Policy Research Working Paper 8094

Cities, Slums, and Early Child Growth

Empirical Evidence from Bangladesh

Dhushyanth Raju
Kyoung Yang Kim
Quynh Thu Nguyen
Ramesh Govindaraj

WORLD BANK GROUP
South Asia Region
Health, Nutrition, and Population Global Practice
June 2017

Policy Research Working Paper 8094

Abstract

This study uses novel household survey data that are representative of Bangladesh's large cities, and of slum and nonslum areas within the cities, to investigate the effects of demographic and socioeconomic factors on early child growth in 2013. The study also decomposes the difference in mean child growth between slum and nonslum areas in 2013, and the increase in mean child growth in slum and nonslum areas from 2006 to 2013. Mother's education attainment and household wealth largely explain the cross-sectional difference and intertemporal change in child growth. Although positive in some cases, the effects of maternal and child health services, and potential health-protective household amenities, differ by the type of health facility, household amenity, and urban area. The results suggest that a focus on nutrition-sensitive programs for slum residents and the urban poor is appropriate.

This paper is a product of the South Asia Region and the Health, Nutrition, and Population Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The corresponding author may be contacted at draju2@worldbank.org.

Cities, Slums, and Early Child Growth: Empirical Evidence from Bangladesh

Dhushyanth Raju
Kyoung Yang Kim
Quynh Thu Nguyen
Ramesh Govindaraj

JEL codes: I12, I14, I15, O15
Keywords: Bangladesh, urban, slum, undernutrition, stunting, height, linear growth, children

---

Raju: draju2@worldbank.org; Kim: kkim7@worldbank.org; Nguyen: qnguyen4@worldbank.org; Govindaraj: rgovindaraj@worldbank.org. We thank Alayne Adams, Karar Zunaid Ahsan, Bushra Binte Alam, Judy Baker, Tekabe Belay, Sadia Chowdhury, Timothy Evans, Jean-Jacques Frere, Nedim Jaganjac, Zahed H. Khan, Iffat Mahmud, Nkosinathi Mbuya, Patrick Mullen, Hossain Zillur Rahman, E. Gail Richardson, Federica Secci, Diana Silimperi, and Owen Smith for helpful suggestions and feedback during various phases of the research. We also thank Naihan Yang for research assistance. Funding from the World Bank's Bangladesh Health Sector Development Program Multi Donor Trust Fund (TF011554) is gratefully acknowledged.

1. Introduction

Urbanization is one of the most important demographic currents historically.[1] It offers a major opportunity for countries to broaden and boost gains in the socioeconomic status of urban residents and, indirectly, of rural residents. On the other hand, rapid urbanization poses significant development risks. Inadequate or low-quality physical and economic infrastructure and a failure to provide basic services for growing urban populations can arrest gains, or even produce losses, in socioeconomic welfare.

The tension between the potential opportunities and perils of urbanization is arguably stronger for developing countries, for at least two reasons. First, these countries are expected to experience large expansions in their already substantial urban populations in the coming decades. The total urban population in the least-developed countries was estimated to be 2.9 billion in 2014, and the figure is projected to reach 5.2 billion by 2050 (UN 2015a).[2] Second, governments in developing countries generally have had a poor record in designing, financing, and implementing policies, rules and regulations, and in providing services in both urban and rural areas, resulting in conditions and outcomes that may be socially inefficient and inequitable (UN-Habitat 2016).

The global imperative to successfully leverage the potential socioeconomic benefits of urbanization, and mitigate potential risks, is reflected in for example the 2030 Agenda for Sustainable Development (Goal 11) and the New Urban Agenda (Quito Declaration on Sustainable Cities and Human Settlements for All) adopted by the UN in 2015 and 2016, respectively (UN 2015a; UN 2017). Protecting and promoting the health of urban residents—including slum and poor residents who face a greater risk to their health from higher exposure to adverse environmental factors—is a key element in the UN agenda on urbanization.

In this study, we investigate patterns, trends, and determinants of child growth in the major cities in Bangladesh, with a focus on differences between slum and nonslum children. The country is especially suitable for such a study. Classified as a lower middle-income country, Bangladesh is the eighth most populous country in the world, with an estimated population of 159 million in 2014 (World Bank 2016). Its urban population increased from 13 million (15.5%

[1] The UN estimates that 54% of the world's population were urban residents in 2014, an increase from 30% in 1950, and projects that the percentage will reach 66% by 2050 (UN 2015a).

[2] These figures represent 48% of the total population in least-developed countries in 2014, and 63% in 2050, respectively.

of the national population) in 1981 to 42 million (28%) in 2011. Over the decade from 2001 to 2011, Bangladesh's urban population expanded by 35%, at an annualized growth rate of 3%. By 2050, its urban population is projected to account for 56% of the country's total population (UN 2015a).

According to UN-Habitat, a settlement is defined to be slum if it lacks access to clean water, access to improved sanitation, sufficient living space, durable housing, or secure tenure (UN-Habitat 2016). Defined as such, slum settlements are a prevalent, persistent feature of the urban landscape in developing countries, arising from poor public planning, regulation, investment, and basic services. UN-Habitat (2016) estimates that 0.9 billion individuals resided in urban slum settlements in developing countries in 2014 (a 28% increase from 1990), representing an estimated 30% of the total urban population in these countries. In Bangladesh, a government census in 2014 counted about 14,000 slum settlements across all urban areas (GOB 2015).

The health and nutrition of slum residents are of interest for several reasons. First, theory and evidence suggest that the study of slum health and nutrition should be treated as distinct from the study of urban health, or the study of poverty and health (Ezeh et al. 2017). One argument for the separate treatment is that the physical and social environments of slum settlements may act to amplify health risks for residents, and produce negative health externalities that extend across a slum settlement, or even more widely. The exposure to concentrated health risks in slum settlements may be particularly harmful to young children, given that they are more immunologically susceptible than older children and adults. Marx et al. (2013) argue that the potential adverse health effects of slum settlements may create a low human-capital equilibrium which, in turn, contributes to making slum settlements into poverty traps. Second, the literature on slum health and nutrition is scant (see Ezeh et al. 2017 for a recent review). The little available evidence points to patterns that would benefit from deeper investigation. For example, the evidence indicates that mean health and nutrition outcomes are worse for slum residents than for nonslum residents, and are often worse than for rural residents (Ezeh et al. 2017; Mberu et al. 2016). Third, research is needed on the health risks and effects of residing in a slum settlement to guide the design and implementation of policies and interventions related to slum development in general and slum health in particular (Lilford et al. 2017).

Past research on urban (slum) health in developing countries has been limited by the lack of data that are representative across and within urban areas.[3] The data situation is changing, and Bangladesh, along with Kenya (Ezeh et al. 2017), is a relative forerunner. In 2006, the National Institute of Population Research and Training (NIPORT) and others conducted the Bangladesh Urban Health Survey (BUHS), providing for the first time extensive data on adult and child health and nutrition outcomes, and potentially relevant factors that are representative for slum and nonslum areas in city corporations (the country's large cities), and for district municipalities and large towns (*paurashavas*). In 2013, the survey was repeated on a new cross-section which is representative for the same domains. The two rounds of the BUHS serve as the source of data for this study.[4,5]

We measure child growth by height-for-age z-scores (HAZ scores). Height is widely regarded as the most relevant measure of overall child nutrition, and child stunting (an HAZ score that is more than two standard deviations [SD] below the international reference median) is seen as the key indicator for tracking progress in addressing child undernutrition.[6] Child stunting reflects the cumulative effects of poor diet and recurrent infection. Globally in 2004, 15% of deaths and another 15% of the burden of disease for children below five years of age are attributed to stunting (Black et al. 2008). International evidence indicates that child stunting is associated with lower motor, cognitive, emotional, and social development, and higher rates of illness, disability, and premature death, as well as poorer socioeconomic outcomes in adolescence and adulthood, measured by, for example, education attainment, student academic achievement, employment, and labor earnings (Currie and Vogl 2013; Black et al. 2013; Cesar et al. 2008).

[3] In the case of Bangladesh, past research has used data from national household surveys to examine urban-rural differences in health and nutrition outcomes (for example, see Srinivasan et al. 2013), or urban health and nutrition outcomes while treating urban areas as an undifferentiated whole (for example, see Headey et al. 2015). Khan and Kramer (2014) examined the health and socioeconomic characteristics of urban slum and nonslum residents using national household surveys based on self-reported information by the household on the slum status of the residence. Other past research has used data from small-scale convenience or purposive samples of individuals, households, or health facilities to examine health and nutrition issues in specific cities and towns (for example, in Dhaka and Chittagong), or in specific subpopulations within cities and towns, such as slum residents (for example, see Choudhury et al. 2012).

[4] The 2006 and 2013 BUHS data were publicly released in 2013 and 2016, respectively.

[5] The 2006 BUHS was funded by the United States Agency for International Development (USAID). The 2013 BUHS was funded by USAID and the United Kingdom Department for International Development.

[6] The child stunting rate is one of two indicators selected to measure progress against Target 2.2 on "ending all forms of malnutrition" in the 2030 UN Sustainable Development Goal 2 (UN 2015b).

While rural and urban stunting rates in Bangladesh have declined markedly over the last two decades (Headey et al. 2015), the stunting rate stood at 36% for the country, and at 31% for urban areas, based on the 2014 Bangladesh Demographic and Health Survey (DHS) (NIPORT et al. 2016). The country's national stunting rate ranks 107 out of 132 countries (IFPRI 2016). Based on the 2013 BUHS, the stunting rate stood at 50% for slum areas and 33% for nonslum areas in city corporations, and 37% for municipal cities and large towns (NIPORT et al. 2015).

Bangladesh lacks rigorous empirical research based on representative data on the determinants of child growth across, and within, urban areas. A recent, notable exception is Ahsan et al. (2017), who examine the effects of various factors on stunting and underweight status for slum and nonslum children using 2013 BUHS data.[7,8] They find that the child's age, mother's education attainment, and household wealth are significant factors for slum and nonslum children, and that mother's membership in an NGO and the child's birth order are additional significant factors for nonslum children.

We begin by investigating the effects of child, maternal, household, and neighborhood-area factors on growth for slum and nonslum children in reduced-form estimations, using the 2013 BUHS. The examined factors proxy for many of the structural and intermediate determinants in the World Health Organization (WHO) Commission on Social Determinants of Health (CSDH) conceptual framework (WHO 2010), and for the immediate, underlying, and basic factors in the United Nations Children's Fund (UNICEF) conceptual framework on the causes of malnutrition (UNICEF 1998). We estimate regressions with administrative-division fixed effects, as well as regressions with neighborhood-area fixed effects, thus respectively accounting for unobserved heterogeneity at the division and neighborhood-area levels.

We then advance on the Ahsan et al. study in five potentially policy-relevant directions. The first four of the five directions use the 2013 BUHS, whereas the fifth direction uses both the 2006 and 2013 BUHS. First, we examine the effects of the local availability of maternal and child health services, and of the use of these services. Second, we examine the effects of access to, or use of, potential health-protective household amenities related to cooking fuel, dwelling

[7] For each outcome and sample, they examine the effects of child and maternal factors, household factors, and neighborhood-area factors through separate regression specifications, and consolidate significant factors from these partially-specified regressions into a single regression.

[8] Other available studies examine the determinants of undernutrition in small samples of children in selected urban slum settlements (for example, see Fakir and Khan 2015; Zaman et al. 2015; Alam et al. 2011).

floor, drinking water, sanitation, and hygiene. Third, we examine the effect of rural-to-urban migration. Sixty-six percent of mothers in our sample reported that they had moved to their current city corporation from elsewhere. We deepen the analysis on the effects of such a move by examining where the mother was born (the current city corporation, another urban area, or a village), the reason reported by her for moving to the current city corporation, and how long ago she had moved. We perform these three analyses for all city-corporation children, as well as separately for slum and nonslum children. Fourth, we examine the extent and nature of the contributions of various factors to the slum-nonslum gap in mean child growth, based on an extension of the Oaxaca-Blinder counterfactual decomposition method. In 2013, mean HAZ scores were 0.58 SD lower for slum than nonslum children. Fifth, we examine the extent and nature of the contribution of various factors to the change in mean HAZ scores for slum and nonslum children, based on the same decomposition method. Between 2006 and 2013, mean HAZ scores improved by 0.23 SD for slum children and by 0.20 SD for nonslum children. (The slum-nonslum gap in mean child growth narrowed marginally over the period.)

We find that mean growth is poorer for slum than nonslum children in city corporations. In addition, mean growth for slum children is poorer than for rural children. However, mean growth for nonslum children is the same as for children in all urban areas, which indicates a cause for concern for city-corporation children in general and slum children in particular. Child's age, mother's age at child's birth, mother's education attainment, and household wealth have significant effects on child growth, which are robust to the inclusion of neighborhood-area fixed effects in the regressions. The positive effect on child growth from residing in a nonslum neighborhood area remains significant even after controlling for a range of factors.

The rates of use of health facilities for antenatal care, delivery, and newborn exam are lower for slum than nonslum children. Relative to their nonslum counterparts, slum households are more likely to use NGO facilities and less likely to use public and private facilities for maternal and child health services. The use of public health facilities for antenatal care, delivery, or newborn exam has a positive effect on child growth; likewise, for the use of NGO or private health facilities for antenatal care. Access to or availability of potential health-protective household amenities are poorer for slum than nonslum children. Access to improved toilets that are shared with a large number of other households has a negative effect on slum child growth, whereas a handwashing site with soap and water at the dwelling has a positive effect on nonslum child growth. Mother's move to the current city corporation, measured by different dimensions of the move decision, does not appear to have a negative effect on child growth.

The difference in mean growth between slum and nonslum children in 2013 is driven by differences in the mean levels of factors for slum and nonslum children, in particular, mother's education attainment and household wealth. Similarly, the increase in mean growth between 2006 and 2013 for both slum and nonslum children is driven by increases in the mean levels of factors, in particular, mother's education attainment and household wealth. These findings are consistent with those from studies for Bangladesh that empirically examine the factors associated with the increase in child growth (Nguyen et al. 2017; Headey, Hoddinott, and Park 2016; Headey et al. 2015), or the factors associated with the rural-urban difference in child growth (Srinivasan, Zanello, and Shankar 2013).

While we do not report the results, we repeat the full analysis by setting the outcome to be whether the child is stunted. The main results hold. Presumably, this is because the sample around mean HAZ scores is not that far apart from the sample around the threshold HAZ score for stunting.

Taken together, the results imply a need for sound policies, programs, and partnerships that aim to produce large, sustained gains in household economic status, gender equality, and formal education attainment. They also point to a need to enhance the health and nutrition payoffs of the use of maternal and child health services and community and home environmental health infrastructure for the urban poor in general and slum residents in particular. While nutrition-specific programs should not be neglected, the results suggest that a focus on the development and improvement of an array of nutrition-sensitive programs is appropriate.[9]

The remainder of the paper is organized as follows. Section 2 provides background information on Bangladesh's urban areas, slum settlements, urban stunting in international and national perspectives, and urban primary health service. Section 3 presents the data, sample, and empirical strategies, and Section 4 presents the results. Section 5 summarizes the main results and discusses their implications for policy.

---

[9] Nutrition-specific programs are those that target the immediate causes of undernutrition as identified in UNICEF's (1998) conceptual framework, namely inadequate nutrient intake and poor health. Nutrition-sensitive programs are those that target the underlying and basic causes of undernutrition.

2. Background

A. *Urbanization*

While Bangladesh's population is predominantly rural, it has a sizeable urban population. According to the 2011 Bangladesh population and housing census (GOB 2014), 23% of the country's population is urban. Based on official measures, Bangladesh's urban population share ranks it in the middle among South Asian countries. In turn, South Asia, with an urban population share of 28%, ranks lowest among all regions in the world (Ellis and Roberts 2016).

Bangladesh's urban population is spatially concentrated. The country is organized into eight administrative divisions and, under them, 64 administrative districts.[10] According to the 2011 census (GOB 2014), at the division level (in 2011, there were seven divisions), Dhaka division had an urban population of 16 million (accounting for 46% of the country's urban population); Chittagong division, seven million (21%); and the remaining divisions, one to three million each. Based on the same data, at the district level, Dhaka district had an urban population of 9.3 million (accounting for 28% of the country's urban population); Chittagong district, 3.2 million (9%); and the other districts, 100,000 to one million each.

Establishing the rate at which Bangladesh is urbanizing is complicated by a recent adjustment in the definition of an urban area. The 2011 population census (GOB 2014) introduced a stricter administrative-based definition of an urban area compared to preceding censuses.[11] If the older census definition of an urban area was retained, the country's urban population would have increased from 13.5 million (15.5% of the total population) in 1981 to 42 million (28% of the total population) in 2011, an annualized urban population growth rate of 3.8%.[12] Over the 2001–11 period, the annualized urban population growth rate was lower, at 3%.

[10] Mymensingh division was formed in 2015, divided from Dhaka division; Ranjpur division was formed in 2010, divided from Rajshahi division.

[11] In the 1981, 1991, and 2001 censuses, the definition of an urban area included urban developments next to large cities. The 2011 redefinition reduced the total area classified as urban from 10,711 square kilometers in 2001 to 8,867 square kilometers in 2011 (a 17% reduction). The reductions affected some districts more than others. In particular, Dhaka, Chittagong, Gazipur, and Khulna districts experienced reductions in their urban areas of more than 50%. With the adjustment in urban areas, Bangladesh's urban population in 2011 totaled 35.1 million, or 23.4% of the total population.

[12] The 2010–11 Bangladesh Household Income and Expenditure Survey (HIES) data was drawn using the 2001 census as the sampling frame, and used the pre-2011 definition of an urban area. An estimated 27% of the country's population was urban based on these data.

These urbanization rates are roughly in line with the overall rate for least-developed countries over the last 40 years (UN 2015a).

Urban centers: Urban centers in Bangladesh are essentially organized into three levels: city corporations, municipal cities and towns (*paurashavas*), and *upazilla* headquarters. According to the 2011 census (GOB 2014), Bangladesh had 506 urban centers: six city corporations (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, and Sylhet), 311 municipal cities and towns, and 189 upazilla headquarters. The six city corporations accounted for 34% of the country's total urban population in 2011.

Since 2011, the number of urban centers has grown, and some urban centers have moved up in level. The number of city corporations has grown from six to 11, with four newly incorporated city corporations: Comila (in 2011), Gazipur (in 2013), Narayanganj (in 2011), and Rangpur (in 2012). Dhaka city corporation was bifurcated into Dhaka North and Dhaka South city corporations in 2011. Based on published census statistics (GOB 2014), we estimate that these 11 city corporations that exist today accounted for 41% of the country's total urban population in 2011.

B. *Slum settlements*

Slum settlements are an important phenomenon in urban Bangladesh. According to a 2014 government census of slum settlements, the country had approximately 14,000 of them in all urban areas, with a total slum population of 2.2 million (GOB 2015).[13] Sixty-five percent of slum settlements were located in city corporations, 24% in municipal cities and towns, and 11% in upazilla headquarters or other urban areas. Slum settlements varied substantially in size: on the low end, 27% of slum settlements had fewer than 10 households, whereas on the high end, 7% of slum settlements had at least 100 households. In 2005, an independent census and mapping of slum settlements counted about 9,000 slum settlements in the six city corporations

[13] A settlement was defined to be slum if it had at least five households and poor housing construction, water supply and sanitation, street lighting, and roads; high population density or crowded housing; and low mean household income status.

that existed at the time, with a total slum population of 5.4 million, or 35% of the overall population in these city corporations (Angeles et al. 2009).[14,15]

The 2005 independent census had several interesting findings on the characteristics of slum settlements. We note four of these findings. First, there were large differences in the population sizes, and housing and public environmental conditions, of slum settlements within and across cities. Large slum settlements were a feature of the larger cities. Second, waste management (garbage disposal and collection, and sanitation) tended to be poorer than other public environmental facilities in slum settlements. Third, the vast majority of slum settlements were situated on private lands, and slum residents tended to have secure tenure. In addition, housing construction tended to be of better quality in slum settlements on private lands, which we presume is a result of residents having secure tenure. Fourth, a large share of slum residents were rural migrants, mostly from rural communities near to the city corporation.

The 2006 and 2013 BUHS reports (NIPORT et al. 2008; NIPORT et al. 2015) and case studies using other data find that slum residents generally have poor mean socioeconomic circumstances and outcomes (for example, see Islam, Farukuzzaman, and Islam 2014; Nahar and Rahman 2013; Hossain, Moniruzzaman, and Islam 2010). The findings are consistent with evidence for slum residents globally (for example, see UN-Habitat 2016). These results, however, directly follow from the definition of a slum settlement.

C. *Urban child growth in international and national perspectives*

Urban Bangladesh versus urban areas in other developing countries: Using statistics compiled by WHO, we compare the urban child stunting rate for Bangladesh to those of other developing countries. Statistics for all 40 countries in the comparison are for the period 2005–09. Bangladesh ranks poorly, at no. 34 (Figure 1, Panel A). The country's rank depends on the urban subpopulation in terms of household wealth quintile (poorest quintile versus richest quintile). Bangladesh's urban stunting rate ranks worse with respect to the poorest than the richest (no. 34

[14] A settlement was defined to be slum if it had at least 10 households and met four of the following five conditions: poor housing quality, high population density or overcrowded housing, poor water supply and sanitation facilities, insecure tenure, and a majority of households who are poor.

[15] While the statistics from the 2005 and 2014 censuses may not reconcile easily, the basic message is identical: slum settlements and their populations are a major feature of urban areas in the country.

versus no. 20) (Figure 1, Panel B). Compared to other South Asian countries, the country's urban stunting rate ranks in the middle (Figure 2).

Urban versus rural areas within Bangladesh: Based on DHS data, we compare urban-rural trends in child stunting rates over the period 1997–2014 for Bangladesh as a whole (Figure 3, Panel A), as well as by division (Figure 3, Panel B). Stunting rates are lower for urban than rural children in Bangladesh, consistent with the pattern documented for developing countries in general (IFPRI 2016; Van de Poel, O'Donnell, and Van Doorslaer 2007). Bangladesh's urban-rural stunting rate gap is on the lower end among South Asian countries (Figure 2). In addition, compared to a large set of developing countries, Bangladesh's urban-rural stunting rate gap is smaller than those of most other countries (IFPRI 2016).

Bangladesh's urban and rural child stunting rates are declining over time. In addition, the gap in rural and urban stunting rates has narrowed from 16 percentage points (pp.) in 1997 to 7 pp. in 2014. The trends in urban and rural stunting rates are not uniform across divisions, and are also more erratic within all divisions. Comparing the first year to the last year in our time series, the gap in rural and urban child stunting rates has narrowed markedly in several divisions.

D. *Urban primary healthcare*

While nutrition sensitive in nature, primary health services in Bangladesh, in particular reproductive, maternal, newborn, and child health (RMNCH) services serve as a main delivery mode for nutrition-specific interventions. Given this, we perform an extended review of the empirical and qualitative research on the supply and demand for, and quality of, such services in the country's urban areas.

Supply: Nongovernment organizations have played a pivotal role in Bangladesh's health development. Chowdhury et al. (2013) state that the contribution of NGOs to national health development was mainly due to strong NGO leadership, international donor support, and government permission and partnership. Urban governments, which are mainly responsible for public primary health service in their areas, have contracted out the operation of a majority of public primary health facilities to NGOs. Nongovernmental organizations also operate their own facilities. Urban governments and NGOs deploy community health workers to engage in health promotion and preventive care outreach in poor neighborhoods.[16] The government and international donor agencies have supported NGO provision of RMNCH services through a number of initiatives, such as the Bangladesh Smiling Sun Franchise Program (BSSFP), started in 2007, and the Bangladesh Urban Primary Health Care Project (BUPHCP), started in 1998. The NGO BRAC also provides RMNCH services through its *Manoshi* initiative, started in 2007.

Private providers also offer RMNCH services. They are fee-based and operate for profit, and include hospitals, clinics, nursing homes, diagnostic centers, and pharmacies, as well as private practices by medical doctors and nonformal or traditional healthcare practitioners. Private health facilities tend to have wider service coverage and longer, more convenient service hours than public or NGO health facilities. A large share of private providers charge low fees, making them affordable to poor households (Adams, Islam, and Ahmed 2015; Afsana and Wahid 2013). However, private providers tend to operate without required licenses, and their staff often lack required academic and professional qualifications (ICDDRB 2015).[17] Compared to staff at public or NGO health facilities, private providers are less likely to be familiar with government guidelines for healthcare practice management (ICDDRB 2015).

A census of health service providers located in, or near, a sample of slum settlements in Dhaka city found that more than 80% were private, 12% were public (but contracted out to NGOs to operate), and 6% were NGO. Thirty-eight percent of private providers were pharmacies, while 35% were nonformal or traditional healthcare practitioners. (Pharmacies not only sell drugs but also provide diagnostic and treatment advice.) More than 60% of private healthcare staff were unqualified, compared to 2% of public healthcare staff. Fifty percent of NGO healthcare staff were community health workers (Adams, Islam, and Ahmed 2015).

A few studies have examined the effects of RMNCH service provision on use, interpreting the results as causal. While the effects are not well identified, the studies tend to find that provision promotes use. For example, comparing slum settlements in Dhaka metropolitan area covered by the Manoshi program to those in the outskirts of Dhaka city corporation, and before and four years after the program was initiated, Alam et al. (2011) find that the program

[16] Community health workers in villages have been credited for the notable declines in fertility and maternal and child mortality, and gains in child vaccination rates and uptake of oral rehydration therapy in Bangladesh (El Arifeen et al. 2013).

[17] Private healthcare staff report that they often obtain their health knowledge through training courses offered by NGOs, or through learning on the job under the guidance of other staff (Adams, Islam, and Ahmed 2015).

increased both the use of maternal and child health services and favorable newborn practices, and, to a lesser extent, mother's knowledge about maternity care and newborn health problems. Comparing urban areas covered by the Bangladesh Smiling Sun Franchise Program to adjacent areas, and one and four years after the program was initiated, Lance, Angeles, and Kamal (2012) find that the program did not have positive effects on the rates of use of modern contraceptives, use of antenatal care services, or vaccination. The authors indicate that the results are due to a growing intensity of other government and NGO maternal and child health service activity in the comparison areas.[18]

Demand: Kamal et al. (2016) find a large increase in the use of maternal and child health services over the first decade of the 2000s in both urban and rural areas in Bangladesh, and that the difference by household economic status in the use of such services has narrowed, particularly in urban areas. They also find that the use of private maternal and child health services dominates, although the use of such services is lower among poorer households.

Slum residents in Dhaka city report that they prefer seeking health care from pharmacies and nonformal or traditional healthcare practitioners, and prefer home deliveries by traditional birth attendants (Adams, Islam, and Ahmed 2015). These findings are consistent with other evidence for urban slum and poor households in Bangladesh (for example, see Nahar and Rahman 2010 for Chittagong city). The findings are also consistent with evidence for many other developing countries that the poor tend to obtain care from informal private health practitioners, who often lack required academic and professional qualifications or are unlicensed to practice (Sudhinaraset et al. 2013).

Gazi et al. (2015) examine the reasons reported by nonusers of maternal and child health services provided by NGO health facilities in Sylhet city under the Bangladesh Urban Primary Health Care Project and the Bangladesh Smiling Sun Franchise Program. They find that the main reasons include the lack of awareness of services, the limited range of offered services, and the availability of free services at public health facilities. Using 2006 BUHS data, Islam and Gagnon

[18] Among other studies, Uddin et al. (2010) use data gathered just before the intervention was initiated and just before it was completed, and find that the Expanded Program of Immunization administered by the Dhaka city-corporation government and NGOs increased the child immunization rate in slum settlements, and that a key factor presumably was longer immunization service hours. Comparing slum settlements in Narayanganj city corporation covered by the Manoshi program to those in another nearby municipal town, Jolly et al. (2016) find higher rates of use of antenatal and postnatal care services in settlements covered by the Manoshi program, although the difference in use rates was smallest among the poorest women.

(2016) find that women who moved to the city are less likely to use maternal and child health services. Adams, Nababan, and Hanifi (2015) find that mothers who have community health workers as part of their social networks are more likely to use maternal and child health services in selected slum settlements under the Manoshi program in Dhaka city.

Distance may not be an important determinant of household demand for RMNCH services, as suggested by responses from users and nonusers of such services (Gazi et al. 2015). Using 2006 BUHS data, Heller (2013) finds that distance of an area to the nearest primary health facility and the density of primary health facilities in an area do not appear to be associated with the use of antenatal or postnatal care services, whether or not the author accounts for the potential endogeneity of where the household resides.

Quality: The quality of care may influence whether households use maternal and child health services, and which provider type they choose. Rigorous, representative evidence is lacking for urban Bangladesh on provider quality of care (measured either directly or indirectly), and on its determinants.[19] Among the available evidence, Gazi et al. (2015) find that the main reported reasons for user satisfaction with BUPHCP- and BSSFP-supported NGO primary health facilities in Sylhet city were staff professionalism and courtesy, and low-cost or free services. Banu and Nasreen (2011) find that the performance of Manoshi delivery facilities in some slum settlements in Dhaka varied markedly across facilities; that the retention and effort of community health workers were key factors associated with facility performance; and that facility hygiene, free services, staff courtesy, and lack of space at home were key factors associated with use.[20] Examining the causes of neonatal and maternal deaths in selected slum settlements in Dhaka under the Manoshi program, Khatun et al. (2012) find performance issues existed with

[19] Audit-study evidence by Das et al. (2012) and Das et al. (2016) for rural and urban India suggests that the quality of care was low in both public and private primary health facilities, as measured by such indicators as completion of checklists for essential and recommended care, correct diagnosis, and correct treatment. At the same time, indicators such as medical equipment, doctor qualifications, and patient caseloads were either not associated, or only weakly associated, with quality of care. While private doctors tended to be unqualified, they were likely to exert greater effort, and did not perform any worse on diagnosis and treatment than qualified public doctors. Qualified public doctors exerted greater effort and were more likely to provide correct treatment in their private practices than in their public practices. We suspect that these issues are similarly prevalent in Bangladesh.

[20] Intermediate indicators of worker retention and job effort were found to be associated with financial rewards, and, to a lesser degree, social recognition and positive community feedback, among a sample of NGO female volunteer community health workers in Dhaka city (Alam, Tasneem, and Oliveras 2012a, 2012b).

community health workers in terms of the coverage and timing of household visits, and the detection and management of, and referral for, risks.[21]

3. Data, sample, and empirical strategy

A. *Data and sample*

The 2006 and 2013 BUHS were designed to provide data that are representative of three overall domains: (1) slum neighborhoods in city corporations, (2) nonslum neighborhoods in city corporations, and (3) municipal cities and towns. The 2006 round covered the six city corporations existing at that time, and the 2013 round covered 10 of the 11 city corporations existing in that year (Gazipur became a city corporation in the year of the survey, and thus was not included in the appropriate sample domain).[22]

The sample frame for the survey was a complete list of mahallas (which we refer to as neighborhoods) in the city corporations and sampled municipal cities and towns. A mahalla is an Islamic parish, and an optional, non-elective administrative unit below the ward in cities and towns in Bangladesh. Focusing on city corporations, neighborhoods were randomly selected in the first stage of sampling. In each sampled neighborhood, all slum and nonslum areas were mapped through visits. An area was defined to be a slum settlement if it had at least 10 households and met four of the following five conditions: poor housing conditions, insecure housing tenure, high population density, poor sanitation and inadequate water access, and at least 75% of the households appeared to be poor.[23] The second stage of sampling differed slightly between the 2006 and 2013 rounds, but essentially, slum and nonslum areas of sampled neighborhoods, the primary sampling units (PSUs), were randomly drawn, stratified by slum status. See NIPORT et al. (2008) and NIPORT et al. (2015) for sample design details. We refer to the PSU as "neighborhood area".

We use data from the neighborhood-area, household, and female questionnaires. The neighborhood area questionnaire was administered to knowledgeable leaders and key informants

[21] In terms of other evidence, Andaleeb (2000) finds for Dhaka city that sample users rated private hospitals higher than public hospitals in terms of responsiveness, communication, and discipline.

[22] In the 2006 BUHS, Barisal, Chittagong, Dhaka, Khulna, Rajshahi, and Sylhet were included in the city-corporation statistical domain. In the 2013 BUHS, Barisal, Chittagong, Comilla, Dhaka North, Dhaka South, Khulna, Narayanganj, Rajshahi, Rangpur, and Sylhet were included in the city-corporation statistical domain.

[23] These conditions are consistent with UN-Habitat guidelines for defining slums (UN-Habitat 2003).

in the neighborhood area. The household questionnaire was usually answered by the female spouse of the household head. The female questionnaire was administered to women ages 18–59 (and those ever-married ages 10–17) in 2006, and it was administered to ever-married women ages 15–49 in 2013. The female questionnaire included a module for children under age five, and an additional module for the youngest child born in the three years before the survey, with information provided by the child's mother or guardian. Survey response rates ranged from 93% to 97% depending on the survey round, questionnaire type (household, female) and city-corporation subdomain (slum, nonslum).

The full sample for our analysis is 2,264 children in 1,956 households in 254 neighborhood areas (slum: 128; nonslum: 126) in 2006, and it is 7,619 children in 6,848 households in 1,278 neighborhood areas (slum: 449; nonslum: 829) in 2013.

B. *Empirical strategy*

Multiple regression: To examine the factors associated with HAZ scores in 2013, we estimate various multiple regression specifications. The base regression relationship is modeled linearly as

$$Y_{imha} = \alpha + X_{imha}\beta_I + X_{mha}\beta_M + X_{ha}\beta_H + X_a\beta_A + \nu + \varepsilon_{imha}, \quad (1)$$

where Y_{imha} denotes the HAZ score for child *i* from mother *i* in household *h* in neighborhood area *a*; X_{imha} is a vector of child factors; X_{mha}, a vector of maternal factors; X_{ha}, a vector of household factors; X_n, a vector of neighborhood-area factors; ν, administrative-division fixed effects; and ε_{ihn}, the error term. We are interested in the parameter vectors β_I, β_M, β_H, and β_A. The regressions are estimated based on ordinary least squares.

We also estimate regressions with neighborhood-area fixed effects, thus accounting for unobserved heterogeneity at the level of the neighborhood area or higher. While this approach can reduce bias in our estimated parameters, it may come at the cost of reduced precision in our estimated standard errors if variation is limited among children within a neighborhood area. In all regressions, standard errors are estimated correcting for heteroskedasticity of arbitrary form and clustering at the neighborhood-area level. All regression specifications are estimated for three neighborhood-area samples: all areas (referred to as pooled), slum areas, and nonslum areas.

Aggregate decomposition: To examine the extent and nature of the contributions of regression factors to the difference in mean HAZ scores between slum and nonslum children in 2013, or the changes in mean HAZ scores between 2006 and 2013 for slum and nonslum children, we apply the extension proposed by Daymont and Andrisani (1984) to the classical Oaxaca-Blinder counterfactual regression-based decomposition method (Oaxaca 1973, Blinder 1973). The Oaxaca-Blinder decomposition method and its extensions have been applied in the health economics literature to investigate differences in health outcomes or health service utilization among social, economic, and spatial groups, and between time periods (for example, see Kumar and Singh 2013; Haddad et al. 2012; Wagstaff, van Doorslaer, and Watanabe 2003). The method has also been applied to nutrition in Bangladesh, for example, to investigate the rural-urban gap in mean HAZ scores (Srinivasan, Zanello, and Shankar 2013) and the intertemporal change in mean HAZ scores in selected rural areas (Nguyen et al. 2017).

Adapting the notation by Fortin, Lemieux, and Firpo (2011), and taking the case of decomposing the slum-nonslum difference in mean HAZ scores in 2013, let *S* denote a slum neighborhood area, and *NS*, a nonslum neighborhood area. The linear regression relationship for HAZ scores is given by

$$Y_g = X\beta_g + \varepsilon_g, \tag{2}$$

where $E(\varepsilon_g \mid X) = 0$ group $g = (S, NS)$. Let $D_S = 1$ be an indicator of residing in a slum neighborhood area; zero otherwise. The slum-nonslum difference in mean HAZ scores, Δ^{μ}, can be decomposed as follows:

$$\begin{aligned}
\Delta^{\mu} &= E[Y_S \mid D_S = 1] - E[Y_{NS} \mid D_S = 0] \\
&= \{E[X \mid D_S = 1](\beta_S - \beta_{NS})\} \\
&\quad + \{(E[X \mid D_S = 1] - E[X \mid D_S = 0])\beta_{NS}\} \\
&\quad + \{(E[X \mid D_S = 1] - E[X \mid D_S = 0])(\beta_S - \beta_{NS})\} \\
&= \Delta^{\mu}_{\beta} + \Delta^{\mu}_{X} + \Delta^{\mu}_{I}
\end{aligned} \tag{3}$$

The first term in braces, denoted by Δ^{μ}_{β}, is the component due to slum-nonslum differences in the regression parameters of the factors, the second term in braces, denoted by Δ^{μ}_{X}, is the component due to slum-nonslum differences in the expected levels of the factors, and the third term in braces, denoted by Δ_I^{μ}, is the component due to the interaction between Δ_{β}^{μ} and Δ_X^{μ}. Equation (3) can be computed by using sample means for the factors $\overline{X}_g$, and parameter estimates $\hat{\beta}_g$.

Detailed decomposition: We are also interested in analyzing the contributions of (groups of) individual factors to the aggregate decomposition components. The aggregate decomposition components are essentially sums of the corresponding decomposition components of the individual factors.[24] We recognize that the detailed decompositions of Δ_{β}^{μ} and Δ_I^{μ} are not independent of the choice of the omitted categories for categorical factors in the regressions. That is, if the omitted category for a given categorical factor changes, the detailed decomposition results can change (Oaxaca and Ransom 1999; Jones 1983). While methods are available, we elect not to address this problem, in order to allow for the interpretability and comparability of our results.[25]

We also estimate all regressions and decompositions for stunting (a dichotomous variable) linearly based on ordinary least squares (limited probability model) and nonlinearly based on a binomial logit model.[26] Our results generally remain unchanged. The robustness of the results to the choice of outcome indicator is likely because the sample around mean HAZ scores is not that far apart from the sample around the threshold HAZ score for stunting. The results for stunting are available upon request.

While we refer to the regression results as "effects" and the decomposition results as "contributions", the results represent associations, and we do not intend to imply causality.

[24] Standard errors for the aggregate and detailed decomposition results are approximated by first estimating the variance-covariance matrix accounting for clustering at the neighborhood-area level and then applying the delta method (Greene 2008; Jann 2008).

[25] Proposed solutions to the problem essentially perform some normalization of the estimated parameters across all categories of the categorical factor (for example, see Yun 2008; Gardeazabal and Ugidos 2004). The drawback is that these normalizations can obviate both the meaningful interpretation of the decomposition results and the comparability of results across studies (Fortin et al. 2011). For example, the omitted categories we choose for our categorical factors, such as Dhaka division for administrative divisions, or "mother born in the current city" for location of mother's birth, are likely to be the same choices made in other studies for Bangladesh.

[26] We estimate conditional fixed-effects binomial logit regressions for the specification with neighborhood area indicators in order to avoid incidental parameters which can bias our estimations. Aggregate and detailed decompositions are based on binomial logit regressions, and the detailed decomposition results are obtained using the nonlinear decomposition approach proposed by Yun (2004).

4. Results

A. *Mean child HAZ scores and mean levels of factors*

Mean outcomes: Table 1 reports mean HAZ scores and stunting rates. In the pooled sample, the mean HAZ score was –1.69 SD below the international reference median, the moderate-to-severe stunting rate was 42%, and the severe stunting rate was 20%.[27] Slum children have significantly worse growth outcomes than nonslum children. Relative to nonslum children, slum children have a mean HAZ score that is lower by 0.58 SD, a moderate-to-stunting rate that is lower by 16 pp., and a severe stunting rate that is lower by 10 pp.[28] Figure 4 shows the cumulative distributions of HAZ scores separately for slum and nonslum children. The two distributions significantly differ, based on a Kolmogorov-Smirnov test.

Comparing our statistics for city corporations to published statistics from the 2014 DHS for rural and urban areas, we note three main findings. First, city corporations have poorer mean child growth outcomes than those for all urban areas. For example, the moderate-to-severe stunting rate in the pooled city-corporation sample is 42%, compared to 31% for all urban areas. Second, slum children in city corporations have poorer mean growth outcomes than rural children. For example, the moderate-to-severe stunting rate for slum children is 48%, compared to 38% for rural children. Third, nonslum children in city corporations have a lower moderate-to-severe stunting rate than rural children (31% versus 38%), but have a comparable severe stunting rate to children in all urban areas (31%). The estimates suggest that mean growth outcomes for urban areas conceal substantial variation in mean outcomes across and within urban entities, and that mean outcomes are especially poor for slum children not just as an urban subpopulation but as a national subpopulation.

Mean levels of factors: Table 2 reports mean levels for the base set of child, maternal, household, and neighborhood-area factors that we include in our multivariate analysis of HAZ

[27] A child is considered to be moderately-to-severely stunted if his or her HAZ score is more than two SD below the international reference population median. A child is considered to be severely stunted if his or her HAZ score is three SD below the international reference population median.

[28] Our estimated stunting rates are a few percentage points off from those provided in the 2013 BUHS report (NIPORT et al. 2015), which we suspect is due to the loss of 100–200 children from our sample identified to have invalid anthropometric measurements.

scores.[29] Appendix Table A1 provides definitions of these and other factors that are examined subsequently. In the pooled sample, 49% of children were female, 3% experienced an illness with acute respiratory infection (ARI) symptoms in the two weeks before the survey, and 31% experienced an illness with fever in the same reference period. In terms of maternal factors, 86% of children were born when their mothers were between 18 and 34 years of age, a range considered to have a lower risk of child death (Rustein and Winter 2014); 20% had mothers that were currently employed; and 85% had mothers who were regularly exposed to mass media as measured by watching TV at least once a week (TV was the most popular mass media source). Mothers' mean education attainment was 5.68 years. In terms of neighborhood-area factors, 69% of children resided in an area with formal garbage collection, 48% with a proper sewerage system, 51% served by community health workers, 48% with an available NGO health facility; 14% with an available public health facility, and 36% with an available private health facility. All neighborhood areas had pharmacies.

The levels of child health (recent illness with fever or ARI symptoms), mother's age at child's birth, mother's education attainment, mother's regular exposure to mass media, and formal garbage collection and proper sewerage system in the neighborhood area were less favorable for slum than nonslum children. Household wealth, measured by a standardized household asset index, was roughly one SD lower for slum children. Slum children were more likely to have mothers who were employed (24% versus 13%). Slum neighborhood areas were more likely to have community health workers (55% versus 44%) and less likely to have private health facilities (33% versus 42%). NGO and public health facilities, and pharmacies, were available at similar rates in slum and nonslum neighborhood areas.

[29] The 2013 BUHS did not collect information on potentially relevant factors such as: for the child, birth weight, diarrhea and treatment, immunization, and deworming; for the mother, physical and mental health (for example, underweight status) and decisionmaking authority over household expenditures on own and child health, and over food for the household; and, for the household, food security. The 2006 BUHS collected information on some of these factors; we find significant differences in the mean levels for several of these factors between slum and nonslum children at that time. While we examine the effects of access to improved toilets later in the paper, the BUHS did not gather information on open defecation. Headey et al. (2015) find that the area-level open defecation rate is negatively associated with HAZ scores in urban areas in particular in Bangladesh. Although the 2013 BUHS collected information on breastfeeding, we do not examine the effect of this factor because of limited variation: for children under two years of age, mothers reported that 70% were breastfed within an hour of birth, and 94% were being breastfed at the time of the survey. Also due to limited variation in our data, we do not include micronutrient supplementation as factors in the regressions: for children under five years of age, 1% were given a nutrient mix and 3% were given iron supplements in the day prior to the survey.

B. *Bivariate associations between child HAZ scores and selected socioeconomic factors*

We examine the bivariate association between HAZ scores and selected continuous factors, namely (1) child's age in months, (2) standardized household wealth index, (3) duration of mother's residence in the current city corporation in years, conditional on having moved there, and (4) mother's education attainment in years. Figure 5 shows local polynomial plots of the bivariate associations, with 95% confidence intervals.

Slum and nonslum children have comparable mean HAZ scores at birth, and then experience a decline in mean HAZ scores before the scores roughly level off at about two years of age. Mean HAZ scores decline more steeply for slum than nonslum children over the first two years of age. Mean HAZ scores are similar between slum and nonslum children for the least and most wealthy households, and between slum and nonslum children with the most educated mothers. Otherwise, mean HAZ scores are higher for nonslum than slum children across the ranges of household wealth, years since the mother moved to the current city corporation, and years of mother's education.

C. *Effects of demographic and socioeconomic factors on child HAZ scores*

Table 3 presents multiple regression results of the effects of the base set of factors on HAZ scores. In the first set of regressions (Columns 1–3), we include division fixed effects, identifying effects of child, maternal, household, and neighborhood-area factors based on variation within a division. In the second set of regressions (Columns 4–6), we include neighborhood-area fixed effects, identifying effects of child, mother, and household factors based on variation within an area. Given that the share of children that experienced a recent illness with ARI symptoms is small, we construct a single indicator for whether the child experienced a recent illness with fever or ARI symptoms.

We begin by discussing significant results from regressions with division fixed effects. Child's age has a negative effect in all samples (pooled, slum, and nonslum). Child illness with fever or ARI symptoms has a negative effect of –0.14 SD in the nonslum sample. In the pooled sample, giving birth when the mother was younger than 18 years of age has a significant negative effect of –0.22 SD, relative to giving birth when the mother was aged between 18 and 34. The pooled-sample effect is driven by the slum-sample effect.

Mother's regular exposure to mass media has a significant positive effect of 0.25 SD in the nonslum sample. Mother's membership in an NGO has a significant positive effect of 0.17 SD in the slum sample. Adams, Nababan, and Hanifi (2015) document the positive link between mother's membership in an NGO and the use of RMNCH services. The effect of NGO membership on HAZ scores that we find may be mediated by the use of RMNCH services, which we do not control for in these regressions.

In all samples, mother's education attainment and household wealth have significant positive effects on HAZ scores. In the pooled sample, an additional year of mother's education has a positive effect of 0.03 SD, and a one SD increase in household wealth (that is, going from the mean to the 84th percentile in the wealth index) has a positive effect of 0.22 SD. Household size has a negative effect in the slum and nonslum samples, but only the pooled-sample effect of –0.02 SD is significant.

The availability of community health workers and NGO and public health facilities in the neighborhood area have negative, but mostly insignificant, effects on HAZ scores. The exception is the nonslum-sample effect of the availability of public health facilities, which is a significant –0.19 SD. The negative effects are presumably placement effects: areas served by community health workers, and NGO and public health facilities, may be socioeconomically disadvantaged in ways not adequately captured by household wealth and neighborhood environmental quality factors that we include in the regressions. The availability of private health facilities in the neighborhood area has a significant positive effect of 0.09 SD in the pooled sample, driven by the slum-sample effect (0.13 SD). Residing in a nonslum neighborhood area has a significant positive effect of 0.20 SD. Factors that have insignificant effects include the child's gender, the mother's employment status, and the availability of formal garbage collection and a proper sewerage system in the neighborhood area.[30]

[30] The effect of maternal employment is net of its effect through greater household income to the extent that the household wealth index captures this potential pathway. Another potential pathway for the effect of maternal employment would be greater maternal authority at home over food and health care decisions, which we do not control for in our regressions. While we do not find a significant negative effect, maternal employment could have adverse effects. Examining working mothers in Dhaka slum settlements, Kabir and Miatrot (2017) find that mothers report poor feeding and care knowledge and practice by siblings, the mother-in-law, and the child's father, and disruptions in feeding and care when the responsibility for the child is shifted among caregivers. Working mothers also report that child feeding and care suffer because of fatigue from their employment activity, and time- and labor-intensive domestic responsibilities.

The results largely hold in the regressions with neighborhood-area fixed effects. Child's age, child illness, mother's age at child's birth, mother's education attainment, mother's birth location (specifically, mother's birth in another urban area), mother's membership in an NGO, and household wealth continue to have significant effects on HAZ scores. For factors that are similar between our analysis and that of Ahsan et al. (2017), inference results from our regressions with division fixed effects for slum and nonslum samples match those from their final stunting regression specifications. Our findings are also largely consistent with those from studies of the determinants of child undernutrition in selected slum settlements in various urban centers in Bangladesh (Fakir and Khan 2015; Zaman et al. 2015; Alam et al. 2011), as well as with international evidence on the determinants of child undernutrition in slum areas (Goudet et al. 2017; Abuya, Ciera, and Kimani-Murage 2012).

D. *Effects of the use of maternal and child health services on child HAZ scores*

Here, we examine the effects of antenatal care, delivery, and newborn exam at health facilities on HAZ scores. The information on antenatal care, delivery, and newborn exam were gathered in the 2013 BUHS only for the youngest child born in the three years before the survey (61% of our full analysis sample).

Mean levels: Table 4 reports the rates of use of health services by provider type. In the pooled sample, mothers of 70% of children obtained antenatal care in a health facility, 49% of children were delivered in a health facility, and 40% of children received an exam when newborn in a health facility. While cases exist of qualified health professionals providing antenatal care and conducting newborn exams at home, the shares fall in the low single digits, and these cases are categorized under "no service".

The use of private providers and facilities dominates. Mothers of 31% of children obtained antenatal care at a private health facility, 23% at an NGO health facility, and 16% at a public health facility. Similarly, 21% of children were delivered at a private health facility, and 14% each at an NGO or public health facility. Eighteen percent of children had a newborn exam at a private health facility, and 11% each at an NGO or public health facility.

Slum children recorded lower rates of use of health services than nonslum children. The rates of maternal antenatal care, delivery, and newborn exam in a health facility were 22–25 pp. lower for slum children. Slum children had higher rates of use of NGO health facilities for maternal antenatal care, delivery, and newborn exam, and lower rates of use of private health facilities for these services. For example, mothers of 27% of slum children obtained antenatal care from an NGO health facility, compared to 17% for nonslum children; mothers of 20% of slum children obtained the same service from a private health facility, compared to 51% for nonslum children.

The 2013 BUHS asked the mother the reason for her choice of delivery site for the youngest child born in the three years before the survey. Table 5 reports the distribution of responses. In the pooled sample, the main reason that mothers chose to deliver in a health facility was due to pregnancy or delivery complications (55% of cases), followed by safety of the health facility (29%). The main reasons that mothers reported for choosing a specific health facility were safety (33% of cases), prior knowledge about the provider (17%), and receipt of antenatal care there (14%). Mothers reported cost as the reason in 6% of cases, and proximity of the health facility to home in 10%. For children who were delivered at home, mothers predominately reported that they felt that it was not necessary to deliver at a health facility (70% of cases). Cost or lack of money was reported only for 12% of cases.

Slum mothers were more likely to report cost and distance as the reasons for their choice of a specific health facility than nonslum mothers (cost: 9% versus 4% of cases; distance: 11% versus 7% of cases). Among those who delivered at home, slum mothers were also more likely to report cost or lack of money as the reason for their choice than nonslum mothers (13% versus 9% of cases).

Effects: The type of health facility for antenatal care or delivery may influence child growth, if, for example, it is associated with quality of care. Mothers may choose to obtain antenatal care or deliver at a specific type of health facility because they expect to obtain better care there for any pregnancy or delivery complications. Even if they obtain better care, complications may induce a negative association between a higher-quality health facility or provider type and child growth.

Table 6 presents the estimated effects on HAZ scores of the use of maternal and child health services at a facility (Panel A), and at a facility by type (Panel B). The regressions control for the base set of factors. Of note, the regressions control for household wealth, which could influence whether households use free or subsidized public or NGO health services, or fee-based private health services, as well as the availability of RMNCH services in the neighborhood area, offered through community health workers or health facilities.

Antenatal care at a health facility has a significant positive effect of 0.21 SD in the pooled sample. The effects are similar in size and significant in the slum and nonslum samples. Although positive, the effects of delivery or newborn exam at a health facility are insignificant in all samples.

Looking by type of health facility, antenatal care has a significant positive effect irrespective of the type in the pooled sample. The pooled-sample effect of 0.28 SD for antenatal care in a public health facility is driven by the nonslum-sample effect (0.42 SD), whereas the pooled-sample effect of 0.14 SD for antenatal care in an NGO health facility is driven by the slum-sample effect (0.18 SD). Delivery or newborn exam in a public health facility have significant positive effects in the pooled sample; the corresponding effects are not always significant in the slum and nonslum samples. The effects for delivery or newborn exam in other types of health facilities are insignificant in all samples.[31]

E. *Effects of potential health-protective household amenities on child HAZ scores*

A sanitary community and home environment can protect children from illness, and thereby promote nutrition status. Reviews of international evidence suggest that poor water and sanitation facilities, and hygiene practices (WASH) are significantly associated with diarrhea and intestinal parasitic infection (Strunz et al. 2014; Ziegelbauer et al. 2012; Fewtrell et al. 2005; Clasen et al. 2007), and that diarrhea is significantly associated with poorer nutrition status (Dewey and Mayers 2011). The international evaluative evidence also generally suggests that improved WASH has a positive, albeit modest, effect on child growth (Dangour et al. 2013). While much more limited, evidence from other countries suggest a negative link between indoor air pollution and nutrition status (Mishra and Retherford 2007), and a positive link between built home flooring and health and nutrition status (Cattaneo et al. 2009).

[31] Pairwise tests indicate that indicators for antenatal care, delivery, and newborn exam at a health facility are significantly and positively correlated; likewise, by health-facility type. Thus, the estimated effect of antenatal care at a health facility in our regressions may have absorbed the effects of delivery and newborn exam at a health facility. Results from regressions where we separately examine the effects of antenatal care, delivery, and newborn exam at a health facility do not indicate that this is the case.

In terms of evidence for Bangladesh, Luby, and Halder (2008) find that a handwashing place at the dwelling is significantly associated with a lower rate of ARI symptoms among young children in a sample of households in Dhaka city. Lin et al. (2013) find that sanitary household WASH conditions are significantly associated with a lower rate of intestinal parasitic infection, better nutrition status, and lower rates of markers of environmental enteropathy among young children in a sample of rural households. Baker et al. (2016) find that young children in households that share toilet facilities have a significantly higher rate of diarrhea in Mirzapur city (as well as in selected urban centers in Africa and other South Asian countries).

Motivated by this evidence, we examine the effects of household access to piped drinking water and an improved toilet, safe disposal of garbage by the household, household use of a clean fuel for cooking, a finished floor in the dwelling, and a handwashing site with soap and water at the dwelling.

Mean levels: Table 7 reports mean levels for potential health-protective household amenities. In the pooled sample, 19% of children belonged to households that had unshared access to piped drinking water, and 45% to households that had shared access. Virtually all children belonged to households that had access to an improved toilet, but shared access was common. Specifically, 31% belonged to households that had unshared access to an improved toilet, 37% that had access to an improved toilet which was shared with fewer than nine households, and 30% that had access to an improved toilet which was shared with nine or more households. Fifty-three percent of children belonged to households that safely disposed of household garbage (through collection or by disposal in an outside bin); 71% that used a clean cooking fuel (liquid petroleum gas, natural gas, kerosene, or biogas); 81% that had a dwelling with a finished floor; and 45% that had a handwashing site with soap and water on the premises, as observed by the survey interviewer.

Household amenities are significantly less available and accessible to slum children than nonslum children. Slum children are much more likely to belong to households that share access to piped drinking water and an improved toilet than nonslum children. For example, 42% of slum children belonged to households that had access to an improved toilet which was shared with nine or more households, compared to 8% of nonslum children.

Effects: Table 8 reports the estimated effects of potential health-protective household amenities on HAZ scores. Given that virtually all households had access to improved toilets, we restrict the analysis to children in such households, and examine the effect of shared access to an improved toilet. The amenities are strongly correlated with our household wealth index even when they are excluded from the construction of the index. Thus, we examine the effects of the amenities, controlling for the base set of factors, but excluding the household wealth index.

Sharing access to an improved toilet with nine or more households has a significant negative effect of –0.20 SD in the pooled sample. The pooled-sample effect is driven by the slum-sample effect (–0.27 SD). Sharing access to an improved toilet with fewer households also has negative effects in all samples but they are insignificant. The presence of a handwashing site with soap and water has a significant positive effect of 0.24 SD for nonslum children. The corresponding effect for slum children is 0.04 SD, and insignificant. All other amenities have insignificant effects. Ahsan et al. (2017) also examine safe garbage disposal and access to improved toilets, and find that these factors have insignificant effects on child stunting status in their full slum and nonslum regression specifications.

As a caveat, our analysis of the effects of household amenities does not account for the quality, reliability, or time availability of these amenities. Large-scale evidence on these dimensions is lacking for Bangladesh. Examining a small sample of poor working mothers in slum settlements in Dhaka city, Kabir and Miatrot (2017) find that, while mothers have access to gas stoves, they report that child feeding suffers because of constraints on when gas supply is available and when they can get access to shared stoves. Although home air quality may have improved due to the use of gas for cooking, thereby promoting child health, the noted issues can undermine child nutrition status through the food consumption channel.

Our finding that households that share toilets with several other households have lower child HAZ scores may be because these communal toilets are particularly unclean and poorly maintained. Such conditions make open defecation more likely, and increase the risk of disease transmission. Alam et al. (2016) find that the main reasons that communal toilets become unsanitary in selected slum settlements in Dhaka city is due to a lack of adequate water for flushing and the disposal of garbage into toilets that leads to clogging. Under an experimental evaluation, the authors find an improvement in toilet maintenance and cleanliness after placing a garbage bin and a small flushing bucket in each communal toilet; providing a large water storage bucket in toilets in slum settlements that suffered from water scarcity; and providing behavior change messages through home visits by health promoters and posters in the toilets.

F. *Effects of mother moving to a city corporation on child HAZ scores*

Existing evidence on the effects of within country, rural-urban migration on health and nutrition outcomes in developing countries is highly limited, and mixed (Mu and de Brauw 2015). We examine the effect on HAZ scores of (1) the type of location from which the mother moved from (another urban center or a rural area), (2) the reason reported by the mother for moving to the current city corporation (work-related, family-related, or other such as education- or property-related), and (3) number of years since the mother moved to the current city corporation.[32] Separate questions were asked to the mother on whether the move to the current city corporation was due to loss from an adverse natural event (salinity, flood, cyclone, drought, or river erosion) or whether any move in the past was due to an adverse natural event. Less than 1% of mothers reported adverse natural events as the reason for moving.

Mean levels: Table 9 reports summary statistics for the various dimensions of the mother's move decision. In the pooled sample, 12% of children had mothers who were born in an urban center other than the current city corporation, and 54% had mothers who were born in a rural area. Conditional on moving to the current city corporation, 67% of children had mothers who had moved for family reasons, 29% for work reasons, and 4% for other reasons. Mean years since the move was 8.52 years. Slum children were more likely to have mothers who were born in a rural area than nonslum children (57% versus 49%). Slum children were also more likely to have mothers who had moved to the city corporation for work-related reasons than nonslum children (33% versus 20%). Mean years since the mother's move were similar for slum and nonslum children.

Effects: One can conceive of different mechanisms that generate positive or negative effects on child growth due to the mother moving to the current city corporation, the reason for the move, or the number of years residing in the current city corporation, depending on whether the upside or downside risks to health and nutrition from residing in an urban area dominate. Thus, the net effect of mother's move to the current city corporation on child growth is theoretically ambiguous. Table 10 reports the effects of the mother moving to the current city

[32] Comparing migrant and non-migrant households at destination in assessing the effects of migration on child nutrition status may be biased. Nonmigrants households at origin are considered as a more appropriate comparison group (Song and Sun 2016; Yu 2010).

corporation on HAZ scores, controlling for the base set of factors. The reference category for the effect of birth location is mother born in the current city corporation. The reference category for the effect of reason for move is mother always resided in the current city corporation. Mothers who moved for reasons other than work or family are omitted from the regressions. The regressions for the effect of time since the mother's move is conditional on moving to the current city corporation.

Mother born in another urban center has a significant positive effect of 0.18 SD in the pooled sample. The pooled-sample effect is driven by the slum-sample effect (0.25 SD). Mother born in a rural area has a significant positive effect of 0.14 SD in the nonslum sample. Mother moving for work reasons has a significant positive effect of 0.30 SD in the nonslum sample. Consistent with the flat patterns in the bivariate plots in Figure 5, Panel C, time since the mother moved has positive, but insignificant, effects in all samples. Discretizing years since the mother moved to the current city corporation, Ahsan et al. (2017) also find that this factor does not have a significant effect on child stunting status in their slum and nonslum regressions. At the very least, the collective evidence suggests that mother's migration to the current city corporation, whether to a slum or nonslum neighborhood area, does not appear to have a negative effect on child growth.

In related research, Islam and Gagnon (2016) use 2006 BUHS data to examine the effects of mother's migration on the use of RMNCH services. Specifically, the authors look at the effects of whether the mother moved to a city corporation; and, for migrant mothers, how long the mother had resided in the current city corporation, whether the mother was born in a rural area, and whether the mother self-reported moving for employment or education reasons. They find that mother's migration has significant negative effects on the use of different maternal and child health services, while years lived in the current city corporation only has a positive effect on the use of antenatal care services. Given these findings, we re-estimate the effects of our various measures related to the mother moving to the current city corporation, controlling for the use of maternal and child health services in the relevant child subsamples. Our results generally hold.

G. *Decomposition of slum-nonslum difference in child HAZ scores*

Table 11 reports the decomposition results for the slum-nonslum difference in estimated mean HAZ scores (the outcome gap), which is a significant –0.59 SD, into (1) slum-nonslum differences in the estimated mean levels of factors (the factor-level gap), (2) slum-nonslum differences in the estimated effects of the factors (the effect gap), and (3) interactions between factor-level and effect gaps (the interaction gap), at the aggregate and detailed (individual factor) decomposition levels. For the detailed decomposition, we only report results for factors that are significant.[33] We perform the aggregate and detailed decompositions for the base set of factors.

To simplify the results and facilitate interpretation, we grouped together selected individual factors for the detailed decomposition. Specifically, we grouped (1) indicators for mother's age at time of child's birth into a "mother's age at child's birth" group; (2) indicators for formal garbage collection and proper sewerage system into a "neighborhood area environmental health" group; (3) indicators for the availability of community health workers and of public, NGO, and private health facilities into an "RMNCH service availability" group; and (4) indicators for administrative divisions into a "division" group.

At the aggregate decomposition level, while both the overall factor-level gap and the overall effect gap are significant contributors to the outcome gap, the contribution of the overall factor-level gap is larger in size (–0.38 SD versus –0.19 SD). The overall interaction gap also contributes to the outcome gap, but its contribution is small (–0.01 SD) and insignificant.

At the detailed decomposition level, the main significant factor-level gap is for household wealth (–0.28 SD), followed by the factor-level gap for mother's education attainment (–0.09 SD). The only significant contributor to the overall effect gap (that is, in the same direction as the overall effect gap) is the mother's age at child's birth. In addition, the only significant contributor to the overall interaction gap is the mother's age at child's birth. The decomposition results remain unchanged when we include factors for the use of maternal and child health services in the regressions.

H. *Decomposition of change in HAZ scores for slum and nonslum children*

We also decompose the change in mean HAZ scores from 2006 to 2013 for slum and

[33] We do not convert the decomposition results into proportions of the outcome gap due to factor level, effect, and interaction gaps as some studies do because this exercise fails to account for the imprecision in the estimates.

nonslum children. Table 12 reports means for child growth, and for child, maternal, household and neighborhood-area factors. Mean HAZ scores significantly increased for slum and nonslum children. Mean HAZ scores increased by 0.23 SD for slum children, and by 0.20 SD for nonslum children. Moderate-to-severe and severe stunting rates significantly declined for slum children by –8 pp. and –5 pp., respectively. Stunting rates for nonslum children also declined, but the magnitudes were insignificant.

In terms of child factors, the shares of children ill with fever or ARI symptoms decreased significantly. Mean birth order also decreased significantly, presumably due to declining fertility. In terms of maternal factors, mean education attainment increased significantly, while the share who are members of NGOs and the share born in rural areas declined significantly. In terms of household factors, mean wealth increased significantly, while mean household size declined significantly. In terms of neighborhood-area factors, the rates of availability of community health workers and pharmacies increased significantly, whereas the changes in the rates of availability of public, NGO, and private health facilities were insignificant. These findings apply to all samples. In addition, the shares of slum neighborhood areas with formal garbage collection or a proper sewerage system increased significantly.

Table 13 reports the decomposition results for the change in mean HAZ scores (the outcome change) into (1) changes in the estimated mean levels of factors (the factor-level change), (2) changes in the estimated effects of the factors (the effect change), and (3) interactions between factor-level and effect changes (the interaction change). We do this separately for slum and nonslum children. We do not decompose the change in the slum-nonslum gap in mean HAZ scores because the gap changed little over the period.

For slum children, at the aggregate decomposition level, the factor-level change significantly contributed 0.09 SD to the outcome change. The effect and interaction changes contributed 0.05 SD and 0.07 SD, respectively, to the outcome change, but the contributions are insignificant. At the detailed decomposition level, the significant contributors to the overall factor-level change are mother's education attainment (0.04 SD) and household wealth (0.06 SD). The only significant contributor to the overall effect and interaction changes is the child's birth order (0.24 SD and 0.05 SD, respectively).

The results for nonslum children are mostly similar. At the aggregate decomposition level, only the factor-level change significantly contributed 0.13 SD to the outcome change. At the detailed decomposition level, the significant contributors to the overall factor-level change are child's recent illness with fever or ARI symptoms (0.02 SD), mother's education attainment (0.04 SD), and household wealth (0.09 SD). There were no significant contributors to the overall effect change, and the only significant contributor to the overall interaction change is the neighborhood area's RMNCH service availability (0.16 SD). The evidence generally suggests that the changes in mean HAZ scores for slum and nonslum children were driven by changes in the mean levels of factors, mainly by the increases in the mean levels of mother's education attainment and household wealth. The decomposition results remain qualitatively similar when we include factors for the use of maternal and child health services in the regressions.

5. Conclusion

To recapitulate, the collective evidence indicates that mean child nutrition status and socioeconomic conditions are substantially poorer for slum than nonslum residents. Compared to nonslum residents, slum residents register lower levels for child growth; mother's education attainment; household wealth; access to, and availability of, health-protective household amenities; use of maternal and child health services; and neighborhood-area environmental quality.

Child's age, mother's age at child's birth, mother's education attainment, and household wealth have significant effects on child growth. The effects remain large and significant even when accounting for unobserved heterogeneity at the neighborhood-area level. The positive effect on child growth of residing in a nonslum neighborhood area remains significant even after controlling for a range of child, maternal, household, and neighborhood-area factors, indicating the continued presence of unobserved heterogeneity correlated with slum status. The use of public health facilities for antenatal care, delivery, or newborn exam has a positive effect on child growth; likewise, for the use of NGO or private health facilities for antenatal care. Access to improved toilets that is shared with a large number of other households has a negative effect on slum child growth, whereas a handwashing site with soap and water at the dwelling has a positive effect on nonslum child growth. Mother's move to the current city corporation, measured by different dimensions of the move decision, does not appear to have a negative effect on child growth.

The difference in mean growth between slum and nonslum children in 2013 is driven by differences in the mean levels of factors for slum and nonslum children, in particular, with respect to mother's education attainment and household wealth. Similarly, the increase in mean growth between 2006 and 2013 for slum and nonslum children is driven by increases in the mean levels of factors, in particular, with respect to mother's education attainment and household wealth.

There is fairly consistent international evidence on the large positive effect of mother's education on child growth. For example, using microdata for a large set of developing countries, Alderman and Headey (2017) find that the effect of mother's education on child growth increases with years of education, is larger than the effect of father's education, and is larger for countries with high stunting rates. Maternal education is theorized to affect child nutrition status through a household income effect arising from greater labor earnings, which we attempt to control for based on household asset-based wealth. Maternal education is also theorized to affect child nutrition status through the direct delivery of health and nutrition information; delayed age of marriage and age at child's birth; greater ability to acquire, absorb, and apply health and nutrition information from other sources; greater openness to RMNCH services; greater decisionmaking authority within the household with respect to food, health, and care; and access to more-educated social networks (Ruel et al. 2013). Using data from a slum settlement in Dhaka, Fakir and Khan (2015) find that the effect of mother's education attainment on child underweight status appears to be partially mediated through her knowledge of health-promoting behaviors. Our data do not allow us to test potential pathways. Nevertheless, the results suggest that policies and programs that aim to raise girls' education attainment are appropriate, and should receive greater priority.

Likewise, international evidence is fairly consistent in showing a large positive effect of household economic status on child growth (Ruel et al. 2013). Cash transfers offer one way to raise household income. Manley, Gitter, and Slavchevska (2013) find that, while the collective evaluative evidence of both unconditional and conditional cash transfer programs is mixed in developing countries, the aggregate effect size of these programs on child growth is small and insignificant. However, the study indicates that the transfers may have a larger impact on poorer, younger, and more socially disadvantaged children; on children in settings with relatively poor nutrition status or low health service utilization rates at baseline; and on children in households that have received transfers over a longer duration.[34] These insights on the variation of effects across transfer programs are useful for intervention design. In addition, Alderman and Headey (2017) find using multi-country microdata that mother's education and household wealth are complements, suggesting that policies and programs that succeed in raising household economic status may also raise the nutrition payoffs to education attainment.

The decomposition results do not suggest that other factors are fundamentally less important for child growth than mother's education attainment and household wealth. Factors included in the decompositions with the largest cross-sectional differences in levels or effects would mechanically contribute the most to the cross-sectional difference in the level of child growth; analogously, in the decompositions of intertemporal changes. Although the results underscore the importance of introducing policies and programs that further promote and leverage mother's education attainment and household economic status, they do not discourage policies and programs that aim to transform factors with low levels or small effects, or factors with levels or effects that have changed little.

The evidence suggests that the development and improvement of nutrition-sensitive programs is key. Two ways to enhance the nutrition sensitivity of programs are by incorporating explicit nutrition goals and by targeting women and children who are more nutritionally vulnerable from a physiological viewpoint (Ruel et al. 2013). Given that slum residents face multiple disadvantages, it may be necessary to saturate slum settlements with a wide array of nutrition-sensitive programs to generate large, durable gains in nutrition status. Notwithstanding, nutrition-specific interventions should remain part of the policy package for slum residents. In their review of the international evidence, Goudet et al. (2017) find that nutrition-specific interventions in slum settlements—such as micronutrient supplementation, nutrition promotion, school feeding, and treatment of acute malnutrition—tend to have positive effects on child nutrition status.

[34] In terms of available evidence for Bangladesh, Ferre and Sharif (2014) examine the effects of a cash transfers offered to very poor households under a pilot program in rural Rangpur division and in slum settlements in Narayanganj city, Dhaka division. The transfers were tied to households attending sessions for child growth monitoring, and counseling on child care and feeding, among other conditions. Using nonexperimental methods, the authors find that the program increased household overall, food, and protein consumption. They also find that knowledge on child feeding rose. The authors do not find significant effects on child dietary diversity, stunting status, or underweight status. They however find a significant negative effect on wasting status for children ages 10–22 months at program enrollment, but not for children in the older age group of 22–46 months at program enrollment.

The success of NGOs in health development in rural Bangladesh is attributed to decades of experience, characterized by continuous learning and adaptation of interventions. Engagement by NGOs in the provision of urban primary health services is much more recent, but a similar process would be needed. Notwithstanding, the health development record in rural Bangladesh is mixed. The government and NGOs have been especially successful in promoting family planning through contraceptives, infectious disease prevention through vaccinations, and diarrheal treatment through oral rehydration, whereas they have been less successful in other areas of maternal and child health, and in addressing maternal and child undernutrition (Arifeen et al. 2013). Hence, there is an even greater need for iterative learning from testing interventions for improving the quality and increasing the use of health services—irrespective of the provider—by slum residents and the urban poor.

While policymakers should continue to expand access to, and improve the quality of, preventive health technologies and services, international evidence points to insufficient demand for preventive health among poor households. Indeed, household demand that is sustained over a long period may be needed for investments in preventive health to translate into significant health benefits (Brown and Clasen 2012). Reviewing experimental evaluations on the effects of interventions on health in developing countries, Kremer and Glennerster (2012) indicate that the patterns in the evidence suggest that household investment in preventive health is highly sensitive to price, convenience, and salience, and that these patterns are consistent with present-biased preferences and limited attention among households. The explanations point to the need for behavioral interventions to influence household choices in relation to factors that we find to be associated with child nutrition status. Dupas and Miguel (2016) also review experimental evaluations on the effects of interventions on health in developing countries. They argue that other patterns in the collective evidence suggest that households may find it difficult to ascertain the benefits of investing in preventive health in settings where illness is highly prevalent and where the sources of illness are many and diverse, or that households may perceive low benefits to investing in preventive health.

Findings in several studies of health and nutrition in urban slum settlements in Bangladesh and elsewhere are consistent with one or both of the above sets of explanations. For example, based on focus group discussions in selected slum settlements in Dhaka, Goudet et al. (2011) find that information does not appear to be a major constraint: community health workers and pregnant female residents are well-informed about the potential determinants of child undernutrition, and awareness is high even among new community health workers and residents who have not received any formal nutrition counseling. In an experimental study in Dhaka, Luoto et al. (2011) examine the effects of providing free, point-of-use water treatment products and repeated, direct counseling on the health risks of using untreated water to poor households. The study finds that although household knowledge of risks increased and the products dramatically reduced pathogen contamination levels when used, use rates of the products were less than 30%. Luby et al. (2004) find in an experimental evaluation that promotion of regular, intensive handwashing and provision of free soap over a period of nine months to slum households in Karachi, Pakistan reduced diarrhea rates in intervention households, including among young, undernourished children. The effects did not last, however. Revisiting evaluation households 19 months after the intervention ended, Luby et al. (2009) find that soap consumption had decreased in intervention households, and diarrhea rates did not significantly differ between intervention and control households.

Access and availability of piped water and improved sanitation facilities, and the elimination of open defecation, appear to be insufficient for improving child health and nutrition. The entire service chain for fecal sludge management—from containment and emptying to treatment and disposal—is considered to be critically poor in Dhaka and other cities in Bangladesh (Ross, Scott, and Joseph 2016; Peal et al. 2014; Stevens et al. 2014). Thus, households may continue to be highly exposed to fecal pathogens. Studies find that virtually all fecal sludge from latrines, across urban neighborhoods, spills into the environment. Latrines empty into built or natural drainage systems, and water bodies, with or without any initial containment in pits or tanks. Pit- or tank-emptying is informal and manual, and the removed sludge is disposed of unsafely. The risk of fecal contamination of ground water is high because of poor-quality containment and shallow water tables.[35] Addressing this situation will have to begin with government policy formulation and regulation.

Most households in urban Bangladesh, including poor ones, seek health care from private providers. Given this, policies, programs, and partnerships should aim to ensure quality of care

[35] Luby et al. (2015) find that microbial contamination of drinking water is associated with subsequent diarrhea in a sample of children in rural Bangladesh.

among such providers. A variety of (typically small-scale) interventions have been tested in different developing-country settings with the aim of improving the utilization and quality of private RMNCH services. These include social marketing, vouchers, franchising, regulation, accreditation, and contracting. While empirical evidence remains scarce on the effects of these interventions, and the evidence that exists is generally of poor quality (Patouillard et al. 2007; Madhavan et al. 2010), recent rigorous evidence is promising. For example. Bennett and Yin (2014) and Bjorkman-Nyqvist, Svensson, and Yanagizawa-Drott (2012) find that the entry of better providers motivates incumbent private providers to respond by improving quality and reducing prices in local drug markets. Under an experimental evaluation, Das et al. (2016) find that general training offered to informal private health providers in rural West Bengal, India increased correct case management for selected common conditions (respiratory distress, child diarrhea, and chest pain) based on information gathered from standardized patients.

Finally, addressing maternal and child undernutrition in urban (slum) areas would presumably hinge on two higher-level actions. First is higher political and bureaucratic prioritization of nutrition in the country's health development agenda in particular and its economic development agenda more generally. Second is a more central treatment of maternal and child nutrition for the urban poor and slum residents in the development and implementation of government national health strategies and operational plans, including in strategies and plans related to urban health.

References

Abuya, Benta A., James Ciera, and Elizabeth Kimani-Murage. 2012. "Effect of Mother's Education on Child's Nutritional Status in the Slums of Nairobi." *BMC Pediatrics*, 12(80).

Adams, Alayne M., Herfina Y. Nababan, and S. M. Manzoor Ahmed Hanifi. 2015. "Building Social Networks for Maternal and Newborn Health in Poor Urban Settlements: A Cross Sectional Study in Bangladesh." *PLoS ONE*, 10(4): e0123817.

Adams, Alayne M., Rubana Islam, and Tanvir Ahmed. 2015. "Who Serves the Urban Poor? A Geospatial and Descriptive Analysis of Health Services in Slum Settlements in Dhaka, Bangladesh." *Health Policy and Planning*, 30: i32–i45.

Afsana, Kaosar, and Syed Shabab Wahid. 2013. "Health Care for Poor People in the Urban Slums of Bangladesh." *Lancet*, 382: 2049–2051.

Ahsan, Karar Zunaid, Shams El Arifeen, Md. Abdullah Al-Mamun, Shusmita H. Khan, and Nitai Chakraborty. 2017. "Effects of Individual, Household and Community Characteristics on Child Nutritional Status in the Slums of Urban Bangladesh." *Archives of Public Health*, 75(9).

Alam, Khurshid, Sakiba Tasneem, and Elizabeth Oliveras. 2012a. "Performance of Female Volunteer Community Health Workers in Dhaka Urban Slums." *Social Science and Medicine*, 75: 511–515.

Alam, Khurshid, Sakiba Tasneem, and Elizabeth Oliveras. 2012b. "Retention of Female Volunteer Community Health Workers in Dhaka Urban Slums: A Case Control Study." *Health Policy and Planning*, 27: 477–486.

Alam, Mahbub-Ul, Farzana Yeasmin, Farzana Begum, Mahbubur Rahman, Fosiul Alam Nisame, Stephen Luby, Peter Winch, and Leanne Unicomb. 2016. "Can Behavior Change Approaches Improve the Cleanliness and Functionality of Shared Toilets? A Randomized Control Trial in Dhaka, Bangladesh." Discussion Paper 9. Water and Sanitation for the Urban Poor.

Alam, Md. Ariful, M. A. Hakim, M. A. Rouf, Md. Obidul Haque, M. E. Ali, and I. S. M. Ziadul. 2011. "Nutritional Status of Urban Slum Children below Five Years: Assessment by Anthropometric Measurements with Special Reference to Socioeconomic Status." *Journal of Food, Agriculture, and Environment*, 9(2): 85–90.

Alam, Narul, Dilruba Begum, Syed Masud Ahmed, and Peter Kim Streatfield. 2011. "MANOSHI Community Health Solutions in Bangladesh: Impact Evaluation Surveys in Dhaka Urban Slums 2007, 2009, 2011." Scientific Report 118. Dhaka: International Center for Diarrhoeal Diseases Research.

Alderman, Harold, and Derek D. Headey. 2017. "How Important is Parental Education for Child Nutrition?" *World Development*, 94: 448–464.

Andaleeb, Syed Saad. 2000. "Public and Private Hospitals in Bangladesh: Service Quality and Predictors of Hospital Choice." *Health Policy and Planning*, 15(1): 95–102.

Angeles, Gustavo, Peter Lance, Janine Barden-O'Fallon, Nazrul Islam, A. Q. M. Mahbub, and Nurul Islam Nazem. 2009. "The 2005 Census and Mapping of Slums in Bangladesh: Design, Select Results and Application." *International Journal of Health Geographics*, 8(32).

Arifeen, Shams El., Aliki Christou, Laura Reichenbach, Ferdous Arifina Osman, Kishwar Azad, Khaled Shamsul Islam, Faruque Ahmed, Henry B. Perry, and David H. Peters. 2013.

"Community-Based Approaches and Partnerships: Innovations in Health-Service Delivery in Bangladesh." *Lancet*, 382(9909): 2012–2026.

Baker, Kelly K., Ciara E. O'Reilly, Myron M. Levine, Karen L. Kotloff, James P. Nataro, Tracy L. Ayers, et al. 2016. "Sanitation and Hygiene-Specific Risk Factors for Moderate-to-Severe Diarrhea in Young Children in the Global Enteric Multicenter Study, 2007-2011: Case-Control Study." *PLoS Med*, 13(5): e1002010.

Banu, Morsheda, and Hashima E. Nasreen. 2011. "Factors Influencing the Performance of Delivery Centers in Urban Slums in Bangladesh: A Qualitative Study." *OIDA International Journal of Sustainable Development*, 2(12): 67–76.

Bennett, Daniel, and Wesley Yin. 2014. "The Market for High-Quality Medicine." Working Paper 20091. Cambridge: National Bureau of Economic Research.

Bjorkman-Nyqvist, Martina, Jakob Svensson, and David Yanagizawa-Drott. 2012. "Can Good Products Drive Out Bad? Evidence from Local Markets for (Fake?) AntiMalarial Medicine in Uganda." Discussion Paper 9114. London: Center for Economic Policy Research.

Black, Robert E., Cesar G. Victora, Susan P. Walker, Zulfiqar A. Bhutta, Parul Christian, Mercedes de Onis, Majid Ezzati, Sally Grantham-McGregor, Joanne Katz, Reynaldo Martorell, Ricardo Uauy, and the Maternal and Child Nutrition Study Group. 2013. "Maternal and Child Undernutrition and Overweight in Low-Income and Middle-Income Countries." *Lancet*, 382: 427–451.

Black, Robert E., Lindsay H. Allen, Zulfiqar A. Bhutta, Laura. E. Caulfield, Mercedes de Onis, Majid Ezzati, Colin Mathers, Juan Rivera. 2008. "Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences." *Lancet*, 371(9608): 243–260.

Blinder, Alan S. 1973. "Wage Discrimination: Reduced Form and Structural Estimates." *Journal of Human Resources*, 8(4): 436–455.

Cattaneo, Matias D., Sebastian Galiani, Paul J. Gertler, Sebastian Martinez, and Rocio Titiunik. 2009. "Housing, Health, and Happiness." *American Economic Journal: Economic Policy*, 1(1): 75–105.

Cesar, Victora G., Linda Adair, Caroline Fall, Pedro C. Hallal, Reynaldo Martorell, Linda Richter, and Harshpal Singh Sachdev. 2008. "Maternal and Child Undernutrition: Consequences for Adult Health and Human Capital." *Lancet*, 371(9609): 340–357.

Choudhury, Nuzhat, Allisyn C. Moran, M. Ashraful Alam, Karar Zunaid Ahsan, Sabina F. Rashid, and Peter Kim Streatfield. 2012. "Beliefs and Practices during Pregnancy and Childbirth in Urban Slums of Dhaka, Bangladesh." *BMC Public Health*, 12(1): 791–796.

Chowdhury, A. Mushtaque R., Abbas Bhuiya, Mahbub Elahi Chowdhury, Sabrina Rasheed, Zakir Hussain, and Lincoln C. Chen. 2013. "The Bangladesh Paradox: Exceptional Health Achievement despite Economic Poverty." *Lancet*, 382: 1734–1745.

Clasen, Thomas, Wolf-Peter Schmidt, Tamer Rabie, Ian Roberts, and Sandy Cairncross. 2007. "Interventions to Improve Water Quality for Preventing Diarrhoea: Systematic Review and Meta-Analysis." *British Medical Journal*, 334(782).

Currie, Janet, and Tom Vogl. 2013. "Early-Life Health and Adult Circumstance in Developing Countries." *Annual Review of Economics*, 5: 1–36.

Dangour, A. D., L. Watson, O. Cumming, S. Boisson, Y. Che, Y. Velleman, S. Cavill, E. Allen, and R. Uauy. 2013. "Interventions to Improve Water Quality and Supply, Sanitation and Hygiene Practices, and their Effects on the Nutritional Status of Children." *Cochrane Database of Systematic Reviews*, 8.

Das, Jishnu, Abhijit Chowdhury, Reshmaan Hussam, and Abhijit V. Banerjee. 2016. "The Impact of Training Informal Health Care Providers in India: A Randomized Controlled Trial." *Science*, 354(6308).

Das, Jishnu, Alaka Holla, Aakash Mohpal, and Karthik Muralidharan. 2016. "Quality and Accountability in Health Care Delivery: Audit-Study Evidence from Primary Care in India." *American Economic Review*, 106(12): 3765–3799.

Das, Jishnu, Alaka Holla, Veena Das, Manoj Mohanan, Diana Tabak, and Brian Chan. 2012. "In Urban and Rural India, a Standardized Patient Study Showed Low Levels of Provider Training and Huge Quality Gaps." *Health Affairs*, 32(12): 2774–2784.

Daymont, Thomas N., and Paul J. Andrisani. 1984. "Job Preferences, College Major, and the Gender Gap in Earnings." *Journal of Human Resources*, 19(3): 408–428.

Dewey, Kathryn G., and Daniel R. Mayers. 2011. "Early Child Growth: How Do Nutrition and Infection Interact? *Maternal & Child Nutrition*, 7(Suppl. 3): 129–142.

Dupas, Pascaline, and Edward Miguel. 2016. "Impacts and Determinants of Health Levels in Low-Income Countries." Working Paper 22235. Cambridge: National Bureau of Economic Research.

El Arifeen, Shams, Aliki Christou, Laura Reichenbach, Ferdous Arfina Osman, Kishwar Azad, Khaled Shamsul Islam, Faruque Ahmed, Henry B. Perry, David H. Peters. 2013. "Community-Based Approaches and Partnerships: Innovations in Health-Service Delivery in Bangladesh" *Lancet*, 382: 2012–2026.

Ellis, Peter, and Mark Roberts. 2016. *Leveraging Urbanization in South Asia: Managing Spatial Transformation for Prosperity and Livability*. Washington, DC: World Bank.

Ezeh, Alex, Oyinlola Oyebode, David Satterthwaite, Yen-Fu Chen, Robert Ndugwa, Jo Sartori, Blessing Mberu, G. J. Melendez-Torres, Tilahun Haregu, Samuel I. Watson, Waleska Caiaffa, Anthony Capon, and Richard J. Lilford. 2017. "The History, Geography, and Sociology of Slums and the Health Problems of People Who Live in Slums." *Lancet*, 389(10068): 547–558.

Fakir, Adnan M. S., and M. Wasiqur Rahman Khan. 2015. "Determinants of Malnutrition Among Urban Slum Children in Bangladesh." *Health Economics Review*, 5(22).

Ferre, Celine, and Iffath Sharif. 2014. "Can Conditional Cash Transfers Improve Education and Nutrition Outcomes for Poor Children in Bangladesh? Evidence from a Pilot Project." Policy Research Working Paper 7077. Washington, DC: World Bank.

Fewtrell, Lorna, Rachel B. Kaufmann, David Kay, Wayne Enanoria, Laurence Haller, and John M Colford Jr. 2005. "Water, Sanitation, and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: A Systematic Review and Meta-Analysis." *Lancet Infectious Diseases*, 5: 42–52.

Fortin, Nicole, Thomas Lemiuex, and Sergio Firpo. 2011. "Decomposition Methods in Economics" Chapter 1. Pages 1–102. Edited by Orley Ashenfelter and David Card. In *Handbook of Labor Economics* Volume 4a. Elsevier B.V.

Gardeazabal, Javier, and Arantza Ugidos. 2004. "More on Identification in Detailed Wage Decompositions." *Review of Economics and Statistics*, 86(4): 1034–1036.

Gazi, Rukhsana, Marufa Sultana, Humayun Kabir, and Nirod Chandra Saha. 2015. "Accessibility, Availability and Perceived Quality of Reproductive Health Services in Selected Urban Areas of Bangladesh: User and Nonusers' Perspectives." *Reproductive System and Sexual Disorders*, 4(3).

GOB (Government of Bangladesh). 2014. *Population and Housing Census 2011: National Volume 3: Urban Area Report.* Dhaka: Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, GOB.

GOB (Government of Bangladesh). 2015. *Preliminary Report on the Census of Slum Areas and Floating Population 2014.*Dhaka: Bangladesh Bureau of Statistics, Statistics and Informatics Division, Ministry of Planning, GOB.

Goudet, Sophie, Paula Griffiths, Barry Bogin, and Nyovani Madise. 2017. "Interventions to Tackle Malnutrition and Its Risk Factors in Children Living in Slums: A Scoping Review." *Annals of Human Biology*, 44(1): 1–10.

Greene, William H. 2008. *Econometric Analysis*. 6th ed. Upper Saddle River, New Jersey: Prentice Hall.

Haddad, Slim, Katia Sarla Mohindra, Kendra Siekmans, Genevieve Mak, and Delampady Narayana. 2012. "'Health Divide' Between Indigenous and Non-Indigenous Populations in Kerala, India: Population Based Study." *BMC Public Health*, 12: 390.

Headey, Derek, John Hoddinott, and Seollee Park. 2016. "Drivers of Nutritional Change in Four South Asian Countries: A Dynamic Observational Analysis." *Maternal & Child Nutrition*, 12(Suppl. 1): 210–218.

Headey, Derek, John Hoddinott, Disha Ali, Roman Tesfaye, and Mekdim Dereje. 2015. "The Other Asian Enigma: Explaining the Rapid Reduction of Undernutrition in Bangladesh." *World Development*, 66: 749–761.

Heller, Lauren R. 2013. "Do Slums Matter? Location and Early Childhood Preventive Care Choices among Urban Residents of Bangladesh." *Social Science and Medicine*, 94: 43–55.

Hossain, M. A., M. Moniruzzaman, and M. A. Islam. 2010. "Urban Environmental Health in Bangladesh Slum: A Comparative Study of Two Metropolitan Cities. *Journal of Science Foundation*, 8: 67–76.

ICDDRB (International Center for Diarrheal Disease Research, Bangladesh). 2015. *Technical Assistance for Assessment of Contribution of Ministry of Health and Family Welfare for Urban Health Services*. Dhaka: ICDDRB.

IFPRI (International Food Policy Research Institute). 2016. *Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030*. Washington, DC: IFPRI.

Islam, Md. Rezaul, Md. Farukuzzaman, and Md. Amirul Islam. 2014. "Situation of Slum's Children in Dhaka City, Bangladesh: A Sample Survey." *Journal of Economics and Sustainable Development*, 5(18): 27–33.

Islam, Mohammad Mainul, and Anita J. Gagnon. 2016. "Use of Reproductive Health Care Services among Urban Migrant Women in Bangladesh." *BMC Women's Health*, 16:15.

Jann, Ben. 2008. "The Blinder-Oaxaca Decomposition for Linear Regression Models." *Stata Journal* 8(4): 453–479.

Jolly, S.P., M. Rahman, K. Afsana, F. M. Yunus, A. M. R. Chowdhury. 2016. "Evaluation of Maternal Health Service Indicators in Urban Slum of Bangladesh." *PLoS ONE*, 11(10): e0162825.

Jones, F. L. 1983. "On Decomposing the Wage Gap: A Critical Component of Blinder's Method." *Journal of Human Resources*, 18(1): 126–130.

Kabir, Ashraful, and Mathilde R. L. Miatrot. 2017. "Factors Influencing Feeding Practices of Extreme Poor Infants and Young Children in Families of Working Mothers in Dhaka Slums: A Qualitative Study." *PLoS ONE*, 12(2).

Kabir, Russell, and Hafiz T. A. Khan. 2013. “Utilization of Antenatal Care among Pregnant Women of Urban Slums in Dhaka City, Bangladesh.” *IOSR Journal of Nursing and Health Science*, 2(2): 16–19.

Kamal, Nahid, Sian Curtis, Mohammad S. Hasan, and Kanta Jamil. 2016. “Trends in Equity in Use of Maternal Health Services in Urban and Rural Bangladesh.” *International Journal for Equity in Health*, 15: 27.

Khan, M. M. H., and Alexander Kramer. 2014. “Role of Women’s Education and Wealth Index to Minimize Slum versus Nonslum Disparities in Socio-Economic and Health-Related Indicators in Bangladesh.” *Global Journal of Quantitative Science*, 1(2): 1–12.

Khutan, Fatema, Sabrina Rasheed, Allisyn C. Moran, Ashraful M. Alam, Mohammad Sohel Shomik, Munira Sultana, Nuzhat Choudhury, Mohammad Iqbal, and Abbas Bhuiya. 2012. “Causes of Neonatal and Maternal Deaths in Dhaka Slums: Implications for Service Delivery.” *BMC Public Health*, 12(1): 84.

Kremer, Michael, and Rachel Glennerster. 2012. “Improving Health in Developing Countries: Evidence from Randomized Evaluations.” In *Handbook of Health Economics*, Volume 2, Edited by Mark V. Pauly, Thomas G. Mcguire, and Pedro P. Barros. (pp. 201–315). Elsevier.

Kumar, Abhishek, and Aditya Singh. 2013. “Decomposing the Gap in Childhood Undernutrition between Poor and Non-Poor in Urban India, 2005–06.” *PLoS ONE*, 8(5): e64972.

Lance, Peter, Gustavo Angeles, and Nahid Kamal. 2012. *Smiling Sun Franchise Program (BSSFP) Impact Evaluation Report*. Chapel Hill, NC: MEASURE Evaluation.

Lilford, Richard J., Oyinlola Oyebode, David Satterthwaite, G. J. Melendez-Torres, Yen-Fu Chen, Blessing Mberu, Samuel I. Watson, Jo Sartori, Robert Ndugwa, Waleska Caiaffa, Tilahun Haregu, Anthony Capon, Ruhi Saith, and Alex Ezeh. 2017. “Improving the Health and Welfare of People Who Live in Slums.” *Lancet*, 389(10068): 559–570.

Lin, Audrie, Benjamin F. Arnold, Sadia Afreen, Rie Goto, Tarique Mohammad Nurul Huda, Rashidul Haque, et al. 2013. “Household Environmental Conditions are Associated with Enteropathy and Impaired Growth in Rural Bangladesh.” *American Journal of Tropical Medicine & Hygiene*, 89(1): 130–137.

Lu, Yao. 2010. “Rural-Urban Migration and Health: Evidence from Longitudinal Data in Indonesia.” *Social Science & Medicine*, 70: 412–419.

Luby, Stephen P., Amal K. Halder, Tarique Md. Huda, Leanne Unicomb, M. Sirajul Islam, Benjamin F. Arnold, and Richard B. Johnston. 2015 “Microbiological Contamination of Drinking Water Associated with Subsequent Child Diarrhea.” *American Journal of Tropical Medicine and Hygiene*, 93(5): 904–911.

Luby, Stephen P., and Amal K. Halder. 2008. “Associations among Handwashing Indicators, Wealth, and Symptoms of Childhood Respiratory Illness in Urban Bangladesh.” *Tropical Medicine and International Health*, 13(6): 835–844.

Luby, Stephen P., Mubina Agboatwalla, Anna Bowen, Eben Kenah, Yushuf Sharker, and Robert M. Hoekstra. 2009. “Difficulties in Maintaining Improved Handwashing Behavior, Karachi, Pakistan.” *American Journal of Tropical Medicine and Hygiene*, 81(1): 140–145.

Luby, Stephen P., Mubina Agboatwalla, John Painter, Arshad Altaf, Ward L. Billhimer, and Robert M. Hoekstra. 2004. “Effect of Intensive Handwashing Promotion on Childhood Diarrhea in High-Risk Communities in Pakistan: A Randomized Controlled Trial.” *Journal of the American Medical Association*, 291(21): 2547–2554.

Luoto Jill, Nusrat Najnin, Minhaj Mahmud, Jeff Albert, M. Sirajul Islam, Stephen Luby, et al. 2011. "What Point-of-Use Water Treatment Products Do Consumers Use? Evidence from a Randomized Controlled Trial among the Urban Poor in Bangladesh." *PLoS ONE*, 6(10): e26132.

Madhavan S., D. Bishai, C. Stanton, and A. Harding. 2010. "Engaging the Private Sector in Maternal and Neonatal Health in Low and Middle Income Countries." Working Paper 12. US: Future Health Systems Research Programme Consortium.

Manley, James, Seth Gitter, and Vanya Slavchevska. 2013. "How Effective are Cash Transfers at Improving Nutritional Status?" *World Development*, 48: 133–155.

Marx, Benjamin, Thomas Stoker, and Tavneet Suri. 2013. "The Economics of Slums in the Developing World." *Journal of Economic Perspectives*, 27(4): 187–210.

Mberu, Blessing U., Tilahun N. Haregu, Catherine Kyobutungi, and Alex C. Ezeh. 2016. "Health and Health-Related Indicators in Slum, Rural, and Urban Communities: A Comparative Analysis" *Global Health Action*, 9: 33163.

Mishra, Vinod, and Robert D. Retherford. 2007. "Does Biofuel Smoke Contribute to Anemia and Stunting in Early Childhood." *International Journal of Epidemiology*, 36: 117–129.

Mu, Ren, and Alan de Brauw. 2015. "Migration and Young Child Nutrition: Evidence from Rural China." *Journal of Population Economics*, 28: 631–657.

Nahar, Samsun, and M. Maksudur Rahman. 2013. "Factors Influencing Health and Healthcare Delivery System for the Urban Poor in Chittagong City, Bangladesh." *Asian Journal of Management Research*, 4(2): 288–296.

Nguyen, Phuong Hong, Derek Headey, Edward A. Frongillo, Lan Mai Tran, Rahul Rawat, Marie T. Ruel, and Purnima Menon. 2017. "Changes in Underlying Determinants Explain Rapid Increases in Child Linear Growth in Alive & Thrive Study Areas Between 2010 and 2014 in Bangladesh and Vietnam." *Journal of Nutrition*, 147(3): 462–469.

NIPORT (National Institute of Population Research and Training), MEASURE Evaluation, International Centre for Diarrheal Disease Research, Bangladesh (ICDDR, B), and Associates for Community and Population Research (ACPR). 2008. *2006 Bangladesh Urban Health Survey*. Dhaka, Bangladesh and Chapel Hill, North Carolina, USA: NIPORT, MEASURE Evaluation, ICDDR, B, and ACPR.

NIPORT (National Institute of Population Research and Training), International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDRB), and MEASURE Evaluation. 2015. *Bangladesh Urban Health Survey 2013 Final Report*. Dhaka, Bangladesh and Chapel Hill, North Carolina: NIPORT, ICDDRB, and MEASURE Evaluation.

NIPORT (National Institute of Population Research and Training)-Bangladesh, Mitra and Associates, and ICF International. 2016. *Bangladesh Demographic and Health Survey 2014*. Dhaka: NIPORT, Mitra and Associates, and ICF International.

Oaxaca, Ronald L., and Michael R. Ransom. 1999. "Identification in Detailed Wage Decompositions." *Review of Economic and Statistics*, 81(1): 154–157.

Oaxaca, Ronald. 1973. "Male-Female Wage Differentials in Urban Labor Markets." *International Economic Review*, 14(3): 693–709.

Patouillard, Edith, Catherine A. Goodman, Kara G. Hanson, and Anne J. Mills. 2007. "Can Working with the Private For-Profit Sector Improve Utilization of Quality Health Services by the Poor? A Systematic Review of the Literature." *International Journal for Equity in Health*, 6: 17.

Peal, Andy, Barbara Evans, Isabel Blackett, Peter Hawkins, and Chris Heymans. 2014. "Fecal Sludge Management: A Comparative Analysis of 12 Cities." *Journal of Water, Sanitation and Hygiene for Development*, 4(4): 563–575.

Ross, Ian, Rebecca Scott, and Ravikumar Joseph. 2016. "Fecal Sludge Management: Diagnostics for Service Delivery in Urban Areas." Water and Sanitation Program (WSP); Water and Sanitation Program Technical Paper. Washington, DC: World Bank.

Ruel, Marie T., Harold Alderman, and the Maternal and Child Nutrition Study Group. 2013. "Nutrition-Sensitive Interventions and Programmes: How Can They Help to Accelerate Progress in Improving Maternal and Child Nutrition?" *Lancet*, 382: 536–551.

Rustein, Shea, and Rebecca Winter. 2014. *The Effects of Fertility Behavior on Child Survival and Child Nutritional Status: Evidence from the Demographic and Health Surveys, 2006 to 2012*. DHS Analytical Studies No. 37. Rockville: United States Agency for International Development.

Song, Yang, and Wenkai Sun. 2016. "Health Consequences of Rural-to-Urban Migration: Evidence from Panel Data in China." *Health Economics*, 25: 1252–1267.

Srinivasan, Chittur S., Giacomo Zanello, and Bhavani Shankar. 2013 "Rural-Urban Disparities in Child Nutrition in Bangladesh and Nepal." *BMC Pubic Health*, 13: 581.

Stevens, Lucy, Rafiul Islam, Alexis Morcrette, Noemie de la Brosse, and Abdullah al Mamun. 2015. "Faecal Sludge Management in Faridpur, Bangladesh: Scaling Up Through Service Level Agreements." Briefing Paper 2248. 38th WEDC International Conference, Loughborough University, UK.

Strunz, Eric C., David G. Addiss, Meredith E. Stocks, Stephanie Ogden, Jurg Utzinger, and Matthew C. Freeman. 2014. "Water, Sanitation, Hygiene, and Soil-Transmitted Helminth Infection: A Systematic Review and Meta-Analysis." *PLoS Med*, 11(3): e1001620.

Strunz, Eric C., David G. Addiss, Meredith E. Stocks, Stephanie Ogden, Jurg Utzinger, and Matthew C. Freeman. 2014. "Water, Sanitation, Hygiene, and Soil-Transmitted Helminth Infection: A Systematic Review and Meta-Analysis." *PLoS Med*, 11(3): e1001620.

Sudhinaraset, May, Matthew Ingram, Heather K. Lofthouse, and Dominic Montagu. 2013. "What is the Role of Informal Healthcare Providers in Developing Countries? A Systematic Review." *PLoS ONE*, 8(2): e54978.

Uddin, M. Sheikh Giash, and M. Mozaffar Hosain. 2011. "Factors Associated with Child Health in Urban Areas in Bangladesh." *Bangladesh Journal of Science Research*, 24(2): 145–154.

Uddin, Md. Jasim, Charles P. Larson, Elizabeth Oliveras, A. I. Khan, M. A. Quiayum, and Nirod Chandra Saha. 2010. "Child Immunization Coverage in Urban Slums of Bangladesh: Impact of an Intervention Package." *Health Policy and Planning*, 25: 50–60.

UN (United Nations). 2015a. *World Urbanization Prospects: The 2014 Revision*. New York: Department of Economic and Social Affairs, Population Division, UN.

UN (United Nations). 2015b. *Transforming Our World: The 2030 Agenda for Sustainable Development*. New York: UN.

UN (United Nations). 2017. *New Urban Agenda: Quito Declaration on Sustainable Cities and Human Settlements for All*. New York: UN.

UN-Habitat (United Nations Human Settlements Programme) 2016. *World Cities Report 2016: Urbanization and Development: Emerging Futures*. Nairobi: Kenya: UN-Habitat.

UN-Habitat (United Nations Human Settlements Programme). 2003. *The Challenge of Slums: Global Report on Human Settlements 2003*. London: Earthscan Publications.

UNICEF (United Nations Children's Fund). 1998. *The State of the World's Children.* New York: UNICEF.

Van de Poel, Ellen, Owen O'Donnell, and Eddy Van Doorslaer. 2007. "Are Urban Children Really Healthier? Evidence from 47 Developing Countries." *Social Science & Medicine*, 65(10): 1986–2003.

Wagstaff, Adam, and Eddy van Doorslaer, and Naoko Watanabe. 2003. "On Decomposing the Causes of Health Sector Inequalities with an Application to Malnutrition Inequalities in Vietnam." *Journal of Econometrics*, 112: 207–223.

WHO (World Health Organization). 2010. "A Conceptual Framework for Action on the Social Determinants of Health." Social Determinants of Health Discussion Paper 2. Geneva: WHO.

World Bank. 2016. *World Development Indicators 2016*. Washington, DC: World Bank.

Yun, Myeong-Su. 2004. "Decomposing Differences in the First Moment." *Economic Letters*, 82(2): 275–280.

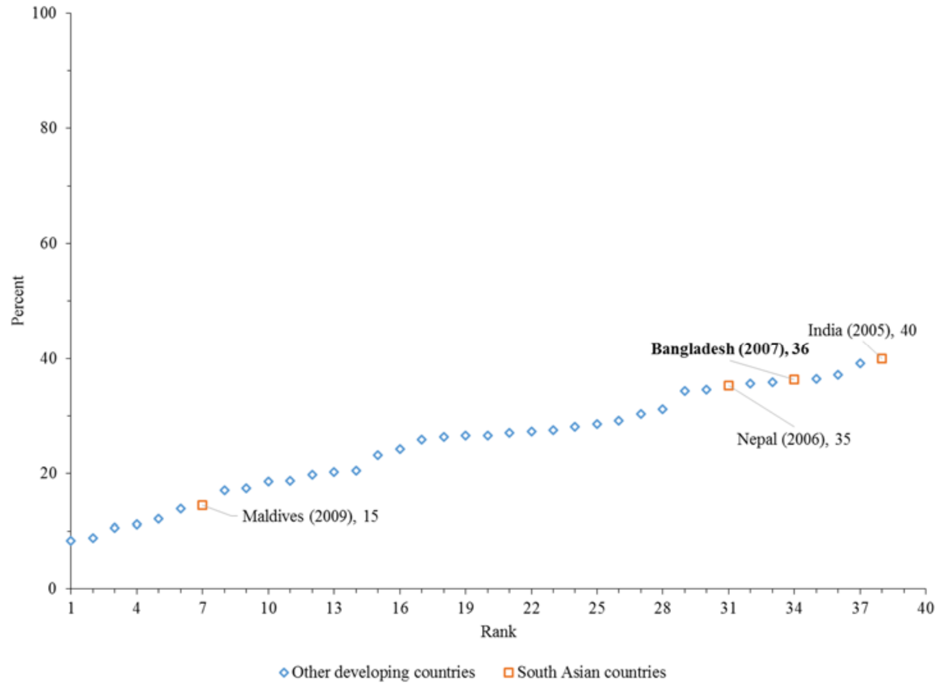
Yun, Myeong-Su. 2008. "Identification Problem and Detailed Oaxaca Decomposition: A General Solution and Inference." *Journal of Economic and Social Measurement*, 33(1): 27–38.

Zaman, Sultan Uz, Nuhad Raisa Seoty, Masud Alam, Rashidul Haque, and Nawzia Yasmin. 2015 "Household Food Insufficiency and Child Nutritional Status in Urban Slum, Dhaka, Bangladesh." *Acta Medica International*, 2(1): 65–69.

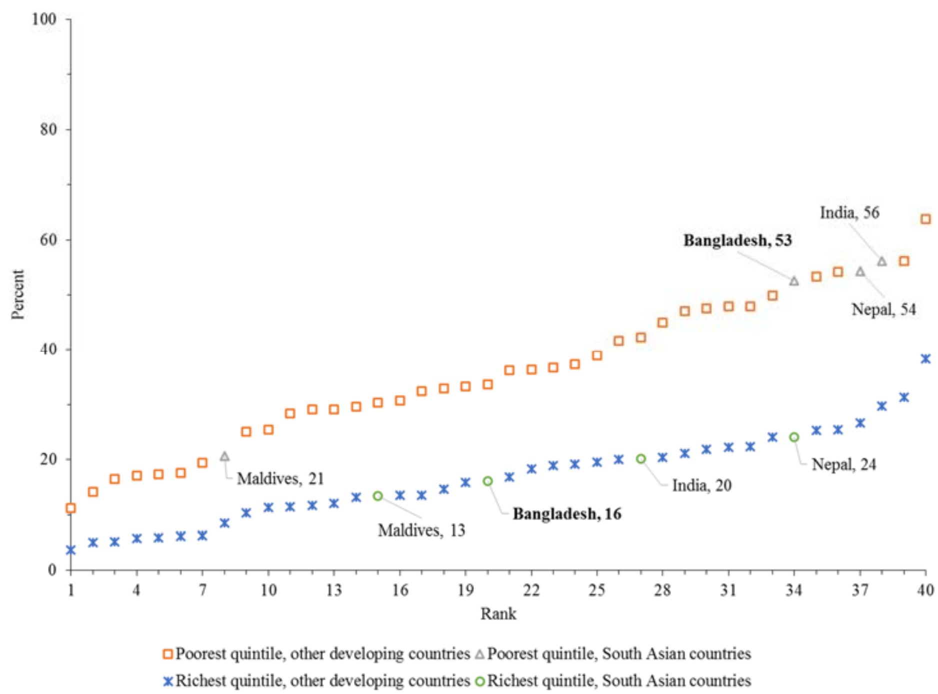
Ziegelbauer, Kathrin, Benjamin Speich, Daniel Mausezahl, Robert Bos, Jennifer Keiser, Jurg Utzinger. 2012. "Effect of Sanitation on Soil-Transmitted Helminth Infection: Systematic Review and Meta-Analysis." *PLoS Med*, 9(1): e1001162.

Figure 1. Urban child stunting rates in international perspective

A. *Urban stunting rates*

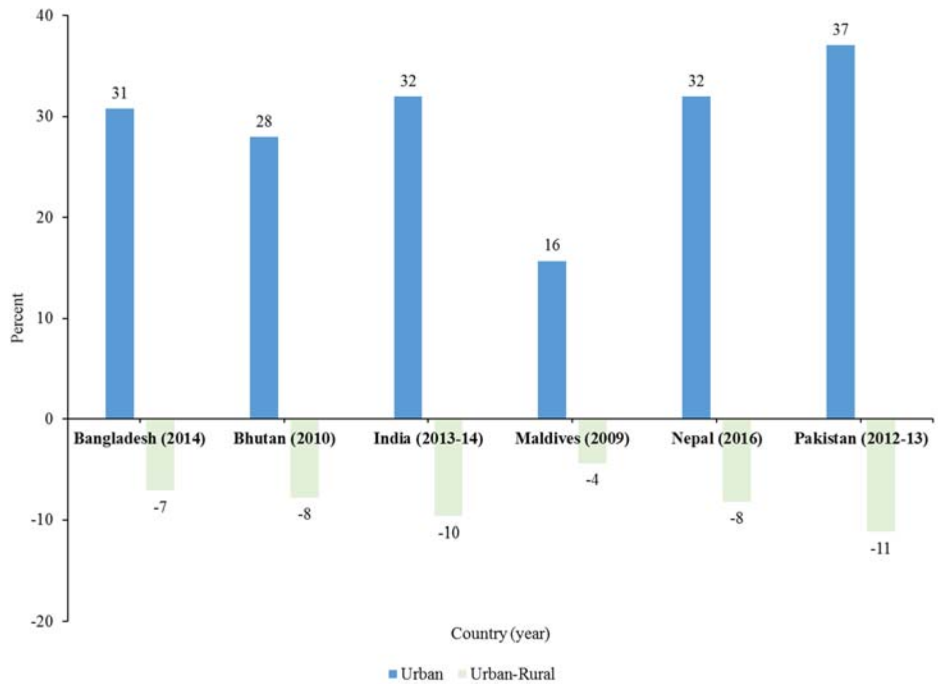


B. *Urban stunting rates for the poorest and richest quintiles*



Source: www.who.int.
Note: Countries with statistics for the period 2005–09 are included in the figure.

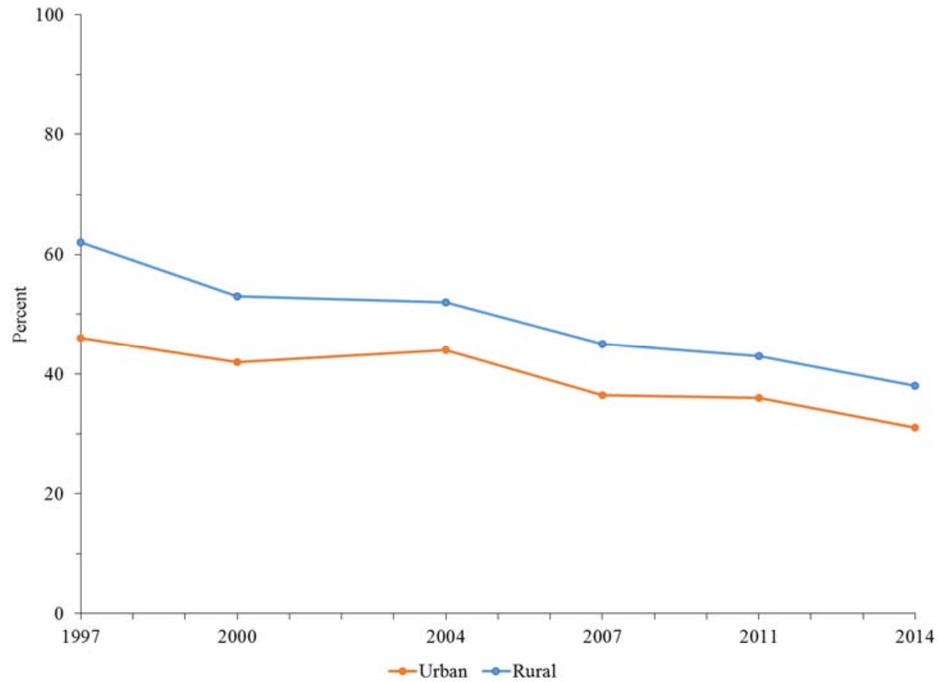
Figure 2. Urban child stunting rates, Bangladesh versus other South Asian countries



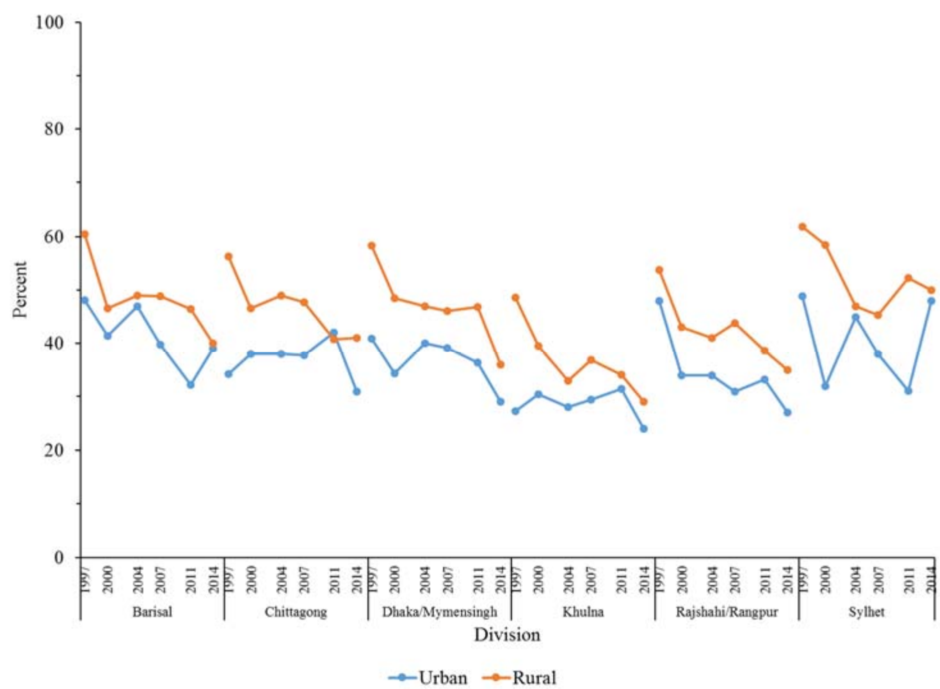
Note: Statistics extracted from the latest DHS reports for Bangladesh (2014), Maldives (2009), Nepal (2016), and Pakistan (2012–13); the 2010 Multiple Indicator Cluster Survey report for Bhutan; and the 2013–14 Rapid Survey of Children report for India.

Figure 3. Child stunting rates in Bangladesh, urban versus rural

A. *National*



B. *By division*



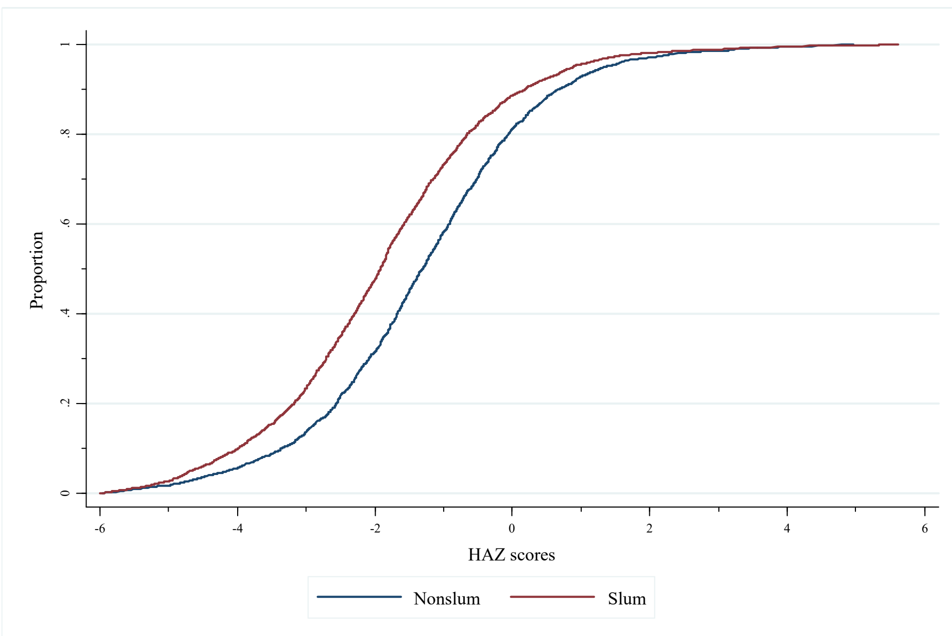
Note: Own estimates using DHS data, and based on WHO 2006 child growth standards. Statistics are for the six divisions that were in existence in 1997 DHS.

Table 1. Mean HAZ scores and stunting rates

	City corporations				2014 DHS	
	Pooled	Slum	Nonslum	Slum-nonslum	Rural	Urban
	(1)	(2)	(3)	(4)	(5)	(6)
HAZ scores	–1.69	–1.88	–1.30	–0.58***	–1.60	–1.30
Moderate-to-severe stunting	0.42	0.48	0.31	0.16***	0.38	0.31
Severe stunting	0.20	0.23	0.13	0.10***	0.12	0.10

Note: Estimates are adjusted for sampling weights. Inference is based on robust standard errors, clustered at the neighborhood-area level. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Figure 4. Cumulative distribution functions for HAZ scores



Note: Estimates are adjusted for sampling weights.

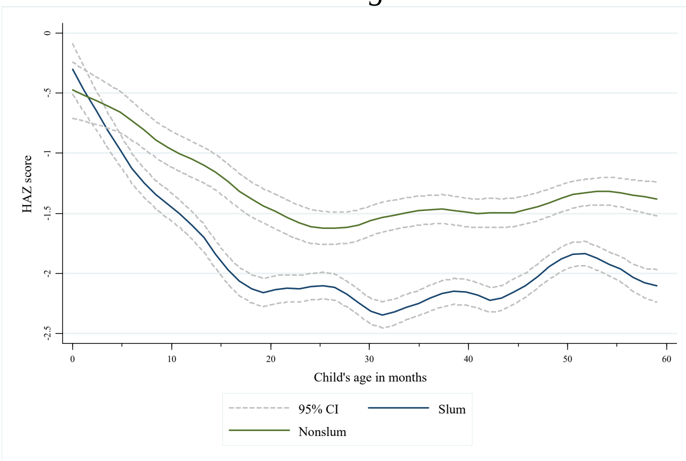
Table 2. Mean values for factors

Factor	Pooled (1)	Slum (2)	Nonslum (3)	Slum–Nonslum (4)
		A. *Child*		
Age (in months)	30.12	30.08	30.20	–0.12
Female	0.49	0.49	0.50	0.00
Birth order	2.06	2.16	1.87	0.29***
Ill with ARI symptoms	0.03	0.03	0.03	0.00
Ill with fever	0.31	0.33	0.28	0.05***
		B. *Mother*		
Age at child's birth <18	0.09	0.11	0.07	0.04***
Age at child's birth 18–34	0.86	0.84	0.89	–0.05***
Age at child's birth >34	0.05	0.05	0.05	0.00
Completed formal education (in years)	5.68	4.33	8.32	–3.98***
Employed	0.20	0.24	0.13	0.11***
Regularly exposed to mass media	0.85	0.81	0.93	–0.12***
Member of an NGO	0.15	0.18	0.09	0.10***
		C. *Household*		
Standardized wealth index	–0.37	–0.73	0.34	–1.07***
Size	4.87	4.76	5.07	–0.31***
		D. *Neighborhood area*		
Formal garbage collection available	0.69	0.62	0.84	–0.22***
Proper sewerage system available	0.48	0.41	0.62	–0.21***
CHW service available	0.51	0.55	0.44	0.10***
NGO health facility available	0.48	0.48	0.46	0.02
Public health facility available	0.14	0.14	0.14	0.00
Pharmacy available	1.00	1.00	1.00	0.00
Other private health facility available	0.36	0.33	0.42	–0.09**

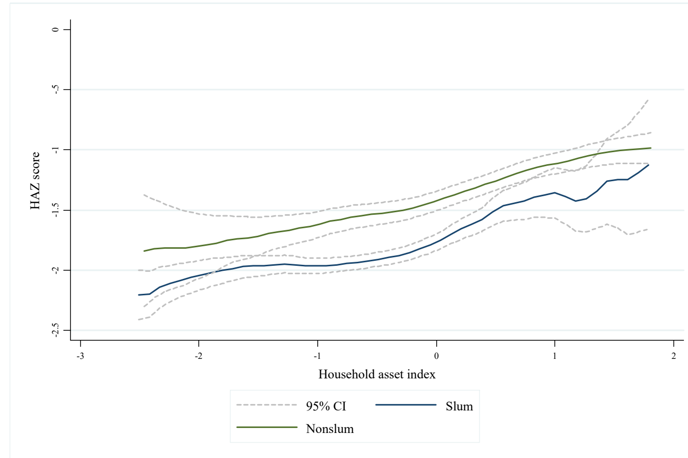
Note: ARI stands for acute respiratory infection; CHW stands for community health worker. Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Figure 5. Bivariate polynomial plots for child HAZ scores

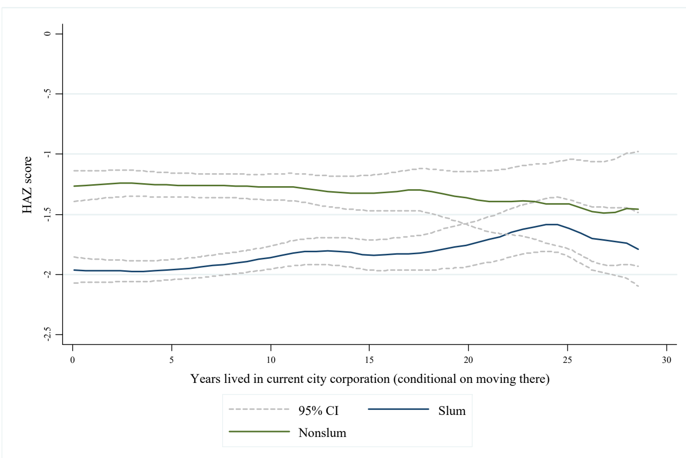
A. *Child: Age in months*



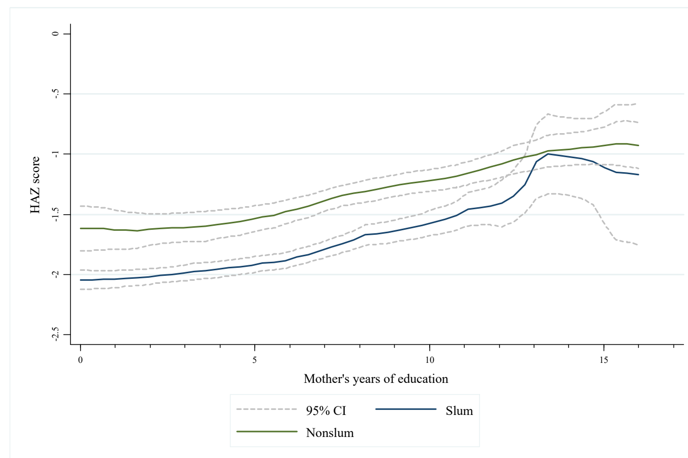
B. *Household: Standardized wealth index*



C. *Mother: Duration of residence in current city corporation in years*



D. *Mother: Education attainment in years*



Note: Estimates are adjusted for sampling weights.

Table 3. Effects on child HAZ scores, base set of factors
Ordinary least square regressions

Factor	Division fixed effects			Neighborhood area fixed effects		
	Pooled (1)	Slum (2)	Nonslum (3)	Pooled (4)	Slum (5)	Nonslum (6)
Child						
Age	–0.016***	–0.017***	–0.013***	–0.016***	–0.017***	–0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Female	0.041	0.040	0.014	0.052	0.068	–0.002
	(0.045)	(0.059)	(0.068)	(0.053)	(0.063)	(0.096)
Birth order	0.031	0.046	0.006	0.017	0.022	–0.006
	(0.024)	(0.030)	(0.038)	(0.029)	(0.035)	(0.052)
Recently ill with fever or ARI symptoms	–0.020	0.030	–0.139*	–0.055	–0.013	–0.171*
	(0.052)	(0.069)	(0.071)	(0.063)	(0.075)	(0.103)
Mother						
Age at child's birth <18	–0.219***	–0.290***	0.037	–0.263**	–0.344***	0.117
	(0.085)	(0.104)	(0.133)	(0.105)	(0.117)	(0.197)
Age at child's birth >34	0.085	–0.146	0.525**	–0.001	–0.114	0.337
	(0.134)	(0.165)	(0.210)	(0.153)	(0.178)	(0.279)
Completed formal education (in years)	0.033***	0.038***	0.022*	0.033***	0.032**	0.033*
	(0.008)	(0.012)	(0.012)	(0.011)	(0.013)	(0.018)
Employed	–0.06	–0.041	–0.08	–0.047	–0.046	–0.053
	(0.062)	(0.075)	(0.101)	(0.074)	(0.082)	(0.155)
Regularly exposed to mass media	0.105	0.069	0.246*	0.078	0.051	0.258
	(0.066)	(0.076)	(0.136)	(0.085)	(0.091)	(0.214)
Member of an NGO	0.079	0.171**	–0.195	0.101	0.152*	–0.077
	(0.072)	(0.083)	(0.122)	(0.081)	(0.088)	(0.182)
Household						
Standardized wealth index	0.219***	0.212***	0.248***	0.205***	0.179***	0.248**
	(0.038)	(0.047)	(0.064)	(0.053)	(0.064)	(0.098)
Number of members	–0.022*	–0.018	–0.030	–0.017	–0.012	–0.030
	(0.013)	(0.017)	(0.019)	(0.017)	(0.020)	(0.031)
Neighborhood area						
Formal garbage collection available	–0.018	–0.006	–0.083	—	—	—
	(0.069)	(0.083)	(0.119)			
Proper sewerage system available	0.037	0.020	0.058	—	—	—
	(0.056)	(0.076)	(0.079)			
CHW service available	–0.018	–0.017	–0.052	—	—	—
	(0.055)	(0.072)	(0.080)			
NGO health facility available	–0.013	–0.069	0.089	—	—	—
	(0.059)	(0.075)	(0.079)			
Public health facility available	–0.077	–0.009	–0.186*	—	—	—
	(0.079)	(0.103)	(0.110)			
Private health facility available	0.089*	0.131*	0.048	—	—	—
	(0.053)	(0.070)	(0.077)			
Nonslum area	0.197***	—	—	—	—	—
	(0.062)					
Intercept	–1.576***	–1.567***	–1.365***	–1.357***	–1.434***	–1.340***
	(0.153)	(0.190)	(0.252)	(0.153)	(0.170)	(0.349)

Table 3. Effects on child HAZ scores, base set of factors
Ordinary least square regressions

Factor	Division fixed effects			Neighborhood area fixed effects		
	Pooled	Slum	Nonslum	Pooled	Slum	Nonslum
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	7,565	5,000	2,565	7,565	5,000	2,565
R-squared statistic	0.082	0.064	0.064	0.268	0.171	0.409

Note: ARI stands for acute respiratory infection; CHW stands for community health worker. Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 4. Mean values for use of maternal and child health services, youngest child born in the three years before the survey

Type	Pooled (1)	Slum (2)	Nonslum (3)	Slum–Nonslum (4)
	A. *Antenatal care*			
Any health facility	0.70	0.62	0.86	–0.24***
Public health facility	0.16	0.14	0.18	–0.04**
NGO health facility	0.23	0.27	0.17	0.10***
Private health facility	0.31	0.20	0.51	–0.31***
	B. *Delivery*			
Any health facility	0.49	0.41	0.66	–0.25***
Public health facility	0.14	0.12	0.17	–0.05***
NGO health facility	0.14	0.17	0.09	0.08***
Private health facility	0.21	0.12	0.40	–0.28***
	C. *Newborn exam*			
Any health facility	0.40	0.33	0.55	–0.22***
Public health facility	0.11	0.10	0.15	–0.05***
NGO health facility	0.11	0.13	0.07	0.06***
Private health facility	0.18	0.11	0.33	–0.23***

Note: Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes p<0.01, ** p<0.05, and * p<0.1.

Table 5. Distribution of reported reasons for choice of delivery site, youngest child born in the three years before the survey

Reason	Pooled	Slum	Nonslum	Slum–Nonslum
	(1)	(2)	(3)	(4)
	A. *Why chose a facility for delivery*			
Due to complications	0.55	0.56	0.54	0.02
Referred by doctor/service provider	0.09	0.09	0.08	0.00
It is safe	0.29	0.29	0.29	–0.01
Other (unspecified)	0.07	0.07	0.08	–0.02
	B. *Why chose specific facility for delivery*			
Low cost	0.06	0.09	0.04	0.05***
Near to my house	0.10	0.11	0.07	0.04**
It is safe	0.33	0.32	0.34	–0.02
Provider is known	0.17	0.14	0.21	–0.06***
Had antenatal care here	0.14	0.13	0.15	–0.01
Had previous delivery here	0.03	0.02	0.04	–0.03***
Other (unspecified)	0.17	0.18	0.15	0.03
	C. *Why chose delivery at home*			
Not necessary	0.70	0.70	0.71	–0.01
Costs too much/lack of money	0.12	0.13	0.09	0.04**
Better care at home	0.05	0.05	0.06	–0.01
Other (unspecified)	0.13	0.12	0.14	–0.02

Note: The sample for Panels A and B is youngest child born in a health facility in the three years before the survey; the sample for Panel C is youngest children born at home in the three years before the survey. Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 6. Effects of type of health facility/provider for antenatal care, delivery, and newborn exam on child HAZ scores

Ordinary least square regressions

	Pooled (1)	Slum (2)	Nonslum (3)
		A. *Use of health facility*	
Antenatal care at a health facility	0.210**	0.198**	0.213*
	(0.079)	(0.094)	(0.123)
Delivery at a health facility	0.088	0.079	0.082
	(0.071)	(0.090)	(0.112)
Newborn exam at a health facility	0.059	0.072	0.036
	(0.076)	(0.099)	(0.107)
		B. *Use of health facility type*	
Antenatal care			
Public health facility	0.281**	0.176	0.417**
	(0.116)	(0.148)	(0.162)
NGO health facility	0.143*	0.182*	0.001
	(0.089)	(0.105)	(0.141)
Private health facility	0.214**	0.200	0.243*
	(0.092)	(0.117)	(0.137)
Delivery			
Public health facility	0.223**	0.195	0.230
	(0.100)	(0.135)	(0.147)
NGO health facility	0.007	0.034	–0.121
	(0.093)	(0.112)	(0.154)
Private health facility	0.052	0.020	0.074
	(0.098)	(0.153)	(0.127)
Newborn exam			
Public health facility	0.264*	0.284*	0.233
	(0.108)	(0.147)	(0.155)
NGO health facility	–0.067	–0.057	–0.102
	(0.112)	(0.135)	(0.164)
Private health facility	0.009	0.033	–0.024
	(0.101)	(0.157)	(0.128)

Note: Regressions control for the base set of factors (see Table 3). Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 7. Mean values for health-protective household amenities

	Pooled	Slum	Nonslum	Slum–Nonslum
	(1)	(2)	(3)	(4)
No access to piped drinking water	0.36	0.44	0.22	0.21***
Unshared access to piped drinking water	0.19	0.05	0.47	–0.43***
Shared access to piped drinking water	0.45	0.52	0.31	0.21***
Access to improved toilet, unshared	0.31	0.14	0.62	–0.48***
Access to improved toilet, shared with <9 other hhs.	0.37	0.41	0.30	0.11***
Access to improved toilet, shared with ≥9 other hhs.	0.31	0.42	0.08	0.35***
Safe disposal of garbage	0.53	0.45	0.68	–0.23***
Use of clean cooking fuel	0.71	0.64	0.87	–0.23***
Finished floor in dwelling	0.81	0.73	0.95	–0.22***
Handwashing site, with water and soap, at dwelling	0.45	0.29	0.74	–0.45***

Note: Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 8. Effects of health-protective household amenities on child HAZ scores
Ordinary least square regressions

	Pooled (1)	Slum (2)	Nonslum (3)
Unshared access to piped drinking water	0.119	–0.015	0.102
	(0.108)	(0.170)	(0.146)
Shared access to piped drinking water	0.066	0.098	–0.045
	(0.064)	(0.076)	(0.116)
Access to an improved toilet, shared with <9 other hhs.	–0.101	–0.129	–0.033
	(0.093)	(0.130)	(0.128)
Access to an improved toilet, shared with ≥9 hhs.	–0.202*	–0.268**	0.026
	(0.103)	(0.133)	(0.174)
Safe disposal of garbage	0.081	0.076	0.115
	(0.062)	(0.078)	(0.093)
Use of a clean cooking fuel	–0.006	–0.046	0.191
	(0.080)	(0.091)	(0.168)
Finished floor in dwelling	0.079	0.113	0.043
	(0.078)	(0.086)	(0.187)
Handwashing site, with water and soap, at dwelling	0.093	0.038	0.237**
	(0.061)	(0.076)	(0.095)

Note: Sample is restricted to children in households with access to an improved toilet. Regressions control for the base set of factors (see Table 3), except for household asset index. Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 9. Mean values for mother's migration to current city corporation

	Pooled	Slum	Nonslum	Slum–Nonslum
	(1)	(2)	(3)	(4)
		A. *Birth location*		
Born in another urban center	0.12	0.11	0.13	–0.02*
Born in a rural area	0.54	0.57	0.49	0.08***
		B. *Reason for move (conditional on moving)*		
For family reasons	0.67	0.63	0.74	–0.11***
For work reasons	0.29	0.33	0.20	0.13***
For other reasons	0.04	0.04	0.06	–0.02**
		C. *Time since mother's move (conditional on moving)*		
Years since move	8.52	8.60	8.37	0.22

Note: A mother who moved to the current city corporation just before the survey was assigned one month for time since move. "Another urban center" is any urban entity other than the current city corporation. Panels B and C report statistics conditional on the mother moving to the current city corporation. Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes p<0.01, ** p<0.05, and * p<0.1.

Table 10. Effects of mother's migration to current city corporation on child HAZ scores

	Pooled	Slum	Nonslum
	(1)	(2)	(3)
	A. *Birth location*		
Born in another urban center	0.181**	0.252**	0.064
	(0.084)	(0.110)	(0.122)
Born in a rural area	0.054	0.016	0.140*
	(0.054)	(0.071)	(0.078)
	B. *Reason for move*		
For family reasons	0.024	0.018	0.056
	(0.057)	(0.077)	(0.079)
For work reasons	0.051	–0.016	0.298***
	(0.074)	(0.090)	(0.113)
	C. *Time since mother's move (conditional on moving)*		
Time since move (in years)	0.006	0.007	0.002
	(0.005)	(0.007)	(0.008)

Note: A mother who moved to the current city corporation just before the survey was assigned one month for time since move. Regressions control for the base set of factors (see Table 3). The reference category is "mother born in the current city corporation" for factors in Panel A; the reference category is "mother always resided in current city corporation" for factors in Panel B. "Another urban center" is any urban entity other than the current city corporation. Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes p<0.01, ** p<0.05, and * p<0.1.

Table 11. Decomposition of slum-nonslum difference in mean child HAZ scores
Based on ordinary least square regressions

Factors	Outcome (1)	Factor level (2)	Effect (3)	Interaction (4)
	Aggregate			
	–0.581***	–0.379***	–0.193**	–0.010
	(0.053)	(0.054)	(0.075)	(0.075)
	Detailed			
Child ill with fever or ARI symptoms		–0.007*	0.047**	0.008*
		(0.004)	(0.028)	(0.006)
Mother: completed education		–0.091**	—	—
		(0.047)		
Mother: age at child birth		—	–0.053***	–0.017*
			(0.017)	(0.009)
Standardized wealth index		–0.280***	—	—
		(0.066)		

Note: ARI stands for acute respiratory infection. Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes p<0.01; ** p<0.05 and * p<0.1.

Table 12. Mean levels for child growth and factors, 2006 and 2013

	Pooled			Slum			Nonslum		
	2006	2013	2013–2006	2006	2013	2013–2006	2006	2013	2013–2006
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
HAZ score	–1.83	–1.69	0.14**	–2.12	–1.88	0.23***	–1.51	–1.30	0.20*
Moderate-to-severe stunting	0.46	0.42	–0.04**	0.56	0.48	–0.08***	0.36	0.31	–0.05
Severe stunting	0.22	0.20	–0.02	0.28	0.23	–0.05***	0.16	0.13	–0.02
Child									
Age	29.79	30.12	0.33	30.13	30.08	–0.05	29.42	30.20	0.78
Female	0.52	0.49	–0.03	0.49	0.49	0.01	0.56	0.50	–0.06**
Birth order	2.45	2.06	–0.38***	2.59	2.16	–0.43***	2.29	1.87	–0.42***
Ill with ARI symptoms	0.14	0.03	–0.11***	0.14	0.03	–0.11***	0.13	0.03	–0.10***
Ill with fever	0.42	0.31	–0.10***	0.43	0.33	–0.10***	0.40	0.28	–0.12***
Mother									
Age at child's birth <18	0.10	0.09	0.00	0.12	0.11	–0.01	0.07	0.07	0.00
Age at child's birth 18–34	0.85	0.86	0.00	0.83	0.84	0.02	0.88	0.89	0.00
Age at child's birth >34	0.05	0.05	0.00	0.05	0.05	0.00	0.05	0.05	0.00
Completed formal education (in years)	4.91	5.68	0.76***	3.24	4.33	1.09***	6.75	8.32	1.57***
Born in current city corporation	0.30	0.34	0.04	0.29	0.32	0.03	0.31	0.38	0.06
Born in another urban area	0.09	0.12	0.03***	0.07	0.11	0.04***	0.11	0.13	0.02
Born in a rural area	0.60	0.54	–0.06**	0.63	0.57	–0.07**	0.57	0.49	–0.08*
Employed	0.18	0.20	0.02	0.23	0.24	0.01	0.13	0.13	0.00
Regularly exposed to mass media	0.87	0.85	–0.02	0.83	0.81	–0.02	0.91	0.93	0.02
Member of an NGO	0.30	0.15	–0.15***	0.30	0.18	–0.12***	0.30	0.09	–0.21***
Household									
Standardized wealth index	–0.09	0.07	0.15*	–0.56	–0.31	0.25***	0.43	0.81	0.37***
Size	5.52	4.87	–0.66***	5.26	4.76	–0.50***	5.81	5.07	–0.74***
Neighborhood area									
Formal garbage collection available	0.60	0.69	0.09*	0.43	0.62	0.19***	0.80	0.84	0.04
Proper sewerage system available	0.49	0.48	–0.01	0.31	0.41	0.10*	0.69	0.62	–0.07
CHW service available	0.17	0.51	0.35***	0.20	0.55	0.35***	0.13	0.44	0.31***

Table 12. Mean levels for child growth and factors, 2006 and 2013

	Pooled			Slum			Nonslum		
	2006	2013	2013–2006	2006	2013	2013–2006	2006	2013	2013–2006
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NGO health facility available	0.45	0.48	0.03	0.45	0.48	0.04	0.45	0.46	0.01
Public health facility available	0.18	0.14	–0.05	0.17	0.14	–0.04	0.19	0.14	–0.06
Private health facility available	0.32	0.36	0.05	0.29	0.33	0.04	0.34	0.42	0.08
Pharmacy available	0.76	1.00	0.24***	0.66	1.00	0.33***	0.87	1.00	0.13***

Note: ARI stands for acute respiratory infection; CHW stands for community health worker. Estimates are adjusted for sampling weights. Inference is based on robust standard errors clustered at the neighborhood-area level. *** denotes $p<0.01$, ** $p<0.05$, and * $p<0.1$.

Table 13. Decomposition of change in mean child HAZ scores between 2006 and 2013
Based on ordinary least squares regressions

	Outcome (1)	Factor level (2)	Effect (3)	Interaction (4)
	A. *Slum areas*			
	Aggregate			
	0.222***	0.094**	0.054	0.074
	(0.069)	(0.044)	(0.088)	(0.069)
	Detailed			
Child: birth order		–0.023*	0.239**	0.045*
		(0.013)	(0.119)	(0.024)
Mother: completed education		0.043***	—	—
		(0.015)		
Household: standardized wealth index		0.055***	—	—
		(0.019)		
	B. *Nonslum areas*			
	Aggregate			
	0.210**	0.134**	0.019	0.057
	(0.101)	(0.054)	(0.120)	(0.106)
	Detailed			
Child: Recent illness with ARI or fever		0.024*	—	—
		(0.013)		
Mother: completed education		0.036*	—	—
		(0.020)		
Household: standardized wealth index		0.093***	—	—
		(0.030)		
Neighborhood area: RMNCH service availability		—	—	0.164**
				(0.072)

Note: ARI stands for acute respiratory infection; RMNCH stands for reproductive, maternal, neonatal, and child health. "RMNCH service availability" groups together indicators for the availability of community health workers, and NGO, public, and private health facilities. Estimates are adjusted for sampling weights. Robust standard errors, clustered at the neighborhood-area level, are reported in parentheses. *** denotes $p<0.01$; ** $p<0.05$ and * $p<0.1$.

Table A1. Definitions of main variables

Variable	Definition
	Outcome
HAZ	Height-for-age z-scores, standardized using 2006 WHO growth standards
Moderate-to-severe stunting	Whether height-for-age z-score is two SD below the international reference median
Severe stunting	Whether height-for-age z-score is three SD below the international reference median
	Factor
A. *Child*	
Age (in months)	Child's age in months (0–59 months).
Female	Whether the child is female.
Birth order	Order in which the child was born.
Ill with ARI symptoms	Whether the child had symptoms of acute respiratory infection (ARI) in the two weeks before the survey.
Ill with fever	Whether the child had a fever in the two weeks before the survey.
Antenatal care at health facility	Whether the mother received antenatal care at a health facility for the child. A health facility is a medical college hospital, specialized government hospital, district hospital, Maternal and Child Welfare Center (MCWC), upazilla health complex, Health and Family Welfare Center (H&FWC), BRAC static clinic, BRAC birthing hut, Marie Stopes clinic, Smiling Sun Franchise Program (SSFP) clinic, Urban Primary Health Care Project (UHSCP) clinic, private hospital/clinic, or qualified doctor's chamber, or private medical college hospital.
Antenatal care at public health facility	Whether the child's mother received antenatal care at a public health facility. Public health facilities are medical college hospital, specialized government hospital, district hospital, MCWC, upazilla health complex, H&FWC, satellite Clinic/EPI outreach, or community clinic.
Antenatal care at NGO health facility	Whether the child's mother received antenatal care at an NGO health facility. A NGO health facility is a NGO static clinic, NGO satellite clinic, or birthing hut.
Antenatal care at private health facility	Whether the child's mother received antenatal care at a private health facility. A private health facility is a private hospital/clinic, qualified doctor's chamber, or private medical college hospital.
Delivered at health facility	Whether child was delivered at a health facility. Health facility defined as for antenatal care.
Delivery in public health facility	Whether the child was delivered at a public health facility. Public health facility defined as for antenatal care.
Delivery in NGO health facility	Whether the child was delivered at an NGO health facility. NGO health facility defined as for antenatal care.
Delivery in private health facility	Whether the child was delivered at a private health facility. Private health facility is defined as for antenatal care.
Newborn exam at health facility	Whether child received an exam within two months after birth at health facility. Health facility is defined as for antenatal care.
Newborn exam at public health facility	Whether child received an exam within two months after birth at public health facility. Public health facility is defined as for antenatal care.
Newborn exam at NGO health facility	Whether child received an exam within two months after birth at NGO health facility. NGO health facility is defined as for antenatal care.

Table A1. Definitions of main variables

Variable	Definition
Newborn exam at private health facility	Whether child received an exam within two months after birth at health facility. Private health facility is defined as for antenatal care.
B. *Mother*	
Age at child’s birth <18	Whether mother's age at child’s birth was under 18 years.
Age at child’s birth 18 to 34	Whether the mother’s age at child’s birth was between 18 and 34 years.
Age at child’s birth >34	Whether mother’s age at child’s birth was over 34 years.
Completed formal education	Years of completed education through either religious or secular schools.
Born in current city	Whether mother was born in the current city.
Born in another urban area	Whether mother was born in another city, district town, or another town.
Born in village	Whether mother was born in a village.
Moved for family reason	Whether mother has moved to current city due to family reasons: join parents, spouse/in-laws, children, or other relatives.
Moved for work reason	Whether the mother has moved to current city due to work-related reasons: service, work, or transfer; higher labor earnings; search for work
Moved for other reason	Whether the mother has moved to current city due to other reasons: own education, children’s education, purchase new land or house; need to look after properties.
Years since move	Number of years mother has been living in the current city, if she had moved from another urban center or a rural area.
Employed	Whether mother is currently employed.
Regular exposure to mass media	Whether mother watches TV at least once a week.
Member of an NGO	Whether mother is a member of Grameen Bank, BRAC, ASA, or Proshika.
C. *Household*	
Wealth index	Standardized asset-based wealth index obtained from the first Principal Component Analysis component, based on information on dwelling space per household member, number of rooms in dwelling, whether the dwelling has a separate room for the kitchen; whether dwelling floor is finished (parquet or polished wood, ceramic tiles, mozaik or cement floor); whether dwelling has a finished roof (tin, wood, ceramic tiles or cement roof), whether dwelling has finished walls (tin, cement, brick or wood plank walls); whether household has an electric connection, TV, fridge, computer, electric fan, air conditioner, mobile phone, or generator; whether household uses clean cooking fuel (electricity, LPG, natural gas, biogas, or kerosene); whether household has access to piped drinking water; whether the household has access to an improved toilet facility.
Finished floor	Whether the main material of the dwelling floor is parquet or polished wood, ceramic tiles, mozaik, or cement.
Access to piped drinking water	Whether the main source of drinking water for members of the household is piped water (piped into dwelling, piped to yard or plot, or public tap or standpipe).
Shared access to piped drinking water	Whether the household has piped water at dwelling that is shared with other households.

Table A1. Definitions of main variables

Variable	Definition
Access to an improved toilet	Whether the household has flush or pour flush toilet (flush to sewer system or septic tank, flush to somewhere else) or pit latrine (ventilated improved pit latrine with or without slab or open pit).
Access to an improved toilet, shared with <9 other hhs	Whether the household shares an improved toilet facility with fewer than nine other households.
Access to an improved toilet, shared with ≥9 other hhs	Whether the household shares an improved toilet facility with nine or more households.
Safe disposal of garbage	Whether garbage is collected from home or disposed in a bin outside the household.
Use of a clean cooking fuel	Whether household mainly uses electricity, LPG, natural gas, biogas, or kerosene for cooking.
Handwashing site, with water and soap, at dwelling	Whether household has a handwashing site with water and soap, all observed by the interviewer.
D. *Neighborhood area*	
Formal garbage collection in the area	Whether garbage is collected from home or in the neighborhood area by government, community association, or private company.
Proper sewerage system in the area	Whether households in the neighborhood area dispose of sewerage into proper sewerage system.
CHW service available in the area	Whether the neighborhood area has community health workers who provide services in reproductive, maternal, newborn, and child health.
Public health facility available in the area	Whether the neighborhood area has a health facility operated by the government.
Private health facility available in the area	Whether the neighborhood area has a health facility operated by the private sector.
NGO health facility available in the area	Whether the neighborhood area has a health facility operated by the NGO sector.
Nonslum area	Whether the neighborhood area is a nonslum area.