Does Mother's Schooling Improve Child Health in Slums? Evidence from India[*]

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Abstract

We use data from the 2005-06 National Family Health Survey to study the relationship between maternal education and child health in India, focusing on the differences between rural, urban, and urban slum areas. For rural and urban areas increasing maternal education significantly improves child health, with the effect of an additional year of education significantly higher in urban areas than in rural areas. This effect does not hold in slum areas. Children of mother's with no education do significantly better in slums than in rural areas, but education affect health substantially less in slums than in rural or urban areas. Only for women with high levels of education, more than 10 years, is the effect of education on child health statistically significant. This effect masks large difference between boys and girls with the marginal effect of education for boys close to zero. We examine different explanations for these results.

1 Introduction

Rapidly growing slums is a important characteristics of the increased urbanization in many developing countries. Between 2000 and 2010, the number of slum dwellers in developing countries increased from 767 million to 828 million, and the figure might reach 889 million by 2020 (UN-HABITAT 2010). Although development economics has a long-lasting focus on agricultural societies and rural areas, both theoretical and empirical studies on slums are still scarce and urgently needed.

Slums are notorious for the poor living conditions. Actually, "having poor living condition" is the main characteristics used to define a slum. According to UN-HABITAT (2003), a simple definition of a slum would be "a heavily populated urban area characterized by substandard housing and squalor". More specifically, a slum is an area that combines to various extents the following characteristics: inadequate access to safe water, inadequate access to sanitation and other infrastructure, poor structural quality of housing, overcrowding and insecure residential status. In the Indian 2005-06 National Family Health Survey (NFHS-3), the definition of slums is a compact area of at least 300 population or about 60 to 70 households or poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities.

Slums also lead to poor health for the urban dwellers (Kimani-Murage and Ngindu 2007). The current child health conditions will be crucial for

the whole slum and urban population in the next decades. Fry, Cousins, and Olivola (2002) focus on Ahmedabad, the largest city in Gujarat, India, and indicate that the child health conditions in urban slums are worse than the national average, in terms of child mortality, immunization rates and more indicators. However, they also suggest that the greater availability of healthy practitioners is an advantage for slum children over their rural counterparts, and slums often turn out to be stable and homogeneous communities rather than chaotic agglomerations, which is a hidden strength of the urban poor. Due to the density of slum population, appropriate policies can generate great external effects and become more effective at lower costs. One way to understand the urban or slum population so that effective actions can be implemented is to examine if some proven mechanisms also exist among slums or urban areas.

While urbanization appears to be a force for better health, the health benefits of urbanization are not uniform. Dye (2008) indicates that the children of both rich and poor families gain from urban living, but the rich gain more. Fotso (2006) shows that in both urban and rural areas, children from the poorest households stand greater risk to be undernourished, than their counterparts in the most privileged households, but this socioeconomic inequality in stunting is significantly larger in urban areas. This suggests that using global urban-rural prevalence to characterize child malnutrition may be misleading so in this paper, we propose to overcome this limitation by specifying how slums are different from the non-slum urban area.

James, Ferro-Luzzi, and Waterlow (1988) examine the average BMI (Body Mass Index) of urban Indians for two socioeconomic groups (higher social group and slum) and two age groups (20-25 and 40-45). The results show that the average BMI of both ages of slum dwellers are lower than BMI of the higher social group people.

Most economic and demographic studies of the determinant of child health find a positive effect on parental, especially maternal, educational attainment on child health (Behrman and Deolalikar 1988; Berhman 1990; Strauss and Thomas 1995; Lam and Duryea 1999; Glewwe 1999). For example, it is estimated that an additional year of schooling of the mother yields a 10 percent reduction in the under-five mortality (Herz and Sperling 2004).

Some studies focus on the mechanisms that link mother's education and child health. For instance, the impact of maternal education can be explained by access to information through different channels (Thomas, Strauss, and Henriques 1991) or by the health knowledge of the mother (Glewwe 1999), and the health knowledge may even crowd out the effects of maternal education (Kovsted, Pörtner, and Tarp 2003).

Abuya, Ciera, and Elizabeth (2011) focus on two urban slums in Nairobi and find that that close to 40 percent of children are stunted. The introduction of the slum of residence reduces the magnitude of the effect of mother's education on stunting, but they did not further explore reasons for that reduction.

This paper examines if the strong and positive link between maternal

education and child health would be affected due to the extremely poor living conditions and high density in slums. This paper utilizes the new characteristics of an Indian survey to study the impact of maternal education on child health in India across rural, urban, and slum areas. The rapidly-growing slum population makes India one of the most ideal countries to study slums. According to the Indian government (Housing and Urban Poverty Alleviation Minister Kumari Selja in 2010), India's slum-dwelling population had risen from 27.9 million in 1981 to 75.26 million in 2001 and is expected to increase to 93.06 million in 2011. We find that the effect of mother's education on child health is significantly stronger in urban non-slum areas than rural areas, but this benefit is non-existent in slum areas.

2 Data

The data used in this paper come from the 2005-06 National Family Health Survey (NFHS-3). NFHS-3 is the third in a series of national surveys; earlier NFHS surveys were carried out in 1992-93 (NFHS-1) and 1998-99 (NFHS-2). All three surveys were conducted under the stewardship of the Ministry of Health and Family Welfare, Government of India, with the International Institute for Population Sciences, Mumbai, serving as the nodal agency. One improvement in NFHS-3 is that the urban samples are disaggregated into slum and non-slum, which yields a great advantage to study slum and non-slum dwellers respectively.

The urban and rural samples within each state were drawn separately and, to the extent possible, unless oversampling was required to permit separate estimates for urban slum and non-slum areas, the sample within each state was allocated proportionally to the size of the state's urban and rural populations. A uniform sample design was adopted in all states. In each state, the rural sample was selected in two stages, with the selection of Primary Sampling Units (PSUs), which are villages, with probability proportional to population size (PPS) at the first stage, followed by the random selection of households within each PSU in the second stage. In urban areas, a three-stage procedure was followed. In the first stage, wards were selected with PPS sampling. In the next stage, one census enumeration block (CEB) was randomly selected from each sample ward. In the final stage, households were randomly selected within each selected CEB.

Each PSU in eight large cities (Chennai, Delhi, Hyderabad, Indore, Kolkata, Meerut, Mumbai, Nagpur) were classified according to whether it is in a slum area according to the census and to whether it is in a slum according to the survey supervisor. In this paper, a sample is considered in a slum when it was identified either by the census or by the survey supervisor. The replications of the main results by using the census identification and the supervisor identification are available upon request.

Table 1 presents the descriptive statistics in the three populations: rural, urban non-slums and urban slums. We limit the sample to children under five years old. Since height-for-age is the better measure to predict children's

health in the long run, weight-for-age z-score, weight-for-height z-score and BMI are not used in the analysis of this paper, but the means of these variables still help us see the general difference across different populations.

Urban children are taller and healthier than children in rural areas. Slum children are less healthy than non-slum children but still much healthier than rural children. What is intriguing is that the average level of education of both mothers and fathers in urban non-slums and slum areas are close to each other and substantially higher than in rural areas. Despite this the health measures for slums areas are essentially mid-point between rural areas and urban non-slum areas.

The most ideal information to measure the density of living across households would be the distance between houses, which is not available in our data. Instead, we use the number of people per room to try to capture the density of living within each household. Not surprisingly, slums have the highest density, but the differences are not that large.

3   Estimation Strategy

To model the effect of mother's education, this paper begins by estimating the following equation:

$$Z_{ij} = \alpha + \beta_1 M_{ij} + \beta_2 A_j + \beta_3 M_{ij} A_j + \beta 4 X_{ij} + \beta_5 H_j + \epsilon_{ij} \qquad (1)$$

Z_{ij} is the health status of child i in household j. Following Glewwe (1999) and Abuya, Ciera, and Elizabeth (2011), this paper uses height-for-age z-scores (HAZ) as the child health indicator. Height-for-age z-scores are based on fitting a standard normal distribution to the growth curves of a healthy population of children. A child with a z-score of zero is exactly at the median in terms of height for age, while children with positive (negative) z-scores are taller (shorter) than average. M_{ij} is mother's years of schooling of the child. A_j is the area of residence of the household. We divide the whole sample into three separate areas: rural, urban non-slum and urban slum areas. X_{ij} is a vector of personal characteristics of that child. H_j is a vector of the household characteristics included place of residence. The variable ϵ_{ij} represents the error term.

A potential issue is that there may be a correlation between unobservable household characteristics and place of residence. On one hand, urban dwellers that do poorly in economic life may be more likely to move to slums. On the other hand, rural people who are interested in improving their living conditions may see slums as a first step toward living in the urban non-slum areas. Furthermore, if households know that living in slums is bad for their children's health, those who care more about child health are more likely to move away from slums. Unfortunately, the NFHS-3 does not provide much information about migration making it difficult to control for selection into living in urban non-slum and slum areas. Because the interest in slums is relatively new there are no longitudinal data sets available that could address

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this potential correlation.

4   Results

Table 2 presents the estimation results by using equation (1). Not surprisingly, children with a taller mother and a more educated father are healthier. Muslim children are less healthier compared with children in households with other religions. Children in higher castes are healthier. The dummies for living in urban non-slums and slums are both positive and statistically significant. Living in cities clearly leads to better child health than living in rural areas. The positive impact of city living is, however, about 25 percent smaller for slum areas than for non-slum areas.

Column 1 shows that mother's education has a significant impact on child health fo the whole sample and for the rural children, which is consistent with evidence from other countries (see Section II in Glewwe (1999) for a more detailed review). The positive impact of maternal education is almost twice as large for urban non-slum children than for rural children. It is possible that due to the better access to health services in cities, mothers with more education have more ways to use their knowledge to improve children's health. However, the impact of mother's education in slums is identical to the effect in rural areas. In other words, living in urban area has a positive impact on child health, while children living in slums do not get the extra positive effect that comes from more education in urban areas.

Since only seven states, namely Delhi, Uttar Pradesh, West Bengal, Madhya Pradesh, Maharashtra, Andhra Pradesh and Tamil Nadu, have samples from slums, Column 2 presents the estimation in these seven states to make the three populations more comparable to each other. In these states with slums, the advantage of being in urban areas is more obvious, and the education's impact on child health in slums is still not different from in rural areas.

Columns 3 and 4 show the comparison between girls and boys. The education impact for girls is lower than the impact for boys in rural areas, but in urban non-slums, mother's education has a greater impact, and the magnitude is much larger for girls. This might contribute to the higher gender equality in cities.

Across all columns in Table 2, child's age is significantly and negatively correlat with child's health. Figure 1 presents the adjusted predictions of height-for-age by child's age, sex and area. All children get less healthy over time, while urban children tend to bounce back slightly.

Selection bias is possible when people can decide where to live. To limit the impact of selection caused by migration, Table 3 replicates columns 1 and 2 in Table 2 and restrict the sample to people who have never changed their residence. Columns 3 and 4 are omitted due to the small sample size. The results are consistent except that there are more benefits to health for people living in slums. One possible reason is that children of mothers who moved into slums are less healthier than children of mothers who have been living

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in slums in their whole lives. Another factor to consider is the distribution of non-migrants. The last line of Table 1 presents the percentage of people who have never changed their residence. It is interesting that the percentage of non-migrants is higher in slums than in rural and urban non-slum areas.

Table 4 presents the estimation results by using education level dummies instead of years of schooling. The education effects appear only when having at least five years of education or above. There is almost no marginal benefit of getting more education for a boy's health after his mother has finished ten to eleven years of schooling, but the additional benefit is much greater for girls' health.

5 What Explains the Differential Impact of Maternal Education?

In order to explain the non-existent effects in slum areas, first, we consider the high density of living in slums. Although the distance between houses is unavailable in our data, we expect the number of people per room should be able to capture the density of living within each household. The density might be endogenous because parents who care more about their children's health might try to avoid a too crowded living environment. Thus, we construct a variable which is the average number of people per room in the PSU, excluding the household itself. This minus-i method will give us an estimate of density within each household in that area, but the variable is exogenous

by construction. The results in Table 5 show that increasing the number of people living in a room will significantly worsen the child's health. The results are consistent and even stronger when we limit the sample to people who have always lived in the current residence as shown in Table 6.

Second, we suspect that the quality of education may vary across areas so the same number of mothers' years of schooling may not yield the same benefit on child health. We use literacy as an indicator for the school quality and estimate the following equation:

$$L_{ij} = \alpha + \beta_1 M_{ij} + \beta_2 A_j + \beta_3 M_{ij} A_j + \beta 4 X_{ij} + \beta_5 H_j + \epsilon_{ij}. \quad (2)$$

L_{ij} is a binary variable indicating whether the mother child i in household j can read or write. This indicator was tested by showing the respondent a sentence and ask her to read and write, not self-reported. Other notations are the same as equation (1). The results are reported in Table 7. The number of years of schooling does increase the probability of being literate, but the area interaction effects are puzzling.

Third, we use the wealth index, constructed by NHFS, as another proxy for the quality of education. It is reasonable to assume that higher quality of educational investment should be tranformed into higher wealth status. We estimate the following equation:

$$W_j = \alpha + \beta_1 M_{ij} + \beta_2 A_j + \beta_3 M_{ij} A_j + \beta 4 X_{ij} + \beta_5 H_j + \epsilon_{ij}. \quad (3)$$

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W_j is the wealth index of household j. Other notations are the same as equations (1) and (2). The results are reported in Table 8. The number of years of schooling has a positive correlation with the household wealth, but for households in slums, there is an offsetting effect. The difference might be driven by the fact that many highly-educated and wealthy households in urban non-slum areas put more efforts in maintaining a clean living environment, such as hiring domestic helpers to clean the house daily, but the households in slums do not have the same practice regardless of their education level and wealth status. It is also interesting to notice that the households in slums are not significantly poorer than households in urban non-slum areas, as shown in Table 1.

6   Conclusion

With the rapid urbanization of the developing world understanding the determinants for child health in urban and slum areas are an important undertaking. Our results suggest that the effect of mother's education in urban non-slums areas is even strong than in rural areas, possibly because of easier access to health facilities. This extra effect of mothers' education is, however, absent for the slum children. The effect of mother's education is identical for rural and slum areas. We plan to investigate this intriguing result further in future versions of this paper.

Due to the extremely poor living condition in slums, future research may

want to consider variables capturing residential crowding, sanitation and health service facilities. If better data are available, dealing with the endogeneity issue caused by migration might shed more light on the potential mechanisms at work among the urban poor.

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7 Tables

Table 1: Descriptive Statistics

| Variable		All	Rural	Urban non-slums	Urban slums
Height-for-age z-score	Mean	-1.63	-1.76	-1.38	-1.52
	Std. Dev.	1.57	1.57	1.55	1.53
Weight-for-age z-score	Mean	-1.57	-1.70	-1.32	-1.45
	Std. Dev.	1.21	1.19	1.22	1.17
Weight-for-height z-score	Mean	-0.91	-0.99	-0.77	-0.84
	Std. Dev.	1.31	1.29	1.34	1.32
BMI	Mean	-0.76	-0.82	-0.63	-0.69
	Std. Dev.	1.34	1.32	1.37	1.37
Child's sex (female = 1)	Mean	0.48	0.48	0.48	0.47
	Std. Dev.	0.50	0.50	0.50	0.50
Child's age (in months)	Mean	30.09	29.83	30.54	30.46
	Std. Dev.	17.00	17.08	16.84	16.91
Mother's years of schooling	Mean	5.22	3.95	7.53	6.72
	Std. Dev.	5.10	4.50	5.39	5.04
Mother's height (in cm)	Mean	151.96	151.76	152.37	152.05
	Std. Dev.	5.79	5.78	5.82	5.72
Father's years of schooling	Mean	7.05	6.06	8.92	7.99
	Std. Dev.	5.11	4.88	5.09	4.76
Number of people per room	Mean	3.24	4.07	3.76	4.39
	Std. Dev.	1.80	1.92	1.76	1.87
Wealth Index (1 to 5)	Mean	3.13	2.59	4.03	4.10
(1 is the poorest)	Std. Dev.	1.39	1.27	1.11	0.89
Mother's literacy	Percentage	57.12	47.35	74.15	71.56
Non-migrant	Percentage	21.08	19.96	21.73	28.00
N		40299	25337	11966	2996
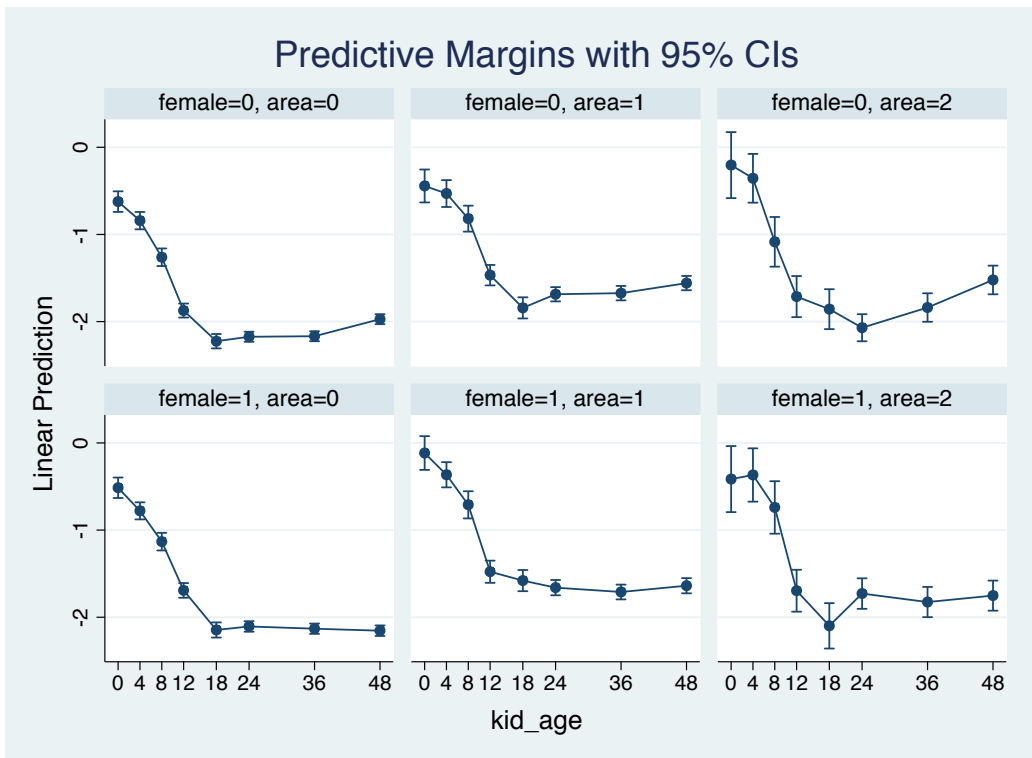
Figure 1: Adjusted Predictions of Height-for-Age by Child's Age, Sex and Area with 95 percent Confidence Intervals

8 Figures

Table 2: Reduced Form Estimation of Determinants of Height for Age Z-Scores

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
ln(mom's edu)	0.054***	0.049***	0.043***	0.053***
	(0.005)	(0.008)	(0.012)	(0.012)
ln(mom's edu)*area				
(ref: ln(mom's edu)*rural)				
ln(mom's edu)*urban non-slums	0.047***	0.063***	0.080***	0.047**
	(0.008)	(0.013)	(0.019)	(0.018)
ln(mom's edu)*urban slums	0.014	0.016	0.046*	-0.009
	(0.014)	(0.015)	(0.022)	(0.021)
area (ref: rural)				
urban non-slums	0.192***	0.227***	0.254***	0.209***
	(0.019)	(0.030)	(0.044)	(0.042)
urban slums	0.153***	0.174***	0.162**	0.189***
	(0.034)	(0.036)	(0.052)	(0.049)
child's sex (female=1)	0.029*	0.002		
	(0.015)	(0.023)		
child's age (in months)	-0.087***	-0.094***	-0.095***	-0.092***
	(0.002)	(0.003)	(0.004)	(0.004)
child's age^2	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
mom's height	0.051***	0.053***	0.048***	0.058***
	(0.001)	(0.002)	(0.003)	(0.003)
ln(dad's edu)	0.041***	0.039***	0.033**	0.046***
	(0.005)	(0.007)	(0.010)	(0.010)
religion (ref: Hindu)				
Muslim	-0.151***	-0.167***	-0.064	-0.263***
	(0.023)	(0.034)	(0.049)	(0.047)
Christian	0.005	-0.036	-0.143	0.056
	(0.040)	(0.101)	(0.140)	(0.144)
Other	0.026	0.107	0.239	0.010
	(0.041)	(0.083)	(0.124)	(0.110)
caste (ref: scheduled caste)				
scheduled tribe	0.040	-0.047	-0.015	-0.084
	(0.030)	(0.056)	(0.079)	(0.079)
other backward class	0.093***	0.103**	0.082	0.123**
	(0.022)	(0.032)	(0.046)	(0.044)
none of above	0.251***	0.250***	0.154**	0.333***
	(0.023)	(0.036)	(0.052)	(0.050)
control for states	Yes	Yes	Yes	Yes
constant	-8.536***	-8.836***	-7.930***	-9.702***
	(0.208)	(0.321)	(0.458)	(0.450)
N	38310	15201	7276	7925

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 3: Reduced Form Estimation of Determinants of Height for Age Z-Scores, Non-Migrants Only

	(1) All states	(2) States with slums
ln(mom's edu)	0.052***	0.068**
	(0.012)	(0.022)
ln(mom's edu)*area (ref: ln(mom's edu)*rural)		
ln(mom's edu)*urban non-slums	0.055**	0.082*
	(0.021)	(0.035)
ln(mom's edu)*urban slums	0.036	0.025
	(0.031)	(0.035)
area (ref: rural)		
urban non-slums	0.186***	0.204*
	(0.048)	(0.080)
urban slums	0.208**	0.235**
	(0.076)	(0.080)
child's sex (female=1)	0.050	0.072
	(0.033)	(0.054)
child's age (in months)	-0.089***	-0.092***
	(0.004)	(0.006)
child's age^2	0.001***	0.001***
	(0.000)	(0.000)
mom's height	0.048***	0.050***
	(0.003)	(0.005)
ln(dad's edu)	0.028**	0.023
	(0.011)	(0.018)
religion (ref: Hindu)		
Muslim	-0.109*	-0.031
	(0.054)	(0.079)
Christian	-0.022	0.193
	(0.074)	(0.177)
Other	0.024	0.190
	(0.088)	(0.157)
caste(ref: scheduled caste)		
scheduled tribe	0.071	-0.002
	(0.072)	(0.134)
other backward class	0.115*	0.110
	(0.057)	(0.077)
none of above	0.164**	0.104
	(0.061)	(0.089)
control for states	Yes	Yes
constant	-7.988***	-8.354***
	(0.479)	(0.736)
N	7903	2940

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 4: Reduced Form Estimation of Determinants of Height for
Age Z-Scores by Education Levels

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
Mom's edu*area				
(ref: no edu*rural)				
1-4 yrs of edu*rural	0.024	0.029	0.054	-0.011
	(0.035)	(0.063)	(0.090)	(0.088)
5-7 yrs of edu*rural	0.110***	0.086	0.034	0.131
	(0.028)	(0.049)	(0.069)	(0.069)
8-9 yrs of edu*rural	0.213***	0.225***	0.178*	0.264***
	(0.030)	(0.053)	(0.075)	(0.075)
10-11 yrs of edu*rural	0.398***	0.384***	0.328**	0.412***
	(0.038)	(0.073)	(0.110)	(0.097)
12+ yrs of edu*rural	0.582***	0.467***	0.526***	0.409***
	(0.041)	(0.075)	(0.107)	(0.105)
no edu*urban nonslum	0.116***	0.113*	0.108	0.126
	(0.031)	(0.048)	(0.070)	(0.067)
1-4 yrs of edu*urban nonslum	0.258***	0.195	0.222	0.172
	(0.057)	(0.101)	(0.144)	(0.142)
5-7 yrs of edu*urban nonslum	0.301***	0.377***	0.373***	0.381***
	(0.038)	(0.061)	(0.087)	(0.087)
8-9 yrs of edu*urban nonslum	0.390***	0.437***	0.542***	0.339***
	(0.037)	(0.064)	(0.092)	(0.089)
10-11 yrs of edu*urban nonslum	0.520***	0.472***	0.469***	0.478***
	(0.041)	(0.067)	(0.099)	(0.090)
12+ yrs of edu*urban nonslum	0.844***	0.896***	0.942***	0.851***
	(0.033)	(0.052)	(0.076)	(0.073)
no edu*urban slum	0.150**	0.160**	0.081	0.231**
	(0.055)	(0.058)	(0.084)	(0.079)
1-4 yrs of edu*urban slum	0.332**	0.332**	0.348*	0.322*
	(0.116)	(0.118)	(0.175)	(0.159)
5-7 yrs of edu*urban slum	0.281***	0.284***	0.348***	0.214*
	(0.065)	(0.068)	(0.096)	(0.095)
8-9 yrs of edu*urban slum	0.257***	0.262***	0.263**	0.256**
	(0.065)	(0.068)	(0.100)	(0.093)
10-11 yrs of edu*urban slum	0.347***	0.348***	0.419***	0.291**
	(0.073)	(0.076)	(0.111)	(0.105)
12+ yrs of edu*urban slum	0.813***	0.808***	0.800***	0.806***
	(0.066)	(0.070)	(0.104)	(0.095)
Control for individual	Yes	Yes	Yes	Yes
characteristics and states				
constant	-8.404***	-8.683***	-7.720***	-9.612***
	(0.209)	(0.324)	(0.462)	(0.453)
N	38310	15201	7276	7925

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 5: Estimation of Determinants of Height for Age Z-Scores,
Controlled for the Density of Living

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
ln(mom's edu)	0.047***	0.044***	0.037**	0.049***
	(0.005)	(0.008)	(0.012)	(0.012)
ln(mom's edu)*area				
(ref: ln(mom's edu)*rural)				
ln(mom's edu)*urban non-slums	0.043***	0.057***	0.074***	0.042*
	(0.008)	(0.013)	(0.019)	(0.018)
ln(mom's edu)*urban slums	0.009	0.011	0.039	-0.013
	(0.014)	(0.015)	(0.022)	(0.021)
area (ref: rural)				
urban non-slums	0.158***	0.192***	0.214***	0.179***
	(0.019)	(0.031)	(0.044)	(0.043)
urban slums	0.171***	0.189***	0.184***	0.198***
	(0.034)	(0.036)	(0.052)	(0.049)
average number of people per room	-0.143***	-0.138***	-0.158***	-0.120***
(minus i at the psu level)	(0.012)	(0.019)	(0.027)	(0.026)
Control for individual	Yes	Yes	Yes	Yes
characteristics and states				
constant	-7.941***	-8.243***	-7.239***	-9.194***
	(0.213)	(0.330)	(0.471)	(0.462)
N	38310	15201	7276	7925

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 6: Estimation of Determinants of Height for Age
Z-Scores, Controlled for the Density of Living and Only
Non-Migrants

	(1) All states	(2) States with slums
ln(mom's edu)	0.046***	0.062**
	(0.012)	(0.022)
ln(mom's edu)*area (ref: ln(mom's edu)*rural)		
ln(mom's edu)*urban non-slums	0.046*	0.060
	(0.021)	(0.035)
ln(mom's edu)*urban slums	0.030	0.016
	(0.031)	(0.035)
Area (ref: rural)		
urban non-slums	0.156**	0.198*
	(0.048)	(0.080)
urban slums	0.240**	0.289***
	(0.076)	(0.081)
child's sex (female=1)	0.051	0.073
	(0.033)	(0.054)
child's age (in months)	-0.089***	-0.093***
	(0.004)	(0.006)
child's age^2	0.001***	0.001***
	(0.000)	(0.000)
mom's height	0.047***	0.049***
	(0.003)	(0.005)
ln(dad's edu)	0.024*	0.017
	(0.011)	(0.018)
average number of people per room	-0.161***	-0.225***
(minus i at the psu level)	(0.026)	(0.046)
religion (ref: Hindu)		
Muslim	-0.019	0.109
	(0.056)	(0.083)
Christian	0.019	0.210
	(0.074)	(0.177)
Other	0.033	0.179
	(0.088)	(0.156)
caste (ref: scheduled caste)		
scheduled tribe	0.072	-0.015
	(0.072)	(0.134)
other backward class	0.109	0.080
	(0.057)	(0.077)
none of above	0.148*	0.062
	(0.061)	(0.089)
Control for states	Yes	Yes
Constant	-7.289***	-7.368***
	(0.491)	(0.760)
N	7903	2940

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 7: Estimation of Education Quality (Dependent Variable: Literacy)

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
ln(mom's edu)	0.210***	0.211***	0.206***	0.211***
	(0.001)	(0.001)	(0.003)	(0.001)
ln(mom's edu)*area				
(ref: ln(mom's edu)*rural				
ln(mom's edu)*urban non-slums	-0.007***	-0.005*	-0.003	-0.005*
	(0.001)	(0.002)	(0.005)	(0.002)
ln(mom's edu)*urban slums	-0.005*	-0.005*	-0.001	-0.006*
	(0.002)	(0.002)	(0.005)	(0.002)
area (ref: rural)				
urban non-slums	0.010***	0.012**	0.014	0.012**
	(0.003)	(0.004)	(0.012)	(0.005)
urban slums	0.028***	0.030***	0.036**	0.028***
	(0.005)	(0.005)	(0.012)	(0.006)
mom's height	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.001)	(0.000)
religion (ref: Hindu)				
Muslim	0.028***	0.030***	0.059***	0.024***
	(0.003)	(0.005)	(0.011)	(0.005)
Christian	0.018**	0.003	-0.000	0.006
	(0.006)	(0.014)	(0.026)	(0.017)
other	0.007	-0.011	-0.006	-0.014
	(0.006)	(0.011)	(0.023)	(0.013)
caste (ref: scheduled caste)				
scheduled tribe	0.000	-0.006	0.006	-0.008
	(0.004)	(0.008)	(0.019)	(0.008)
other backward class	0.005	0.007	0.001	0.009
	(0.003)	(0.004)	(0.011)	(0.005)
non of above	-0.005	-0.004	-0.018	-0.001
	(0.003)	(0.005)	(0.013)	(0.005)
control for states				
constant	0.540***	0.529***	0.460***	0.544***
	(0.029)	(0.044)	(0.106)	(0.049)
N	38061	15162	2932	12230

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

Table 8: Estimation of Education Quality (Dependent Variable: Wealth)

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
ln(mom's edu)	0.260***	0.241***	0.250***	0.237***
	(0.003)	(0.005)	(0.013)	(0.006)
ln(mom's edu)*area				
(ref: ln(mom's edu)*rural				
ln(mom's edu)*urban non-slums	0.003	0.029***	0.050*	0.028**
	(0.005)	(0.008)	(0.022)	(0.009)
ln(mom's edu)*urban slums	-0.068***	-0.051***	-0.023	-0.058***
	(0.009)	(0.010)	(0.022)	(0.011)
area (ref: rural)				
urban non-slums	1.026***	1.265***	1.147***	1.284***
	(0.012)	(0.020)	(0.050)	(0.021)
urban slums	1.294***	1.392***	1.241***	1.426***
	(0.022)	(0.023)	(0.050)	(0.026)
mom's height	0.015***	0.014***	0.021***	0.013***
	(0.001)	(0.001)	(0.003)	(0.001)
religion (ref: Hindu)				
Muslim	-0.106***	-0.090***	-0.028	-0.104***
	(0.015)	(0.022)	(0.049)	(0.024)
Christian	0.205***	-0.049	-0.051	-0.043
	(0.026)	(0.065)	(0.111)	(0.080)
Other	0.246***	0.131*	0.114	0.134*
	(0.027)	(0.053)	(0.098)	(0.064)
caste (ref: scheduled caste)				
scheduled caste	-0.090***	-0.225***	-0.297***	-0.199***
	(0.020)	(0.036)	(0.084)	(0.040)
other backward class	0.278***	0.268***	0.189***	0.285***
	(0.014)	(0.021)	(0.048)	(0.023)
none of above	0.466***	0.483***	0.333***	0.512***
	(0.015)	(0.023)	(0.055)	(0.026)
constant	0.475***	0.397	-0.437	0.599**
	(0.134)	(0.206)	(0.459)	(0.231)
N	38310	15201	2940	12261

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.

9 Appendix

Table 9: Reduced Form Estimation of Determinants of Height for Age Z-Scores by Education Levels (Full Table 4)

	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
Mom's edu × area (ref: no edu × rural)				
1-4 yrs of edu × rural	0.024	0.029	0.054	−0.011
	(0.035)	(0.063)	(0.090)	(0.088)
5-7 yrs of edu × rural	0.110***	0.086	0.034	0.131
	(0.028)	(0.049)	(0.069)	(0.069)
8-9 yrs of edu × rural	0.213***	0.225***	0.178*	0.264***
	(0.030)	(0.053)	(0.075)	(0.075)
10-11 yrs of edu × rural	0.398***	0.384***	0.328**	0.412***
	(0.038)	(0.073)	(0.110)	(0.097)
12+ yrs of edu × rural	0.582***	0.467***	0.526***	0.409***
	(0.041)	(0.075)	(0.107)	(0.105)
no edu × urban nonslum	0.116***	0.113*	0.108	0.126
	(0.031)	(0.048)	(0.070)	(0.067)
1-4 yrs of edu × urban nonslum	0.258***	0.195	0.222	0.172
	(0.057)	(0.101)	(0.144)	(0.142)
5-7 yrs of edu × urban nonslum	0.301***	0.377***	0.373***	0.381***
	(0.038)	(0.061)	(0.087)	(0.087)
8-9 yrs of edu × urban nonslum	0.390***	0.437***	0.542***	0.339***
	(0.037)	(0.064)	(0.092)	(0.089)
10-11 yrs of edu × urban nonslum	0.520***	0.472***	0.469***	0.478***
	(0.041)	(0.067)	(0.099)	(0.090)
12+ yrs of edu × urban nonslum	0.844***	0.896***	0.942***	0.851***
	(0.033)	(0.052)	(0.076)	(0.073)
no edu × urban slum	0.150**	0.160**	0.081	0.231**
	(0.055)	(0.058)	(0.084)	(0.079)
1-4 yrs of edu × urban slum	0.332**	0.332**	0.348*	0.322*
	(0.116)	(0.118)	(0.175)	(0.159)
5-7 yrs of edu × urban slum	0.281***	0.284***	0.348***	0.214*
	(0.065)	(0.068)	(0.096)	(0.095)
8-9 yrs of edu × urban slum	0.257***	0.262***	0.263**	0.256**
	(0.065)	(0.068)	(0.100)	(0.093)
10-11 yrs of edu × urban slum	0.347***	0.348***	0.419***	0.291**
	(0.073)	(0.076)	(0.111)	(0.105)
12+ yrs of edu × urban slum	0.813***	0.808***	0.800***	0.806***
	(0.066)	(0.070)	(0.104)	(0.095)
child's sex (female=1)	0.028*	−0.004		
	(0.014)	(0.023)		
child's age (in months) (ref: 0-2)				
3-5	−0.045	−0.021	−0.022	−0.026
	(0.052)	(0.083)	(0.114)	(0.121)
6-11	−0.523***	−0.598***	−0.642***	−0.557***
	(0.046)	(0.074)	(0.104)	(0.106)

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	(1) All states	(2) States with slums	(3) States with slums - girls	(4) States with slums - boys
12-17	−1.249***	−1.354***	−1.376***	−1.328***
	(0.046)	(0.074)	(0.104)	(0.106)
18-23	−1.544***	−1.675***	−1.761***	−1.597***
	(0.047)	(0.075)	(0.106)	(0.106)
24-35	−1.490***	−1.613***	−1.690***	−1.542***
	(0.043)	(0.070)	(0.098)	(0.100)
36-47	−1.482***	−1.564***	−1.659***	−1.480***
	(0.043)	(0.070)	(0.097)	(0.100)
48-59	−1.406***	−1.465***	−1.598***	−1.341***
	(0.043)	(0.070)	(0.097)	(0.100)
mom's height	0.049***	0.051***	0.046***	0.056***
	(0.001)	(0.002)	(0.003)	(0.003)
ln(dad's edu)	0.035***	0.034***	0.028**	0.040***
	(0.005)	(0.007)	(0.010)	(0.010)
religion (ref: Hindu)				
Muslim	−0.116***	−0.129***	−0.030	−0.224***
	(0.023)	(0.034)	(0.048)	(0.047)
Christian	−0.001	−0.037	−0.124	0.045
	(0.040)	(0.100)	(0.139)	(0.143)
other	0.019	0.067	0.204	−0.033
	(0.041)	(0.082)	(0.123)	(0.109)
caste(ref: scheduled caste)				
scheduled tribe	0.019	−0.079	−0.051	−0.111
	(0.030)	(0.055)	(0.078)	(0.078)
other backward class	0.073***	0.078*	0.062	0.097*
	(0.022)	(0.032)	(0.046)	(0.044)
none of above	0.198***	0.192***	0.096	0.276***
	(0.023)	(0.036)	(0.052)	(0.050)
constant	−8.404***	−8.683***	−7.720***	−9.612***
	(0.209)	(0.324)	(0.462)	(0.453)
N	38310	15201	7276	7925

Note. Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Estimation of Determinants of Height for Age
Z-Scores, Controlled for the Density of Living (Full Table 5)

	(1)	(2)
	All states	States with slums
ln(mom's edu)	0.047***	0.044***
	(0.005)	(0.008)
ln(mom's edu)*area (ref: ln(mom's edu)*rural)		
ln(mom's edu)*urban non-slums	0.043***	0.057***
	(0.008)	(0.013)
ln(mom's edu)*urban slums	0.009	0.011
	(0.014)	(0.015)
Area (ref: rural)		
urban non-slums	0.158***	0.192***
	(0.019)	(0.031)
urban slums	0.171***	0.189***
	(0.034)	(0.036)
average number of people per room	-0.143***	-0.138***
(minus i at the psu level)	(0.012)	(0.019)
child's sex (female=1)	0.030*	0.003
	(0.015)	(0.023)
child's age (in months)	-0.087***	-0.094***
	(0.002)	(0.003)
child's age^2	0.001***	0.001***
	(0.000)	(0.000)
mom's height	0.050***	0.053***
	(0.001)	(0.002)
ln(dad's edu)	0.036***	0.036***
	(0.005)	(0.007)
religion (ref: Hindu)		
Muslim	-0.073**	-0.080*
	(0.024)	(0.036)
Christian	0.026	-0.042
	(0.040)	(0.100)
other	0.026	0.084
	(0.041)	(0.082)
caste (ref: scheduled caste)		
scheduled tribe	0.045	-0.041
	(0.030)	(0.056)
other backward class	0.086***	0.088**
	(0.022)	(0.032)
none of above	0.230***	0.219***
	(0.023)	(0.036)
Control for states	Yes	Yes
Constant	-7.941***	-8.243***
	(0.213)	(0.330)
N	38310	15201

Notes: Standard errors are in the bracket. $*p < 0.05, **p < 0.01, ***p < 0.001$.