary school enrollment. This identification strategy is valid and reliable only when the instrument is valid, and the criterion for a valid instrument requires that the instrument should closely correlate with the endogenous regressor (Female Secondary School Assistance Program participation) but not (*directly*) with the outcome variable. The observed association between the instrument and the outcome should be (*fully*) mediated by endogenous explanatory variable (Angrist and Kreuger, 2001: p. 73).

Female Secondary School Assistance Program participation requires that girls must stay unmarried until they graduate secondary school. This institutional arrangement is particularly instructive for my choice of an instrumental variable considering the following. In the context of rural Bangladesh, the norm of marriage dictates that parents should arrange their daughter's marriage (a) as soon as she reaches the age of menarche, and (b) in the order she is born. This marriage norm should affect girls of different age and birth-order differently to participate to Female Secondary School Assistance Program. As such, parental decision to send their daughters to school and allow them to participate to the stipend program should be the same. However, if we assume the violation of Female Secondary School Assistance Program rules has consequences, we should expect parents to consider daughter's age and birth-order into serious consideration as they decide whether or not to allow their daughters to participate in the stipend program. A 15-year old girl who is first in parity faces more pressure to get married than another 15 year-old girl who is not a first-born and/or in the order of marriage, and is awaiting marriage of her earlier sister(s) instead. And, the latter will

have a higher likelihood than the former to participate in the stipend program. So, after controlling for the common education-correlates, girls' birth order is an instrument of stipend program participation.

I employ a 2-Step Least Squares and the Biprobit techniques to estimate the parameters in Equations (1) and (2). The two-step Least Squares and Biprobit are the standard econometric techniques when explanatory and outcome variables are binary (Yes/No).<sup>41</sup> But, first, a discussion about the structure of data is warranted. The data is structured in the way that we observe enrollment outcomes of *mostly* those who are receiving stipends.<sup>42</sup> We therefore are dealing with Scenario A as opposed to Scenario B in Table 1. Scenario A maintains some variation in the explanatory variable in that enrollment is happening (mostly) with or (sometimes) without stipends as opposed to Scenario B where enrollment occurs only with stipends.<sup>43</sup> Secondly, the Yes-Yes cells in the stipend-enrollment columns can differ fundamentally from the No-No cells in the stipend-enrollment columns. And, an inter-group comparison between Yes-Yes and No-No might produce biased estimate for stipend program participation since the estimated effects would capture a combined individual- as well as stipend program participation effects and would overestimate stipend program participation effects on enrollment.

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<sup>41</sup> Probit and Logit models, regardless of differences in respective logistic and normal distribution, produce similar results for most part. However, researchers choose between them based on (a) mathematical convenience, and (b) theoretical consideration in that when (a) the binary outcome is distributed as though there are a very few "Yes" or "No" values, and because of that (a) a key explanatory variable has a widely varied responses, models tend to offer inconsistent estimates of probabilities. However, differences seem not to be sizeable (Greene, 2000: 815).

<sup>42</sup> The survey asks: (a) "Are you currently going to school?", and in the case of positive responses, (b) "Did you get stipend/scholarship/tuition waiver from following sources?"

<sup>43</sup> The survey does not ask if girls had had received stipend while in school yet decided to drop out regardless.

Table 5. 1: Actual and Hypothetical Data Scenarios

Set up A: current scenario		Vs.	Set up B: hypothetical scenario	
Stipend	Enrollment		Stipend	Enrollment
Yes	Yes		Yes	Yes
No	Yes		No	No
No	No			

Second, the Two-Step Least Squares mimic the logic behind Two-Stage Least Squares (2SLS), and is commonly employed in the following situations. First, researchers have data on outcome variables from those who are participating in social programs, and they have no data from those who are not participating in social programs. But, researchers must somehow also consider those who are not participating in the social programs so that they can estimate with validity social program participation effects on outcomes of their interest (Heckman, 1979). Second, explanatory and outcomes variables are neither continuous nor random.

Accordingly, I (a) estimate the probit of the binary stipend program participation, and (b) use the predicted program participation estimates from (a) and *sequentially* estimate another probit for the binary enrollment status. Alternatively, I compare parameter estimates from 2-step sequential Least Squares modeling with those using the Bivariate Probit modeling technique. I do so because the sequential estimation from 2-step Least Squares is not as attentive as Bivariate Probit to simultaneous determination of endogenous and outcome variables, and thereby risks faulty tests of significance. Bivariate Probit is particularly applied when explanatory and outcome variables are (a) binary and (b) jointly determined. Joint determination in this study suggests that unobserved heterogeneity (disturbances) affecting parental decision to allow their

daughter's stipend program participation also affect their decision to allow daughter to attend secondary school (i.e., error terms are correlated). And, when this exists, and I ignore simultaneity in equations, I might report inconsistent variance estimates and faulty significance tests of stipend program participation effects on female educational attainment.

Variance-covariance matrix is corrected for (a) heteroskedastic and (b) clustered (within 104 villages) residuals.<sup>44</sup> Although households are units of analysis, the fact that (sampled) households live in villages, and this hierarchical (multi-level) sampling design plagues the analysis. Random sampling of clusters implies that clusters are “independently” and identically distributed, *iid*, (inter-cluster correlations = 0), yet random sampling of households does not eliminate the fact that households within clusters somehow correlate (due to unobserved cluster effects). Jackknife variances are clustered over villages and aim to overcome this possible violation of *iid*.<sup>45</sup>

## Results

### *Descriptive Patterns*

Secondary school enrollment among successive age cohorts is on the rise in Bangladesh, and this increase among girls is particularly noticeable (Figure 1). While the gender gap—at a decreasing rate— still persists across age-cohorts, a reversal is evident in that

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<sup>44</sup> Both are common in the survey data, and clustered residuals are more common in rural Bangladesh. Heteroskedasticity occurs from deviation of each household from (aggregate/all) household mean due to that particular household's unique conditions, known to households, unknown to researchers. Clustered residuals occur when households living in a same cluster behavior similarly among household living within that cluster and differently from households living outside clusters due to cluster-specific attributes, unknown to researchers through survey instruments.

<sup>45</sup> Studies identify several routes to inter-household correlation within villages: (a) household exposure to identical amenities in villages, (b) households' selective migration to villages with certain amenities, and/or (c) households seeking community approval adapt behavior and utilization of village amenities.

in 1999 secondary school enrollment among girls was higher than that among boys aged 13—18.

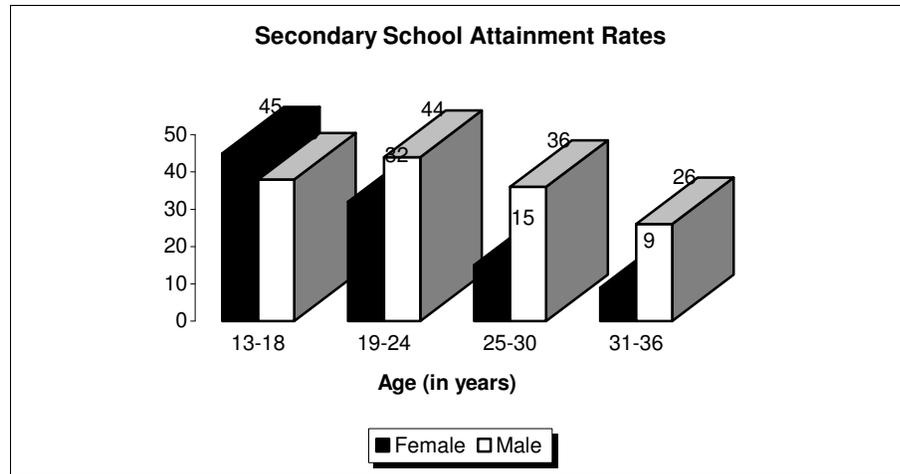


Figure 5. 1: Gender-Specific Secondary School Attainment Rates in Bangladesh, 1998/99

I explore in detail this upward secondary school enrollment among girls. I want to gather a rather crude understanding whether the period for pro-female gap in education (Figure 1) corresponds to 1994—the year when secondary school stipend program for girls started nationwide. I estimate a PROBIT for Equation 3 and compare the marginal enrollment probabilities for girls aged 14—24 years with girls aged 25 years or older. I repeat this for boys.

$$[3] S_i = \alpha + \sum_{l=14}^{24} P\beta_l + \varepsilon_i, S=\text{enrollment status (Yes/No)}; P=\text{age}$$

The cut-off of age at 25 is based on the following logic. I compare secondary school enrollment between boys and girls aged 14—36 in 1999 (during the time of the survey). Those who were completing or yet to complete secondary school and were aged **19 or less in 1994** have had some exposure to the secondary school subsidy program. To capture this with the 1999 survey responses, I identify those **24 or less in 1999** are those

who have had some exposure to the stipend program and those who were 25 or older in 1999 had already past secondary school age when Female Secondary School Stipend Program Assistance was introduced in 1994 and had not benefited from the program.

In addition, I estimate Equation 3 separately for boys and girls. Boys serve a natural “reference” category in that boys’ enrollment is what we can expect to see over time and without any interventions.

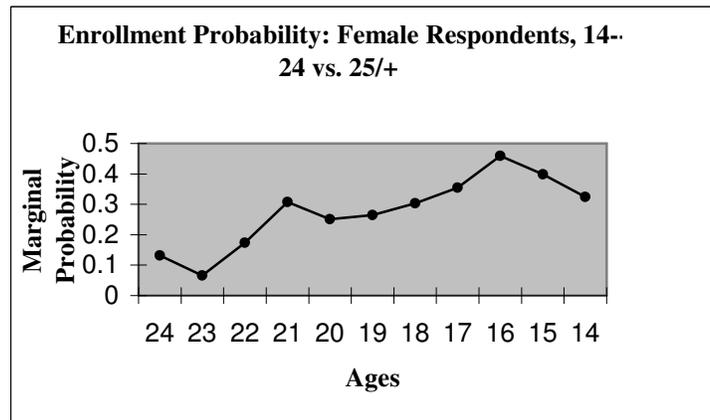
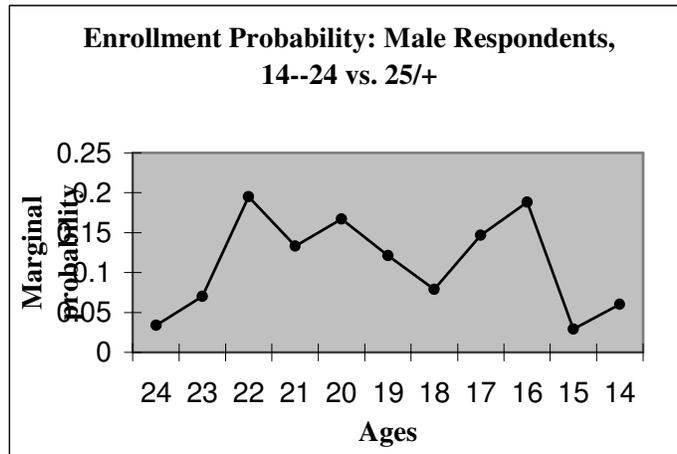


Figure 5. 2: Gender-Specific Marginal Probability to Secondary School Enrollment in Bangladesh, 1998/99

Overall, the marginal enrollment probabilities are systematically higher for girls aged 14—24 with exposure to the stipend program than those aged 25 years or older with no such exposure. As such, a 14-year-old girl in or after 1994 has nearly 40% higher likelihood than a 14-year-old girl before 1994 to enroll in secondary school. A similar trend is all-but-systematic for boys. Marginal probabilities for enrollment are higher among male respondents aged between 14 and 24 years compared to 25 or older. This

suggests the possibility of an upward trend in education *without intervention* in Bangladesh in that younger cohorts are more likely to enroll in secondary education than older cohorts. But (high) enrollment probabilities across ages for boys are not as systematic as for girls, and such inconsistencies hint that education differences across cohorts is not only due to age differences.

In sum, a side-by-side boy-girl comparison of their marginal enrollment probabilities shows that enrollment among all is getting higher, yet these rates for girls are increasing more systematically than those for boys. An upward trend in girls' enrollment defies the "natural", boys' enrollment trend, and suggests that some external effects are in action.

### ***Summary Statistics***

Table 2, and Figures 2 and 3 show that nearly half of secondary school age women included in the analysis were born to parents/households with no or low education and income. Only 25% (45%) of are born to mothers (fathers) with primary or secondary educations, and 60% are born to households owning half an acre of land or less (Column 1). Among those who are currently enrolled, their parental education and landownership are high. However, notably, enrollment is also high among those whose parents are not educated. 57% (40%) of enrolled girls are born to mothers (fathers) with no formal education; and 50% are attending schools despite households' low or no landownership (Column 2). Patterns in parental education and landownership are comparable between girls enrolled and enrolled with stipend program participation. Mothers of more than half (56%) of the girls attending the secondary school while participating in a stipend program have never attended a secular (formal) school; 46% of girls participating in the stipend

program and attending school are born to uneducated fathers; and nearly half of them are born to and live in families with low or no agricultural land (Column 3). Most girls belong to Islamic faith regardless of being enrolled with or without stipend program participation.

Table 5. 2: Summary statistics

	(1) All (n=904)	(2) Enrolled (n=418)	(3) FSSAP Participants (n= 292)
Age			
12	21.10	11.48	7.88
13	17.68	20.10	20.89
14	20.33	23.21	20.55
15	13.70	17.94	20.21
16	11.71	15.79	19.18
17	4.53	5.02	5.82
18	6.74	4.55	3.77
19	1.99	0.72	1.03
20	2.21	1.20	0.68
Islam	89.94	89.00	88.36
Father: No Education	55.91	40.43	40.41
Father: Primary education	26.52	29.90	28.77
Father: Secondary education	17.57	29.67	30.82
Mother: No education	72.49	57.89	56.16
Mother: Primary education	20.77	27.75	28.77
Mother: Secondary education	6.74	14.35	15.07
Landless	16.24	9.09	7.88
Land ownership: 5 to 49 decimals	44.20	41.63	40.75
Land ownership: 50 to 149 decimals	22.32	26.32	26.71
Land ownership: 150 to 249 decimals	9.39	12.20	11.64
Land ownership: 250 decimals or more	7.85	10.77	13.01

Note: Columns 1, 2 and 3 include *all* girls, *only* enrolled, and *only* participants respectively.

## Estimation Results

### *The Standard Model*

Table 5. 3: PROBIT Estimates of Secondary School Enrollment

	(1)	(2)	(3)
Age	1.756(0.166)***	1.327 (0.219)***	2.347(.262)***
Age-squared	-0.060(0.005)***	-0.045(0.007)***	-0.081(0.009)***
<b>Female</b>	<b>0.132(0.056)***</b>	--	--
<b>Islam</b>	<b>-0.208(0.092)**</b>	<b>-0.338 (0.126)**</b>	<b>-0.056(0.140)</b>
(Log) of household size	0.212(0.077)**	0.001(0.111)	0.430(0.113)***
Father's education: primary	0.123(0.066)***	-0.015(0.093)	0.277(0.098)**
Father's education: secondary	0.640(0.087)***	0.589(0.120)***	0.723(0.131)***
Mother's education: primary	0.374(0.072)***	0.362(0.101)***	0.393(0.106)***
Mother's education: secondary	1.032(0.144)***	0.911(0.191)***	1.276(0.234)***
0< land ownership<0.50 acres	0.408(0.089)***	0.460(0.129)***	0.312(0.127)***
0.50<= land ownership<1.50 acres	0.741(0.098)***	0.893(0.139)***	0.522(0.141)***
1.50<= land ownership<2.50acres	0.771(0.121)***	0.949(.172)***	0.536(0.175)***
Land ownership=>2.50	0.717(0.126)***	0.917(0.173)***	0.491(0.189)***
Constant	- 13.836(1.276)***	- 10.401(1.692)***	- 18.331(2.007)***
Universe	All	Male-only	Female-only
<b>Inflection point in years (Age-Age<sup>2</sup>)</b>	<b>14.63</b>	<b>14.74</b>	<b>14.49</b>
N	2742	1421	1321
Log likelihood ratio	-1326.496	-697.094	-610.118

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

Note: Robust standard errors in parentheses are adjusted for village-level clusters. The excluded categories for dummy variables are non-Muslim households, illiterate father, illiterate mother, and landless households.

Table 3 shows parameter estimates of educational attainment among all (Column 1), boys (Column 2), and girls (Column 3). Results are revealing especially concerning effects of gender and culture. First, being a *female* increases the probability of enrollment in secondary school. Considering that female enrollment is high despite low parental education and income hints at the fact that some external intervention is active on the female. Second, Islam constrains education, but does so significantly for boys but not for

*girls*. This is counterintuitive in that existing scholarship reports a depressing effect of Islam on secular education for all, and more so for girls than boys. This hints at recent trends in Islamic schools in enrolling as many girls as boys in an effort to secularize Islamic schools. Age maintains a nonlinear effect on educational attainment in that education decreases with age after a threshold. The fact that girls drop out at around same age as boys suggests that (a) parents keep their daughters in school as long as they keep their sons—a key finding in a patriarchal society, and (b) their decision is influenced by some other factor that is strong enough to offset preferential treatment of sons. Parental education and income help educational attainment, as expected.

#### ***Results from First-Stage Estimation***

Tables 4 and 5 present parents' estimated direct and indirect economic, education, and cultural effects on (unmarried, secondary-school age) daughters' secondary school enrollment in 1999. In particular, Table 4 presents parental effects on stipend program participation, and Table 5 presents the stipend program participation effects on enrollment. Estimation in two-steps serves a dual purpose: it allows estimation on female education of (a) direct and mediated intergenerational effects and (b) independent effects of otherwise endogenous stipend program participation, instrumented with specific cultural attributes (discussed and justified on pages 12-13).

Table 5. 4: First Stage Regression: Determinants of Stipend Program Participation

	(1) 2-Part Method	(2) Bi-variate probit
Gender-specific birth-order	0.432** (0.177)	0.367** (0.173)
Age	2.603*** (0.454)	2.654*** (0.462)
Age-squared	-0.085*** (0.015)	-0.087*** (0.015)
Islam	-0.087 (0.192)	-0.108 (0.188)
(Log) of household size	0.317* (0.179)	0.302* (0.179)
Father's education: primary	0.244* (0.133)	0.231* (0.130)
Father's education: secondary	0.530** (0.198)	0.510** (0.219)
Mother's education: primary	0.361** (0.149)	0.371** (0.146)
Mother's education: secondary	0.663*** (0.267)	0.683** (0.258)
0< land ownership<0.50 acres	0.467*** (0.157)	0.457*** (0.160)
0.50<= land ownership<1.50 acres	0.591*** (0.187)	0.579*** (0.188)
1.50<= land ownership<2.50acres	0.605** (0.263)	0.595** (0.262)
Land ownership=>2.50	0.838*** (0.233)	0.837*** (0.277)
Constant	-21.559*** (3.410)	-21.337*** (3.833)
N	904	904
Log likelihood ratio	-467.480	-736.864

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

Note: Robust standard errors in parentheses are adjusted for village-level clusters. The excluded categories for dummy variables are non-Muslim households, illiterate father, illiterate mother, and landless households.

Culture expands as well as constrains stipend program participation, and maintains its constraining effect on stipend program participation in situations where economic status is not as constraining (detail below). Age is significant at its nominal and polynomial order and birth-order significantly affect participation (Columns 1 and 2). Demographic characteristics are therefore no less important than parental education and income. Despite differences in socioeconomic status, parents conform to (externally defined) cultural norms that prescribe a unique set of parental roles and rules based on a daughter's age and birth-order. As such, culture encourages parents to marry off the first-born daughter as soon as she reaches puberty—contracting opportunities for the first-born for stipend program participation and education, and discouraging breaking birth-order in

the order they are married off—expanding opportunities for the later-born despite pubescent years as she awaits the marriage of her older sisters. These results suggest that parents seem to have considered that in deciding who participates in the stipend program. Firstly, gender-specific birth-order maintains a positive and significant effect on stipend program participation, *ceteris paribus*. In other words, the (relatively) later-born between two girls of comparable age and socio-economic backgrounds has a 5% greater chance of stipend program participation. Age-effect on participation is significant (at  $\alpha=0.01$ ), as we expect it to be for girls in a traditional society, yet the fact that the likelihood of participation is not high (low) for younger (older) girls in the sample suggests that (a) the age-effect is neither linear nor monotonic, and (b) the youngest cohort and the cohort older than fifteen years—the average age of marriage—are less likely to participate in the program.

Parental education and income matter for stipend program participation. However, the fact that some paternal and maternal education (primary: 1-5 years of education) helps daughters' participation in the secondary school stipend program is revealing. Similarly, the finding that even nearly landless households encourage daughters' stipend program participation suggests education intervention's penetration into the lower, if not the lowest, economic classes. Yet, the fact that parental education and income are significant where Islam is not is no less intriguing, and suggests that stipend program participation has yet to be entirely status-blind so much that interventions have not reached the lowest income and education households. Even when stipend relieves educational expenses, indirect costs of stipend program participation—uniforms, being away from her usual chores at home, etc.—are still in place, and parents

must attain a threshold income or education that makes that level of education possible in order for girls to be able to complete primary education and participate in the secondary school stipend program. As such, a little education among parents is not dangerous in that some education and land among parents expands the likelihood of daughters' secondary school stipend program participation. A father with primary (secondary) school education is 3% (5%) more likely than a father with no (formal) education to allow daughter's stipend program participation. And, an educated mother favors stipend program participation more than an uneducated mother in that a mother is 6% and 11% more likely to allow participation when she has primary and at least secondary school, respectively. Girls from landless households participate less frequently than those with at least some land: the likelihood increases by 7%, 8%, 10% and 11% when girls live in household that is not landless but owns no more than half an acre, 1.5 acre, 2.5 acre and more than 2.5 acre of land.

Table 5. 5: Stipend Program Effects on Schooling

	2-Part Method	Bi-variate probit
Stipend program participation	3.111*** (0.391)	4.245*** (0.333)
Islam	0.043 (0.181)	-0.005 (0.221)
(Log) of household size	0.056 (0.174)	0.202 (0.192)
Father's education: primary	0.072 (0.121)	0.159 (0.117)
Father's education: secondary	0.238 (0.164)	0.412* (0.243)
Mother's education: primary	0.026 (0.140)	0.120 (0.159)
Mother's education: secondary	1.059*** (0.331)	1.344*** (0.469)
0< land ownership<0.50 acres	0.027 (0.142)	0.005 (0.151)
0.50<= land ownership<1.50 acres	0.144 (0.177)	0.240 (0.174)
1.50<= land ownership<2.50acres	0.198 (0.223)	0.283 (0.225)
Land ownership=>2.50	-0.208 (0.258)	-0.166 (0.324)
Constant	-1.399*** (0.375)	-1.724*** (0.405)
N	904	904
Log likelihood ratio	-494.194	-736.864
$\rho$		-0.753
$\chi^2$ ( $\rho = 0$ )		4.397**

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

Note: Robust standard errors in parentheses are adjusted for village-level clusters. The excluded categories for dummy variables are non-Muslim households, illiterate father, illiterate mother, and landless households.

### ***Results from Second-Stage Estimation***

Table 5 presents stipend program participation's direct and parent's mediated socioeconomic effects on enrollment. Stipend program participation is significant and positive across estimation techniques and when the key predictors of education are controlled in model specifications. Stipend effect on enrollment among the secondary school-age girls is sizeable. All else equal, when a girl receives a stipend, she is a staggering 200% more likely than a girl with no stipend to continue on to and get enrolled in school. Except for maternal education, education and income endowments in the family a girl is born into are no longer a significant route to intergenerational social mobility. This suggests that in the rural Bangladesh context maintaining a general

antipathy to female educational attainment, the state can evolve as an alternative institution and do the job for parents as long as the state manages to successfully *bribe* parents into letting daughters complete primary education and utilize secondary schooling opportunities.

**Interaction Analysis**

Table 5. 6: Complementarity Analysis

	(1) Enrollment	(2) Enrollment	(3) Enrollment	(4) Attendance	(5) Performance
(Predicted) stipend program participation	7.534*** (1.006)	7.167*** (0.945)	6.713*** (1.620)	0.829 (1.064)	5.411 (22.038)
Mother: education	0.091*** (0.032)	0.102*** (0.051)	0.089 (0.065)	0.004 (0.025)	-0.841 (0.769)
Mother: Family Planning utilization	0.457*** (0.155)		0.294 (0.267)	0.184 (0.230)	-0.034 (4.158)
Stipend×Education		-0.127 (0.201)	0.007 (0.327)	-0.061 (0.107)	2.761 (2.861)
Stipend×Family Planning			1.121 (1.839)	-0.631 (0.981)	5.974 (22.744)
Constant	-1.525*** (0.184)	-1.167*** (0.116)	-1.397*** (.219)	5.522*** (0.231)	22.862*** (3.832)
Universe	Eligible	Eligible	Eligible	Participants	Participants
N	636	864	636	456	426
Log Likelihood Ratio/F-value	-345.997	-483.244	-345.793	0.75	0.75

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$

Note: Jackknife standard errors in parentheses are adjusted for village-level clusters in (1), (2), and (3). Robust standard errors are reported in (3) and (4).

I further seek a rather crude understanding of whether maternal education, exposure to modern health practices, and state interventions complement or substitute (that we need

one instead of all). Educating girls is easier with maternal education and, despite education, exposure to modernity (perhaps through health practices—family planning).

And this poses a concern among policy makers about prioritizing programs and timing of

interventions. While maternal education and exposure to modernity (family planning) are

significant predictors of stipend program participation for secondary school enrollment

(Column 1), the fact that interactions are not significant suggests that stipend programs

can be successful even at low level of maternal education and exposure to modernity

(Columns 2 and 3). However, stipend program participation does not ensure quality of

learning among girls (Column 4 and 5). Using two indicators of performance, namely, weekly attendance in school and performance in the last annual exam, I show that that stipend program does not ensure better attendance or performance.

In sum, the feminization of education opens up as previously unavailable route to female educational attainment. Does the feminization of education augment female educational attainment and dissociate parental positions, statuses, and resources from the process as it aims to do? Are educational opportunities and parental attributes substitutes or complements for female educational attainment during the period of mass expansion of female educational opportunities?

I answer these questions of grave structural and policy importance, and offer a systematic investigation within the limits of survey data by embarking on neither of the following approaches: first, I do not evaluate the feminization of education policy, and second, I do not include economic and demographic determinants as the alternative determinants of female educational attainment as most prior studies do (Mare and Maralani, 2006; Filmer and Schady, 2008; Berhman et al., 2005; Duflo, 2001).<sup>46</sup> Instead, I invoke a new analytical framework as I (a) unify rather *disjoint* efforts in demographic and development literatures and (b) include largely omitted cultural parameters of policy adoption.

Two empirical realities in Bangladesh are particularly instructive. First, female education has risen fairly sharply in a relatively short period of time in Bangladesh, which suggests the efficiency of intervention. Second, parents overwhelmingly concur that their otherwise-would-be-married daughter(s) should participate in Female Secondary School Assistance Program, and this suggests a fundamental change in norms

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<sup>46</sup> Exceptions include Beutel and Axinn (2002) among others.

and values about ascribed and achieved female roles and statuses. If so, the question is whether Female Secondary School Assistance Program catalyzes as opposed to causes educational attainments.

Results are revealing, and suggest that while culture indeed mediates gender-sensitive education policy's effects on female educational attainment, it is more permeable than the existing literature often suggests. In particular, I find that education subsidies increase female enrollment in the secondary school in a traditional society and thereby eliminate reproduction of intergenerational social immobility for large part as long as schooling delays but does not deny the cultural importance of girls' marriage and reproduction in rural Bangladesh where pro-natalist and pro-familial values prevail. Female Secondary School Assistance Program-induced female educational attainment is possible only after some level of parental economic and cultural constraints are relaxed. Culture still constrains female education, but appears to be less constraining in the presence of pro-female education policy than it could have been in its absence. As such, while subsidies appear to have little effect upon first-born girls, who face overwhelming pressure to marry and reproduce at a young age, they seem to have profound effect on offspring of later parities, who tend to stay at school while their older female sibling(s) await marriage—and thereby raise the prospects for human development down the road.

## CHAPTER VI: CONCLUSION

My dissertation addresses this “Bangladeshi paradox” of rapid gains in human development against the backdrop of a social scientific literature that portrays two endemic features of Bangladeshi society—Islam and illiberal politics—as inveterate obstacles to its achievement. Over the course of the past three decades, Bangladesh has been transformed from an international “basket case” into one of the fastest reducers of infant and child mortality in the world. The country has reduced mortality despite (a) economic stagnation of 1980s, (b) high level of absolute poverty, (c) relatively low public investment in health, (d) low female literacy rates, (e) a history of authoritarian and fragile democratic regimes, and (f) unaccountable bureaucracy. Moreover, Bangladesh’s success seems to follow, in its purest form, the “wealthier is healthier,” the “health with public universal-provisioning of health and education services,” or the “social determinants” explanation of human development.

The market-based, the “wealthier is healthier” account maintains that rising national income increases private spending on goods and services that directly or indirectly improve health (McKeown and Record, 1962; McKeown 1983; Pritchett and Summers, 1996; Easterly, 1999; Filmer and Pritchett 1999; Filmer, Hammer and Pritchett, 2000, 2002; Dollar and Kraay, 2004). Scholars who defend this account note the empirical regularity that children die in higher rates in low-income countries and lower rates in high-income countries and make the causal claim that economic growth reduces childhood mortality by increasing individual purchases of health inputs, broadly defined to include food, health care, medical services, and basic education. The market-based approach faces myriad critiques, and among them, the social determinant scholars

question their core assumptions as they differentiate between purchasing ability and accessibility of health goods and services and argue that the former encourages but not necessarily ensures the latter.

While proponents of the market-based thesis are concerned only with absolute poverty reduction with economic growth, some scholars who study *Social Determinants of Health* would argue that child health deteriorates from relative poverty as much as it does from absolute poverty (Marmot 2004, 2005; Marmot et al., 2006; Wilkinson, 1996; Wilkinson and Pickett, 2009; WHO, 2006). These scholars believe access to health goods and services, such as adequate nutrition, clean water, quality medical care, etc. is socially determined. As such, conditions at home, work, and leisure, education, life in communities, towns, and cities socially constitute both the onset and response to treatment of life-threatening diseases. In particular, the social determinant scholars look at (a) individuals' social hierarchical position—how an individual's social position deviates from the positions most members of his/her reference group maintain and (b) individuals' psychosocial stress from their absolute as well as relative social positions to predict individuals' susceptibility to life-threatening diseases and response to their treatment.

Finally, others argue that the public provision of health inputs – primary health care, sanitation, clean drinking water, and especially female education—helps reduce childhood deaths regardless of macroeconomic trends (Anand and Ravallion, 1993; Anand and Barnighausen, 2004; Caldwell, 1986, 1993; Dreze and Sen, 1991; Hill and Pebley, 1989; Preston, 1980; Bohkhari et al., 2006; Gupta et al., 2002; McGuire, 2001; Wagstaff, 2003; Jalan and Ravallion, 2003; Soares, 2007; Schultz, 2002; Frost et al.,

2005; Ravallion, 2006). The growing dissociation between economic growth and childhood mortality, and the striking human development gains of countries and states like Sri Lanka, Costa Rica, and Kerala (India), pose a threat to the market-based, economic explanation of childhood death, and thereby suggest that child health can be achieved at relatively low cost. In fact, scholars in this camp maintain that economic growth becomes instrumental in reducing childhood deaths only when growth translates into (a) high public expenditures on health and education (Ranis, Stewart, and Ramirez, 2000), and (b) reduction of income poverty (Anand and Ravallion, 1993).

Why do cultural, structural, or institutional disadvantages seem not to be as binding in Bangladeshi child mortality decline as pertinent literature so vividly suggests? How has the country managed to reduce mortality despite its inhospitable political culture? To reiterate, Bangladesh has not unequivocally followed any of the above three explanations of human development. By saving substantially more lives than expected at country's levels of economic development and income-redistribution, Bangladesh's such success seems to follow unequivocally with neither the "wealthier is healthier" nor the "health with public universal-provisioning of health and education services" explanation of human development. Also, Bangladesh's succeeded in saving lives among children despite the fact that its socio-economic inequality, and the level of social capital and cohesion have remained unchanged—if not more (Sen et al., 2006). I attempt to answer in this dissertation the micro-implications of these macro questions.

I use panel data from household surveys, conducted by the Bangladesh Institute of Development Studies in collaboration with the World Bank in 1991-2 and 1998-9 to identify the distal causes of Bangladeshi mortality decline in Chapter 3. The Weibull

model estimates the probability of mortality among children born during the ten years preceding the surveys conditional on their parent's economic and social status, and household's demographic characteristics. For all children, the surveys include the age at death or age at the survey date if the child is still alive. The Weibull functional form makes sense theoretically as well as empirically since the likelihood of death is a decreasing function of age among children, and the model estimates independent variables using a proportional hazard specification. The standard errors are robust, and the significance tests are therefore based on heteroskedasticity-consistent estimates of the variance-covariance matrix. To present robust parameter estimates, I (a) run cross-sectional and panels models using data from each survey year and over time; and (b) correct for the possibility of heteroskedasticity in standard errors and therefore conduct meaningful significance tests.

I find that female education has a linear effect and household income has a curvilinear effect on infant and child mortality. This merely pushes the Bangladeshi paradox back a step, however, and the subsequent analyses therefore address the new puzzles I have identified: Why is the relationship between income and child mortality curvilinear (quadratic)? And why is female education improving in an allegedly hostile Muslim environment?

I address the first question in Chapter 4. I consider whether Bangladesh's targeted antipoverty/social safety net programs are behind the counterintuitive curvilinear association between household income and child mortality. Soon after Bangladesh's independence from Pakistan in 1971, the government had initiated a number of social safety net programs as relief efforts in a war-wrenched country. And, in later years, the

Bangladeshi government utilized these social safety net programs to address seasonal calamities, unemployment, loss of primary income earners among other such “ad-hoc” needs (Deolalikar, 2005). In recent years, the Bangladeshi government have incorporated these social programs into its poverty reduction strategy, and thereby aim to enhance (a) capital accumulation, (b) nutrition/food security, and (c) human development (education, in particular) among the targeted economic and demographic groups (Sen et al., 2004). Examples of these social programs include Vulnerable Group Development, Vulnerable Group Feeding, Food-for-Work, Food-for-Education, Female Secondary School Assistance Program, etc.

Based on the analysis in Chapter 4, I suggest Bangladesh’s targeted antipoverty/social safety net programs are behind the counterintuitive curvilinear association between household income and child mortality. By deploying an overly conservative targeting criteria, the Bangladeshi government is excluding many poor families, and is thereby raising the likelihood that the very poor—who benefit from the programs—experience lower levels of infant and child mortality than the everyday poor, who do not qualify for the subsidies. Results suggest that state redistributive programs might have offset poverty-induced threats to human development among beneficiary families but left the non-beneficiaries—many of whom are still poor—to fend (or in many cases not fend) for themselves. Although the welfare gains among the targeted poor are encouraging, as targeted redistribution appears effective and beneficial, the fact that the non-targeted poor are less successful in suppressing premature death, perhaps because they are cut off from redistribution, is troubling, and calls for a reevaluation of targeting criteria or perhaps the very practice of targeting.

I address why female education is improving in an allegedly hostile Muslim environment in Chapter 5. In particular, I examine if secondary-education subsidies from gender-targeted, Female Secondary School Assistance Program alleviate cultural discouragement for female educational attainment in rural Bangladesh. I employ, alternatively, 2-Step Least Squares, and Biprobit techniques to estimate the effects of education subsidies on female secondary-educational attainment. 2-Step Least Squares and Biprobit are the standard econometric estimation techniques when both explanatory and outcome variables are measured at the bi-nominal level of measurements (Yes/No). I find that female secondary-education attainment is possible by subsidizing the secondary education as long as education delays but does not deny the cultural importance of marriage and reproduction. And, the impact of female education subsidy is mediated by birth order. While subsidies appear to have little effect upon first-born girls, who face overwhelming pressure to marry and reproduce at a young age, they seem to have a profound effect on offspring of later parities, who tend to stay in school while their older female sibling(s) await marriage—and thereby raise the prospects for human development down the road.

Results are revealing, and have significant implications for Bangladeshi human development policy. Table 6.1 summarizes the key findings of my dissertation.

Table 6. 1: Key Findings At A Glance

Empirical HD Puzzles	Determinants			
	Income	Redistribution		
		Universal redistribution	Targeted redistribution	
			Female-targeted education services	Poor-targeted food transfers
I. Child deaths (decline in a poor country with low level of <i>universal</i> redistribution)	↑	?	↓	↓ then ↑
II. Female educational attainment (in a patriarchal, predominantly-Muslim country)	↑	?	↑	NA

Note: HD=Human Development

Results from the inferential analyses in Chapters 3—5 suggest: (a) gender- and land-targeted redistributive development policies are overall human developmental since they can augment even poor household’s access to food and education, and (b) gender-targeted redistributive education policy can increase female secondary-education attainment and child bearing age by delaying marriage; however, (c) land-targeted redistributive policy seem to maintain a ceiling effect in that land-targeted redistributive policies are human developmental for targeted very-poor among all poverty groups. Land-targeted redistributive policy appears human under-developmental based on the fact that the non-beneficiaries—many of whom are still poor— are cut off from redistribution and are left to fend (or in many cases not fend) targeting.

My dissertation findings will better reflect empirical reality as well as quantitative analysis allows when I will tackle in future the following methodological and substantive limits:

- (a) Variation is low in data on mortality among children aged 5 or less at times of surveys. I have dealt with lack of variation by including data on mortality among children born during the ten years preceding the surveys. By doing so, I have stretched the concept of mortality among infants (1-11 months) and children (12-59 months).
- (b) Household-income measures are available from the survey years of 1991/92 and 1998/99, and mortality incidences are from pre-surveys years. With this, I assume household-income to have stayed statistically unchanged between child death- and survey-years. I am making an assumption may or may hold intact in empirical reality.
- (c) The fact that data on targeted transfer programs is available by village whereas that on potentially targeted households' actual program participation is not prevents optimal assessment of the mechanisms explaining non-linearity between income and child mortality.
- (d) Hierarchical structure in data, and, that, for some households, data is available from two survey-years may violate the assumption that observations are independently and identically distributed (*iid*). In other words, let's consider the scenarios that a few children can belong to the same household, or a number of households can belong to the same village. If so, these can make child-observations within a household- and household-observations with a village-cluster to maintain a contemporaneous correlation. And, that, for some households, data is available from two survey-years can refer to the fact that these households maintain a temporal correlation. I have tackled the issues of *iid*

violation with appropriate statistical fixes. Yet, I plea caution in interpreting results since statistical fixes to reduce might not necessarily eliminate the effects from violating *iid*.

- (e) The BIDS-WB surveys do not contain data in detail on health infrastructures or services. And, by using the BIDS-WB survey data, I limit my analysis from controlling for health infrastructures or services the way I should to capture their greater availability in rural Bangladesh in the 1990s. Possibly, my analysis suffers from omitted variable bias.

In future, I will attempt to rectify the limitations I have listed in (a) – (e), and carry out the following: I will (a) unravel the casual mechanisms mediating the income-mortality curvilinear association with the primary or secondary qualitative evidence, (b) compare Bangladesh and Pakistan in efforts to track down the historical origins and structural requisites of onset, sustenance, and success of targeted social transfer programs, and (c) conduct a quantitative comparative analysis to assess the macro-relationship between country's gender-sensitive development policy and human development outcomes. When carried out, (b) and (c) should explain why the Bangladeshi government should be willing to adopt a gender- and pro-targeted development policy, and whether Bangladeshi lessons are transferable to elsewhere.

Ultimately, my dissertation reveals that Muslim societies and cultures are more permeable than the standard portrait allows, even by ineffective governments, albeit not in precisely the manner expected. It therefore casts doubt upon an existing literature that portrays Islam as inimical to human development and Muslim societies as deeply resistant to change. But Muslim societies are neither monolithic nor homogenous, and

Pakistan's experience suggests that structural and policy changes that promote gender equity and human development are not equally available to all Muslim societies. My research demonstrates *which* interventions are likely to yield human development payoffs even in a Muslim society. In particular, Bangladesh's gender-targeted redistributive development policies have contributed to the country's success in reducing infant and child mortality. Moreover, gender-targeted redistributive developmental policies can take off in presumably an inhospitable culture of Islamic culture and patriarchy. While state's policy adoption occurs due to (a) internal-local structural condition, (b) isomorphic external-global forces, or (c) a combination of both, some exogenous shocks (for example, man-made or natural disasters) play a role to alter the relative importance of (a), (b) or (c). I suspect that (a) massive female casualties in the country's 1971 war against Pakistan and (b) donor support in the aftermath of the war have weakened structural or cultural constraints and conspired to push Bangladeshi authorities in a more equitable and gender-sensitive direction. And, in the absence of exogenous shocks, Pakistan has maintained the human under-developmental course.

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