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MOTHER-FATHER RESOURCE CONTROL, MARRIAGE PAYMENTS, AND GIRL-BOY HEALTH IN RURAL BANGLADESH

Kelly K. Hallman

Food Consumption and Nutrition Division

International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
(202) 862–5600
Fax: (202) 467–4439

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ABSTRACT

This study examines the effects of (1) current individual parental assets, (2) assets held by each parent before marriage, (3) transfers made at the time of the parents' marriage, and (4) family background characteristics of parents on the morbidity of preschool boys and girls in rural Bangladesh. The approach is unique in that it simultaneously tests alternative models of household decisionmaking *and* investigates gender bias within the household. Moreover, it is one of the few investigations we know of that provides a formal test of the intrahousehold model in the South Asian context.

Results indicate that higher father share of current assets benefits boys' health, but does not affect girls' health. A greater proportion of pre-wedding assets held by the mother lowers the number of morbidity days experienced by girls. A larger share of wedding payments directed toward the husband's side at the time of marriage reduces illness for preschoolers of both sexes later in the union. The finding that maternal and paternal shares have different impacts leads to a rejection of the unitary model of the household. Extended families also appear to play an important role in the production of child health, especially the number of living brothers of each parent, which reduces preschooler morbidity days.

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Kelly K. Hallman
International Food Policy Research Institute

1. INTRODUCTION

A growing body of literature suggests that men and women allocate resources under their control in systematically different ways. Many of these studies have examined the effect of women's income on household expenditure patterns and found that women typically spend a higher proportion of their income on food and health care for children, as well as other goods for general household consumption than do men.[1] A related stream of inquiry has looked at the influences of male and female resource control within the household on child human capital outcomes. Results indicate that female income more often has a greater impact than male income on infant and child survival probabilities, preschooler nutrition, and child education. Doss (1997), for example, finds a larger share of assets controlled by women correlates with improved child education outcomes in rural Ghana. Thomas (1994) shows that the effect of women's unearned income on child survival probabilities is almost 20 times higher than that of men's unearned income in urban Brazil.

Studies of this type often seek to test the validity of "collective" versus "unitary" model of the household (see Haddad, Hoddinott, and Alderman 1997; Strauss and Beegle 1995; and Strauss and Thomas 1995 for reviews). The unitary model, sometimes called the "common preferences" model, maintains that either all household members share the same preference function, or that the preferences of a single decisionmaker dominate all others in the household. Alternatively, collective models allow members of the household to have different preferences. When these individual preferences are aggregated up to the household level, the collective model predicts that distribution among individuals reflects their bargaining power.

An issue related to intrahousehold allocation is that of gender bias. A large number of studies have addressed this topic (see Haddad et al. 1996 for a review). Many

[1]See, for example, Guyer 1980, Dwyer and Bruce 1988, Garcia 1991, Kennedy 1991, Thomas 1994, Thomas and Chen 1994, and Katz 1992.

focus on the intrahousehold distribution of nutrients. Of the 43 studies reviewed by Haddad et al. (1996), pro-male bias in nutrient allocations appears to be most prevalent in South Asia. Boys here are also more favored in the distribution of nonfood health inputs, such as health care.[2] Furthermore, this is the only area of the world in which girls have higher child mortality rates than boys.[3] The evidence on anthropometric outcomes on the South Asian subcontinent is not as plentiful. The studies that exist, however, show that girls are no worse off than boys (see Haddad 1999 and Haddad et al. 1996 for discussions). Obviously, this runs contrary to what might be expected, given the data on differential investments. Haddad (1999) outlines several hypotheses that help explain this apparent contradiction.[4]

Only infrequently has testing of the unitary versus the collective model of the household been combined directly with an analysis of gender bias. The value-added of such an exercise is the ability to examine the effect of male and female resource control within the household on the well-being of different household members. Thomas (1990) finds in urban Brazil that nonlabor income attributed to mothers has a significantly larger effect on the weight-for-height of daughters relative to sons, and that nonlabor income in the hands of fathers has a larger effect on this outcome for sons. In Côte d'Ivoire, Haddad and Hoddinott (1994) find that increases in the proportion of cash income accruing to women (instrumented) significantly increases boys' height-for-age relative to that of girls.

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[2] Besides Haddad et al. (1996), see Filmer, King, and Pritichett (1998), Mitra et al. (1997), and Mitra et al. (1994).

[3] Filmer, King, and Pritchett (1998), Basu (1993), Muhuri and Preston (1991), Langsten (1985), Rosenzweig and Schultz (1982), Miller (1981), Chen, Huq, and D'Souza (1981), and D'Souza and Chen (1980) provide evidence.

[4] First, excess female infant and child mortality will remove the most undernourished girls from ever appearing in anthropometric data. Second, because the birth of a girl is a less celebrated social event in South Asia than that of a boy (Blanchet 1984, pp. 119–121, and Aziz and Maloney 1985, pp. 23, 39, verify and give underlying reasons for this), there may be a tendency to inaccurately report girls' ages. If this is so and female ages are underreported, girls would appear better nourished for their age than they actually are. (Aziz and Maloney (1985) p. 57 report that the age of adolescent girls is often understated for the purpose of making them more attractive marriage partners.) Third, the reference standards may not be gender neutral.

In Zambia, mother's income increases infant girls' weight-for-age more than it does for infant boys, while father's income increases boys' weight- and height-for-age more than girls' (Wang 1996).[5]

Despite a large body of research on gender bias, there are few tests of alternative household models for South Asia. This scarcity may, in part, reflect the difficulties of collecting sex-disaggregated data on resources because of the stigma often attached to female wage work in this part of the world (Haddad et al. 1996). A new household survey from rural Bangladesh collected by IFPRI-BIDS-INFS-DATA (1996), however, contains an unusual mix of detailed data on intrahousehold resource allocations and outcomes, as well as information regarding individual current asset holdings, premarital assets, marriage transfer payments, and family background characteristics for husbands and wives. With this unique data, this study tests the unitary versus the collective model of the household *and* investigates gender bias in health outcomes for children.

The approach is to examine the effects of household asset ownership patterns on the morbidity status of male and female preschoolers, measured as the number of illness days in the two weeks preceding the household survey. Asset control is measured along several dimensions:

(1) current individual asset holdings of parents;

(2) assets brought to the marriage by each parent, which comprise:

   (a) assets held by each parent before marriage, and

   (b) transfers made at the time of marriage to each parent; and

(3) family background factors of each parent that help determine their current asset situation.

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[5] Also see Thomas, Contreras, and Frankenberg (1997) for Indonesia and Quisumbing (1994) for the Philippines.

There are several important findings of the study, which as a group indicate that resource control in the household has noticeable effects on child health, and that the effects differ according to the sex of the child.

Controlling for the value of current household assets per capita, a higher share of current assets held by the father reduces the number of reported illness days for boys, while a higher share for the mother results in the reverse. Current ownership shares appear to not have a statistically significant effect on girl-child morbidity; however, greater household wealth may reduce slightly the number of sickness days experienced by girls.

Using an alternative measure of resource control, share of assets brought to the marriage by each parent, a higher proportion brought by the wife reduces the morbidity of girl-children. When an important cultural component of the parents' wedding transaction is used, transfer payments made by each family at the time of marriage, other interesting results emerge. A greater share of transfer payments directed toward the husband reduces child morbidity, regardless of the child's sex. This may at first appear to be contrary to what might be expected given the evidence from other parts of the world that greater maternal control over resources generally increases child welfare. However, in the cultural context of prevailing marriage practices in rural Bangladesh, the results are not surprising. Moreover, when considered along with other recent evidence on the effect of wedding payments later in the marriage, they indicate that dowry (payments from the wife's to the husband's side at the time of marriage) most likely enhances the bargaining power of wives to make allocation decisions in marriage. For example, Russell et al. (1999) show that dowry is a strong determinant of child weight-for-age in Pakistan. Rao (1997) and Rao and Bloch (1993) find in India that smaller dowries increase wife-beating and reduce child caloric intake later in the marriage. Zhang and Chan (1999) find that bride's welfare in Taiwan, measured by the extent of husband's help with household chores, is improved by dowry, but is not affected by brideprice (payments from the husband's to the wife's side at the time of marriage).

Finally, this study finds that extended family may also play a role in determining child health. Mother's number of living brothers reduces morbidity for both boys and girls, while the value of her parent's landholdings reduces only boys' illness. The former result is consistent with longstanding cultural norms of daughter transference of inherited land to her brothers in exchange for future brotherly support of her and her children. Surprisingly, the characteristics of the father's natal family were beneficial only for girls: his living brothers and the education of his father reduced illness days for preschool girls, but not boys.

Section 2 of this study outlines the theoretical model. Section 3 describes the data and variables. Section 4 lays out the empirical specification. Sections 5 and 6 present the results and concluding remarks.

2. THEORETICAL MODEL

We begin with a static model of the household in which household welfare, W, depends on the utility of each household member, i (= 1,...., M).[6] Each individual's utility function, U_m depends on the commodity consumption of all household members, X_{im} (I = 1,.....G, goods), as well as the consumption of leisure by each individual in the household, L_1,....., L_M. In addition, utility is affected by a vector of home-produced goods, θ_{1M},....., θ_{HM}, which includes, for example, the health, nutrition, and education of each household member. This paper focuses on one element of θ, the short-term morbidity status of children, as measured by the number of days they were reported as sick in the two weeks preceding the household survey.

A set of observed individual- and household-specific characteristics, μ, may affect tastes and therefore utility, $U_m(X, L, \theta; \mu, \omega)$; ω captures unobserved heterogeneity.

The household welfare function aggregates the individual utility functions:

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[6] This section draws from Thomas (1997, 1994).

$$W = W[U_1(x, L, \theta; \mu, \omega), ..., U_M(x, L, \theta; \mu, \omega)] . \tag{1}$$

This is maximized subject to a household budget constraint and a production function for each element of θ. The household budget constraint is

$$pX = \sum m\ [wm\ (T - Lm) + ym]\ , \tag{2}$$

where the vector p is the set of prices of all goods in X. The price of time for each individual is w_i, so that an individual's total income is the value of earned income, $w_m\ (T - L_m)$, together with nonlabor income, y_m. Household income is simply the sum of all individuals' incomes.

The production functions for each component of θ are specified in general terms as

$$q = q\ (k, m, u), \tag{3}$$

where k are inputs, some of which are purchased in the market, and others, e.g., the time of family members, are not; this vector of inputs thus includes some elements of the consumption vector, X. Outputs, θ, may depend on individual, household, and community characteristics, μ. Individual and family unobserved heterogeneity is represented by υ.

The output of interest, child morbidity, is produced by a set of inputs (such as time spent in child care, nutrient intakes, preventive and curative health care use, and sanitation practices). It is also affected by individual child characteristics (such as age, sex, birth order, and innate healthiness), by family characteristics (such as parental education and nutritional status, parental and household incomes, and household structure), and by community characteristics (such as the sanitation environment, availability of health services, rainfall, and temperature).[7]

Solving the maximization problem given by equations (1)–(3), gives a household demand for each element of the commodity vector, *X*, for leisure, and for each element of 2. These demands depend on a set of exogenous determinants that includes prices, wages, individual and household characteristics, individual nonlabor income or assets, and unobserved heterogeneity.

For our purposes the determinants of child health, *h*, will consist of child, mother, father, household, and community characteristics, as well individual resource holdings within the household, denoted μ_c, μ_p , μ_h , μ_s , and $y_1,....., y_M$, respectively:

$$hc = hc\ (mc\ , mp\ , mh\ , ms\ , y1,....., yM\ , e_c)\ , \qquad (4)$$

where ε_c is intended to reflect unobserved individual heterogeneity, some of which may be shared by children in the same household due to household or family specific variation in healthiness.

As discussed above, we allow for the possibility that maternal and paternal characteristics, including economic resources, can have different effects depending on the sex of the child. This could arise for two potential reasons. It has already been mentioned that the health production technology may vary by child gender. The second potential reason is that mothers (and fathers) may have different preferences with respect to the health of their sons and daughters. It is feasible that if, because of cultural norms, men

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[7] It is possible that this underlying health technology could differ by sex of the child. If, for instance, the social structure is characterized by an extreme gender division of labor, then it could simply be more efficient for mothers to spend time with their daughters and fathers to spend time with their sons. In rural areas of Bangladesh women are engaged mainly in nonmarket activities, and cultural norms often compel them to remain close to the homestead. Men, on the other hand, are predominantly involved in agricultural work in the fields (their own, or as hired labor) and in marketing activities. Therefore, if individual parents are observed to invest more heavily in children of their own gender, one could argue that this is because normal daily interactions are between parents and children of the same sex. While it is true that gender identities are taught at an early age, gender-specific tasks do not start to be important until after preschool age (the *sisu* stage of life), which is the group we are examining here (see Aziz and Maloney 1985 for evidence).

expect to spend more time with their sons than with their daughters, they may wish to invest more in their sons. However, a substitution story is also possible here: if fathers expect they will not have the opportunity to spend much time with their daughters, they may try to make up for it by investing more resources in daughter health or nutrition.

In contrast to the collective model just laid out, the traditional economic model of the household assumes either that all household members have common preferences (in which case U_m is identical for all m in equation x), or that one member dictates all allocation decisions (in which case the aggregator function, $W(\bullet)$, assigns a zero weight to all but that member's utility function). Thus, the model is referred to as either the "common preferences" or the "unitary" model. With these assumptions, the health demand function depends not on individual resources, $y_1,\ldots, y_M$, but only on total household resource levels, y_h:

$$h_c = h_c\,(\mu_c\ , \mu_m\ , \mu_{f,}\ \mu_h\ , \mu_s\ , y_h\ , \varepsilon_c)\ . \tag{5}$$

This observation suggests a simple empirical test of the traditional economic model of the household against the more general collective model. Under the assumptions of the traditional model, household members may be treated as if they pool all their incomes, in which case the distribution of those resources within the household should have no effect on their allocation. That is, observed consumption and investment patterns should be unaffected by shifting the control of income from, say, men to women. This is a key prediction of the traditional model, not shared by any of the less restrictive collective models that permit heterogeneity in the preferences of household members.

Maintaining individual assets, as well as transfers received at the time of marriage, as exogenous measures of resource control within the household, the prediction of the common preferences model can be tested by determining whether resources attributed to men have the same effect on child health as those attributed to women. A discussion of the individual asset and marriage transfer variables used in the analysis follows.

3. DATA

THE HOUSEHOLD SURVEY

This study uses new household survey data from 47 villages in three rural areas in Bangladesh. The data were collected as part of an impact evaluation of new agricultural technologies being disseminated in the three areas. Improved vegetable technologies are being introduced in Saturia *thana*, Manikganj District (referred to below as "Saturia"). The use of improved polyculture fish production methods are being initiated in the other two sites, Jessore Sadar *thana*, Jessore District (referred to below as "Jessore"), and Gaffargaon *thana*, Mymensingh District, and Pakundia and Kishoreganj Sadar *thanas*, Kishoreganj District (referred to below collectively as "Mymensingh").

The technologies, extension programs disseminating them, and target households in each site are unique. In two sites (Saturia and Jessore), the technologies are being introduced through NGO programs targeted exclusively at women, who are supplied training and credit. At the third site (Mymensingh), Department of Fisheries and project extension agents provide training and training-with-credit directed at both men and women, but to men more often than women. The primary distinction between the two polyculture fish production sites (Jessore and Mymensingh) is that in Jessore, the NGO (Banchte Shekha, translated from Bangla as "Learning How to Survive"), has arranged long-term leases of ponds, which are managed by groups of 5–20 poor women. In Mymensingh, ponds are privately owned and managed by households who have either single- or joint-family ownership.

In each site, a census of households was conducted in villages where the NGO had introduced the technology and comparable villages where the NGO was operating, but where the new technologies had not yet been introduced. In each site, three types of households were selected: NGO-member adopting households, NGO-member likely adopter households in villages where the technology was not yet introduced, and a sampling of all other households in both types of villages to represent the general population. A four-round survey collected detailed information on households and their individual members regarding agricultural production, other income-earning activities, expenditure patterns, time allocation, nutrient intakes, and nutrition, micronutrient, and morbidity status.

Family background data were collected individually from husbands and wives in the second survey round. Between the second and third rounds, a parallel study using qualitative methods was conducted in a pair of villages (one adopting "program" village, and one non-adopting "control" village) in each of the three sites to elicit group members' views on the effects of the NGOs and the new technologies on incomes, education and health of children, and women's status and empowerment (Naved 1997). Results of the qualitative study were drawn upon to formulate questionnaire modules that were fielded in the fourth round. Both men and women were asked about family background, marriage history, premarital assets, and inheritance; women were questioned about transfers at marriage and indicators of their mobility and empowerment.

VARIABLES AND SUMMARY STATISTICS

In order to explore the effects of resources held by men and women on the health of preschool children, the study focuses on children in monogamous households where both mother and father are present, where no change in marital status occurred during the four survey rounds, and where complete individual asset (current and premarital) and family background information is available. This sample consists of 390 children age 0–7 years in 269 households.[8]

Illness Patterns

Short-term morbidity for individual household members was reported by the head female, who was asked whether any member had experienced an illness in the 14 days

[8] Without these qualifiers, there would be 478 children with complete child, parent, household, and community data.

preceding the survey, and if so, the symptoms and duration. Fifty-seven percent of preschool children in the subsample were reported as having had an illness in the 14 days before the survey, as shown in Table 1. The majority of problems suffered by preschoolers were respiratory (defined as those reporting acute respiratory infection [ARI], cough, or cold), with a prevalence of 30 percent; fever, with a prevalence of 23 percent; and 13 percent of children had diarrhea.[9] These illnesses are of major importance for infant and child survival in Bangladesh. It is estimated that respiratory illness (RI) accounts for some one-quarter of deaths to children under 5 years of age, and diarrhea accounts for approximately 30 percent (Mitra et al. 1994, Mitra et al. 1997).

To assess the magnitude of morbidity among preschoolers, the analysis measures the number of days sick *not* conditioned on an illness being experienced, i.e., nonsick children are counted as having zero days. This measure is useful because it combines prevalence and conditional durations. Using this statistic, the mean number of unconditional illness days for preschoolers was 3.9, as shown in Table 2. Unconditional diarrhea and RI days, shown in Appendix Tables 9 and 10, were 0.6 and 2.0, respectively.[10]

As shown in Tables 1 and 2, and Appendix Tables 9 and 10, boys had higher morbidity prevalence than girls. Sixty-one percent of boys, but only 53 percent of girls, had an illness in the two weeks preceding the survey (a difference statistically significant at the 1 percent level). Durations for those who had an episode, however, were 6.8 days for both sexes, while unconditional illness days were 4.1 for boys and 3.6 for girls, a difference statistically significant at the 2 percent level (due to boys' greater prevalence).

Boys had a statistically significant higher prevalence of respiratory illness than girls, at 32 and 27 percent, respectively. Conditional durations did not differ;

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[9]By comparison, 30.9, 12.8, and 7.6 percent of children under five years of age were reported to have had fever, cough accompanied by rapid breathing, and diarrhea, respectively, during a two-week recall period in the 1996–1997 Bangladesh Demographic and Health survey (Mitra et al. 1997).

[10]Conditional upon an illness being experienced, the mean number of overall sick days was 6.9, while conditional diarrhea and RI days were 4.7 and 8.4, respectively.

unconditional RI durations were statistically higher for boys due to greater prevalence. For diarrhea, there was no statistical difference by sex for prevalence, conditional or unconditional durations.

Biological differences by child sex can explain part of the higher reported illness we observe for boys relative to girls. Boys tend to have higher infant mortality rates (birth to 1 year) than girls, indicating that they are probably more vulnerable at this age. This trend is generally short-lived, however, and mortality differences diminish after the first year of life. The situation is even more extreme in South Asia, however, where the trend actually reverses: this is the only region of the world where girls have higher child mortality rates (age 1–5 years) than boys.[11] Muhuri and Preston (1991) find that differences in child mortality in Bangladesh are influenced not only by sex, but by sex-specific birth order as well: girls born after other daughters fare worse than sons born after other sons. Clark (1999) and Das Gupta (1987) find similar results for India as a country and for the Indian Punjab, respectively.[12]

Despite higher girl child mortality rates in South Asia, morbidity prevalence reported for girls is often no greater than for boys, and is sometimes less. Using cross-country data from demographic and health surveys in South Asia, Filmer, King, and Pritchett (1998) report that even though boys have lower child mortality rates (ages 1–5), their reported frequencies of episodes of ARI and diarrhea are the same or slightly higher than for girls'. Arnold (1992) and Hill and Upchurch (1995) show similar evidence, as reported in Haddad (1999). One source of this disparity, as mentioned earlier in reference to South Asian child anthropometry statistics, could be that the sickest girls have the highest mortality, and so do not appear in the morbidity figures. Another reason could be the reporting behavior of the survey respondent, usually the child's mother or the senior adult female in the household. If it is the case that boys are preferred for health

[11]See Filmer, King, and Pritchett 1998, Basu 1993, Rosenzweig and Schultz 1982, Miller 1981, Chen, Huq, and D'Souza 1981, D'Souza and Chen 1980, and others.

[12]See also Miller (1981), Ware (1984), and Lloyd (1995).

investments over girls,[13] their illnesses could garner more attention. They may therefore be more apt to be *reported* as ill, even if the number of illness episodes and durations are no greater than for girls. Other research from Bangladesh and South Asia shows that boys are more likely to be taken for health care conditional upon being reported as sick.[14]

Returning to the sample, Table 2 and Appendix Tables 9 and 10 indicate that sickness days by survey site were highest in Jessore, the poorest of the three sites, and lowest in Mymensingh, the site with highest income levels. Diarrheal illness was greatest in Saturia, a low-lying wet area; RI burdens, on the other hand, were highest in Jessore. Boys had more reported illness days in every site. The site with the largest gender differences in illness was Jessore where boys' had higher levels of overall and RI; diarrhea did not differ statistically by sex within each site.

Across per capita asset terciles, overall, diarrhea, and RI burdens decrease slightly for children as a group with household per capita assets, especially when moving from

[13] The underlying reasons for differential health investments by child sex are numerous. One could be that mothers are aware that infant boys are, on average, sicker and may therefore attempt to compensate for the difference through better or more investments in boys. Another is the expectation that boys and not girls will transfer more resources to their natal home later in life, either because they have greater opportunities for earning income, or because of strong patrilineal and patrilocal social structures (Das Gupta 1987). Other possible reasons are given in Haddad (1999).

[14] See Filmer, King, and Pritchett (1998), Hill and Upchurch (1995), Kurz and Johnson-Welch (1997), BBS (1996), and Chen, Huq, and D'Souza (1981). Ahmed, Sobhan, and Islam (1998) find no statistical gender difference in illness episodes for neonates (age 0–1 month); however, conditional on being ill, boys are more likely to be taken to trained providers for care. Alderman and Gertler (1997) find that boys in rural Pakistan are more likely to be taken to higher quality medical care; Hallman (1999) reports a similar finding for 0–2 year olds in the Philippines.

the poorest to the middle income group. Overall and RI sickness do not always fall monotonically with income, however. [15]

In two of the three sites, illness was highest in round three. As Round 3 occurred during the dry season, it was not surprising that RI levels peaked during this time; it is also the lean time in terms of rice availability. In these same two sites, illness was lowest in Round 4; interestingly, this is the same season as Round 1 but one year later; this indicates that inter-year, and not just inter-season, variations are important.

Sex differences by survey round show that boys' burdens are greatest during the wet season; during the dry season, girls' sickness days rise to equal to those of boys. In Round 4, reported illness days drop for both sexes. Sex disparities were largest in Round 1 in Saturia and Mymensingh, and in Round 4 in Jessore.

By age, boys had more unconditional days of general and RI illness in the first and third years of life; from the fourth through the sixth year the pattern is mixed. For diarrhea, a significant gender difference occurs between 2 and 3 years of age, when girls experience more diarrhea days than boys.[16]

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[15]Why might this be the case? If higher income mothers are also more educated, it may be that they are better at recognizing child illness symptoms, and therefore, more likely to report a child as being sick (e.g., Sindelar and Thomas 1991). This "reporting bias" could occur because better educated women are more aware of symptoms due to greater access to information on child health via more contact with health providers, the media, or other channels (Strauss and Thomas 1995). It could also be that mothers of children from wealthier households may be better able to afford to take time from productive activities when children are sick, and therefore more likely to consider the child as having been ill than a poorer mother who did not reduce her activities. This could lead to children of higher SES status to appear more ill than lower income children, or more ill than would be expected given the level of resources of their households.

[16]Any breast-feeding ceases around this age (33–35 months—reported by recall among mothers in this sample; see also Mitra et al. 1997 and Mitra et al. 1994). This probably does not explain, however, the increase in diarrhea days at this age for girls, mainly because neither the prevalence nor the duration of exclusive breast-feeding is very high in Bangladesh. Using DHS data, Mitra et al. (1997) report that in Bangladesh only 50 percent of 0–3 month olds are exclusively breast-fed, and by 6 months the figure drops to 9 percent; the median duration of exclusive breast-feeding is 1.5 months. This implies that potential disease-causing agents introduced through supplementary foods could begin to enter the child's diet starting well before 2 years of age. Furthermore, there is no statistical difference in this sample by child sex in the reported age of cessation of exclusive breast-feeding (as recalled by the mother for those children who are no longer being breast-fed).

Individual Parental Assets

In the first round of the survey, the male household head provided a detailed inventory of land owned and operated. Information about mode of acquisition and individual owner was provided, as well as an estimate of the plot’s value; the same type of information was collected about animals, including poultry, sheep and goats, and cattle. The head also provided an inventory of 30 types of durable goods and capital equipment owned in the household along with an estimate of the asset’s value and identification of the owner.

When assets were owned jointly with some nonhousehold member, only the share accruing to the household has been kept for purposes of estimating household values. When ownership was not assigned, the asset was considered household property, including when it was specified as a “couple's property.” For calculating individual husband and wife asset holdings, the value of shared household property was divided equally between husband and wife. When ownership was assigned to another household member, it was included only in the household’s total value and not in the husband’s or wife’s.

Asset values are presented in Table 3 in 1996 taka. Mean value of wife’s current assets is only a tiny fraction of total household wealth, and standard deviations are large. Land is the most unequally distributed asset, with wives’ holdings valued at less than 1 percent of total household mean value. Animals and durables (jewelry, household items, agricultural and business equipment) are less unequally distributed, although the differences are still large. Standard deviations are large, mainly due to cross-site differences.

Following qualitative work performed between the second and third survey rounds, and after the survey teams had established a rapport with survey respondents through repeated visits, men and women were asked in the fourth round to recall their assets owned before marriage. Land, cattle, and durables (jewelry, clothes, and household utensils) were asked of both spouses, food items of women, and houses of men.[17] Husbands' premarital asset values are much greater than those of wives in every category, especially land and livestock. Women owned some durables and land before marriage. It appears that over the course of marriage, men accumulate large amounts of land through inheritance and purchases. Husbands' livestock ownership declines substantially after marriage. Wives, on the other hand, accumulate livestock, mostly in the form of small animals (poultry, goats, and sheep).[18]

Transfers at the time of marriage were also asked in the fourth round survey of female respondents. The categories asked about arose from the qualitative survey administered between the second and third rounds of data collection. To construct total value of transfers, those reported to have been given to each party were summed. In the questionnaire, transactions were recorded as occurring between husband, husband's family, wife, wife's family, or the couple. For this study, those going to (from) the wife or her family are considered as going to (from) the wife; similarly, those going to (from) the husband or his family are considered as going to (from) the husband. Thus the term husband or groom means him or his family, and the term wife or bride means her or her family. In cases where transfers were reported to have been given to "the couple," husband and wife were each assigned half the value.

As reported in Table 4, brides, on average, received larger transfers than did grooms.[19] This is consistent with the Muslim practice of the husband (or his family) pledging to pay *mahr* (also sometimes called "dower," or more loosely, "brideprice") to the bride. This payment is a legal obligation and was established for the purpose of

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[17] The value of the house in which the newlywed couple lived was attributed to the wife if it had been constructed by her parents.

[18] Quisumbing and de la Brière (1999) report that the most frequently *owned* pre-wedding categories for women are food and durables; the value of these items is often low, however.

[19] As noted in Quisumbing and de la Brière (1999), underreporting of transfers to the groom is a possibility since only the wife was interviewed about these transfers and she may not have been aware of all payments made to the groom. Moreover, recall bias and asset valuation might lead to measurement error in both marriage transfers and pre-wedding assets.

providing economic security to the wife in the case of divorce. One portion of the dower, an amount agreed upon by the families, is paid at the time of marriage; the remainder is payable only if and when a divorce occurs. *Mahr* is often viewed as a mechanism for discouraging divorce—in particular the form of divorce most common in rural areas, *taliq*, in which a husband has the power to divorce his wife by simple declaration—by making divorce costly to the husband's side.[20]

A closer look at marriage payment data by payment source, however, reveals that not all transfers directed toward the bride originate from the husband's side. In the sample, approximately one-half of all transfer values received by brides come from their own families, while nearly all those directed toward grooms originate from the bride's side. This is indicative of a widely discussed trend: the movement away from brideprice toward dowry in South Asia.[21] Our data are consistent with this reported trend. Figure 1 shows log transfer amounts by recipient, source, and year of marriage. (Marriages in this subsample occurred between 1961 and 1994, with the mean marriage year being 1982.) Starting in the 1970s, husband-to-wife amounts begin to decline clearly, while wife-to-husband amounts begin to rise slightly. One important possibility to consider is that of reciprocal transfers—the situation where payments at any single wedding go in both directions, from the wife's to the husband's side and vice versa. It is feasible that within particular unions, husband-to-wife payments are compensated to some degree by wife-to-husband payments, and hence, looking only at one side of the coin does not give the full picture.[22] Figure 2 graphs share of total wedding transfer payments directed toward the

[20]Dower is said to serve other purposes as well: the amount symbolizes the socioeconomic statuses of the families of the bride and groom; it helps establish economic ties between the families that may contribute to the stability of the marriage; and it may be used as a means of funding the brideprice of future daughter-in-law (Aziz 1979). As mentioned in the text, only a portion of the dower is required to be paid at the time of the marriage, with the understanding that the balance is payable only in case of a divorce. It is reported that this remaining amount is often not paid (see, for example, Monsoor 1999, p. 36). Alternatively, desertion of the wife without a divorce in order to avoid paying the remainder of the dower is also reported to occur.

[21]For discussions see, among others, Monsoor (1999), Todd (1996), and White (1992) for Bangladesh; and Rao (1993, 1997) and Bloch and Rao (1998) for India.

[22]For example, Rao (1993) looks at net transfer amounts (the difference between dowry and brideprice).

Figure 1—Transfer amounts, by year of marriage, by source and recipient

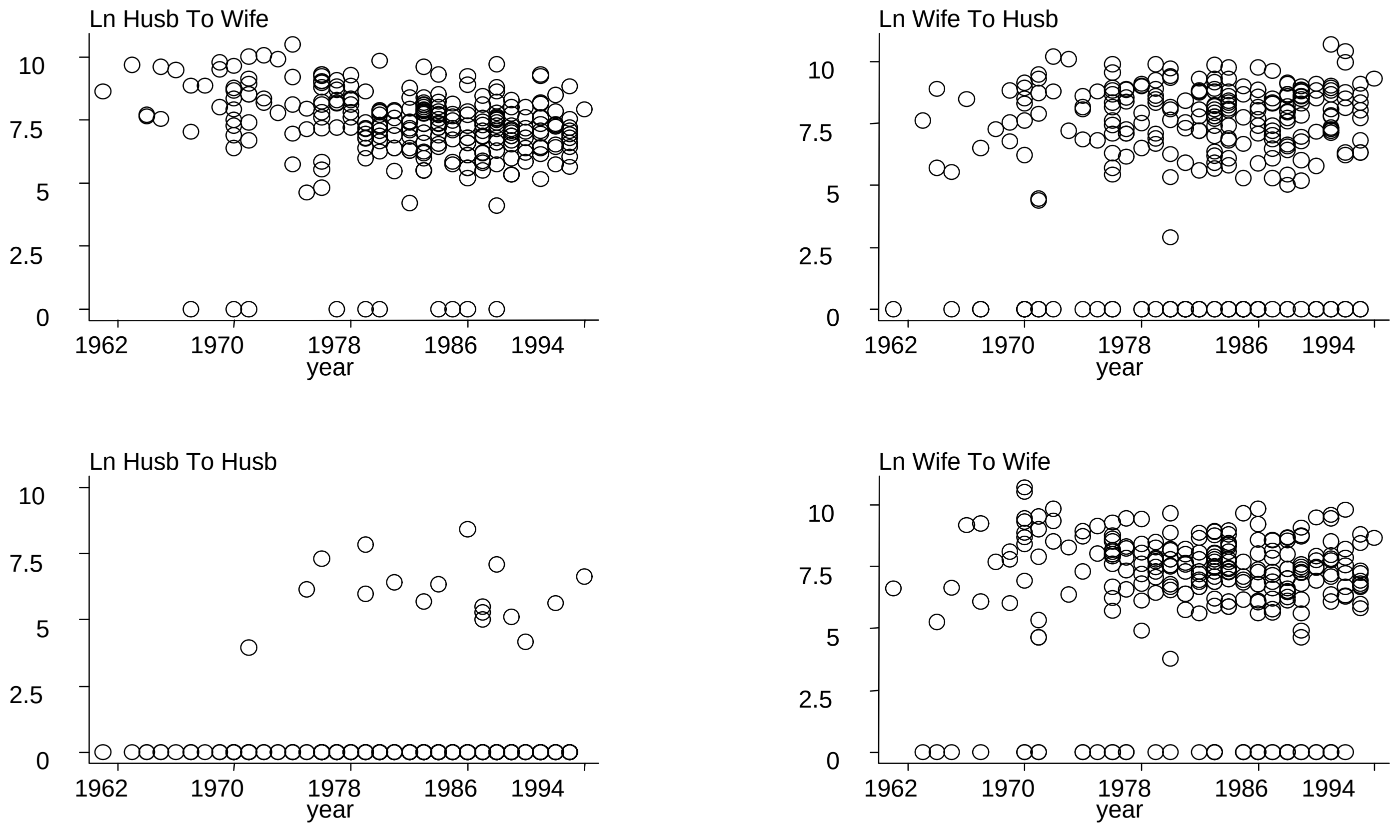
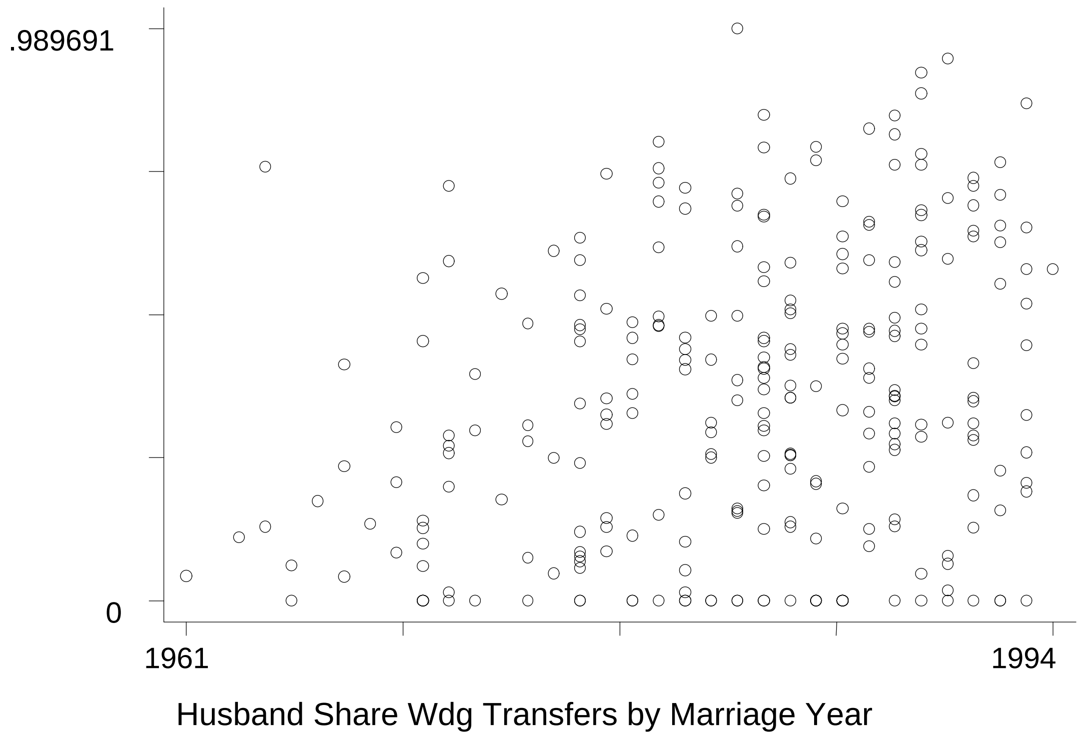


Figure 2—Husband's share of wedding transfers, by marriage year



husband by year of marriage. The figure shows an upward trend in the share over time, indicating that dowry amounts are increasing relative to brideprice amounts.

Underlying this trend is a custom, (most likely originating with former Hindu tradition), that the ideal marriage arrangement for a woman is hypergamy, meaning a girl should marry into a family of higher social status so that her family's social status will be elevated (see Maloney, Aziz, and Sarker 1981). (A man "marrying up" does not, however, enhance his family's social status.) For this reason, the woman's family often takes the initiative to search for a potential partner for their daughter. This in itself could lead to higher dowry relative to brideprice payments, but it does not explain the relative rise in dowry over time. Consider, however, that the mean age difference between husbands and wives in South Asia is around 10 years. Rao (1993) shows that because of population growth, the cohort of men of appropriate marriageable age is smaller than the cohort of women approximately 10 years younger in India. This "marriage squeeze" where there are fewer available husbands may explain rising dowry amounts.[23, 24]

4. EMPIRICAL SPECIFICATION

To test the model and estimate the demand for child health, a morbidity function is estimated. Its components are listed below and then discussed afterwards. Summary statistics are given in Table 5.

$$h = a + b_c\,Child_c + b_f\,Mom_f + b_d\,Dad_d + b_h HH_h + b_s\,Loctn_s + e_, \qquad (6)$$

where

Child is a vector of child-specific characteristics including age, age squared, sex, height-for-age Z-score (HAZ), and birth order.

Mom is a vector of maternal attributes and is comprised of age, age squared, dummies for primary and secondary school completion, height, and

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[23]Rao (1993) provides evidence that even though overall male-to-female population ratios are increasing (due at least in part to high girl-child mortality as discussed above), population growth in the twentieth century (due to mortality declines) was high enough that, beginning in the 1950s, the cohort of men age 20–29 was larger than the cohort of women age 10–19.

[24] Others speculate that the reason may be related to a possible marginalization of women as their crop processing role is taken over by machines; this could fuel the perception that a wife is an economic burden instead of an asset (Todd 1996). There may be some truth to this theory; however, in our survey women are still very heavily involved in rice processing; furthermore, other productive opportunities both within and outside of the household (such as through microcredit programs) appear to be increasingly more available to rural women. This theory, therefore, does seem to satisfactorily explain rising dowry payments in this rural area of Bangladesh. Still others emphasize women's social construction as dependent and their lack of alternatives to marriage; it is socially unacceptable for a girl to be unmarried and this fosters the view that girls are liabilities and boys are assets to parental households (White 1992).

The relationship between female education and dowry is also debated. One view holds that a more educated woman may have better economic opportunities, so more education can be seen as a substitute for higher payment of cash and other goods as dowry. An alternative view says that if a girl is educated, she has to have an educated husband, resulting in a dowry demand much higher than many parents can afford. In the words of one mother, "It is better [for her daughter] to marry than to read," (Todd 1996). This is cited as a major reason for not allowing girls to advance in school. Another reinforcing motivation for early marriage and cessation of schooling is the desire of some more traditional parents to have their daughters married before they reach puberty so as to protect them from the "evils" of the world.

indicators of her knowledge regarding the public health system and nutritional content of foods.

Dad is a vector of paternal attributes and consists of his age, age squared, dummies for primary, secondary, and university completion, and height.

HH is a vector of household-level characteristics. It includes a household sanitation score, the log of household size, the number of persons in different age-sex demographic groups in the household, the log of monthly household expenditure per capita, the log value of current household assets per capita, individual parental asset shares, the log value of total wedding transfers made at the time of the couple's wedding, and the share of wedding transfers received by each spouse.

Loctn is a vector of dummy variables indicating household location, survey round, and their interactions to capture differences in sites, seasons, and variations in seasonality patterns across the three sites.

e is the error term; and

a, b_c, b_f, b_d, b_h, and b_s are parameters to be estimated.

Child age is used since susceptibility to illness changes with child age. Children in the sample are age 0–7 years, with a mean age of 3.6 years. During early infancy, girls are biologically more robust than boys; however, over time there are more opportunities to be exposed to pathogens and to poor sanitation, feeding, and care practices (these practices may themselves vary by child gender). Including age squared allows the relationship to be nonlinear. The estimation approach allows the health technology to be gender-specific; this is important because boys and girls may be affected differently by various sanitation, nutrition, demographic, and economic factors.[25] HAZ score is a

[25]To be more specific, each explanatory variable is first interacted with a male dummy in one regression and then with a female dummy in a second regression. In the first regression, the non-interacted coefficients give the effects for girls, while the interacted coefficients give the boy-girl difference; the non-interacted coefficients in the second regression give the effects for boys, while the interacted terms give the girl-boy difference. This method is used instead of simple stratification, because with it one can test the significance of the girl-boy difference for each effect, and the full sample can be used for estimation.

measure of child nutritional status. It is used (instead of other measures such as dietary intake) because intakes are not exogenous in a model of child illness while a longer-term measure like HAZ is.[26] The mean HAZ score is –2.23 and the prevalence of stunting (defined as children with HAZ below –2) is 59 percent. This is a very high prevalence by international standards, but very close to that reported for rural children age 0–5 years in the nationally representative Bangladesh 1996–1997 Demographic and Health Survey (56.2 percent). (In fact we would expect the mean for this sample to be slightly higher than for an age 0–5 year sample since stunting prevalence increases with child age.) As discussed above, birth order is included because earlier-born children may be favored in Bangladesh for health and nutrition inputs due to long-term economic incentives of parents. Sex-specific birth order is used in the model since female-specific birth order has been shown to be an important determinant of girl-child nutrition and mortality in South Asia (discussed above).

Mother's age may influence the child's birth outcome and thus its later health; teenage mothers, who are often still developing physically themselves, tend to have smaller and less vital children. Mean mother age is 37 years; around 3 percent of which are below 20 years. Maternal education is hypothesized to improve child health through several potential pathways: increased access to and ability to utilize information, improved feeding and caring practices, ability to use resources more effectively, and greater degree of control over household resources.[27] Two-thirds of mothers have no formal education, one-third has at least some primary education, and 14 percent have more than primary level. These levels are slightly lower than the Bangladesh national

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[26] Health production functions (see Cebu Study Team 1992; Strauss and Thomas 1995; and Gertler and Rose 1997) were also experimented with. We attempted to construct instrumented current (and lagged) calorie intakes using current (and lagged) average household per-capita food expenditures as instruments; the instruments proved weak, however, so predicted variables are not included. Similarly, health care utilization was not used because it is endogenous in a model of health outcomes. Predicting current and lagged utilization of modern and traditional health care providers was tried using current (and lagged) health care fees and travel times as instruments. These instruments turned out to be weak as well.

[27] It is also possible, however, that mothers with more education are more aware of illness symptoms, so they may be more likely to report their children as being ill, especially in the case of more complex illnesses such as RI.

average (see Mitra et al. 1997). Maternal height reflects genetic health influences. Moreover, since this is a poor and undernourished population, it is also a measure of the quantity and quality of investments made in the mother's nutrition and health early in her life; therefore, it is a reflection of her health and human capital as well an indicator of the resources that were available in her natal home during her childhood. The national mean height for mothers with children under five years of age as reported in the 1996–1997 DHS was 150.2 centimeters; mother height averaged 150.8 centimeters in this sample. Thirteen percent of sample mothers were shorter than 145 centimeters, compared with 17 percent nationally; height below 145 centimeters is considered to increase the risk of difficult birth. To capture knowledge about nutrition programs, a dummy is included for whether the mother knows that vitamin A capsules (VACs) are distributed in national public campaigns every six months; two-thirds of mothers report being aware of this program.[28] Also included is a mother nutrition knowledge score. Mothers were asked a series of six questions concerning which foods are good for prevention of specific micronutrient-related health problems; mothers are given a 1 for a correct answer and 0 for an incorrect answer; hence, the values of this index range from 0 to 6, with a mean of 2.5.[29]

Household sanitation score is an index consisting of sanitation practices; this was constructed so that child-specific sanitation practices were not included; hence the index

[28] Since 1973, a high dose VAC has been distributed to all children age 6–71 months biannually. Government health workers undertake distribution in the rural areas and NGOs and city corporations carry out distribution in urban areas (IFPRI 1997). Data are available in this survey on use of VAC also; however, knowledge of VAC is used in the analysis because it is exogenous to health outcomes, whereas, utilization is not.

[29] An index for feeding and caring practices of mothers was constructed. It proved, however, not to have any explanatory variable in the model. Moreover, it was a problematic regressor for several reasons. First, because the age of the children in the analysis is 0–7, many will not have not reached the age where their mothers could answer important questions regarding the age at introduction of supplementary foods, weaning, etc. The younger children could have been dropped from the model, but this would have greatly reduced the sample size. For mothers with older children, it might have been possible to construct such an index and make the assumption that maternal caring behaviors had not changed with later children. However, (a) not all mothers had older children, and (b) the questions in the survey were asked only of mothers who had children 0–5 years of age, so this approach would also have greatly limited the sample size.

is assumed to be an exogenous determinant of child health.[30] The mean sanitation score was 4.5. Household size and demographic composition are included to capture scale and crowding effects. Average household size is 5.7 persons.

As laid out in the theoretical section, the collective model of household decisionmaking is tested against the unitary model. Bargaining models suggest that women with more assets, income, or education have greater household bargaining power because they have more options outside of the household; therefore, their "threat points" in the household are greater because they have more ability to leave and still survive. In any setting, however, cultural factors influence the ability of various players to attain the factors that make up these threat points. In rural South Asia, for example, there exist constraints on what types of behaviors are acceptable for women regarding their movement in society, which in turn affect their ability to earn income and exercise control over property. Even if a woman has more education it may not serve her in the labor market because women have few opportunities to work outside the home. (These opportunities are increasing, however; see Hamid 1996 and Khan 1988, for instance.) One important determinant of a woman's fallback position outside of marriage, however, is the support she could expect to receive from her natal family if she left her husband. An important indicator here is the amount of dowry her family paid to the groom's family at the time of the wedding. The dowry amount is a reflection of her family's financial status. Her ability to either return to her natal family or receive monetary support from

[30] The index consists of nine practices. A value of 1 is added to the index for each of one that holds; otherwise, a zero is added. The individual factors, which are summarized in Appendix Table 11, include whether there is a lid kept on the drinking water storage container, the inside of the house is dry, the inside of the house is clean, garbage is not disposed of in the household compound, a sanitary latrine is used, the adult female regularly uses soap to wash her hands, meals are taken on a mat or table instead of the bare floor, cattle are not kept in the house at night, and chickens are not kept in the house at night.

them will depend to a large degree on their ability and willingness to support her, as reflected in her dowry.[31]

Therefore, to test the bargaining hypothesis, we investigate whether maternal shares of (a) current assets, (b) premarital assets, and (c) marriage payments have different effects on child morbidity than do paternal shares.

The assertion of the exogeneity of individual current assets held by husbands and wives is an issue (see Haddad, Hoddinott, and Alderman 1997). These could be influenced by accumulation decisions that were made within the marriage; furthermore, in many settings, these assets are considered joint property and so are not easily attributable to a particular spouse.

A different measure, assets brought to marriage, may be exogenous to decisions made within marriage. However, these, as well as transfers made at the time of the marriage, could be affected by marriage market selection and assortive mating (Foster 1996). The latter issues are relevant to the South Asian context where parents and other members of the extended family often take responsibility for arranging marriages: it is not unreasonable to expect that these actors could also influence household allocation decisions within the marriage. Foster (1993), for example, finds that characteristics of extended family members influence educational attainment of children in Bangladesh.

Using the same data as the present study, Quisumbing and de la Brière (1999) explore the determinants of individual assets. The authors find that characteristics of the origin family of husbands and wives affect both current assets and those brought to marriage. The most important positive influences on premarital assets of husbands are their own education, age, birth order, value of parents' land, and later calendar year of marriage; more siblings has a negative effect. For wives, their own and husband's

[31] Russell et al. (1999) give two other reasons why dowry could increase a woman's bargaining power in marriage in Pakistan, another predominantly Muslim country. The first is that because dowry is likely to contribute to the current economic productivity of the household, while its withdrawal could act as threat point. The second is that the dowry would give her an economic option outside of the marriage. While these may hold in theory, they make the strong assumption that the woman is able to take all or part of the dowry with her if she leaves. Evidence from Bangladesh indicates that this is not usually the case (see, for example, Monsoor 1999).

education and age, as well as the landholdings and education of her own and husband's parents increase her premarital values. Husband's current assets are influenced by his birth order, number of siblings, and wife's education. Wife's current assets are increased by her education and number of living brothers. Own parents' land values have positive effects for husbands and wives.

Quisumbing and de la Brière use this family background information to instrument individual current and premarital assets in an analysis of household expenditure shares. Given that education is one of the strongest and most consistent predictors of individual asset holdings, however, it means that this set of instrumental variables is inappropriate for the current study. This is because education of husband and wife has important effects on preschooler health. The approach taken here will, therefore, be to examine the effects of individual mother and father share of current assets, then premarital assets, then marriage transfers on preschooler days of illness. We will then investigate whether the family background determinants of husband and wife assets have any direct effect on child morbidity. In all regressions, the log of per-capita current household assets is included to control for wealth levels.

Since the determinants of any illness are expected to differ from those of diarrhea and respiratory ailments, we estimate separate morbidity functions for the three outcomes, making the underlying technology disease- as well gender-specific. The dependent variables are defined as days of any diarrheal and respiratory illness in the past two weeks *unconditional* on an illness episode (conditioning would amount to truncating the dependent variable and would therefore lead to biased estimates).[32] A robust tobit estimator is used to control for the censoring of the dependent variable and for the fact that there are repeated observations on individual children.

[32]We focus in this paper on unconditional durations because they provide more information than prevalence. In separate results, not reported here, the three binary outcomes of whether or not there was an episode of any illness, of diarrhea, or of RI during the past 14 days were analyzed; the determinants are similar to those reported here.

5. FINDINGS

ANY ILLNESS

Table 6 presents the three specifications exploring the influence of parental resource shares on illness days of girls and boys. In version 1, wife and then husband current shares are included in separate regressions.[33] Controlling for household current assets per capita, a higher father share (version 1B) reduces boys' illness days. The current resource ownership pattern does not appear to be an important influence on the illness days of girls. Using pre-wedding shares, the significant effects are now for girls.[34] Higher mother share decreases girl illness days.

The finding that resources attributed to mothers help girls, and those to fathers help boys, are consistent with those of Thomas (1994) for child height in the United States, Ghana, and urban Brazil. Thomas tests the robustness of his results (i.e., that the differences in the gender effects are due to differences in parental preferences and not caused by simple gender-specific disparities in child health production technology) by examining the birth weight and birth length of children. The idea here is that if incongruity in the effects of parental attributes on current child height reflect behavioral differences toward sons and daughters, then the effects of these attributes on birth outcomes should be the same for boys and girls because parents do not yet know the sex of the child when decisions regarding prenatal inputs are made. His tests indicate that there is no difference in the impacts of mother and father nonlabor income on birth outcomes by gender of the child.

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[33] In cases where husband and wife share sum to the total amount in question, the effect of one's share will be the inverse of the other's. This is true for premarital assets and for marriage payments. However, for current assets, there are on occasion other asset owners in the household. Therefore, the impact of one's share will not always be the inverse of the other's. This is the reason for presenting the effects of both wife's and husband's share of current assets.

[34] In 27 couples (10 percent of the subsample), both husband and wife reported having no pre-wedding assets. These households are dropped from the pre-wedding specification.

Information on birth outcomes is not available in this data; however, we can examine prenatal and birth delivery behaviors for the most recently born child of each mother to investigate whether there are differences in pre-birth inputs by child gender. In analyses not presented here, we find that resource holdings of individual parents do not have disparate influences by child gender on three pre-birth variables: whether the full dose of tetanus vaccinations was received before the child's birth, on which month of pregnancy prenatal care was first sought, and on whether a trained birth attendant was used. These results suggest that disparities in the effects of maternal and paternal characteristics by child gender on illness may be due to different preferences of mothers and fathers with respect to the health of their sons and daughters.[35]

Several methods of entering wedding transfers were investigated. Initially, marriage payments and pre-wedding asset holdings were aggregated into a single variable. This was deemed unsatisfactory, however, since claims over these two types of resources could differ: individual control over resources held before the union may be greater than control over those transferred at the time of, and to some extent as a result of, the union itself. The latter may be given strategically in an effort to establish influence over future decisionmaking in the marriage. This led to the inclusion of wedding transfer shares received by each partner as regressors separate from the pre-wedding shares.[36]

The final specification in Table 6 shows that a greater share of wedding payments directed toward the husband reduces the reported morbidity of both boys and girls, and

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[35]To further explore the technology versus preference issue, Thomas (1994) includes a dummy variable for whether the mother had more education than her partner on the grounds that she would likely have more control over household resources because her potential earning and thus bargaining power would be greater. We experimented with this variable, but it had no influence on either boy or girl health. It is possible that in the rural Bangladeshi context that even if a wife does have more education than her spouse (which occurs in 12 percent of the households in this subsample), it does not imply that she has more earning, i.e., bargaining, power because of cultural practices that restrict women's work outside the home. We also included the age difference between spouses, which also had no influence.

[36] As shown in Table 4, wedding transfer sources differ between husbands and wives. Nearly half the value of wife transfers come from her family. In regressions not reported here, transfer shares were also disaggregated by source. Shares of total wedding payments coming only from the opposite side had effects that were very similar to the ones presented in the paper.

by nearly the same magnitude. This is consistent with evidence discussed earlier of dowry payments having important consequences for brides and their children.[37] Of particular note are the results of Russell et al. (1999), who show that dowry significantly increases child weight-for-age in Pakistan. (Sex-specific impacts were not examined.) Rao and Bloch (1993) find that wife abuse, attributed to lower than expected dowry amounts, not only reduces her well-being, but also diminishes caloric allocation within the household to her children.

Low or no payment of dowry has also been cited as a reason for the groom "returning" the bride (but not the dowry—see White 1992) to her family. This is a real threat to women from very poor families because return to her parents' home is likely to bring economic hardship and embarrassment to her natal family (White 1992, among others); moreover, if she has children, the burden on her parents would be even greater. In order to avoid this situation, women may remain in "bad marriages," where they reside in the same household as the husband but have only limited interaction with him (Bloch and Rao 1998). It is reported in such situations that wives may be forced to break contact with their natal families. This occurs largely through the husband not allowing the woman to go for periodic visits to her natal home. (White [1992] and others report these visits as being one of the primary mechanisms through which wives attain resources, cash or in-kind, from their natal families.) At the same time, she is denied access her husband's resources. These factors together severely reduce a woman's access to resources and force her to make do on her own. It is also reported that marital difficulties originating from low payment of dowry reduce the groom's interest in the welfare of the children he has with this wife, in part, because he is more likely to take on a second "favored" wife who can bear him other children (Bloch and Rao 1998).

One implication of the above evidence is that *higher* dowry payments may (1) reduce a wife's chances of being mistreated both physically and emotionally, and (2)

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[37] Although not discussed here, another important effect of dowry is the financial burden it places on the bride's family. See White (1992), Miller (1992), and Basu (1997), among others, for discussions.

decrease the likelihood of her losing access to the resources of her husband and her natal family. The first factor would render her better able to allocate the resources she has to child health because she is healthier and more equipped to make sound decisions. The second would mean she has more potential resources upon which to draw. Both of these are consistent with our finding that larger marriage payments from the wife's to the husband's side reduce child morbidity.[38]

When asset shares are replaced with family background characteristics of parents (important determinants of individual parental assets), we observe interesting differences by child gender as shown in Table 7. Higher birth order mothers have slightly sicker daughters. Later birth order may be indicative of fewer parental resources upon which to draw because there are more siblings to compete for them. Furthermore, although daughters may inherit their father's property by Muslim personal law, they are entitled to only one-half the amount of their brothers. In practice, women often relinquish their inheritance to their brothers in exchange for the promise of future livelihood security from brothers, and for visiting rights to their natal homes. Number of living maternal brothers reducing days of illness for both boys and girls is most likely a result of this social custom (called *naior*).[39]

The extended family of the child's father has less of an influence on child health than that of the mother. (We might expect this since the mother is often primarily responsible for daily care of young children.) Interestingly, however, both of the effects that are significant are for girls and work in their favor. Father's number of living

[38] Payment of *mahr* can be viewed as the other side of the coin. Besides being a type of divorce insurance for wives, it is sometimes viewed as a way to compensate women's natal households for the loss of an economically active member and for the resources that went into raising her. In an area where dowry is more and more dominant, however, a *mahr* payment (from the husband's to the wife's side) at the time of marriage may come with expectations that the wife be "well-behaved." This could lead to her taking a more subordinate position in the relationship with consequently less decisionmaking power. Moreover, the portion of the *mahr* promised in case of a divorce may lead to the husband feeling trapped in the marriage; this could manifest itself in his restricting the wife's access to his earnings. In either case, the woman would be less able to provide inputs (time and quality of child care, nutrients, health services, etc.) for the provision of child health.

[39] See, for example, Khan (1988) for a description.

brothers and his father having secondary education each decrease the number of days girls are sick.

The effects of the other determinants do not vary across the asset share specifications, so only the results using husband's current share are presented in Table 8. At the child level, girls' reported illness days decrease faster with age than boys'. Child height-for-age, on the other hand, an indication of child long-term nutritional status, has equally beneficial effects for boys and girls. Being a later-born child with siblings of the same sex is detrimental for both boys and girls. (In earlier specifications not presented here, overall birth order was used and a negative impact was found only for girls, in accordance with previously mentioned results of Das Gupta [1987], Muhuri and Preston [1991], and Clark [1999], who find that higher birth order girls are at a disadvantage.)

Besides individual assets, other parental characteristics have disparate effects by child gender. The mother having some secondary education is beneficial for boys but not girls. This effect of maternal secondary schooling is similar to those in Bhuiya et al. (1986) and Bhuiya and Streatfield (1991), who find, respectively, in Matlab, Bangladesh, that maternal education improves WAZ and age 1–5 survival chances for sons but not daughters. Fathers having some primary schooling may increase daughters' but reduce sons' illness, as indicated by the significance in the girl-boy difference.

Household sanitation score has an important effect on daughter morbidity, reducing it. It is interesting that girls benefit more from better general sanitation practices, even though these practices are not specific to childcare. This is probably because activities of female children are more confined to the household compound than those of male children. [40]

[40] In separate analyses not reported here, each factor of the index was used as a separate regressor in the pooled sample of boys and girls for each of the three morbidity outcomes. Overall illness was reduced by a lid being kept on the drinking water pot, disposal of garbage away from the house, and cattle not kept in the house at night. Diarrhea was reduced by a lid being kept on the drinking water pot, the inside of the house being generally clean, and meals not being taken on the floor. RI days were decreased by drinking water lid, garbage disposal away from the house, and house being kept dry.

Among the household composition variables, more elderly women in residence relative to additional elderly men (the omitted household demographic group) increase reported days sick for preschool boys but not girls. It is possible that elderly women channel resources away from boys. More probable, however, are (1) the fact that they are often present during the interview of the head female, and (2) that these women come from a generation where survival in old age depended crucially upon their adult sons. If it is the case that these women focus more on son than on daughter health, they are likely to influence the mother's reporting. (Moreover, the respondent is probably her daughter-in-law—over whom she exercises great social influence and who is likely to defer to her suggestions and comments.)

The presence of other children in the household has the effect of reducing daughters' more than sons' illness. More boys and girls in the 6–9 and 0–5 age ranges significantly reduce girl morbidity. One possibility here is that if a woman has borne a "sufficient" number of children (a boy to help take care of her and her husband in old age and a girl to help with current domestic responsibilities), her marriage may be more stable. This would, therefore, give her higher status, and a better bargaining position in the household, so she would be better able to channel resources toward girls.

A few differences are found by sex among the location and seasonality regressors. Boys fare better in survey Round 4 relative to survey Round 1. Interestingly, these survey rounds occur during the same season, the onset of the monsoon, but in consecutive years; this suggests that inter-year, and not just inter-season, differences are important. Also for boys, the pure effect of residing in Jessore is to reduce illness; however, boys in this site were noticeably healthier in Round 1 than in the other three survey rounds.

DIARRHEAL ILLNESS

The asset share results for diarrhea illness are given in Appendix Table 11. Results here are not as strong, possibly because the prevalence of reported diarrheal symptoms was relatively low at 13 percent of children, resulting in an average of only 0.6 unconditional days in the two weeks before the survey.

Contrary to the results for overall illness, current asset shares do not affect days of diarrhea experienced. Household per capita assets, however, significantly lower girls' diarrhea days; this effect holds across all the asset share specifications.

Mothers' share of pre-wedding assets has important beneficial effects on girls. Wedding transfer shares, however, no longer have any effects for either girls or boys.

Among the child characteristics, greater height-for-age is significant for lowering diarrhea days for boys only. Sex-specific birth order is now observed to be detrimental only for girls. Similar to overall illness, we see that mothers having at least some secondary education reduces diarrhea illness days only for sons. Contrary to expectation, father having some university education increases the diarrhea days of sons (this could be a reporting effect). On the other hand, paternal height, another indicator of father human capital, reduces boy diarrhea days.

Household composition has only minor influences on diarrhea: adolescent females (relative to elderly males) in the household increase diarrhea days for girls, but not boys.

Location dummies reveal that girls have less diarrhea in Jessore and Mymensingh relative to Saturia. The three survey sites are agroecologically distinct; Saturia is a low-lying flood-prone area, so this result would be expected. It was surprising, however, that the effect was found only for girls; this may suggest that girls are more vulnerable in more wet, flood-prone areas. Girls had less diarrhea in survey Round 2, which is at the end of the wet season. This reinforces the notion that girls' diarrhea may fluctuate more seasonally than boys'.

RESPIRATORY ILLNESS

The parental asset effects differ somewhat for respiratory relative to overall illness. Current parental shares have no significant effect on either girls or boys.

Moreover, the asset position of the household does not reduce girls' RI as it did with overall and diarrheal illness. Similar to overall illness, however, mother share of pre-wedding assets reduces girl, but not boy, respiratory illness.

Marriage transfers have similar effects on RI as on overall morbidity. Higher dowry payments (from the wife's to the husband's side) reduce RI for all preschoolers; however, the effect is much larger for boys than for girls.

Influential child-level determinants include age and height-for-age, each of which reduces RI days for both sexes (similar to the results with overall morbidity). The magnitude of the age effect is greater for boys, while the HAZ effect is greater for girls. Like the finding for overall illness, later birth order is detrimental for both girls and boys.

Mothers' age increases RI days for boys, but the significance of its square indicates that the rise is at a decreasing rate. Fathers having some university education reduce respiratory illness for preschoolers of both sexes.

Mother micronutrient knowledge reduces the number of days boys have respiratory illness, while higher household sanitation scores benefit girls only (as with overall morbidity).

The presence of other household members has varying effects by sex. Household size has a large negative impact on boy RI days. Number of elderly women increases reported respiratory days for boys only. As discussed above with regard to overall illness, this could be a preference among these women for focusing on the health problems of male children, which reveals itself in higher reported days ill; adolescent females in residence also have this effect on male RI. As in the overall illness results, the number of children age 6–9 in the household decreases reported illness days of girls only. This could be a "success in childbearing" effect, resulting in higher maternal access resources, as surmised above in the overall morbidity results.

Among the location and seasonal impacts, residence in Jessore raises girls' RI days, while residence in Mymensingh generally increases boys' RI. Boys in Mymensingh, however, had fewer RI days in survey rounds three and four (dry and early monsoon seasons, respectively) than in the first survey round. Ex ante, we would have expected Round 3 to be the higher RI period because it is the dry season. As in the main illness findings, it was surprising that there were a high number of days in Round 4 relative to Round 1, given that these rounds are the same season but in subsequent years.

6. CONCLUSION

Individual resources controlled by husbands and wives in rural Bangladesh are shown in this paper to have differential impacts on preschooler health by child sex: resources held by mothers reduce the number of morbidity days of girls, while those held by fathers reduce the morbidity days of boys.

Controlling for current household assets per capita, a higher share held by the father reduces boys' illness days. Current ownership shares appear to not have a statistically significant effect on girl-child morbidity; however, greater household wealth reduces slightly the number of girls' sick days. A higher proportion of pre-wedding assets held by the wife reduces the morbidity of girl-children. For payments made at the time of marriage, a higher share directed toward the husband reduces child morbidity, regardless of child sex. The last result may at first appear contrary to what might be expected, given the evidence from other parts of the world on maternal control over resources increasing child welfare; however, when taken in the cultural context of prevailing marriage practices in rural Bangladesh, the effect of marriage payments later in the relationship is not surprising. Moreover, the results are consistent with findings from other studies of South Asia that examine the intrahousehold consequences of marriage payments and find, for example, that low dowry payments increase wife-beating and reduce child caloric intake during the marriage.

The findings suggest that either the technology of health production is gender-specific or that mothers and fathers have dissimilar preferences regarding the health status of their boys and girls. We test, however, for whether individual parental resources have a differential impact on pre-birth inputs by child sex (before the sex of the child is known to the parents), and find no evidence for this. The preference explanation, therefore, becomes more compelling.

Characteristics of the extended family of each parent, which have been found elsewhere to strongly influence the assets held by Bangladeshi husbands and wives, also have significant effects on child health. Living brothers of both parents are particularly beneficial, and especially for girls.

The results also clearly indicate that the unitary model of the household is not an appropriate description of household decisionmaking, even in a male-dominated setting such as rural Bangladesh. Using the different measures of parental assets, we find resources held by mothers have different effects on child health than those held by fathers; this leads to a rejection of the unitary model in favor of the collective household model. The current study is one of the few that formally tests the unitary versus the collective model in a South Asian context.

Also relatively unique among intrahousehold models is the study's focus on morbidity. Given that (1) morbidity interacts with nutrition to affect child growth, and (2) the reduction in maternal and child morbidity is the focus of many policy interventions, it may be useful to examine this outcome more often. Moreover, using an intrahousehold approach could yield particularly insightful results, especially for a region such as South Asia where girls and women have been found to be discriminated against in health and nutrition investments.

Policies that help increase the share of household resources held by women could have definite beneficial effects for girls' health in rural Bangladesh. Moreover, a higher degree of female command over household wealth may encourage parents in subsequent generations to invest more in daughters. Current patrilineal inheritance patterns cause parents to favor sons over daughters—sons are seen as better economic assets and old age security than daughters, who have limited inheritance rights and who leave their natal households upon marriage. With more resources at their disposal, adult daughters, not just sons, may begin to be viewed as potential sources of future livelihood security for elderly parents. Related to this, the establishment of a formal social security system may also help reduce bias toward investing more in sons by decreasing elderly parents’ need to rely on adult sons.

TABLES

Table 1—Morbidity prevalence, by illness type, child sex, and overall asset tercile

Asset tercile	Boys	Girls	Both
Any illness			
Low	0.63	0.55	0.60
Middle	0.61	0.51	0.56
High	0.58	0.54	0.56
Total	0.61	0.53	0.56
Respiratory			
Low	0.35	0.27	0.32
Middle	0.30	0.22	0.26
High	0.31	0.32	0.32
Total	0.32	0.27	0.30
Diarrhea			
Low	0.14	0.12	0.13
Middle	0.15	0.18	0.16
High	0.11	0.07	0.09
Total	0.13	0.13	0.13
Fever			
Low	0.25	0.19	0.23
Middle	0.25	0.22	0.23
High	0.25	0.19	0.22
Total	0.25	0.20	0.23
Other			
Low	0.17	0.16	0.17
Middle	0.17	0.13	0.15
High	0.13	0.13	0.13
Total	0.16	0.14	0.15

Table 2—Unconditional illness days for preschoolers in last two weeks, by site, per capita asset tercile, survey round, and age

	Saturia			Mymensingh			Jessore			All children		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Asset tercile												
Low	4.5	4.0	4.3	4.0	3.5	3.8	4.9	5.0	4.9	4.5	4.2	4.4
Middle	4.0	3.8	3.9	4.4**	3.0**	3.7	2.8	3.3	3.1	4.0	3.3	3.7
High	3.8	3.2	3.5	2.9	3.5	3.1	5.9**	3.4**	4.9	3.8	3.4	3.6
Total	4.1	3.7	3.9	3.7	3.3	3.5	4.7	4.0	4.4	4.1**	3.6**	3.9
Survey round												
1	4.5	3.5	4.0	4.8**	3.2**	4.1	3.0	3.6	3.3	4.3**	3.4**	3.9
2	3.8	3.7	3.7	4.7	3.7	4.2	4.5	3.5	4.0	4.3	3.7	4.0
3	5.0	4.4	4.7	2.8	3.1	3.0	6.2	5.5	5.9	4.4	4.2	4.3
4	3.1	3.1	3.1	2.3	3.0	2.7	4.8	3.5	4.3	3.2	3.2	3.2
Total	4.1	3.7	3.9	3.7	3.3	3.5	4.7	4.0	4.4	4.1	3.6	3.9
Child age (years)												
0-1	4.2	3.8	4.0	4.8**	2.7**	3.8	6.1	6.6	6.2	5.0	4.0	4.6
1-2	4.8	4.4	4.7	5.0	6.2	5.4	6.9	5.8	6.3	5.3	5.5	5.4
2-3	4.6	4.0	4.3	4.0	3.6	3.9	5.3**	2.0**	3.9	4.5*	3.4*	4.0
3-4	3.8	4.6	4.3	4.7*	2.7*	3.9	2.7**	5.6**	3.8	3.9	4.1	4.0
4-5	4.7	4.0	4.4	2.4	3.2	2.9	4.6	2.1	3.6	3.9	3.3	3.6
5-6	2.7	3.0	2.9	2.7	4.2	3.4	3.5	2.1	2.8	2.9	3.2	3.0
6-7	4.1**	2.1**	3.2	2.1	1.5	1.9	3.1	3.7	3.5	3.1	2.3	2.7
Total	4.1	3.7	3.9	3.7	3.3	3.5	4.7	4.0	4.4	4.1	3.6	3.9

Note: * and ** indicate a two-sided t-test of the difference between the sex-specific means is significant at 10 percent and 5 percent level, respectively.

Table 3—Value of individual wife and husband assets

	Current		Prewedding	
	Mean	Standard Deviation	Mean	Standard Deviation
Wife				
Land	617	4,016	1,323	127,001
Animals	741	1,668	300	1,486
Durables	1,119	2,312	833	2,351
House	131	1,669	131	1,669
Food			239	410
Total	2,608	5,733	2,826	13,592
Husband				
Land	118,881	167,897	14,935	58,347
Animals	3,429	6,130	60,539	64,173
Durables	3,095	7,751	1,765	6,575
House	2,136	5,834	2,448	6,307
Food				
Total	127,540	172,731	79,686	92,744
Other members				
Land	9,614	74,344		
Animals	1,736	4,207		
Durables	5,785	12,615		
Total	17,134	76,824		
Household				
Land	129,111	178,870		
Animals	5,906	6,721		
Durables	9,998	15,356		
House	2,267	6,022		
Total	147,283	187,074		

Notes: 1. 1996 taka; 2. N = 269 couples; 3. Non-ownership counted as value of zero.

Table 4—Wedding transfers, by recipient and source

	Amount received	
	Mean	Standard Deviation
Wife		
From husband (or his family)	3,123	4,464
From her family	2,962	4,840
Total	6,085	7,049
Husband		
From his family	52	342
From wife (or her family)	3,801	5,432
Total	3,853	5,444
Couple		
From husband (or his family)	37	280
From wife (or her family)	445	1,418

Notes: 1. 1996 taka; 2. N = 269 couples; 3. Non-ownership counted as value of zero.

Table 5—Summary statistics

	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
	All		Boys		Girls	
Child-level						
Child age (years)	3.615	2.001	3.54	2.01	3.71	1.99
Child gender (1=male)	0.546	0.498	1.00	0.00	0.00	0.00
Stunted (0-1)	0.591	0.492	0.56	0.50	0.63	0.48
Height-for-age Z-score	-2.231	1.172	-2.15	1.13	-2.33	1.21
Sex-spec birth order	3.306	2.047	3.26	1.98	3.37	2.12
N = 1,466 children						

	Mean	Standard Deviation
Parent-level		
Mother share current assets	0.055	0.114
Father share current assets	0.802	0.293
Value household assets per capita (Tk)	26,467.440	29,101.890
Total value household assets (Tk)	147,282.600	187,074.200
Mother share pre-wedding assets	0.367	0.465
Father share pre-wedding assets	0.633	0.465
Total value pre-wedding assets	91,680.48	95,503.35
Share wedding payments received by mother	0.654	0.253
Share wedding payments received by father	0.346	0.253
Total value wedding transfer payments	10,420.430	10,609.490
N = 269 households		

Table 5 (continued)

	Mean	Standard Deviation
Household-level		
Average monthly household PC expense (Tk)	592.54	267.05
Parent marriage year	1,982.24	7.23
Mother age (years)	37.27	14.48
Mom primary education (0-1)	0.34	0.47
Mom secondary education (0-1)	0.14	0.34
Mom height (centimeters)	150.84	4.79
Dad age (years)	40.09	10.17
Dad primary education (0-1)	0.46	0.50
Dad secondary education (0-1)	0.26	0.44
Dad university education (0-1)	0.06	0.23
Dad height (centimeters)	162.60	5.49
Mom Aware of vitamin A Cap Distrib Campaign	0.67	0.47
Mom Micronutrient Knowledge Score (0-6)	2.46	1.57
Household Sanitation Index	4.47	1.65
Household size	5.65	1.89
Number of elderly males (65 years +)	0.04	0.21
Number of elderly females (65 years +)	0.09	0.29
Number of adult males (20-65 years)	1.21	0.54
Number of adult females (20-65 years)	1.29	0.64
Number of adolescent males (10-19 years)	0.53	0.77
Number of adolescent females (10-19 years)	0.59	0.74
Number of child males (6-9 years)	0.46	0.62
Number of child females (6-9 years)	0.42	0.56
Number of infant males (0-5 years)	0.71	0.64
Number of infant females (0-5 years)	0.60	0.67
Saturia (0-1)	0.365	0.482
Mymensingh (0-1)	0.404	0.491
Jessore (0-1)	0.231	0.422
Round 1 (0-1)	0.268	0.443
Round 2 (0-1)	0.250	0.433
Round 3 (0-1)	0.243	0.429
Round 4 (0-1)	0.239	0.427
N=269 households		

Table 6—Impact of parental asset and wedding payment shares on preschool girl and boy illness days

	Girls		Boys		Difference (G - B)	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Version 1A						
Mother share current assets	-2.404	-1.08	4.366	**1.90**	-6.770	**-2.12**
Ln PC current household assets (Tk)	-0.378	**-1.81**	0.220	0.85	-0.599	**-1.80**
Ln Average PC expense per month (Tk)	0.037	0.05	-0.311	-0.42	0.348	0.32
Version 1B						
Father share current assets	-0.775	-0.69	-2.054	**-1.94**	1.279	0.83
Ln PC current household assets (Tk)	-0.162	-0.83	0.216	0.85	-0.378	-1.18
Ln average PC expense per month (Tk)	-0.091	-0.12	-0.272	-0.36	0.180	0.17
Version 2						
Mother share pre-wedding assets	-2.317	**-2.08**	-0.454	-0.39	-1.863	-1.16
Ln total pre-wedding assets (Tk)	-0.385	**-2.26**	-0.215	-1.09	-0.169	-0.65
Ln PC current household assets (Tk)	-0.225	-1.09	0.219	0.74	-0.444	-1.23
Ln average PC expense per month (Tk)	0.586	0.74	0.217	0.27	0.369	0.33
Version 3						
Father share wedding transfers	-1.874	**-2.11**	-1.722	**-1.77**	-0.152	-0.12
Ln total wedding transfers (Tk)	-0.151	-0.50	0.200	0.70	-0.352	-0.85
Ln PC current household assets (Tk)	-0.254	-1.36	-0.095	-0.35	-0.159	-0.48
Ln average PC expense per month (Tk)	0.176	0.22	-0.089	-0.11	0.264	0.24

Table 7—Influence of extended family on days of preschooler overall illness

	Girls		Boys		Difference (G-B)	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Year of parents' marriage	-0.074	-0.42	-0.105	-0.96	0.034	0.43
Mother's characteristics						
Her birth order	0.379	**1.65**	-0.103	-0.63	0.476	**1.72**
Her number of siblings	0.166	0.56	0.639	**3.38**	-0.484	-1.40
Her number of living brothers	-0.799	**-2.26**	-0.564	**-2.12**	-0.218	-0.50
ln(her parents' land + 1)	0.481	1.64	-0.334	**-1.73**	0.814	**2.35**
Her father has primary education	-0.389	-0.35	1.780	**2.03**	-2.187	-1.55
Her father has secondary education	-0.127	-0.09	-1.494	-1.20	1.386	0.73
Her mother has primary education	-1.635	-1.25	1.973	**1.76**	-3.594	**-2.11**
Her mother has secondary education	0.681	0.23	-0.071	-0.03	0.755	0.21
Father's characteristics						
His birth order	0.241	1.06	0.168	0.82	0.067	0.22
His number of siblings	-0.145	-0.61	-0.114	-0.57	-0.028	-0.09
His number of living brothers	-0.946	**-2.51**	0.128	0.42	-1.061	**-2.22**
ln(his parents' land + 1)	0.012	0.06	0.146	0.81	-0.136	-0.48
His father has primary education	1.956	1.54	1.318	1.37	0.587	0.37
His father has secondary education	-3.431	**-2.04**	1.354	1.07	-4.743	**-2.28**
His mother has primary education	0.236	0.10	0.801	0.50	-0.572	-0.20
His mother has secondary education	1.275	0.30	-4.997	-0.97	6.269	0.94

Note: All other child, parental, household, location, and season variables are included in the regression but are not reported.

Table 8—Impact of other determinants on preschool girl and boy illness days in past two weeks

	Girls		Boys		Difference	
	Coefficient	Z-score	Coefficient	Z-score	Coefficient	Z-score
Marriage year	0.001	0.01	-0.066	-0.92	0.067	0.60
Child age (years)	-0.955	**-2.31**	-0.596	-1.22	-0.358	-0.56
Child age squared	0.057	1.00	-0.028	-0.44	0.085	0.99
Child height-for-age Z-score	-0.605	**-3.13**	-0.563	**-2.81**	-0.042	-0.15
Child birth order	0.476	**3.24**	0.428	**2.74**	0.048	0.22
Mom age (years)	0.228	0.69	0.058	0.16	0.169	0.35
Mom age squared	-0.002	-0.39	-0.003	-0.47	0.001	0.08
Mom primary education (0-1)	0.149	0.25	1.200	1.48	-1.051	-1.05
Mom secondary education (0-1)	0.567	0.69	-1.842	**-2.13**	2.409	**2.01**
Mom height (centimeters)	0.040	0.87	0.058	1.38	-0.019	-0.30
Dad age (yreas)	-0.165	-0.58	0.139	0.53	-0.304	-0.79
Dad age squared	0.002	0.58	-0.001	-0.42	0.003	0.71
Dad primary education (0-1)	0.724	1.40	-0.716	-1.14	1.440	**1.77**
Dad secondary education (0-1)	0.403	0.61	-0.226	-0.29	0.629	0.61
Dad university education (0-1)	-1.457	-1.25	-1.195	-1.28	-0.262	-0.18
Dad height (centimeters)	0.011	0.23	0.011	0.22	0.000	-0.01
Mom aware vitamin A caps	-0.492	-0.97	0.134	0.27	-0.626	-0.88
Mom Micronutrient Score (0-6)	0.021	0.13	-0.201	-1.15	0.222	0.94
Household Sanitation Score	-0.395	**-3.08**	-0.216	-1.37	-0.179	-0.88
Ln household size	2.566	1.05	-1.847	-0.71	4.413	1.24
Number of elderly females (65+)	0.261	0.34	1.756	**2.00**	-1.495	-1.28
Number of adult males (20-65)	-0.164	-0.20	-0.041	-0.07	-0.123	-0.12
Number of adult females (20-65)	-0.959	-1.35	0.138	0.25	-1.098	-1.23
Number of adolescent males (10-19)	-0.461	-0.81	0.112	0.23	-0.573	-0.76
Number of adolescent females (10-19)	-0.385	-0.75	0.565	1.14	-0.949	-1.33
Number of child males (6-9)	-1.505	**-2.57**	0.159	0.26	-1.664	**-1.96**
Number of child females (6-9)	-1.785	**-3.13**	0.081	0.12	-1.866	**-2.08**
Number of infant males (0-5)	-1.073	**-1.82**	-1.389	**-1.93**	0.316	0.34
Number of infant females (0-5)	-1.205	**-1.74**	-0.457	-0.76	-0.748	-0.82
Mymensingh	-0.425	-0.54	0.272	0.31	0.697	-0.60
Jessore	0.872	0.91	-1.569	**-1.73**	2.442	**1.85**
Round 2	0.004	0.01	-1.061	-1.37	1.065	1.00
Round 3	0.271	0.33	-0.171	-0.19	0.441	0.36
Round 4	-1.157	-1.32	-2.368	**-2.55**	1.211	0.95
Mym*Round 2	0.228	0.21	0.895	0.79	-0.667	-0.42
Mym*Round 3	-0.639	-0.58	-2.338	**-2.12**	1.698	1.09
Mym*Round 4	0.160	0.15	-0.818	-0.72	0.978	0.63
Jess*Round 2	-0.520	-0.40	2.504	**1.97**	-3.024	**-1.66**
Jess*Round 3	1.028	0.66	2.946	**2.17**	-1.918	-0.93
Jess*Round 4	-0.638	-0.47	3.295	**2.74**	-3.933	**-2.17**
Constant Term	-3.065	-0.02	-3.065	-0.02		

Note: See Table 6 for impacts of parental asset shares and household asset levels.

Appendix Tables

Table 9—Unconditional diarrhea days for preschoolers in last two weeks, by site, per capita asset tercile, survey round, and age

	Saturia			Mymensingh			Jessore			All children		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Asset tercile												
Low	0.6	0.9	0.7	0.7	0.7	0.7	0.3	0.2	0.3	0.6	0.6	0.6
Middle	1.0	1.1	1.0	0.6	0.7	0.6	0.2	0.4	0.3	0.7	0.8	0.7
High	0.4	0.3	0.3	0.3	0.2	0.3	0.8	0.0	0.5	0.5	0.2	0.3
Total	0.7	0.7	0.7	0.5	0.5	0.5	0.4	0.2	0.3	0.6	0.5	0.6
Survey Round												
1	0.8	0.9	0.9	0.6	0.5	0.6	0.3	0.3	0.3	0.6	0.6	0.6
2	0.6	0.4	0.5	0.7	0.8	0.7	0.2	0.3	0.3	0.5	0.5	0.5
3	0.9	0.8	0.9	0.4	0.5	0.5	0.8	0.2	0.5	0.7	0.5	0.6
4	0.5	0.7	0.6	0.4	0.2	0.3	0.5	0.0	0.3	0.4	0.4	0.4
Total	0.7	0.7	0.7	0.5	0.5	0.5	0.4	0.2	0.3	0.6	0.5	0.6
Child age (years)												
0-1	1.1	1.6	1.3	0.9	0.7	0.8	0.6	0.4	0.5	0.9	0.8	0.8
1-2	1.4	1.4	1.4	0.7	1.3	0.9	1.0	0.8	0.9	1.0	1.2	1.1
2-3	1.0	1.0	1.0	0.5	1.4	0.8	0.1	0.2	0.2	0.6	1.0	0.8
3-4	0.3	0.6	0.4	0.4	0.3	0.4	0.5	0.1	0.3	0.4	0.4	0.4
4-5	0.5	0.5	0.5	0.0	0.2	0.1	0.0	0.0	0.0	0.2	0.3	0.3
5-6	0.3	0.4	0.3	0.7	0.3	0.5	0.5	0.0	0.3	0.5	0.3	0.4
6-7	0.5	0.2	0.4	0.4	0.0	0.3	0.1	0.0	0.0	0.4	0.1	0.3
Total	0.7	0.7	0.7	0.5	0.5	0.5	0.4	0.2	0.3	0.6	0.5	0.6

Table 10—Unconditional RI days for preschoolers in last two weeks, by site, per capita asset tercile, survey round, and age

	Saturia			Mymensingh			Jessore			All children		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Expenditure tercile												
Low	2.0	1.9	1.9	2.6	1.6	2.2	2.9	2.6	2.8	2.5	2.0	2.3
Middle	1.6	1.1	1.3	2.3	1.4	1.9	0.9	1.5	1.3	1.8	1.3	1.6
High	2.3	2.0	2.1	1.1	2.1	1.5	4.1	2.8	3.6	2.1	2.2	2.1
Total	1.9	1.6	1.8	1.9	1.7	1.8	2.8	2.2	2.5	2.1	1.8	2.0
Survey Round												
1	1.5	1.1	1.3	3.4	1.8	2.7	1.3	1.9	1.6	2.3	1.6	2.0
2	1.0	1.6	1.3	2.1	2.0	2.0	2.6	1.4	2.0	1.9	1.7	1.8
3	3.4	2.9	3.2	1.3	1.8	1.5	4.7	3.4	4.1	2.9	2.6	2.8
4	1.6	1.1	1.4	0.5	1.1	0.8	2.5	2.5	2.5	1.4	1.4	1.4
Total	1.9	1.6	1.8	1.9	1.7	1.8	2.8	2.2	2.5	2.1	1.8	2.0
Child age (years)												
0-1	3.3	0.6	2.2	2.9	1.5	2.2	4.2	5.0	4.5	3.4	2.1	2.8
1-2	1.8	2.4	2.0	2.0	4.2	2.8	5.8	2.9	4.4	2.8	3.3	3.0
2-3	1.6	2.0	1.8	2.9	1.6	2.4	4.0	1.5	2.9	2.7	1.7	2.3
3-4	2.2	2.3	2.3	3.2	1.2	2.4	0.8	4.3	2.1	2.3	2.3	2.3
4-5	1.8	1.2	1.5	1.3	1.6	1.5	2.6	0.9	1.9	1.8	1.4	1.6
5-6	1.4	1.4	1.4	0.4	2.0	1.1	0.7	0.6	0.7	0.9	1.4	1.1
6-7	1.9	1.1	1.5	0.7	0.7	0.7	0.8	1.3	1.1	1.2	1.0	1.1
Total	1.9	1.6	1.8	1.9	1.7	1.8	2.8	2.2	2.5	2.1	1.8	2.0

Table 11—Sanitation score elements

Variable label	Mean	Standard Deviation
Lid on drinking water container	0.70	0.46
House is dry	0.53	0.50
House is clean	0.61	0.49
No garbage disposal in house/compound	0.69	0.46
Sanitary latrine	0.30	0.46
Adult female washes hands with soap	0.10	0.30
Meal taken on straw mat or table	0.24	0.43
Cattle not kept in house in evening	0.80	0.40
Chickens not kept in house in evening	0.50	0.50

n = 269 households

Table 12—Impact of wife share of current household assets on preschool girl and boy diarrhea days

	Girls		Boys		Difference	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Version 1A						
Mother share current assets	-0.686	-0.86	0.364	0.53	-1.050	-1.00
Ln PC current household assets (Tk)	-0.147	**-1.90**	0.000	0.00	-0.147	-1.48
Ln Average PC expense/month (Tk)	-0.277	-0.89	-0.048	-0.24	-0.228	-0.62
Version 1B						
Father share current assets	0.428	1.27	0.340	1.37	0.088	0.21
Ln PC current household assets (Tk)	-0.164	**-2.22**	-0.056	-0.94	-0.108	-1.13
Ln Average PC expense/month (Tk)	-0.244	-0.80	-0.017	-0.09	-0.226	-0.62
Version 2						
Mother share pre-wedding assets	-0.409	**-1.93**	0.110	0.76	-0.519	**-2.02**
Ln total pre-wedding assets (Tk)	-0.016	-0.54	-0.009	-0.48	-0.007	-0.21
Ln PC current household assets (Tk)	-0.104	**-1.66**	-0.011	-0.20	-0.093	-1.13
Ln Average PC expense/month (Tk)	-0.281	-0.94	-0.029	-0.14	-0.252	-0.71
Version 3						
Father share wedding transfers	-0.002	-0.01	0.264	0.85	-0.266	-0.64
Ln Total wedding transfers (Tk)	0.058	0.51	-0.015	-0.19	0.073	0.53
Ln PC current household assets (Tk)	-0.120	**-1.88**	-0.007	-0.12	-0.113	-1.34
Ln Average PC expense/month (Tk)	-0.318	-1.02	-0.049	-0.24	-0.268	-0.72

Table 13—Impact of other determinants on preschool girl and boy diarrhea days in past two weeks

	Girls		Boys		Difference	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Marriage year	0.006	0.20	-0.006	-0.27	0.012	0.32
Child age (years)	-0.263	-1.59	-0.193	-1.51	-0.070	-0.34
Child age squared	0.005	0.20	0.016	0.93	-0.011	-0.39
Child height-for-age Z-score	0.095	1.53	-0.145	**-2.11**	0.241	**2.59**
Child birth order	0.098	**1.90**	-0.041	-0.93	0.139	**2.05**
Mom age (years)	0.181	1.63	-0.091	-0.79	0.272	**1.70**
Mom age squared	-0.002	-1.50	0.001	0.49	-0.003	-1.38
Mom primary education (0-1)	0.266	1.18	0.301	1.20	-0.035	-0.10
Mom secondary education (0-1)	0.125	0.38	-0.632	**-3.07**	0.757	**1.97**
Mom height (centimeters)	-0.015	-0.83	0.009	0.69	-0.024	-1.08
Dad age (years)	-0.098	-1.12	-0.024	-0.23	-0.074	-0.54
Dad age squared	0.001	1.07	0.000	0.42	0.001	0.37
Dad primary education (0-1)	-0.048	-0.25	-0.019	-0.10	-0.029	-0.11
Dad secondary education (0-1)	0.153	0.68	0.035	0.15	0.118	0.36
Dad university education (0-1)	0.437	0.66	0.725	**2.12**	-0.288	-0.39
Dad height (centimeters)	0.004	0.29	-0.040	**-2.81**	0.044	**2.23**
Mom Aware vitamin A Caps	-0.090	-0.51	-0.158	-1.17	0.068	0.30
Mom Micronutrient Score (0-6)	0.019	0.36	0.087	0.30	-0.069	-0.95
HH Sanitation Score	-0.022	-0.40	-0.074	-0.95	0.052	0.75
Ln Household size	-1.411	-1.39	0.474	0.75	-1.885	-1.60
Number of elderly females (65+)	0.107	0.39	-0.498	-1.60	0.605	**1.70**
Number of adult males (20-65)	0.287	1.02	0.017	**1.70**	0.271	0.80
Number of adult females (20-65)	0.049	0.20	-0.233	0.80	0.282	0.99
Number of adolescent males (10-19)	0.410	1.56	0.019	0.99	0.391	1.28
Number of adolescent females (10-19)	0.421	**2.28**	0.131	1.28	0.290	1.18
Number of child males (6-9)	0.211	0.92	-0.045	1.18	0.255	0.89
Number of child females (6-9)	-0.089	-0.39	-0.306	0.89	0.217	0.75
Number of infant males (0-5)	0.353	1.49	0.097	0.75	0.256	0.76
Number of infant females (0-5)	0.030	0.12	0.334	0.76	-0.304	-0.98
Mymensingh	-0.715	**-1.97**	-0.032	-0.98	-0.683	-1.30
Jessore	-0.803	**-1.81**	-0.183	-0.08	-0.619	-1.11
Round 2	-0.619	**-1.73**	-0.098	-1.11	-0.521	-1.03
Round 3	-0.229	-0.44	0.345	-0.27	-0.574	-0.82
Round 4	-0.374	-0.83	-0.015	0.74	-0.359	-0.65
Mym*Round 2	0.883	1.89	0.200	-0.65	0.683	1.00
Mym*Round 3	0.148	0.27	-0.453	1.00	0.601	0.79
Mym*Round 4	-0.099	-0.22	-0.127	0.79	0.028	0.05
Jess*Round 2	0.542	0.95	0.016	0.05	0.526	0.74
Jess*Round 3	0.031	0.06	0.131	0.74	-0.100	-0.12
Jess*Round 4	-0.238	-0.52	0.279	-0.12	-0.517	-0.83
Constant Term	-5.990	-0.09	-5.990	-0.09		

Note: see Appendix Table 12 for impacts of parental asset shares and household asset levels.

Table 14—Impact of wife share of current household assets on preschool girl and boy RI days

	Girls		Boys		Difference	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Version 1A						
Mother share current assets	0.402	0.19	3.081	1.22	-2.679	-0.81
Ln PC current household assets (Tk)	0.043	0.22	0.213	0.85	-0.171	-0.54
Ln Average PC expense/month (Tk)	0.139	0.20	-0.452	-0.63	0.591	0.59
Version 1B						
Father share current assets	-1.748	-1.54	-1.579	-1.34	-0.169	-0.10
Ln PC current household assets (Tk)	0.238	1.31	0.222	0.84	0.016	0.05
Ln Average PC expense/month (Tk)	-0.037	-0.06	-0.429	-0.58	0.392	0.40
Version 2						
Mother share pre-wedding assets	-2.004	**-1.73**	-0.566	-0.48	-1.439	-0.87
Ln Total pre-wedding assets (Tk)	-0.376	**-2.46**	-0.269	-1.37	-0.108	-0.43
Ln PC current household assets (Tk)	0.045	0.27	0.303	1.08	-0.258	-0.79
Ln Average PC expense/month (Tk)	0.248	0.36	-0.149	-0.20	0.396	0.39
Version 3						
Father share wedding transfers	-1.324	-1.64	-2.228	**-2.36**	0.903	0.73
Ln Total wedding transfers (Tk)	-0.012	-0.05	0.080	0.28	-0.092	-0.24
Ln PC current household assets (Tk)	0.014	0.09	-0.051	-0.19	0.065	0.21
Ln Average PC expense/month (Tk)	0.225	0.32	-0.230	-0.30	0.455	0.44

Table 15—Impact of other determinants on preschool girl and boy RI days in past two weeks

	Girls		Boys		Difference	
	Co-efficient	Z-score	Co-efficient	Z-score	Co-efficient	Z-score
Marriage year	0.075	1.09	-0.043	-0.68	0.118	1.26
Child age (years)	-0.792	**-2.10**	-0.920	**-1.77**	0.129	0.20
Child age squared	0.038	0.80	0.023	0.36	0.015	0.19
Child height-for-age Z-score	-0.773	**-4.55**	-0.470	**-2.08**	-0.303	-1.08
Child birth order	0.372	**2.81**	0.474	**3.35**	-0.101	-0.52
Mom age (years)	0.285	0.94	0.580	**1.78**	-0.295	-0.66
Mom age squared	-0.002	-0.54	-0.009	**-1.90**	0.007	1.05
Mom primary education (0-1)	0.425	0.82	1.256	1.62	-0.831	-0.89
Mom secondary education (0-1)	0.202	0.28	-1.286	-1.55	1.487	1.36
Mom height (centimeters)	0.019	0.46	0.032	0.73	-0.013	-0.21
Dad age (years)	-0.318	-1.25	-0.105	-0.41	-0.212	-0.59
Dad age squared	0.004	1.44	0.001	0.48	0.003	0.74
Dad primary education (0-1)	0.226	0.51	-0.777	-1.27	1.003	1.33
Dad secondary education (0-1)	1.067	**1.73**	0.161	0.20	0.906	0.90
Dad university education (0-1)	-2.546	**-3.45**	-2.092	**-2.33**	-0.454	-0.39
Dad height (centimeters)	0.016	0.42	0.087	1.59	-0.071	-1.08
Mom aware vitamin A caps	-0.472	-1.15	-0.151	-0.29	-0.321	-0.49
Mom micronutrient score (0-6)	-0.082	-0.66	-0.370	**-2.10**	0.288	1.34
Household sanitation score	-0.260	**-2.45**	-0.267	-1.60	0.007	0.03
Ln Household size	2.135	1.15	-3.974	**-1.73**	6.109	**2.07**
Number of elderly females (65+)	0.488	0.78	2.950	**2.82**	-2.463	**-2.02**
Number of adult males (20-65)	0.044	0.06	-0.028	-0.05	0.072	0.08
Number of adult females (20-65)	-0.701	-1.20	0.733	1.52	-1.434	**-1.89**
Number of adolescent males (10-19)	-0.226	-0.47	0.633	1.33	-0.859	-1.27
Number of adolescent females (10-19)	-0.604	-1.43	1.079	**2.14**	-1.683	**-2.56**
Number of child males (6-9)	-0.857	**-2.02**	0.492	0.81	-1.349	**-1.82**
Number of child females (6-9)	-0.757	**-1.71**	0.642	0.98	-1.399	**-1.76**
Number of infant males (0-5)	-0.193	-0.42	-0.932	-1.44	0.738	0.93
Number of infant females (0-5)	-0.925	-1.57	0.209	0.36	-1.135	-1.36
Mymensingh	0.410	0.63	1.229	**1.65**	-0.819	-0.83
Jessore	1.497	**1.73**	-0.447	-0.59	1.944	**1.69**
Round 2	0.327	0.43	-0.729	-1.46	1.057	1.16
Round 3	1.342	1.50	1.191	1.47	0.151	0.13
Round 4	-0.629	-0.85	-0.956	-1.31	0.327	0.32
Mym*Round 2	-0.439	-0.42	-0.836	-0.92	0.396	0.29
Mym*Round 3	-1.796	-1.54	-3.913	**-3.99**	2.117	1.39
Mym*Round 4	-0.904	-0.97	-2.875	**-3.26**	1.971	1.54
Jess*Round 2	-1.603	-1.44	1.556	1.50	-3.159	**-2.07**
Jess*Round 3	-0.411	-0.27	1.416	1.02	-1.828	-0.88
Jess*Round 4	-0.309	-0.24	0.921	0.97	-1.231	-0.76
Constant Term	-153.926	-1.12	72.931	0.56		

Note: see Appendix Table 14 for impacts of parental asset shares and household asset levels).

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