# Effect of household environment & family's economics status on child health status in Urban India

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## ABSTRACT

**Context**: The process of urbanization is rapidly unfolding, associated with enormous challenges of providing decent housing facilities, safe drinking-water and hygienic sanitation to urban dwellers in India. However, recent evidence suggests tremendous shortage of essential housing, water and sanitation facility in urban areas, especially among the urban poor. How the unavailability and deficiencies in urban amenities (housing, safe drinking water and sanitation facility) influence the health status of population, especially child health status in Urban India is not properly understood, and poses critical challenges for health professionals and planners, given relatively poor nutritional status and high infant & child mortality scenario.

**Objectives**: We investigate the relationship between availability household amenities (quality of housing, drinking water, sanitation facility and cooking fuel) and child health & nutritional status after adjusting for critical socioeconomic, demographic and contextual confounding variables.

**Data & Methods**: We used cross-sectional data from third round of National Family Health Survey (NFHS) conducted in 2005-06. The analysis is based on 19,483 children below five years of age. The main outcome variables related to health status of children are-diarrhea, and acute respiratory infections. Anthropometric measures of weight-for-age (underweight), height-for-age (stunting) and weight-for-height (wasting) are used to assess the nutritional status of children. Cross-tabulations, Chi-square test and logistic regressions models have been used to fulfill objectives of the study.

**Findings**: Result indicates significant differentials in child health (ARI & diarrhea) and nutritional status (stunting, wasting and underweight) according to availability of housing amenities in urban India. However, these crude variations become insignificant once controlled for critical socioeconomic and demographic confounders in the logistic regression analysis. We do not find any significant association between housing amenities and child health and nutritional status in India. However, mother education and household economic status remains critical factors governing child health and nutrition in urban India.


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## Introduction

The recent population projections by United Nations indicate that by 2030 each major region in the developing world will house more urban than rural dwellers. Furthermore, by 2050 nearly two-third of population in developing countries will live in urban areas (Montgomery, 2008). The total urban population in developing world was estimated around 1.97 billion in 2000, which is likely to increase up to 3.90 billion in 2030 and finally reach a figure of 5.26 billion by 2050 as per United Nations population projection. Under the process of rapid urbanization and modernization, one of the key challenges of recent times relates to the provision of basic infrastructural facilities to urban dwellers and improving their well-being and quality of life (Sclar et al, 2005). It was for the first time in the history of human population that more than 50 percent of population now lives in cities. According to the recent United Nations estimates, the world urban population is growing annually at the rate of 1.8 percent and is likely to outpace the overall world population growth rate of 1 percent (United Nations, 2005).

However, the matter of concern relates to the fact that more than one third of current 3 billion urban dwellers live in slums or places characterized by poor structural housing conditions, deficient access to safe drinking water and sanitation, and severe overcrowding. More importantly, all these myriad factors have direct bearing upon the physical and psychological well-being of the urban population. Very often, owing to sub-standard living conditions in urban slums and shanty towns, the urban dwellers are subject to morbidities and mortality from various communicable and non-communicable health hazards and diseases. Due to inadequate provision of water and sanitation facilities, more than half of population in developing countries suffers from diarrhoeal and warm infections (WHO, 1999). Owing to higher level of overcrowding in urban areas, poor urban dwellers become more vulnerable to contracting various communicable diseases such as tuberculosis, acute respiratory infections and meningitis. The risk of contracting such communicable disease among urban slum dwellers is further perpetuated due to poor nutritional status and inappropriate intake of food. Furthermore, inadequate provision of drainage and sanitation facilities leads to the risk of several vector borne diseases like malaria, dengue and yellow fever etc (UN-HABITAT, 2003).

India, like the other countries of the developing world, is also undergoing the rapid process of urbanization as nearly 27.8 percent of countries population lives in urban areas, comprising around 285.4 million urban dwellers in absolute number. More strikingly, the urban population grew at a relatively faster decadal growth rate of 31.2 percent compared to only 17.9 percent in rural areas during 1991-2001. The recent population projection by the United Nations suggests that India's urban population will grow to 538 million by 2030 with more than half of the country's population living in urban areas (United Nations, 2005). However, along with the rapid process of urbanization in India, the slum population has also increased at high pace. It was noted that the slum population represents the fastest growing component of urban population at an annual growth rate of 5 to 6 percent, which is double to the actual growth rate of overall urban population (Chatterjee, 2002). Studies have noted that slums are marked by crowded living conditions, unhygienic surroundings, and lack of basic amenities, such as safe drinking water, sanitation and proper disposal of garbage. This grave situation is further compounded by the unavailability of proper civic amenities and lack of essential primary health care services that further heightens the health risk of poor urban dwellers. Therefore, previous studies have noted that the health condition of poor urban dwellers is worse off than the rest of urban population, and is often comparable to the health condition of rural population (Montgomery and Hewett, 2005).

Though previous studies in the context of developing countries have examined the health status and health seeking behavior among urban population in general (Agrawal et al, 2007). However, there is a dearth of study that specifically examine the effect of the availability of basic housing amenities like quality of housing, safe drinking water and sanitation on the health and nutritional status of children living in urban areas in developing countries in general and Indian context in particular. Therefore, the main objective of the present study is to examine the association between the availability of housing amenities and health and nutritional status of Indian children in urban India using nationally representative cross-sectional data set.

**Data & Methods**

We used cross-sectional data from third round of National Family Health Survey (NFHS) conducted in 2005-06. NFHS is a nationally representative, large scale, multi-round survey in a representative sample of households throughout India. The principal objective of NFHS is to provide state and national level estimates on fertility, mortality, family planning, HIV-related knowledge, and on important aspects of nutrition, health and health care. The survey provides state and national level estimates of demographic and health parameters as well as data on various socioeconomic and program dimensions, which are critical for bringing in the desired changes in demographic and health parameters.

The survey adopted a two-stage sample design in most rural areas and a three-stage sample design in most urban areas. In rural areas, the villages were selected at the first stage by using Probability Proportional to Size (PPS) sampling scheme. The required number of households was selected at the second stage using systematic sampling. In urban areas, blocks were selected at the first stage, census enumeration blocks (CEB) containing approximately 150-200 households were selected at the second stage, and the required number of households were selected at the third stage using systematic sampling technique (For details regarding sampling, see IIPS & ORC Macro 2007). NFHS provide sufficiently large sample sizes to carry out the analysis at the national as well as the state level. The data were collected using household and individual interview schedule.

In the interviewed households, individual interviews were completed with 124,385 women out of 131,596 who stayed in the household the night before the household interview. The individual response rate, i.e., the number of completed interviews per 100 eligible women identified in the households, was 95 percent for the country as a whole (93 percent in urban areas and 96 percent in rural areas). The response rate for eligible women varied from 90 percent in Maharashtra and Meghalaya to 99 percent in Madhya Pradesh and Chhattisgarh. Individual interviews were completed with 74,369 eligible men out of 85,373 who stayed in the household the night before the household interview. The response rate for eligible men was 87 percent for the country as a whole (85 percent in urban areas and 90 percent in rural areas). The response rate for eligible men varied from 76 percent in Delhi to 98 percent in Madhya Pradesh.

To make the estimates representative and to account for the multi-stage sampling design adopted, we used appropriate weights in the analysis. The details of the sampling weights are given in NFHS reports of the various rounds (IIPS & ORC Macro , 2007). The present analysis is restricted 19,483 children below five years of age living in urban India during 2005-06. The kids file has been used to conduct the analysis. Access to basic amenities, such as proper housing, safe drinking water and sanitation, and clean cooking fuel, is not only an important measure of the socioeconomic status of the household but is also fundamental to the health of its members. NFHS-3 provides information on several household characteristics that affect living conditions.

**Outcome variables**

The main outcome variables related to health status of children are-*diarrhea* and *acute respiratory infections* (*ARI*). Anthropometric measures of *weight-for-age* (underweight), *height-for-age* (stunting) and *weight-for-height* (wasting) following recent WHO standards are used to assess the nutritional status of children.

To assess nutritional status, NFHS-3 included an anthropometric component, in which all children under five years of age were weighed and measured. Every interviewing team included two health investigators who conducted the anthropometric measurements. Each health investigator carried a scale and a measuring board. The scale was a solar-powered electronic SECA scale with a digital screen designed and manufactured under the guidance of the United Nations Children's Fund (UNICEF). The measuring board was specially designed by Shorr Productions for use in survey settings. Children younger than 24 months were measured lying down on the board (recumbent length); older children were measured while standing. In previous NFHS surveys, anthropometric measurements were restricted to children born to women interviewed with the Women's Questionnaire. However, the data from those surveys do not represent all children, since they exclude children whose mothers were not in the household (either because they did not live there or because they had died), children whose mothers were not eligible for the individual interview (i.e., they were under age 15 or age 50 and over), and children whose mothers did not complete an individual interview. To overcome these biases,

NFHS-3 included height and weight measurements for all children born in the five years preceding the survey who were listed in the Household Questionnaire.

Evaluation of nutritional status is based on the rationale that in a well-nourished population, there is a statistically predictable distribution of children of a given age with respect to height and weight. In any large population, there is variation in height and weight; this variation approximates a normal distribution. Use of a standard reference population as a point of comparison facilitates the examination of differences in the anthropometric status of subgroups in a population and of changes in nutritional status over time. The use of a reference population is based on the empirical finding that well-nourished children in all population groups for which data exist follow very similar growth patterns before puberty. Until 2006 the most commonly used reference population, which was used in NFHS-1 and NFHS-2, was the U.S. National Center for Health Statistics (NCHS) standard, which was recommended at that time by the World Health Organization (Dibley et al., 1987a; 1987b). NFHS estimates based on a new international reference population released by WHO in April 2006 (WHO Multicenter Growth Reference Study Group, 2006) and accepted by the Government of India. However, to facilitate the analysis of changes in nutritional status over time, nutritional status in NFHS-2 has also been recalculated using the new WHO standard.

The new WHO growth standard adopts a prescriptive approach, describing how healthy children should grow. The new standard is based on children around the world (Brazil, Ghana, India, Norway, Oman, and the United States) who are raised in healthy environments, whose mothers do not smoke, and who are fed with recommended feeding practices (exclusive breastfeeding for the first 6 months and appropriate complementary feeding from 6 to 23 months). The WHO growth standard identifies breastfed child as the normative model for growth and development standards, depicts normal early childhood growth under optimal environmental conditions, and can be used to assess children regardless of ethnicity, socioeconomic status, and type of feeding.

In the NFHS-3 discusses the prevalence and treatment of acute respiratory infection, fever, and diarrhoea. Mothers of children born during the five years preceding the survey were asked if their children had suffered from cough, fever, or diarrhea during the two weeks

preceding the survey, and if so, the type of treatment given. Accuracy of all these measures is affected by the reliability of the mother's recall of when the disease episode occurred. The two-week recall period is thought to be most suitable for ensuring that there will be an adequate number of cases to analyze and that recall errors will not be too serious. It should be noted that the morbidity data collected are based on mothers' perceptions of illness without validation by medical personnel.

Acute respiratory infection (ARI) is one of the leading causes of childhood morbidity and mortality throughout the world. Early diagnosis and treatment with antibiotics can prevent a large proportion of deaths caused by ARI. In NFHS-3, the prevalence of ARI was estimated by asking mothers whether their children under age five years had been ill with a cough accompanied by short, rapid breathing which was chest related in the two weeks preceding the survey. These symptoms are compatible with ARI.

**Exposure variables**

We have used a set of theoretically pertinent set of socioeconomic and demographic variables that have been associated with the child health and nutritional status. We have used mainly four exposure variables to examine the association between basic housing amenities and child health and nutritional status in urban India. These includes source of drinking water (categorized as unsafe, piped water inside dwelling, safe water outside dwelling); source of toilet facility (categorized as safe vs. unsafe); type of house (kuccha, semi-pucca and pucca); type of cooking fuel (unsafe vs. safe). We have also controlled various child level, mother level and household level confounding variables that might lead to spurious association between the outcome and set of exposure variables. Major confounding variables controlled in the multivariate analysis includes: age, sex, birth order, family size, birth weight, birth size, and breastfeeding status of the child; mother's age, height, education and exposure to mass media; household's wealth index, religion and caste.

**Methods**

We have used the univariate and bivariate analysis to look at the sample profile of the study population and socioeconomic and demographic differentials in various child health and nutritional status indicators. We have also employed logistic regression models, since the nature of the dependent variable is binary, to understand the adjusted effect of main exposure variables on outcome variables. We present the result of regression analysis in terms of adjusted odds ratios.

## Results

### Univariate Analysis

We present the basic sample profile of the study population in table 1. This indicates that only 47 percent of children (0-59 months) had access to safe drinking water within their dwellings and only 43 percent children were fortunate to have access to some safe toilet facilities in urban India. However, majority of children (77 percent) were residing in pucca houses, though only half of the children were living in households with safe cooking fuel. Around 54 percent of our sample consist of male children, with nearly 20 percent who had low birth weight (<2.5 kg), with similar proportions who had small size at birth and more than three siblings in the household. Nearly 30 percent children belonged to adolescent mothers with no education. However, the exposure to mass-media among mothers of our sample children remained impressive. Nearly 30 percent of our sample children belonged to poorest to middle wealth quintile households. Majority of sample children belonged to Hindu religion followed by Muslims and others. Nearly 40 percent of sample children belonged to 'other forward caste groups' followed by 39 percent 'other backward class' and 19 percent 'schedule caste'.

### Bivariate Analysis

Table 2 presents the state level differentials in the prevalence of anthropometric failure (stunting, underweight and wasting) and health status (diarrhea and ARI) among children (0-59 months) in urban India. Result suggest that, in urban India, nearly 41 percent children were suffering from stunting (chronic undernutrition), 33 percent were suffering from underweight and 17 percent were wasted (acute undernutrition). On the other hand, nearly 9 percent of

children were suffering from diarrhea and four percent had ARI with was inter-state differentials. This clearly indicates the poor story of health and nutritional status of children in urban India.

However, we also note stark inter-state disparities in the prevalence of anthropometric failure and disease outcomes across Indian states in urban areas. States from the central, eastern and northern part of India reported higher proportion of anthropometric failures and disease outcomes than their counterparts in the southern part of India. For instance, stunting was relatively higher in states like Meghalaya, Uttar Pradesh, Bihar, Madhya Pradesh, Gujarat, Chhattisgarh, Jharkhand, Orissa etc. Surprisingly, states like Haryana and Delhi with relatively better economic indicators fared poor in nutritional indicators for urban children. We also note similar inter-state disparities in the prevalence of diarrhea and ARI.

Table 3 presents the percentage distribution of anthropometric failure and child health status by selected household, demographic and socioeconomic characteristics in urban India. Result indicates that large household, demographic and socioeconomic variations in the prevalence of anthropometric failure and child health status in urban India. For example, higher percentage of children were suffering from stunting, wasting and underweight along poor health status like diarrhea and ARI who had access to only unsafe toilet facilities compared to their counterparts. Similarly, result indicate that children who where residing in household where cooking fuel was used, more proportion were suffering from various anthropometric failure and poor health outcomes. Type of housing also suggests that children living in kuccha or sub-standard housing were more prone to suffer from poor anthropometric and health outcomes than their counterparts living in the pucca households. However, we do find any consistent pattern with the source of drinking water facility and various anthropometric failure and child health status. Rather the result comes in the opposite direction than the customary understanding suggests.

We also found sharp variations in the prevalence of anthropometric failure and child health status according to the age of child, birth weight of child, birth size, family size, mother education, economic status of household, religion and caste groups etc in urban India.

**Multivariate Analysis**

We have fitted five sets of logistic regression models to examine the association between anthropometric failure (stunting, underweight and wasting) and child health status (ARI & diarrhea) and quality of housing measured by access to safe drinking water, type of toilet facility, type of house and cooking fuel used after adjusting for various demographic and socioeconomic characteristics. We present the results of the logistic regression models in terms of adjusted odds ratio. In the first model where we examined the effect of type of housing qualities on stunting, result suggest that after adjusting for various demographic and socioeconomic confounders, children who do not have access to safe toilet facilities were 18 percent more likely to be stunted than their counterparts in urban India. However, the effect of type of house and coking fuel on stunting is very weak and goes opposite to the expected direction. We do not find any significant effect of source of safe drinking water on stunting among children in urban India. However, mother's education, age, height and wealth status had a strong negative effect on stunting, whereas, low birth weight, small birth size and large family size were positively associated with stunting. Mass media exposure had no effect on stunting among children.

In the second mode, where we examined the effect of housing qualities on underweight, results indicates that source of drinking water, toilet facility and type of house had no significant effect on underweight. However, surprisingly, children living in household using safe cooking fuels were more likely to by underweight than their counterparts. However, mother's education, age, height and wealth status had a strong negative effect on underweight, whereas, low birth weight, small birth size and large family size were positively associated with underweight.

In the third model, we examined the effect of housing qualities on wasting after adjusting for various demographic and socioeconomic characteristics. Results indicate null findings as none of the housing qualities measure had any significant effect on wasting among children in urban India. However, mother's height had a strong negative effect on wasting, whereas, low birth weight, small birth size and large family size was positively associated with wasting. However, mother education and economic status of household had a very weak and negative effect on wasting.

In the forth model, we test the effect of housing amenities on acute respiratory infections (ARI) among children in urban India, after adjusting for pertinent demographic and socioeconomic confounders. Result indicates that children living in household using safe means of cooking fuel were 28 percent less likely to suffer from ARI than their counterparts. However, source of drinking water, type of toilet facility and type of housing were associated with ARI.

In the fifth model, we examined the effect of hosing qualities on risk of diarrhea among children in urban India, after adjusting for various demographic and socioeconomic confounding characteristics. Result suggests strong and negative effect of improved type of housing on risk of diarrhea as children living in pucca houses were 75 percent less likely to suffer from diarrhea than children living in kuccha houses. Source of toilet facilities and cooking fuels were not associated with risk of diarrhea among children. However, surprisingly we found that children who had access to water from tube-well/bore-well were more likely to suffer from diarrhea than their counterparts. However, these findings need to be interpreted with caution because of very small sample size in the category of unsafe drinking water.

**Discussion and Conclusion**

Using data from the third round of National Family Health Survey (NFHS, 2005-06), the present study examined the effect of quality of housing on the risk of anthropometric failure and child health status in urban India. Its very urgent to from the policy and program perspective to understand whether source of safe drinking water, type of toilet facilities, type of housing and cooking fuel really makes a difference when it comes to the health and nutritional status of Indian children, particularly the urban poor.

The main findings from the present studies indicate the poor nutritional and health status of children in urban India. We also note large interstate disparities in anthropometric failures and ARI & diarrhea among urban children across various Indian states. Result from the multivariate analysis suggest that poor source of sanitation facilities and poor quality of housing significantly elevates the risk of stunting and diarrhea, whereas use of safe cooking fuel reduces the likelihood of ARI among children in urban India. However, we do not find any significant effect of quality

of housing on the risk of underweight and wasting. Furthermore, few of the findings from the analysis appear in opposite directions that should be interpreted with caution which might be possible due to small sample size in few categories. Therefore, we need further in-depth research at micro-level to explore the plausible mechanism of how does housing quality influence child health and nutritional status in urban India.

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**Table 1. Percent distribution of children (0-59 months) according to selected household, demographic and socioeconomic characteristics, Urban India, 2005-06**

| Variables | Total Urban Sample=19483 |
|---|---|
| **Source of drinking water** | |
| Unsafe | 5.7 |
| Piped water | 47.0 |
| Outside safe water | 47.4 |
| **Source of toilet facility** | |
| Safe | 43.0 |
| Unsafe | 57.0 |
| **Type of house** | |
| Kuccha | 3.6 |
| Semi-pucca | 19.8 |
| Pucca | 76.6 |
| **Cooking fuel** | |
| Safe | 48.3 |
| Unsafe | 51.7 |
| **Sex of child** | |
| Male | 53.2 |
| Female | 46.9 |
| **Birth weight (in kilograms)** | |
| >=2.5kg | 80.7 |
| <2.5kg | 19.3 |
| **Size of child at birth** | |
| Small | 19.0 |
| Average | 56.2 |
| Large | 24.9 |
| **Birth order** | |
| One | 49.7 |
| Two | 22.7 |
| Three | 12.1 |
| More than three | 15.5 |
| **Living children in household** | |
| Less than 3 | 82.8 |
| More than 3 | 17.2 |
| **Age of mother** | |
| 15-24 | 33.8 |
| 25-34 | 64.3 |
| 35-49 | 1.8 |
| **Mother's education** | |
| No education | 28.3 |
| Primary | 12.6 |
| Secondary | 45.6 |
| Higher | 13.5 |
| **Mother's exposure to mass media** | |
| No | 11.9 |
| Yes | 88.1 |
| **Wealth index** | |
| Poorest | 4.7 |
| Poorer | 8.3 |
| Middle | 16.6 |
| Richer | 30.4 |
| Richest | 40.0 |
| **Religion** | |
| Hindu | 72.3 |
| Muslim | 22.1 |
| Christian | 2.6 |
| Shikh | 1.2 |
| Other religious groups | 1.9 |
| **Caste** | |
| Schedule Caste | 19.2 |
| Schedule Tribe | 3.6 |
| Other Backward Class | 39.3 |
| Others | 38.0 |

**Table 2. State-wise differentials in prevalence of anthropometric failure (stunting, underweight & wasting) and morbidities (ARI & diarrhea) among children (0-59 months), Urban India, 2005-06**

| | Stunting | Under weight | Wasting | ARI | Diarrhea |
|---|---|---|---|---|---|
| **India** | **40.6** | **33.4** | **17.0** | **4.3** | **8.9** |
| **North** | | | | | |
| Haryana | 38.7 | 36.1 | 17.7 | 0.4 | 8.1 |
| Delhi | 41.7 | 27.7 | 16.1 | 4.8 | 7.9 |
| Himachal Pradesh | 27.2 | 24.1 | 15.2 | 2.4 | 7.2 |
| Jammu and Kashmir | 29.4 | 15.6 | 12.3 | 3.4 | 4.5 |
| Punjab | 35.3 | 21.3 | 9.1 | 4.2 | 7.4 |
| Rajasthan | 34.9 | 31.6 | 20.9 | 9.4 | 14.9 |
| Uttaranchal | 27.7 | 24.2 | 11.4 | 4.9 | 12.7 |
| **Central** | | | | | |
| Chhattisgarh | 39.3 | 32.4 | 18.3 | 5.6 | 7.5 |
| Madhya Pradesh | 44.4 | 51.9 | 32.6 | 3.2 | 15.3 |
| Uttar Pradesh | 50.4 | 35.2 | 13.1 | 4.5 | 7.9 |
| **East** | | | | | |
| Bihar | 48.2 | 48.7 | 26.1 | 2.4 | 12.0 |
| Jharkhand | 35.2 | 39.9 | 24.9 | 2.6 | 9.9 |
| Orissa | 35.2 | 30.4 | 14.6 | 9.6 | 10.3 |
| West Bengal | 29.9 | 24.9 | 14.1 | 7.3 | 5.1 |
| **Northeast** | | | | | |
| Arunachal Pradesh | 40.8 | 20.4 | 7.8 | 8.5 | 19.7 |
| Assam | 35.6 | 26.7 | 14.2 | 5.0 | 7.8 |
| Manipur | 29.7 | 19.7 | 8.6 | 6.1 | 12.2 |
| Meghalaya | 54.9 | 40.5 | 24.3 | 0.6 | 5.2 |
| Mizoram | 29.6 | 15.1 | 8.3 | 4.1 | 12.1 |
| Nagaland | 30.9 | 19.4 | 10.6 | 2.8 | 8.1 |
| Sikkim | 34.3 | 22.4 | 15.4 | 1.6 | 12.0 |
| Tripura | 34.5 | 33.6 | 24.1 | 12.2 | 7.0 |
| **West** | | | | | |
| Goa | 21.4 | 19.1 | 11.9 | 4.5 | 6.3 |
| Gujarat | 47.1 | 39.4 | 16.5 | 9.1 | 13.1 |
| Maharashtra | 42.5 | 31.1 | 14.0 | 3.8 | 7.3 |
| **South** | | | | | |
| Andhra Pradesh | 37.2 | 28.5 | 10.8 | 2.6 | 7.5 |
| Karnataka | 36.3 | 15.4 | 17.1 | 1.6 | 9.0 |
| Kerala | 22.4 | 26.9 | 10.5 | 5.9 | 7.5 |
| Tamil Nadu | 31.3 | 33.2 | 21.3 | 0.6 | 4.2 |

**Table 3. Percentage distribution of anthropometric failure and morbidities among children (0-59 months) by selected household, demographic and socioeconomic characteristics, Urban India, 2005-06**

| Variables | Stunting | Under weight | Wasting | ARI | Diarrhea |
|---|---|---|---|---|---|
| **Source of drinking water** | | | | | |
| Unsafe | 36.0 | 32.6 | 17.1 | 4.6 | 8.8 |
| Piped water inside/yard /plot | 36.2 | 29.2 | 15.6 | 4.8 | 9.1 |
| Tube-well/bore well | 45.5 | 37.8 | 18.3 | 3.6 | 8.3 |
| **Source of toilet facility** | | | | | |
| Safe | 32.1 | 25.5 | 13.9 | 4.1 | 8.4 |
| Unsafe | 46.2 | 39.1 | 19.5 | 4.5 | 9.3 |
| **Type of house** | | | | | |
| Kucca | 57.4 | 58.1 | 30.6 | 2.7 | 10.6 |
| Semi-pucca | 55.2 | 46.6 | 19.8 | 4.5 | 8.3 |
| Pucca | 36.0 | 28.9 | 15.6 | 4.2 | 8.7 |
| **Cooking fuel** | | | | | |
| Unsafe | 47.4 | 40.9 | 19.4 | 4.8 | 9.4 |
| Safe | 32.2 | 24.9 | 14.5 | 3.9 | 8.4 |
| **Sex of child** | | | | | |
| Male | 40.7 | 33.4 | 17.8 | 4.2 | 0.2 |
| Female | 39.4 | 32.9 | 16.2 | 4.5 | 0.4 |
| **Age of child (in months)** | | | | | |
| 0-5 | 20.7 | 24.3 | 25.8 | 4.7 | 13.8 |
| 6-23 | 43.8 | 32.3 | 18.1 | 5.9 | 14.2 |
| 24-35 | 45.3 | 33.6 | 14.7 | 4.2 | 8.5 |
| 36-47 | 45.2 | 37.6 | 14.0 | 4.2 | 5.3 |
| 48-59 | 41.8 | 36.2 | 14.3 | 3.5 | 3.5 |
| **Birth weight (in kilograms)** | | | | | |
| >=2.5kg | 30.5 | 23.7 | 14.6 | 4.4 | 8.4 |
| <2.5 kg | 42.6 | 40.3 | 22.4 | 4.9 | 9.5 |
| **Size of child at birth** | | | | | |
| Small | 47.2 | 43.4 | 24.5 | 5.6 | 10.9 |
| Average | 38.0 | 30.7 | 15.8 | 3.9 | 8.2 |
| Large | 38.2 | 30.7 | 14.4 | 4.5 | 9.2 |
| **Living children in household** | | | | | |
| Less than 3 | 36.9 | 30.5 | 16.7 | 4.4 | 8.9 |
| More than 3 | 55.6 | 46.1 | 18.8 | 4.3 | 9.2 |
| **Age of mother** | | | | | |
| 15-24 | 41.8 | 34.7 | 18.2 | 4.6 | 10.7 |
| 24-34 | 38.7 | 31.9 | 16.2 | 4.2 | 7.9 |
| 35-49 | 50.5 | 43.2 | 15.3 | 5.1 | 5.4 |
| **Mother's education** | | | | | |
| No education | 55.1 | 48.0 | 20.6 | 3.9 | 9.0 |
| Primary | 45.5 | 37.0 | 18.3 | 5.4 | 9.5 |
| Secondary | 35.7 | 28.8 | 16.2 | 4.5 | 9.4 |
| Higher | 19.0 | 14.1 | 11.5 | 3.6 | 6.3 |
| **Mother's exposure to mass media** | | | | | |
| No | 56.5 | 48.7 | 19.5 | 5.0 | 8.5 |
| Yes | 38.0 | 31.2 | 16.7 | 4.3 | 9.0 |
| **Wealth index** | | | | | |
| Poorest | 61.0 | 58.8 | 28.1 | 3.1 | 8.8 |
| Poorer | 58.9 | 49.4 | 21.0 | 2.6 | 8.1 |
| Middle | 51.6 | 44.0 | 19.0 | 5.0 | 9.5 |
| Richer | 43.5 | 35.6 | 17.8 | 5.1 | 9.7 |
| Richest | 26.3 | 20.5 | 13.5 | 4.0 | 8.2 |
| **Household head's religion** | | | | | |
| Hindu | 39.3 | 32.9 | 16.7 | 4.1 | 8.6 |
| Muslim | 44.4 | 37.1 | 19.1 | 5.1 | 9.7 |
| Christian | 32.3 | 23.5 | 13.0 | 4.8 | 8.1 |
| Sikh | 15.6 | 9.0 | 7.7 | 6.9 | 8.8 |
| Other | 46.8 | 30.4 | 18.2 | 3.1 | 8.0 |
| **Caste** | | | | | |
| Schedule Caste | 48.0 | 39.0 | 18.8 | 4.1 | 9.7 |
| Schedule Tribe | 43.3 | 37.2 | 20.6 | 3.9 | 9.4 |
| Other Backward Class | 41.4 | 35.6 | 18.7 | 3.9 | 9.4 |
| Others | 34.7 | 27.7 | 14.2 | 4.8 | 8.1 |

**Table 4. Logistic regression models showing adjusted odds ratio for anthropometric failures (stunting, underweight & wasting) and morbidities (ARI & diarrhea) among children (0-59 months), Urban India, 2005-06¥**

| Variables | Stunting | Underweight | Wasting | ARI | Diarrhea |
|---|---|---|---|---|---|
| **Source of drinking water** | | | | | |
| Unsafe® | 1 | 1 | 1 | 1 | 1 |
| Piped water inside/yard /plot | 1.18 | 1.01 | 0.95 | 0.86 | 1.40* |
| Tube-well/bore well | 1.26 | 0.96 | 1.07 | 0.80 | 1.51** |
| **Source of toilet facility** | | | | | |
| Safe® | 1 | 1 | 1 | 1 | 1 |
| Unsafe | 1.18** | 1.11 | 1.08 | 1.08 | 0.97 |
| **Type of house** | | | | | |
| Kuccha® | 1 | 1 | 1 | 1 | 1 |
| Semi-pucca | 1.47 | 0.76 | 0.79 | 0.67 | 0.30*** |
| Pucca | 1.61* | 0.93 | 0.95 | 0.4 | 0.25*** |
| **Cooking fuel** | | | | | |
| Unsafe® | 1 | 1 | 1 | 1 | 1 |
| Safe | 1.18* | 1.28*** | 0.88 | 0.72* | 1.22 |

¥ : Results have been mutually adjusted for age, sex, birth order, family size, birth weight, birth size, and breastfeeding status of the child; mother's age, height, education and exposure to mass media; household's wealth index, religion and caste.

P values- *** Significant at 1 percent; ** Significant at 5 percent; * Significant at 10 percent.

®- Reference category.