Sibling Rivalry and Birth Order Effects on the Nutritional Status of Children in Rural Bangladesh

Anoshua Chaudhuri
San Francisco State University

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Please direct any comments to Anoshua Chaudhuri, Department of Economics, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA 94132.
Phone: (415) 338 2108, Fax: (415) 3381057, Email: anoshua@sfsu.edu

Introduction

We know that as more children are born in resource constrained households, resource allocation faces a tradeoff between equity and efficiency. Theories suggest that parents will invest in the child with greatest potential returns. In the South Asian context, research has provided evidence towards the fact that, sons who are expected to look after their parents, work in the labor market, often in strenuous jobs, also get the lion's share of resources while daughters who are expected to marry and leave the family offer no incentive to their parents to invest in their human capital. Several papers have also looked at the effects of birth order and gender composition of siblings in determining intra-household allocation of resources amongst children in developing countries (Strauss and Thomas 1995).

Dasgupta (1987) and Muhuri and Preston (1991) provide evidence towards discrimination against girls and show that girls with older sisters have very high mortality rates. To some extent, boys with older male siblings have a high mortality rate too according to Muhuri and Preston (1991). Parents in Bangladesh seem not to treat sons and daughters as perfect substitutes and seem to undertake a selective child survival strategy aimed at a balance between male and female children. Rahman and Davanzo (1993) however have shown that parents do have some preference for daughters if they have managed to have one or two sons. This means that not all girls are discriminated against.

Discriminatory behavior exists when labor and capital markets are imperfect. Becker's pure investment model (1991) if generalized, suggests that siblings that have less competition from other siblings will tend to do better. In areas where there are pro-male bias, siblings with sisters will fare better in the use of limited household resources. Parish and Willis (1994) show that Taiwanese children with older sisters are better educated. Behrman (1982) on the other hand suggested with some evidence that parents were inequality averse, however in the lean season, they followed a pure investment model which would leave the female children most vulnerable. Garg and Morduch (1998) using a survey from Ghana showed that children with all sisters (and no brothers) had better health status than if they had all brothers (and no sisters). Birth order did not seem to matter and the inequalities in health status amongst children according to gender stemmed from siblings being rivals for household resources. They predicted that if time and credit constraints were lifted from the parents, rivalries would be reduced. If boys are favored and they draw away resources from girls, then households facing less resource constraints will not exhibit such behavior.

This paper uses a recent round of data from Matlab, Bangladesh to test if there is any evidence of gender gap in children's health status as a result of household gender composition of children and their birth orders, as shown by earlier work on this area. Further, Matlab has seen an ongoing maternal and child health intervention program for the last decade and half (before the data was collected). This paper also looks at the effect of gender composition and birth order effects across the program and control area on children's health and nutritional status in this rural area of Bangladesh. The idea is that if the intervention program reduced time costs for health care significantly and added health resources to the households (in the form of in-kind transfers), did it help to reduce competition amongst siblings for resources and therefore reduce gender gap in the health status of children?

Health is measured using age and sex standardized heights and weights as indicators of long run and short run health respectively. Both continuous and discrete measures of health are used. (Only the results for continuous height for age has been reported here). With a control area, equally impoverished as the treatment area, which never got the MCH program, and the fact that all eligible women and children in the treatment area were given the program, provides a perfect platform for a natural experiment and hence scope for examining program effects without the problems of endogenous program placement and selection.

In a previous paper, I find that the program has a positive and significant impact on the health and nutritional status of children (Chaudhuri, 2003). I also see that the program makes girls in richer households (proxied by land holdings) healthier with no significant effect on boys. This is possible if the boys in richer households are already looked after and any additional resources are spent on making girls better off thus lending credence to the theory that unconstrained households will see a reduction in gender gap. On the other hand, in poorer households, there is no significant effect on the nutritional status of girls but boys in the treatment area are better off compared to those in the control area. As a further extension to that work, this paper investigates whether the program effect is different for the boys in poor households across the two areas depending on whether they have more male or more female siblings and whether gender composition of siblings matter for the girls in richer households.

In addition, this paper also looks at the program effect in the presence of a *socialization effect* (effect of having a male or a female sibling) and a *reference group effect* (effect on girls with male siblings or boys with female siblings). Few studies have attempted to correct for household heterogeneity arising from correlations between birth order and children ever born. This issue is addressed in this paper and attempts have been made to overcome this problem using sibling fixed effects. Further the program itself may have altered the household composition across the two areas and the interpretation of results needs to take this into account.

The results clearly indicate that the differential effect of the program on girls and boys is due to differences in intra-household resource sharing. Boys increase the rivalry for household resources and the program offers positive effects for the long term health of boys. Girls are better off in richer households that have more girls and girls that have only male siblings are healthier. Higher number of children has an adverse effect on the health of children, having male siblings impact more adversely than having female siblings. Boys of higher birth orders seem to do better while the program area and birth order has no significant interacted effects.

Description of the MCH Program in Matlab

Matlab, situated at the confluence of Dhonogoda and Gumti rivers in the flood plain of the Meghna river system, is a regularly flooded area of Bangladesh and was well-known for its frequent cholera epidemics in the 1960s and 1970s. An independent, international, non-profit-making research organization called Cholera Research Laboratory, hosted and supported by the government of Bangladesh was set up in Matlab, Bangladesh in 1963 which later, in 1978 became known as the International Center for Diarrhoeal Disease Research (ICDDR, B). Matlab is the principal field station of the ICDDR, B where several studies and experiments have been carried out over the last several decades.

The climate is subtropical with 6 major seasons and three main agricultural seasons. Most of the households depend on underwater cultivation of rice in the monsoon season (June to September) when almost all land outside of homestead land on high ground is flooded. The landless households and small landholders in this season incur huge debts to pay off during post-harvest season which results in huge fluctuations in prices, nutritional levels, labor outcomes as well as high incidences of default, foreclosures and landlessness.

According to the ICDDR, B census of 1993, 88% of the population is Muslim and the rest are Hindus. In 1974, 38.2% of males and 17.2% of females were found to be literate. Agriculture and fishing are the main occupations. The villages in this area have an average population of 1,100 persons with an average population density of about 1500 persons per square miles. In the months of July to September, water level rises by more than 4 meters, population density increases manifold. Apart from the single motorable road between the Matlab *bazaar*[1] and the district capital of Chandpur, all other transport and communication are either by boat or by foot. Thus by all indices, this is a very poor, underdeveloped and densely populated rural community.

Between 1975 and 1977, a 'Contraceptive Distribution project (CDP)' was carried out in 150 villages in Matlab, retaining 84 villages as a control group. Although, contraceptive usage increased from a baseline of 1% to 18% in the first three months, the long-term impact was limited because of insufficient planning and a lack of sustained implementation. Notwithstanding these flaws, the CDP generated a substantial desire for contraceptive use in the community. This led to a need for the 'Family Planning- Health Services Project', set up in 1977. The study area covering 150 villages was divided into treatment and control areas. The treatment area consisted of 70 villages, where the ICDDR, B administered its family planning services along with limited health services. The neighboring control area continued to receive government family planning and health services in the normal course. The treatment area was further split into 4 operational blocks, (A, B, C, D) each organized around a small Maternal and Child Health-Family Planning (MCH-FP) clinic staffed by paramedical personnel. Bhatia et al (1980) provides a comprehensive description of this project.

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[1] market

The community health workers of the Matlab Family Planning-Health Services Project delivered a range of contraceptive methods and also referred interested women to the local MCH-FP clinic to treat common illnesses and family-planning related problems. They dispensed nutritional advice to pregnant and lactating women, administered tetanus toxoid shots to pregnant women and distributed iron and folic acid tablets. They also rendered basic childcare, nutrition and breastfeeding advice to interested mothers as well as distributed and promoted the use of oral re-hydration solutions amongst young mothers through a door-to-door delivery method. Bhatia et al (1980) pointed out this unlike most other rural societies, women in this area did not work outside their *bari*[2]. Hence it was necessary to have intensive antenatal, delivery and postnatal care component to a family planning program in order to decrease tremendously high maternal and neonatal mortality rates.

In 1982, the MCH-FP extension project introduced the intensive MCH program in two of the four blocks of the treatment area, focusing on the health component of the MCH-FP program. Blocks A and C were randomly chosen as the "intensive MCH" blocks, wherein community health workers (CHWs) provided tetanus toxoid immunization to all married women of reproductive ages (as opposed to only pregnant women), measles vaccination to all children between nine months and 5 years of age, and antenatal care and safe delivery kits to pregnant women. In the areas B and D, known as the "limited MCH" blocks, the CHWs continued to deliver the same services as in the preceding phase.

In 1986, the intensive MCH services were introduced in blocks B and D as well. The intensive MCH services also introduced in various phases, components such as: Complete

[2] Several related households around a clearing makes up a *bari*.

immunization against the six EPI[3] diseases (in 1986), Vitamin A supplementation (in 1986), nutrition rehabilitation (started in 1986), community based maternity care program involving midwives posted in the field (in 1987), control of acute respiratory infections (started in 1988) and control of dysenteric diarrhea (started in 1989) (Fauveau [1994]).

The Matlab Health and Socioeconomic Survey was collected in 1996, by which time the intensive MCH interventions were present in the treatment blocks for 14 years in blocks A and C and for 10 years in blocks B and D. Some of the baseline characteristics comparing the treatment and control areas in 1996 are given in Chaudhuri (2003).

Framework

Theoretical model

We assume that households maximize welfare given household production functions (including those of child health) and a household budget, given income, prices and other assets (such as parental education and household wealth). Reduced form demand functions for children's health that depend on incomes, prices, parental assets, household assets (such as head's education), and other observed household characteristics (such as health endowments of parents, children's background information, gender composition, sibling information) and community and village characteristics (such as presence of the MCH program) are derived.

With an in-kind transfer of information and health inputs, the households could react in two ways. If they are extremely poor and there is no change in monetary resources, they have no incentive to change the quantity or quality of children in the households. However, if there is a perceived change in resources associated with presence of a child, they

[3] Expanded Program on Immunization (1991).

would not only have more kids to get the MCH services but will also be influenced to invest in the private health goods for older children. However, over a period of time, they would realize that this increases the shadow price of children. They could then resort to either a decrease in quantity and increase in quality or keep quantity the same and resort to some kind of discrimination, i.e. undertake differential quality investment either by gender or birth order or some other attributes of the children (Chen et al, 1981 provides evidence towards gender discrimination in food allocation in Matlab).

There are no a priori expectations from the theoretical model. The question is purely an empirical one. If female sibs helped in health production, having female sibs and program resources would reinforce any positive nutritional effects. If female sibs are rivals in the use of the resources, having female sibs would reduce the impact of the extra resources. Having male sibs who are rivals would reduce the program impact on nutritional status. However, if older male sibs are expected to increase household resources, then having more such sibs should have a positive effect on health status. Previous research has looked at household composition effects but not in conjunction with a public program. The contribution of this paper therefore is unique. This paper also investigates if birth order has any significant effects on the long term nutritional status of these children. Birth order is further interacted with sex of the child to see if there are any differential gender effects. We estimate the reduced form health demand functions to find the program impact on the health status of children[4] by restricting the base model according to various specifications and samples.

Empirical model

[4] See Chaudhuri (2003) for a detailed version of the model.

The reduced form demand equation that is derived is a function of prices, income, household and individual characteristics and the program variable. We are interested in measuring the program effect on the health outcomes of children and also other determinants of children's health under certain restrictions. For estimation purposes, we assume a linear form of the reduced form demand function, given by

[Equation 1]: $H_{ij} = \beta_0 + \beta_1 A_j + \beta_2 P_{(Z^2)j} + \beta_3 Y_j + \beta_4 I_{ij} + \beta_5 J_j + \varepsilon_{ij}$

where,

i : indexes the individual

j : indexes the household

H: vector of health outcomes

A: Program presence in the household

$P_{(Z^2)}$: Price of private health goods z^2

Y: Log of household per capita monthly expenditure (proxy for income and prices of all other goods)

I: Observed individual characteristics

J: Observed household characteristics including sibling composition and characteristics

ε: Disturbance term,

and the parameters that are to be estimated are the vector of coefficients given by β.

The standard errors are corrected for within-cluster correlation of error terms as well as for arbitrary heteroscedasticity. Squared terms of regressors as well as interaction terms between the covariates are introduced in the empirical specifications to account and control for any non-linearity.

Seven variants of the model are examined. First, children are restricted to samples according to household land ownership and composition of siblings to determine the program effect. Second, effect of having at least one opposite sex sibling or having all same sex siblings (ie, socialization effect) on boys and girls is determined. Third, effect of living with all opposite sex siblings or 'reference group effect' is examined. Fourth, birth order of children and its interacted term with the program are included as a determinant to determine birth order effects. Fifth, the model is then expanded further to include sex composition determinants in the equation itself and program effect and effects of sibling composition and birth order are examined. Sixth, the samples are restricted to girls in richer households and boy and in poorer households to see some of the effects of sibling composition and birth order. Finally, household fixed effects are used to control for any household heterogeneity.

Econometric Issues

This paper analyses the impact of the intensive MCH program and other socioeconomic characteristics on children's health and nutritional status. With a control area, equally impoverished as the treatment area to start with and one which never got this MCH program, it provides a perfect platform for a natural experiment and hence scope for evaluation of a public program without the problems of endogenous program placements. Rosenzweig and Wolpin [1986] showed that because health programs tend to get placed in areas of poor health, the results might show a negative correlation between health investments and health outcomes. Hence if health programs do get placed in less healthy areas, their impacts might in fact be understated. Selective participation might also result in biased results.

In this case, both control and treatment areas started from the same levels and then contraceptive rates and schooling participation rates rose while age-specific fertility rates[5] started declining in the treatment area. This is well documented in Foster and Roy (1997) and Phillips et al (1988). Moreover, all eligible children in the treatment area received the program through a door-to-door delivery method leaving no possibility for selection bias. Program leakages due to diffusion of information and migration into the treatment area did not seem to have occurred on a large-scale (Strauss and Thomas (1995), Phillips et al 1982) in order to threaten biased results. It is, however possible that there is mortality selection in this area where very high mortality rates prevail due to natural disasters such as epidemics and floods. This might result in downwardly biased results. However, lack of data on deceased children makes it a difficult task to correct for selection of this nature. It however makes a stronger case for the contribution of the program in improving long term health and nutritional status of children as what we see in the results are probably a lower bound in the face of possible mortality selection bias.

Further, this region of the world is particularly known for excess female mortality. If we use household sibling composition as a determinant, there is potential for selective mortality bias. However, Muhuri and Preston in their 1991 study explain that the treatment

[5] Throughout and four years before the start of the intensive health program, the treatment area received and continues to receive a family planning program which is thought to have lowered fertility rates although the control area also had a government-aided family planning program going on at the same time. If lower fertility results in positive fertility selection, this could render overestimated health program effects while the program impacts would be underestimated if there is a negative fertility selection. However Foster and Roy talk about little impact of the health program on fertility. Foster and Roy also talk about both areas being much below total fertility rates and the desire for children relatively the same across the two areas. In an area where son preference exists, only households with sons would be expected to practice contraception and limit fertility. This could result in an increased stock of older male children and would give us the opportunity to examine the long-run impact of the health program on nutritional status of these children compared to the surviving children in the control area. While households with more girls would be expected to not limit fertility, this will not impact our estimation in any way. Strauss and Thomas (1995) conclude based on available studies, potential mortality and fertility selection problems have not produced convincing results even in high mortality and fertility countries like Bangladesh.

program had a major impact on birth rates but it was primarily due to child survival strategies rather than fertility strategies. If control area did not receive such benefits, our estimates will most likely be underestimates than overestimates of the effect of the program.

Numerous children from the same household, unobserved characteristics correlated with determinants are potential problems for which cluster correction methods are used. We use both household level and bari level fixed effects to account for household heterogeneity. Use of fixed effects will render the program effect unidentified if dummy is used. However, we use years exposed to the program as an alternative in the fixed effects estimation.

Data

This paper uses data from the Matlab Health and Socioeconomic Survey of 1996. Anthropometric information, individual and household characteristics are gathered from the Household and Community surveys. The health program was intensively introduced in Blocks A and C of the designated treatment area of Matlab in 1982 while the other two blocks, B and D were later given the program in 1986. Hence the children who were first exposed in 1982 would be minimum 14 years of age in 1996 while the children who are 14 years of age and residing in blocks B and D were 4 years in 1986 and hence eligible for the program when it first started. This sample consists of children up to 14 years of age.

The *anthro* software (Center for Disease Control) has been used to calculate height for age Z scores. The children who have height for age Z scores that are 2 standard deviations below the median of the reference population (NCHS) are considered to be stunted. About 60% of children in this area are stunted, 17% are wasted and 63% are underweight compared to the reference population. This means that the children face chronic malnutrition in the long term (which is reflected by the high stunting rates). See appendix for summary statistics.

Looking at a descriptive in Table 18, one can see that higher proportion of first born children are stunted and higher birth order girls are slightly more stunted than higher birth order boys. According to household composition, it is clear that presence of more number of boys probably increase rivalry for resources, rendering higher proportion of children in such households stunted.

Results

The following sub-sections report estimation results that evaluate the MCH effects according to sibling compositions and birth order using variants of the main model.

According to sibling composition

In the first model, we look at the pooled group of children and include a dummy variable indicating the program area, a dummy indication households that have more boys and the interacted variable. Results indicate that children living in households with more boys are rivals in the use of resources and their health is adversely affected. However, the program effect and the interacted effect is positive (although statistically not significant within accepted levels of significance). Separating the household into samples, the households with more boys indicate a significant program effect on the children while children in the households with more girls show no effect. Mother's education is a significant determinant of health in all the samples.

Scrutinizing the sample of households with more girls and looking at girls and boys both pooled and in separate samples, there is no significant program effect. In the pooled sample, being a girl adversely affects the health of these children living in more-girls households. However, mother's education has a positive influence on the health of the girls. In the households with more boys, the pooled sample show positive and significant effect of the program on the health of the children. Looking at separate boys and girls samples, boys are doing significantly better in terms of their health in the program area.

According to sibling composition and land ownership

Land ownership is used as an indicator of wealth for these households. A previous paper by the same author shows that girls in richer households living in the program area are of better health status than their counterparts in the control area. There is also significant and differential program effect on boys and girls across poorer and richer households. In this paper, we therefore try to determine whether number and gender composition of siblings affect this differential. Results indicate that the MCH program significantly improved the health status of boys living in poorer households that had more boys than girls. On the other hand, comparing the program area to the control area, the program area girls living in richer households that have more number of girls than boys are of better health status than their control area counterparts.

Socialization Effect/Reference Group Effect

Sociologists and psychologists have looked at various ways in which parent's attitude towards their children depend on the sibling composition. Children may be socialized in different ways, for eg, if there was at least one brother, parents may encourage more masculine traits in their daughters and these traits maybe more physical activity or self confidence. This might affect the treatment of girls with at least a brother compared to girls with only sisters. This socialization effect is captured by using a dummy variable indication that there is at least one male sibling. Also, girls with only brothers may be treated differently than girls with at least one other sister. This socialization effect is investigated using various combinations of sibling composition.

Program has a significant effect on the health of children living in households with at least one boy. Looking at the sample of boys and girls separately, having at least one boy in the household makes the program area boys better off than their control area counterparts but there is no significant effect of the program on the girls. This might indicate that parents care more about and want to improve the health of boys and the program helps them achieve this goal. Having at least one girl does not make the program area children significantly better off but boys in households with at least one girl in the program area are better off than their counterparts in the control area. There is no program effect on children living in households with only same sex siblings. Girls living only with male siblings in the program area have better health while there is no significant program effect for girls living with only female sibs or boys living with either male or female sibs. These results to some extent show that girls living with only male sibs are possibly treated equally. Boys are in general the greatest beneficiaries of the MCH program. Boys are of better health status due to the program in poorer households, in households with at least one boy. Girls are affected by the program only if they reside with male sibs, or are in richer households or are in richer households that have more girls than boys.

Alternative specifications

Instead of restricting samples, if sibling composition and birth order variables are included as determinants in the estimating equations, we can see that the program effect disappears after controlling for the number of children in the pooled samples. Number of children affects the health status of children negatively and significantly while children of higher birth order seem to be of better health. Having male and female siblings makes children worse off with the relative magnitude of having female siblings smaller. Higher birth order has a positive and significant effect on the health status of children.

Taking the sample of girls in richer households, program has a positive and significant effect on the long term health of the girls. Having male sibs makes girls in richer households worse off but having female siblings does not have any significant effects. Birth order has no effect on the girls.

For boys in poorer households, having male or female siblings have no significant effect on their health status. Higher birth order has a positive and significant effect on the health of the boys.

Robustness Check

Household heterogeneity could lead to biased results, for which fixed effects is used to purge these fixed unobservables to obtain unbiased results. Foster and Roy in their Matlab study used fixed effects because they suspected that unmeasured factors changed across the two areas contributing to changes in fertility and schooling levels and in fact their program impact results on schooling and fertility got strengthened. However, fixed effects can also purge all the unobserved time invariant household characteristics that may result in omitted variable bias. If the source of unobserved heterogeneity is not fixed, then also fixed effects estimates will be biased (Strauss and Thomas [1995])

To test whether household heterogeneity is a source of bias for the results discussed so far and to see if program impact results can be improved, this study uses household-level fixed effects model for a sample restricted to at least two children from each household.

Exposure to the program at birth is used to indicate the program effect since there is some variation amongst children even if they are from the same household. Using a dummy variable to indicate the program presence will not work here since all household level variables will be swept out in the differencing involved in a fixed effects regression. The sample of children is such that not all children in the same household have the same parents and hence parent's education variables do not drop out. The model with a pooled sample and sibling composition and birth order as determinants is estimated.

The OLS coefficients of the program exposure variable are positive but insignificant. Mother's education is still positive and significant. Birth order is insignificant. However, number of female and number of male siblings have a negative and significant effect and their relative magnitudes are as expected. However in the fixed effects results, none of the effects exist anymore. This is what Wolfe and Behrman find in their 1987 study but not what Strauss found in his 1990 study about mother's education.

If there were fixed unobservables that were correlated to program variable, fixed effects results would have been both consistent and efficient. However, it is possible that either omitted variables or measurement error is not relevant or source of unobserved heterogeneity is not correlated to the program variable but is in fact random, hence the fixed effects model does not substantially improve the OLS results. It is possible that the fixed effect coefficients were insignificant because there is very little variation in the 'program exposure at birth' variable for siblings at the household level in this sample. It is also possible that household level heterogeneity is very small or that fixed effects method is not relevant so that the fixed effects results are inconsistent and inefficient. If this were indeed true, then the random effects model would be more appropriate. Results indicate that the random effects model in fact reports consistent and more precise results. A Hausman test, for the null hypothesis that random effects model is properly specified and consistent, cannot reject the hypothesis Hence using the fixed effects model is not relevant because unobserved heterogeneity is either very small or not fixed.

Conclusion

This paper clearly indicates that the differential effect of the program on girls and boys is due to differences in intra-household resource sharing. Boys increase the rivalry for household resources but the program offers positive effects for the long term health of boys. Girls are better off in richer households and girls that have male siblings are healthier.

This paper thus has very important policy implications. According to WHO classification of child malnutrition, a prevalence of stunting of about 40 percent is considered very high and reflects a critical public health problem (WHO, 1995). The effectiveness of an intensive maternal and child health program in alleviating some of this problem albeit in one particular area calls for widespread adoption of such programs to deal with chronic public health problems.

We see that the program has a significant impact on the long-term health of boys in the treatment area compared to the control area but no such effects on girls. However we do see significant effects on girls in particular kinds of households. This does suggest that in an area where son preference is strong, public intervention will be used to improve the quality of sons. However, in certain cases, the program can substantially improve the impact on the health of girls. In the absence of a change in social attitudes, community interventions in the form of external transfer of resources might help bring about an equalization of treatment towards male and female children. Further, mother's education has a significant impact on daughter's health and the program has a higher benefit on girls for the economically better of households. This would also mean that when the price of health care is reduced by improving availability and access or through economic development and more education, the households would have the opportunity to make more resources available for their daughters, without any costs imposed on how much they look after their sons. Last but not the least, studies such as this would help identify households that need to be carefully targeted to ensure survival and good health of their female children.

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Table 1: Program Effect according to numerical composition of boys and girls within households

	(1) Households with more girls	(2) Households with more boys	(3) Pooled
Treatment dummy	0.0480	0.1535**	0.0410
	(0.88)	(2.32)	(0.75)
Time in mins to the drinking water source	-0.0168	-0.0247*	-0.0209**
	(1.24)	(1.96)	(2.24)
Average time taken to go to the various available providers	-0.0573	-0.0979	-0.0720*
	(1.31)	(0.92)	(1.66)
Log of expenditure per capita	0.0190	0.0469	0.0299
	(0.80)	(1.45)	(1.55)
Age in mths	-0.0143***	-0.0212***	-0.0169***
	(5.95)	(7.51)	(9.23)
Age in mths squared	0.0001***	0.0001***	0.0001***
	(5.86)	(6.78)	(8.71)
Female dummy	0.0008	-0.0690	-0.0199
	(0.02)	(0.82)	(0.46)
Mother's age in years	-0.0042	0.0032	-0.0011
	(0.88)	(0.61)	(0.32)
Mother's education (yrs)	0.0708***	0.0645***	0.0682***
	(6.08)	(4.71)	(7.66)
Father's education (yrs)	-0.0218***	0.0108	-0.0089
	(2.77)	(1.03)	(1.41)
Head's age (yrs)	0.0049	0.0043	0.0046**
	(1.59)	(1.42)	(2.05)
Mother's height in cms	0.0461***	0.0366***	0.0424***
	(10.00)	(5.71)	(11.33)
More boys=1			-0.1035*
			(1.67)
More boys * Treatment			0.1332
			(1.59)
Constant	-8.8166***	-7.6054***	-8.3087***
	(12.26)	(7.35)	(13.96)
Observations	2288	1498	3786
Adjusted R-squared	0.10	0.13	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2: Program effect on the sample of children living in households with more girls than boys

	(1) girls	(2) Boys	(3) Pooled
Treatment dummy	0.0542	0.0430	0.0430
	(0.85)	(0.49)	(0.49)
Time in mins to the drinking water source	-0.0043	-0.0463**	-0.0463**
	(0.28)	(2.07)	(2.07)
Average time taken to go to the various available providers	-0.0502	-0.0071	-0.0071
	(1.20)	(0.04)	(0.04)
Log of expenditure per capita	0.0175	0.0153	0.0153
	(0.63)	(0.38)	(0.38)
Age in mths	-0.0104***	-0.0224***	-0.0224***
	(3.63)	(4.97)	(4.99)
Age in mths squared	0.0001***	0.0001***	0.0001***
	(3.72)	(4.73)	(4.75)
Mother's age in years	-0.0029	-0.0102	-0.0102
	(0.52)	(1.27)	(1.28)
Mother's education (yrs)	0.0842***	0.0375*	0.0375*
	(6.09)	(1.89)	(1.89)
Father's education (yrs)	-0.0195**	-0.0224*	-0.0224*
	(2.04)	(1.75)	(1.76)
Head's age (yrs)	0.0056*	0.0047	0.0047
	(1.83)	(0.92)	(0.92)
Mother's height in cms	0.0505***	0.0355***	0.0355***
	(8.64)	(5.11)	(5.12)
Female			-3.2683**
			(2.41)
Female* Treatment			0.0112
			(0.11)
Female*water			0.0420
			(1.60)
Female*Time to provider			-0.0431
			(0.27)
Female*l(exp per cap)			0.0022
			(0.05)
Female*age in mths			0.0120**
			(2.25)
Female*age in mthssq			-0.0001*
			(1.94)
Female*Mother's age			0.0073
			(0.80)
Female*Mother's education			0.0467**
			(1.99)
Female* Father's education			0.0029
			(0.19)
Female* Head's age			0.0009
			(0.19)
Female* Mother's height			0.0150*
			(1.71)
Constant	-9.7945***	-6.5263***	-6.5263***
	(10.59)	(6.19)	(6.21)
Observations	1561	727	2288
Adjusted R-squared	0.10	0.10	0.10

Chow test for 3: F= 1.89 (pval=0.0317)
Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Program effect on children living in households with more boys than girls

	(1) Girls	(2) Boys	(3) Pooled
Treatment dummy	0.1925	0.1471**	0.1471**
	(1.16)	(2.08)	(2.07)
Time in mins to the drinking water source	-0.0485*	-0.0182	-0.0182
	(1.83)	(1.33)	(1.32)
Average time taken to go to the various available providers	-0.4659**	0.0098	0.0098
	(2.11)	(0.08)	(0.08)
Log of expenditure per capita	0.0847	0.0437	0.0437
	(0.86)	(1.31)	(1.31)
Age in mths	-0.0211***	-0.0215***	-0.0215***
	(2.63)	(7.19)	(7.16)
Age in mths squared	0.0001***	0.0001***	0.0001***
	(2.74)	(6.33)	(6.31)
Mother's age in years	-0.0049	0.0054	0.0054
	(0.29)	(1.02)	(1.02)
Mother’s education (yrs)	0.0637*	0.0660***	0.0660***
	(1.86)	(4.46)	(4.45)
Father’s education (yrs)	0.0286	0.0072	0.0072
	(1.24)	(0.62)	(0.62)
Head’s age (yrs)	0.0108	0.0033	0.0033
	(1.12)	(1.06)	(1.05)
Mother's height in cms	0.0385**	0.0361***	0.0361***
	(2.56)	(5.24)	(5.23)
Female			-0.6135
			(0.23)
Female* Treatment			0.0453
			(0.26)
Female*water			-0.0303
			(1.11)
Female*Time to provider			-0.4757*
			(1.96)
Female*l(exp per cap)			0.0410
			(0.41)
Female*age in mths			0.0004
			(0.04)
Female*age in mthssq			0.0000
			(0.29)
Female*Mother’s age			-0.0103
			(0.59)
Female*Mother’s education			-0.0023
			(0.06)
Female* Father’s education			0.0214
			(0.85)
Female* Head’s age			0.0075
			(0.75)
Female* Mother’s height			0.0024
			(0.15)
Constant	-8.1788***	-7.5653***	-7.5653***
	(3.20)	(6.90)	(6.88)
Observations	217	1281	1498
Adjusted R-squared	0.12	0.13	0.13

Chow test for 3: F= 0.79 (pval=0.6613)
Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Program effect on children living in richer households that have more girls than boys

	(1) Pooled height-for-age Z-scores	(2) Girls height-for-age Z-scores	(3) Girls height-for-age Z-scores	(4) Boys height-for-age Z-scores	(5) Boys height-for-age Z-scores
Treatment area=1	0.1403	0.2147**	0.2663**	-0.0449	0.0040
	(1.50)	(1.98)	(2.47)	(0.31)	(0.03)
Time in mins to the drinking water source	-0.0138	-0.0105	-0.0136	-0.0051	-0.0093
	(0.66)	(0.46)	(0.60)	(0.11)	(0.21)
Average time taken to go to the various available providers	0.0312	0.0903	0.0817	-0.0664	-0.0726
	(0.23)	(0.63)	(0.58)	(0.29)	(0.32)
Log of expenditure per capita	-0.0545	-0.0607	-0.0398	-0.0297	-0.0274
	(1.40)	(1.16)	(0.76)	(0.51)	(0.47)
Age in mths	-0.0098**	-0.0006	-0.0024	-0.0287***	-0.0283***
	(2.42)	(0.14)	(0.53)	(3.91)	(3.92)
Age in mthssq	0.0000**	0.0000	0.0000	0.0001***	0.0001***
	(2.27)	(0.14)	(0.50)	(3.67)	(3.68)
Female	-0.0068				
	(0.08)				
Number of kids	-0.1595	-0.2112		-0.1811	
	(1.11)	(1.42)		(0.40)	
Number of kids squared	0.0074	0.0121		0.0133	
	(0.34)	(0.54)		(0.20)	
Mother's age in years	-0.0030	-0.0038	-0.0021	-0.0034	-0.0047
	(0.42)	(0.41)	(0.23)	(0.30)	(0.42)
Mother’s education	0.0655***	0.0799***	0.0811***	0.0290	0.0315
	(3.69)	(3.87)	(3.92)	(0.89)	(0.98)
Father’s education	-0.0143	-0.0123	-0.0128	-0.0040	-0.0052
	(1.23)	(0.87)	(0.90)	(0.20)	(0.26)
Head’s age	0.0040	0.0040	0.0042	0.0076	0.0073
	(1.09)	(0.94)	(1.00)	(1.17)	(1.13)
Mother’s height	0.0438***	0.0461***	0.0478***	0.0365***	0.0358***
	(5.20)	(4.20)	(4.39)	(3.21)	(3.18)
Constant	-7.7377***	-8.4237***	-9.3168***	-5.9948***	-6.2807***
	(5.84)	(4.74)	(5.44)	(3.33)	(3.84)
Observations	800	536	536	264	264
Adjusted R-squared	0.10	0.11	0.10	0.11	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Program effect on children living in richer households with more boys than girls

	(1) Pooled Height-for-age Z-scores	(2) Girls height-for-age Z-scores	(3) Girls height-for-age Z-scores	(4) Boys height-for-age Z-scores	(5) Boys height-for-age Z-scores
Treatment area=1	0.0891	0.0703	0.1404	0.0755	0.1031
	(0.85)	(0.31)	(0.62)	(0.68)	(0.93)
Time in mins to the drinking water source	-0.0134 (0.66)	-0.0196 (0.60)	-0.0262 (0.79)	-0.0033 (0.15)	-0.0022 (0.10)
Average time taken to go to the various available providers	-0.1856 (1.31)	-0.7321*** (2.92)	-0.7133*** (2.85)	-0.0604 (0.42)	-0.0677 (0.47)
Log of expenditure per capita	0.0482 (0.91)	-0.1030 (0.97)	-0.0868 (0.76)	0.0766 (1.45)	0.0832 (1.56)
Age in mths	-0.0194***	-0.0239**	-0.0217**	-0.0186***	-0.0195***
	(4.10)	(2.27)	(2.04)	(3.66)	(3.84)
Age in mthssq	0.0001***	0.0001*	0.0001*	0.0001***	0.0001***
	(3.47)	(1.95)	(1.72)	(3.04)	(3.22)
Female	-0.0530				
	(0.44)				
Number of kids	-0.2042***	-0.3064		-0.1929**	
	(2.75)	(0.97)		(2.17)	
Number of kids squared	0.0272*** (3.34)	0.0399* (1.78)		0.0243** (2.07)	
Mother's age in years	0.0127 (1.53)	0.0364* (1.77)	0.0366* (1.79)	0.0094 (1.08)	0.0098 (1.12)
Mother's education	0.0805*** (3.61)	0.1794*** (3.47)	0.1679*** (3.20)	0.0659*** (2.85)	0.0659*** (2.86)
Father's education	0.0011	0.0007	-0.0021	0.0053	0.0059
	(0.07)	(0.02)	(0.07)	(0.34)	(0.38)
Head's age	0.0023	-0.0008	-0.0010	0.0027	0.0031
	(0.57)	(0.06)	(0.08)	(0.64)	(0.74)
Mother's height	0.0444***	0.0469**	0.0511**	0.0440***	0.0450***
	(4.85)	(2.12)	(2.28)	(4.82)	(4.89)
Constant	-8.6593***	-8.2162**	-9.5513***	-8.8069***	-9.3217***
	(5.53)	(2.42)	(2.75)	(5.67)	(5.97)
Observations	549	83	83	466	466
Adjusted R-squared	0.17	0.30	0.28	0.15	0.15

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: Program effect on poorer households that have more girls than boys

	(1) Pooled height-for-age Z-scores	(2) Girls height-for-age Z- scores	(3) Girls height-for-age Z-scores	(4) Boys height-for-age Z-scores	(5) Boys height-for-age Z-scores
Treatment area=1	-0.0370	-0.0542	-0.0445	0.0329	0.0698
	(0.55)	(0.70)	(0.57)	(0.30)	(0.62)
Time in mins to the drinking water source	-0.0163 (0.94)	0.0014 (0.07)	0.0009 (0.05)	-0.0581** (2.32)	-0.0588** (2.30)
Average time taken to go to the various available providers	-0.0904* (1.94)	-0.0942* (1.90)	-0.0918* (1.86)	0.0622 (0.27)	0.0645 (0.28)
Log of expenditure per capita	0.0457 (1.53)	0.0453 (1.37)	0.0448 (1.36)	0.0351 (0.64)	0.0340 (0.61)
Age in mths	-0.0164***	-0.0146***	-0.0144***	-0.0208***	-0.0198***
	(5.40)	(3.97)	(4.00)	(3.68)	(3.53)
Age in mthssq	0.0001***	0.0001***	0.0001***	0.0001***	0.0001***
	(5.33)	(4.03)	(4.04)	(3.52)	(3.45)
Female	-0.0000				
	(0.00)				
Number of kids	0.2085	0.1411		0.4685	
	(1.34)	(0.82)		(1.18)	
Number of kids squared	-0.0432 (1.58)	-0.0286 (0.90)		-0.0925 (1.53)	
Mother's age in years	-0.0051 (0.75)	-0.0026 (0.36)	-0.0027 (0.37)	-0.0132 (1.10)	-0.0149 (1.25)
Mother’s education	0.0697*** (4.18)	0.0834*** (4.18)	0.0850*** (4.35)	0.0336 (1.21)	0.0376 (1.37)
Father’s education	-0.0255**	-0.0226*	-0.0242*	-0.0313*	-0.0334*
	(2.28)	(1.70)	(1.84)	(1.76)	(1.91)
Head’s age	0.0052	0.0062	0.0060	0.0034	0.0028
	(1.05)	(1.38)	(1.37)	(0.39)	(0.34)
Mother’s height	0.0480***	0.0518***	0.0512***	0.0379***	0.0357***
	(8.71)	(7.50)	(7.43)	(4.14)	(3.94)
Constant	-9.3834***	-10.1643***	-9.9248***	-7.4658***	-6.6124***
	(10.32)	(9.01)	(9.05)	(4.92)	(4.67)
Observations	1488	1025	1025	463	463
Adjusted R-squared	0.10	0.10	0.10	0.09	0.08

Robust t statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Program effect on children living in poorer households with more boys

	(1) Pooled Height-for-age Z-scores	(2) Girls height-for-age Z-scores	(3) Girls height-for-age Z-scores	(4) Boys height-for-age Z-scores	(5) Boys height-for-age Z-scores
Treatment area=1	0.1351	0.1244	0.1365	0.1403	0.1666*
	(1.52)	(0.48)	(0.56)	(1.46)	(1.78)
Time in mins to the drinking water source	-0.0297*	-0.0298	-0.0293	-0.0262	-0.0250
	(1.82)	(0.65)	(0.64)	(1.54)	(1.46)
Average time taken to go to the various available providers	0.0103	-0.0511	-0.0703	0.0767	0.0895
	(0.06)	(0.21)	(0.29)	(0.37)	(0.43)
Log of expenditure per capita	0.0279	0.2187*	0.2151*	0.0058	0.0168
	(0.69)	(1.88)	(1.93)	(0.13)	(0.39)
Age in mths	-0.0209***	-0.0154	-0.0130	-0.0212***	-0.0225***
	(5.79)	(1.35)	(1.17)	(5.53)	(5.98)
Age in mthssq	0.0001***	0.0001	0.0001	0.0001***	0.0001***
	(5.33)	(1.54)	(1.35)	(4.93)	(5.37)
Female	-0.0053				
	(0.04)				
Number of kids	-0.0690	2.0791		-0.1231	
	(0.58)	(1.56)		(0.99)	
Number of kids squared	0.0001	-0.2648*		0.0104	
	(0.00)	(1.68)		(0.50)	
Mother's age in years	-0.0010	-0.0267	-0.0313	0.0036	0.0038
	(0.15)	(1.06)	(1.31)	(0.53)	(0.55)
Mother’s education	0.0503***	-0.0123	-0.0089	0.0615***	0.0652***
	(2.71)	(0.24)	(0.18)	(3.04)	(3.22)
Father’s education	0.0215	0.0672**	0.0685**	0.0117	0.0102
	(1.45)	(1.98)	(2.04)	(0.70)	(0.61)
Head’s age	0.0038	0.0216	0.0203	0.0019	0.0029
	(0.82)	(1.49)	(1.43)	(0.40)	(0.61)
Mother’s height	0.0328***	0.0346*	0.0296	0.0327***	0.0325***
	(4.01)	(1.81)	(1.60)	(3.64)	(3.57)
Constant	-6.6272***	-12.6093**	-7.8663**	-6.4783***	-6.7822***
	(5.10)	(2.55)	(2.35)	(4.63)	(4.78)
Observations	949	134	134	815	815
Adjusted R-squared	0.10	0.07	0.07	0.11	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Program effect on children living with at least one boy

	(1) pooled	(2) boys	(3) Girls
Treatment dummy	0.1064*	0.1377*	0.0711
	(1.94)	(1.77)	(0.94)
Time in mins to the drinking water source	-0.0247**	-0.0170	-0.0323**
	(2.23)	(1.15)	(2.13)
Average time taken to go to the various available providers	-0.0494	0.0198	-0.0579
	(1.13)	(0.16)	(1.35)
Log of expenditure per capita	0.0447*	0.0273	0.0673**
	(1.70)	(0.73)	(2.01)
Age in mths	-0.0195***	-0.0254***	-0.0132***
	(8.23)	(7.85)	(3.88)
Age in mths sq	0.0001***	0.0001***	0.0001***
	(7.94)	(7.06)	(4.23)
Female	-0.0046		
	(0.09)		
Mother's age in years	-0.0114**	-0.0037	-0.0200***
	(2.12)	(0.55)	(2.67)
Mother’s education	0.0670***	0.0638***	0.0670***
	(6.08)	(3.91)	(4.71)
Father’s education	-0.0075	-0.0016	-0.0143
	(0.88)	(0.12)	(1.34)
Head’s age	0.0089***	0.0061	0.0132***
	(2.58)	(1.46)	(3.11)
Mother's height	0.0414***	0.0332***	0.0488***
	(8.19)	(4.82)	(6.75)
Constant	-8.1146***	-6.6772***	-9.5643***
	(9.90)	(5.89)	(8.42)
Observations	2286	1163	1123
Adjusted R-squared	0.11	0.12	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Program effect on children living with at least one girl

	(1) Pooled	(2) Boys	(3) girls
Treatment dummy	0.0675	0.1163*	0.0134
	(1.24)	(1.66)	(0.16)
Time in mins to the drinking water source	-0.0134	-0.0227	-0.0028
	(0.94)	(1.32)	(0.12)
Average time taken to go to the various available providers	0.0346	0.0453	0.0324
	(0.40)	(0.38)	(0.27)
Log of expenditure per capita	0.0022	0.0196	-0.0242
	(0.09)	(0.61)	(0.66)
Age in mths	-0.0179***	-0.0217***	-0.0138***
	(7.27)	(6.48)	(3.73)
Age in mths sq	0.0001***	0.0001***	0.0001***
	(6.76)	(5.87)	(3.62)
Female	-0.0050	0.0000	0.0000
	(0.09)	(.)	(.)
Mother's age in years	-0.0078	-0.0088	-0.0068
	(1.41)	(1.38)	(0.81)
Mother’s education	0.0733***	0.0564***	0.0915***
	(6.18)	(3.70)	(4.98)
Father’s education	-0.0156*	-0.0180*	-0.0123
	(1.87)	(1.65)	(0.99)
Head’s age	0.0069**	0.0084**	0.0063
	(2.04)	(2.22)	(1.41)
Mother's height	0.0445***	0.0381***	0.0507***
	(9.41)	(6.57)	(6.54)
Constant	-8.3376***	-7.3049***	-9.3356***
	(11.22)	(7.95)	(7.71)
Observations	2219	1205	1014
Adjusted R-squared	0.10	0.11	0.10

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Program effect on children living with same sex siblings only

	(1) only boys	(2) Only girls
Treatment dummy	0.1088	0.0360
	(1.22)	(0.37)
Time in mins to the drinking water source	-0.0261*	0.0175
	(1.71)	(0.77)
Average time taken to go to the various available providers	-0.0381	-0.2430
	(0.25)	(1.26)
Log of expenditure per capita	0.0544	-0.0297
	(1.27)	(0.71)
Age in mths	-0.0233***	-0.0090**
	(5.98)	(1.99)
Age in mths sq	0.0001***	0.0000
	(5.38)	(1.63)
Female	-	-
Mother's age in years	0.0105	0.0169**
	(1.61)	(2.15)
Mother's education	0.0515***	0.0981***
	(2.77)	(4.19)
Father's education	0.0188	-0.0097
	(1.27)	(0.64)
Head's age	-0.0024	-0.0015
	(0.61)	(0.38)
Mother's height	0.0335***	0.0529***
	(3.84)	(6.42)
Constant	-7.0618***	-10.0466***
	(5.15)	(7.59)
Observations	803	655
Adjusted R-squared	0.12	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Program effect on children living with opposite sex siblings only

	(1) girls with male sibs	(2) girls with fem sibs	(3) boys with male sibs	(4) boys with fem sibs
Treatment	0.1878*	-0.0183	0.1376	0.0682
	(1.82)	(0.15)	(1.19)	(0.70)
Time in mins to the	-0.0295	0.0386	-0.0092	-0.0324
drinking water source	(1.52)	(1.09)	(0.50)	(1.35)
Average time taken	-0.0902	-0.1272	0.0362	0.0796
to go to the various	(1.55)	(0.51)	(0.20)	(0.46)
available providers				
Log of expenditure	0.0581	-0.1108**	0.0453	0.0152
per capita	(1.18)	(2.20)	(0.80)	(0.35)
Age in mths	-0.0113**	-0.0120**	-0.0266***	-0.0176***
	(2.37)	(2.08)	(5.72)	(3.52)
Age in mths sq	0.0001**	0.0000	0.0001***	0.0001***
	(2.44)	(1.44)	(5.19)	(3.31)
Mother's age in years	-0.0109	0.0218*	0.0139	-0.0016
	(1.18)	(1.85)	(1.54)	(0.20)
Mother's education	0.0514**	0.0978***	0.0456*	0.0404*
	(2.46)	(3.23)	(1.89)	(1.84)
Father's education	-0.0165	-0.0107	0.0244	-0.0186
	(1.19)	(0.54)	(1.24)	(1.35)
Head's age	0.0106**	-0.0011	-0.0050	0.0023
	(2.12)	(0.20)	(1.05)	(0.51)
Mother's height	0.0499***	0.0561***	0.0284**	0.0372***
	(5.44)	(5.07)	(2.59)	(4.54)
Constant	-9.8684***	-9.9734***	-6.2480***	-7.2042***
	(6.53)	(5.65)	(3.54)	(6.00)
Observations	536	427	537	579
Adjusted R-squared	0.10	0.11	0.11	0.07

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12: Program effect on children according to birth order

	(1) pooled	(2) Boys	(3) girls
Treatment area=1	0.1408*	0.2122*	0.0741
	(1.66)	(1.90)	(0.59)
Time in mins to the drinking water source	-0.0209**	-0.0261**	-0.0138
	(2.24)	(2.26)	(1.01)
Average time taken to go to the various available providers	-0.0704	-0.0108	-0.0831*
	(1.63)	(0.11)	(1.74)
Log of expenditure per capita	0.0297	0.0323	0.0241
	(1.55)	(1.26)	(0.90)
Age in mths	-0.0170***	-0.0221***	-0.0117***
	(9.24)	(8.71)	(4.32)
Age in mthssq	0.0001***	0.0001***	0.0001***
	(8.49)	(7.70)	(4.26)
Female	-0.0019		
	(0.05)		
Birth order	-0.0176	-0.0116	-0.0234
	(0.52)	(0.26)	(0.47)
Treatment* birth order	-0.0272	-0.0573	0.0010
	(0.62)	(1.03)	(0.01)
Mother's age in years	0.0002	0.0021	-0.0020
	(0.04)	(0.43)	(0.36)
Mother’s education	0.0677***	0.0565***	0.0798***
	(7.60)	(4.76)	(6.22)
Father’s education	-0.0083	-0.0038	-0.0127
	(1.31)	(0.44)	(1.44)
Head’s age	0.0046**	0.0037	0.0062**
	(2.00)	(1.32)	(2.10)
Mother's height	0.0427***	0.0360***	0.0491***
	(11.35)	(7.13)	(8.96)
Constant	-8.3762***	-7.2070***	-9.5708***
	(14.10)	(9.05)	(11.10)
Observations	3786	2008	1778
Adjusted R-squared	0.11	0.12	0.10

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Program effect on children, according to sibling composition and birth order, using OLS

	(1) Haz	(2) Haz	(3) Haz	(4) Haz	(5) Haz	(6) haz
Treatment dummy	0.0948** (2.25)	0.0862** (1.97)	0.0621 (1.41)	0.0619 (1.41)		
Prop of lifetime exposed						0.0679 (1.21)
Exposed at birth					0.0524 (1.16)	
Time in mins to the drinking water source	-0.0208** (2.23)	-0.0208** (2.23)	-0.0214** (2.29)	-0.0211** (2.26)	-0.0212** (2.26)	-0.0212** (2.26)
Average time taken to go to the various available providers	-0.0701 (1.62)	-0.0686 (1.59)	-0.0682 (1.58)	-0.0659 (1.53)	-0.0696 (1.61)	-0.0693 (1.60)
Log of expenditure per capita	0.0304 (1.58)	0.0312 (1.62)	0.0242 (1.26)	0.0245 (1.28)	0.0248 (1.29)	0.0250 (1.30)
Age in mths	-0.0168*** (9.21)	-0.0169*** (9.21)	-0.0157*** (8.19)	-0.0157*** (8.17)	-0.0158*** (8.19)	-0.0157*** (8.17)
Age in mths sq	0.0001*** (8.67)	0.0001*** (8.68)	0.0001*** (8.37)	0.0001*** (8.34)	0.0001*** (8.39)	0.0001*** (8.40)
Female	-0.0005 (0.01)	-0.0001 (0.00)	0.0056 (0.15)	0.0071 (0.18)	0.0073 (0.19)	0.0077 (0.20)
Mother's age in years	-0.0012 (0.33)	-0.0009 (0.25)	-0.0034 (0.86)	-0.0034 (0.85)	-0.0035 (0.88)	-0.0036 (0.90)
Mother’s education	0.0681*** (7.64)	0.0687*** (7.69)	0.0674*** (7.53)	0.0674*** (7.53)	0.0674*** (7.53)	0.0674*** (7.53)
Father’s education	-0.0087 (1.37)	-0.0093 (1.44)	-0.0084 (1.31)	-0.0086 (1.33)	-0.0085 (1.32)	-0.0084 (1.31)
Head’s age	0.0047** (2.06)	0.0046** (2.06)	0.0044* (1.95)	0.0044* (1.94)	0.0044* (1.93)	0.0044* (1.95)
Mother's height	0.0424*** (11.32)	0.0429*** (11.44)	0.0431*** (11.55)	0.0431*** (11.55)	0.0431*** (11.55)	0.0431*** (11.56)
Muslim		-0.0919 (1.18)	-0.0840 (1.07)	-0.0846 (1.08)	-0.0870 (1.11)	-0.0881 (1.13)
Number of kids			-0.0859*** (3.53)			
Birth order			0.0580 (1.64)	0.0579 (1.63)	0.0585* (1.65)	0.0593* (1.68)
Number of fem sibs				-0.0702** (2.47)	-0.0717** (2.52)	-0.0715** (2.51)
Number of male sibs				-0.1020*** (3.52)	-0.1031*** (3.56)	-0.1030*** (3.56)
Constant	-8.3667*** (14.06)	-8.3592*** (14.05)	-8.2062*** (13.80)	-8.2987*** (13.98)	-8.2787*** (13.97)	-8.3009*** (13.98)
Observations	3786	3786	3786	3786	3786	3786
Adjusted R-squared	0.11	0.11	0.11	0.11	0.11	0.11

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 14: Program effect on children, according to sibling composition and birth order, using Fixed Effects

	(1)	(2)	(3)
	OLS	FE	RE
Exposed at birth	0.0400	-0.0122	0.0305
	(0.80)	(0.08)	(0.63)
Time in mins to the drinking water source	-0.0175*	-	-0.0173
	(1.67)		(1.59)
Average time taken to go to the various available providers	-0.0503	-	-0.0498
	(1.14)		(0.83)
Log of expenditure per capita	0.0127	-	0.0149
	(0.60)		(0.67)
Age in mths	-0.0176***	-0.0153***	-0.0170***
	(8.37)	(5.49)	(9.21)
Age in mths sq	0.0001***	0.0001***	0.0001***
	(8.67)	(5.31)	(8.49)
Female	0.0155	-0.0736	0.0067
	(0.37)	(1.32)	(0.16)
Muslim	-0.0738	-0.3276	-0.0700
	(0.84)	(0.23)	(0.86)
Number of female sibs	-0.0709**	-	-0.0787**
	(2.16)		(2.27)
Number of male sibs	-0.1020***	-	-0.1103***
	(3.03)		(3.14)
Birth order	0.0472	0.0469	0.0495
	(1.20)	(0.60)	(1.28)
Mother's age in years	-0.0065	-0.0160	-0.0064
	(1.38)	(1.06)	(1.42)
Mother’s education	0.0653***	-0.0280	0.0656***
	(6.69)	(0.34)	(6.83)
Father’s education	-0.0095	-0.0389	-0.0089
	(1.35)	(0.66)	(1.24)
Head’s age	0.0057**		0.0055**
	(2.18)		(2.41)
Mother's height in cms	0.0431***	-0.0141	0.0421***
	(10.69)	(0.51)	(10.28)
Constant	-8.0700***	1.5363	-7.9259***
	(12.54)	(0.35)	(12.19)
Observations	3292	3292	3292
R-squared	0.11	0.06	
Number of households		1995	1995

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 15: Program effect on children, according to sibling composition and birth order, according to land holding

	(1) Pooled	(2) land<1	(3) land>=1
Treatment dummy	0.0602	0.0216	0.1249*
	(1.38)	(0.39)	(1.76)
Time in mins to the drinking water source	-0.0201**	-0.0218*	-0.0147
	(2.15)	(1.79)	(1.01)
Average time taken to go to the various available providers	-0.0646	-0.0721	-0.0609
	(1.50)	(1.56)	(0.60)
Log of expenditure per capita	0.0243	0.0383	-0.0076
	(1.27)	(1.60)	(0.24)
Age in mths	-0.0156***	-0.0171***	-0.0135***
	(8.07)	(6.97)	(4.29)
Age in mths sq	0.0001***	0.0001***	0.0001***
	(8.26)	(7.45)	(3.96)
Female	0.0097	-0.0017	0.0273
	(0.25)	(0.03)	(0.44)
Muslim	-0.0857	-0.1132	-0.0156
	(1.09)	(1.15)	(0.13)
Birth order	0.0589*	0.0878*	0.0097
	(1.66)	(1.83)	(0.18)
Number of kids	-0.2533**	-0.0356	-0.3777***
	(2.55)	(0.24)	(3.74)
Number of kids sq	0.0223*	-0.0115	0.0414***
	(1.74)	(0.57)	(4.11)
Number of female sibs	0.1456*	0.0459	0.2518**
	(1.89)	(0.42)	(2.35)
Number of female sibs sq	-0.0403*	-0.0162	-0.0719**
	(1.70)	(0.44)	(2.49)
At least one boy	0.0330	-0.0142	0.0357
	(0.45)	(0.15)	(0.33)
Mother's age in years	-0.0036	-0.0065	0.0020
	(0.91)	(1.18)	(0.33)
Mother’s education	0.0674***	0.0629***	0.0709***
	(7.53)	(4.99)	(5.17)
Father’s education	-0.0084	-0.0077	-0.0091
	(1.31)	(0.84)	(0.99)
Head’s age	0.0042*	0.0045	0.0036
	(1.85)	(1.25)	(1.31)
Mother's height in cms	0.0430***	0.0428***	0.0441***
	(11.52)	(9.22)	(6.99)
Constant	-8.0121***	-8.2087***	-7.9516***
	(13.31)	(10.99)	(7.92)
Observations	3786	2437	1349
Adjusted R-squared	0.11	0.10	0.12

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 16: Program effect on girls in richer households, according to sibling composition and birth order

	(1) height-for-age Z-scores	(2) height-for-age Z-scores	(3) height-for-age Z-scores
Treatment dummy	0.2155**	0.2062**	0.2066**
	(2.10)	(2.00)	(2.00)
Time in mins to the drinking water source	-0.0200	-0.0226	-0.0235
	(1.08)	(1.21)	(1.29)
Average time taken to go to the various available providers	-0.0478	-0.0416	-0.0465
	(0.32)	(0.27)	(0.30)
Log of expenditure per capita	-0.0765	-0.0813*	-0.0821*
	(1.63)	(1.73)	(1.75)
Age in mths	-0.0033	-0.0030	-0.0034
	(0.75)	(0.69)	(0.76)
Age in mths sq	0.0000	0.0000	0.0000
	(1.00)	(0.92)	(0.99)
Muslim	0.0122	0.0003	-0.0036
	(0.08)	(0.00)	(0.02)
Birth order	0.0873	0.0901	0.0832
	(1.04)	(1.07)	(0.99)
Number of kids	-0.3079**	-0.1541	
	(2.15)	(1.02)	
Number of kids sq	0.0324**	0.0066	
	(2.54)	(0.32)	
Number of female sibs	0.1135		-0.0677
	(0.74)		(0.54)
Number of female sibs sq	-0.0470		-0.0155
	(1.15)		(0.43)
Number of male sibs		-0.3382	-0.5180**
		(1.02)	(2.24)
Number of male sibs sq		0.0916	0.1121***
		(1.18)	(2.59)
At least one boy	-0.2068	0.0203	0.0657
	(1.22)	(0.07)	(0.26)
Mother's age in years	-0.0016	-0.0014	-0.0011
	(0.18)	(0.15)	(0.13)
Mother’s education	0.0907***	0.0903***	0.0896***
	(4.91)	(4.88)	(4.82)
Father’s education	-0.0137	-0.0143	-0.0143
	(1.05)	(1.09)	(1.09)
Head’s age	0.0032	0.0034	0.0033
	(0.80)	(0.83)	(0.81)
Mother's height in cms	0.0473***	0.0468***	0.0468***
	(4.75)	(4.69)	(4.62)
Constant	-8.3913***	-8.4311***	-8.5751***
	(5.32)	(5.25)	(5.40)
Observations	619	619	619
Adjusted R-squared	0.12	0.12	0.12

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 17: Program effect on boys in poorer households, according to sibling composition and birth order

	(1)	(2)	(3)
	height-for-age Z-scores	height-for-age Z-scores	height-for-age Z-scores
Treatment dummy	0.0815	0.0797	0.0805
	(1.06)	(1.04)	(1.05)
Time in mins to the drinking water source	-0.0316**	-0.0340**	-0.0320**
	(2.28)	(2.47)	(2.32)
Average time taken to go to the various available providers	0.0607	0.0448	0.0587
	(0.38)	(0.28)	(0.37)
log of expenditure per capita	0.0158	0.0140	0.0178
	(0.47)	(0.41)	(0.53)
Age in mths	-0.0195***	-0.0191***	-0.0196***
	(5.91)	(5.84)	(5.92)
Age in mths sq	0.0001***	0.0001***	0.0001***
	(6.03)	(5.99)	(6.04)
Muslim	-0.1560	-0.1500	-0.1548
	(1.32)	(1.27)	(1.31)
Birth order	0.1175*	0.1193*	0.1167*
	(1.89)	(1.90)	(1.88)
Number of kids	-0.2836	-0.1195	
	(1.56)	(0.87)	
Number of kids sq	0.0194	-0.0041	
	(0.84)	(0.18)	
Number of female sibs	0.2055		-0.0005
	(1.42)		(0.00)
Number of female sibs sq	-0.0755		-0.0609
	(1.62)		(1.48)
Number of male sibs		-0.2454	-0.1651
		(0.67)	(1.54)
Number of male sibs sq		0.0631	0.0087
		(0.65)	(0.23)
At least one boy	0.0513	0.1836	
	(0.38)	(0.61)	
Mother's age in years	-0.0062	-0.0062	-0.0057
	(0.92)	(0.92)	(0.85)
Mother's education	0.0556***	0.0552***	0.0551***
	(3.40)	(3.37)	(3.37)
Father's education	-0.0061	-0.0053	-0.0056
	(0.48)	(0.42)	(0.44)
Head's age	0.0023	0.0021	0.0023
	(0.54)	(0.50)	(0.53)
Mother's height in cms	0.0348***	0.0347***	0.0349***
	(5.09)	(5.09)	(5.12)
Constant	-6.4123***	-6.5290***	-6.7361***
	(5.98)	(6.11)	(6.33)
Observations	1278	1278	1278
Adjusted R-squared	0.10	0.10	0.10

Robust t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 18: Profile of Stunting amongst children below 14 years of age

	All	<2yrs	2-4	5-9	10-13
Program					
MCH intensive^	55.95	35.46	56.44	58.77	60.81
MCH	56.42	37.50	56.08	59.64	60.80
Comparison	61.27	39.36	62.04	63.14	68.37
Gender					
Female	58.77	41.70	63.79	59.29	62.78
Male	59.13	35.54	54.82	63.70	66.10
Birth order					
=1 & female	60.27	56.90	58.87	57.66	63.66
>1 & female	57.66	37.31	65.79	60.20	58.75
=1 & male	61.54	33.33	52.63	60.30	67.65
>1 & male	57.20	36.12	55.59	65.63	60.29
Religion					
Muslim	58.91	34.34	59.15	61.41	65.00
Hindu	59.41	40.00	60.23	61.96	61.96
Literacy					
Mother	53.93	36.16	56.45	55.85	57.45
Father	58.36	37.25	61.56	60.33	61.67
Size					
Hhsize4	56.23	40.83	57.69	60.12	57.97
Hhsize5-8	61.04	39.94	61.24	62.76	66.63
Hhsize9more	50.97	30.11	52.29	55.10	59.32
Assets					
Own house	58.80	38.03	59.53	61.25	64.58
Land<1acre	61.94	40.99	62.48	63.82	68.52
Land>=1acre	54.09	34.82	53.42	57.40	59.23
Households with					
More boys	60.08	34.70	55.45	64.82	67.90
More girls	58.23	40.98	61.51	59.48	62.21
Only boys	59.17	36.00	55.38	63.75	66.67
Only girls	55.94	44.54	61.36	53.70	62.15
At least 1 boy	61.33	37.11	60.44	64.77	66.94
At least 1 girl	58.93	36.67	61.47	61.07	64.06
Girls with only male sibs	59.71	38.24	58.73	63.60	63.12
Girls with only female sibs	55.35	36.36	65.66	54.85	59.14
Boys with only male sibs	62.39	38.81	58.82	66.95	68.13
Boys with only female sibs	55.98	38.46	56.78	58.48	59.28
All	58.96	38.46	59.26	61.46	64.74
N	4347	546	864	1845	1092

^ Intensive area encompasses Blocks A and C that received the intensive treatment first.

Summary Statistics (0-14 years)

Variable	N	Mean	Std. Dev.
Dependent Variable			
Height-for-age Z-score	4347	-2.1344	1.2838
Weight-for-age Z score	4946	-2.2419	0.9721
Weight-for-height Z score	3529	-1.2280	1.0843
Stunted	4347	0.5896	0.4919
Underweight	4946	0.6684	0.4708
Wasted	3529	0.2355	0.4244
Program Variables			
1982 program =1	8423	0.2545	0.4356
1982/86 program =1	8423	0.4574	0.4982
Control area =1	8423	0.5426	0.4982
Percent Exposed at birth	8423	0.3964	0.4891
Exposure as a proportion of life	8423	0.3310	0.4189
Years of exposure	7737	1.4866	2.0666
Mother's years of exposure	7909	4.8256	5.8909
Other targeted members' years of exposure	7292	5.1148	8.9273
Household Characteristics			
Time to drinking water (minutes)	8410	1.9870	2.2056
Average time to health provider from headman's house (hours)	8423	0.4806	0.3914
Log (total expenditure per capita)	8423	7.3915	1.1234
Head's Education	8423	3.0215	3.6874
Head's Age in yrs	8423	46.1042	12.3640
Household Land ownership (acres)	7598	1.6284	10.4869
Individual Characteristics			
Age in years	8423	7.3206	3.9621
Age squared	8423	69.2878	58.1064
Whether Female=1	8423	0.4950	0.5000
Mother's height (centimeters)	6584	150.1529	5.7441
Mother's age in years	7381	34.6857	7.1092
Father's age in years	6558	42.8284	9.2050
Mother's education in years	8423	1.8549	2.7739
Father's education	8423	2.5121	3.6305
Head's age in years	8423	46.1042	12.3640
Head's education in years	8423	3.0215	3.6874