Children’s health in slum settings

Alon Unger

ABSTRACT

Rapid urbanisation in the 20th century has been accompanied by the development of slums. Nearly one-third of the world’s population and more than 60% of urban populations in the least developed countries live in slums, including hundreds of millions of children. Slums are areas of broad social and health disadvantage to children and their families due to extreme poverty, overcrowding, poor water and sanitation, substandard housing, limited access to basic health and education services, and other hardships (eg, high unemployment, violence). Despite the magnitude of this problem, very little is known about the potential impact of slum life on the health of children and adolescents. Statistics that show improved mortality and health outcomes in cities are based on aggregated data and may miss important intrasuburban disparities. Limited but consistent evidence suggests higher infant and under-five years mortality for children residing in slums compared with non-slum areas. Children suffer from higher rates of diarrheal and respiratory illness, malnutrition and have lower vaccination rates. Mothers residing in slums are more poorly educated and less likely to receive antenatal care and skilled birth assistance. Adolescents have earlier sexual debut and higher rates of HIV, and adopt risky behaviours influenced by their social environment. We also know little about the consequences of this form of early childhood on long-term health-related behaviour (eg, diet and exercise) and non-communicable disease outcomes, such as obesity, heart disease and mental illness. Further attention to understanding and addressing child health in slum settings is an important priority for paediatricians and those committed to child health worldwide.

INTRODUCTION AND SCALE OF THE PROBLEM

Children and adolescents are increasingly growing up in an urban world. Urban population growth is most concentrated in the least developed countries, where 90% of this growth takes place. Children and young people make up a large proportion of urban populations in the poorest countries, and their population growth reflects this broader trend as can be seen in figure 1. The rapid and unplanned growth of cities has also given rise to informal or illegal settlements, commonly known as slums. These poor urban areas grow at up to two times the rate of the surrounding city. Today, nearly one-third of the world’s population lives in slums, and over 90% of slum dwellers live in low-income and middle-income countries, including hundreds of millions of children (table 1 and figure 2).

Several authors have called attention to the challenges that urbanisation and slums present to public health, yet little is known about the potential impact of slum life on the health of children and adolescents. Studies of child health outcomes frequently demonstrate overall improvements in urban areas, and also better outcomes than in rural areas. However, statistics of child health in cities are often based on aggregated data and may miss important intrasuburban disparities, particularly in slums that often have unregistered residents. There is limited but consistent evidence suggesting poorer health outcomes for children and adolescents in slums compared with those from non-slum areas of the same city. This review describes what is known about child health in slum settings, and the potential implications for paediatricians and those committed to child health worldwide.

BACKGROUND: CITIES, SLUMS AND CHILD HEALTH

For most of the 20th century, urban areas were associated with improved child health and lower mortality than rural areas. They concentrated the benefits of Chadwick’s sanitary revolution in safe water and sanitation, access to vaccinations and antibiotics, and safe childbirth and perinatal care. Cities provided families with more economic and educational opportunities, improved nutrition and more possibilities for healthcare. However, despite overall favourable health statistics in cities, several authors have pointed out large variations between countries and within cities, and the potential influence of slums on these variations.

Slums are the product of rapid and unplanned growth of urban areas predominantly over the last 50 years. They accompanied the economic growth of cities as new industries created jobs and wealth attracting immigrants from beleaguered rural areas. Slums offered cheap and available housing in cities that promised more secure food and water security and public services. In addition to demographic forces, the coupling of urban growth and slums was fuelled by ill-equipped transitioning economies, inadequate urban planning and overwhelmed or negligent political systems. Slums are a diverse set of communities, located centrally and in the periphery of cities, on floodplains and hillsides, poorly constructed and ranging from thousands to millions of residents. See figure 3. The UN operationally defines them as having at least one of five characteristics: insecure residential status, poor structural quality of housing, overcrowding and inadequate access to safe water, sanitation and other infrastructure.

In addition to the UN legal and physical definition, conditions of slum life are also characterised by extreme poverty and exceedingly substandard living conditions. They are also areas of broader social disadvantage to children and their families with limited access to basic healthcare, schools and important municipal services, such as safe public transportation, policing, playgrounds or recreational
Social problems commonly affect these communities (e.g., fragmented families, low educational achievement, economic or sexual exploitation, alcohol and drug trafficking and abuse). Families also experience high unemployment or informal employment, poor or dangerous working conditions and threat of violence, eviction or natural disaster. They are also often removed from the protective benefits of tradition, extended family and community support14 15 (see table 2 and box 1).

Social determinants may affect child and adolescent health in various ways. The effects may be immediate or cumulative, and early life experiences may have latent consequences on future adult health or set individuals on trajectories that influence health and well-being16 17 (see box 2). Nonetheless, evidence of the causal link is limited and often difficult to establish in complex slum settings where data are sparse. Associations may be found from the level of the individual and household to the neighbourhood, and factors may be proximate (e.g., open sewers) or further ‘upstream’ or structural (e.g., geography, political policies).18–20 Table 2 provides an overview of possible adverse conditions that can affect slum residents.

Table 1  Urban population living in slums by region, 2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Estimated slum population</th>
<th>Proportion of urban population (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing regions</td>
<td>827 690 000</td>
<td>32.7</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>199 540 000</td>
<td>61.7</td>
</tr>
<tr>
<td>Southern Asia</td>
<td>190 748 000</td>
<td>35.0</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>88 912 000</td>
<td>31.0</td>
</tr>
<tr>
<td>East Asia</td>
<td>189 621 000</td>
<td>28.2</td>
</tr>
<tr>
<td>West Asia</td>
<td>35 713 000</td>
<td>24.6</td>
</tr>
<tr>
<td>Oceania</td>
<td>556 000</td>
<td>24.1</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>110 763 000</td>
<td>23.5</td>
</tr>
<tr>
<td>North Africa</td>
<td>11 836 000</td>
<td>13.3</td>
</tr>
</tbody>
</table>

health outcomes associated with slum settings. The next section outlines what is known about specific child health outcomes in slum settings and the possible connection with conditions of slum life.

SELECT CHILD HEALTH CHALLENGES IN SLUMS

Mortality

Demographic data show declines in under-five year mortality in urban areas and lower rates of mortality than rural areas. However, these declines have stagnated in some areas of high slum prevalence, such as sub-Saharan Africa. In Nairobi, where more than 60% of the urban population lives in slums on 5% of the land, the under-five year mortality is now higher than it was 20 years ago and also higher than rural areas of Kenya. Overall child mortality in Nairobi slums, like Kibera and Mathare, are 2.5 times greater than in other areas of the city. Similar findings in Bangladesh and Nigeria also reflect high child mortality in slums and heterogeneous urban areas with varying mortality based on residence. The disparity in mortality based on location of urban residence is not exclusive to developing nations and has been demonstrated in wealthier countries, such as higher black infant mortality by degree of residential segregation in the USA.

Communicable diseases

Water-borne and vector-borne diseases

Slums concentrate many known risk factors for parasitic, water-borne and vector-borne diseases, including: flooding, poor water drainage, open sewers and overcrowding. These characteristics of the physical environment are exacerbated by poor hygiene practices and high rates of malnutrition in children, and affect the burden of intestinal parasites and diarrhoeal diseases, such as persistent entero-aggregative Escherichia coli diarrhoea. In slums, infants who live without piped water may have up to 4.8 times the risk of death from diarrhoea. In New Delhi, diarrhoea is accountable for 36% of infant mortality and 50% of child mortality under 7 years of age. Cholera also disproportionately affects these urban settlements, with the heaviest burden on young children. Standing water in slums is associated with increased risk of mosquito-borne and other vector-borne diseases in children, such as dengue, which is further exacerbated by poor housing and high population densities. Persistent or recurrent ill health due to infectious diseases also has broader effects on child well-being, including poor school attendance, and has been implicated in poor school achievement and long-term cognitive function.

Vaccine-preventable and respiratory diseases

Lower immunisation coverage contributes to more frequent outbreaks of vaccine-preventable diseases, such as pertussis, measles and diphtheria, and they cluster in areas of high population densities. The UN created a unifying operational definition of the physical and legal characteristics shared by slums in 2002.

Table 2 Characteristics of slums—UN operational definition*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Physical/legal outcome</th>
<th>Potential adverse health outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecure residential status</td>
<td>► Threat of eviction</td>
<td>► Poor access to health sector</td>
</tr>
<tr>
<td>Less formal title deeds to land or residence</td>
<td>► Exposure to hazardous environments (eg, pollution, flooding)</td>
<td>► Low service utilisation</td>
</tr>
<tr>
<td>No proof of tenure</td>
<td>► Lack of access to formal health care infrastructure</td>
<td>► Unable to advocate for self</td>
</tr>
<tr>
<td>Poor structural quality of housing</td>
<td>► No data for health service planning</td>
<td>► Exposed to accidental injuries</td>
</tr>
<tr>
<td>Superior building materials (cardboard, tin, mud, low-grade concrete)</td>
<td>► Risk from natural or other disasters (flooding, landslides, fire)</td>
<td>► Poisoning or respiratory diseases, for example, asthma</td>
</tr>
<tr>
<td>Substandard construction</td>
<td>► Poor ventilation</td>
<td>► Industrial/polluted areas</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>► Susceptible to collapse</td>
<td>► Unintentional injuries</td>
</tr>
<tr>
<td>Less than 5 square metres per person</td>
<td>► Social stressors</td>
<td>► Falls, burns, drowning, electrocution</td>
</tr>
<tr>
<td>More than 2 people per room</td>
<td>► Facilitates disease transmission</td>
<td>► Asthma or infectious respiratory illness</td>
</tr>
<tr>
<td>Inadequate access to safe water</td>
<td>► Contaminated water</td>
<td>► Stress</td>
</tr>
<tr>
<td>Less than 50% have access to household connection, public stand pipe or rainwater collection</td>
<td>► Privatisation and high cost of water</td>
<td>► Scabies</td>
</tr>
<tr>
<td>Inadequate access to sanitation and other infrastructure</td>
<td>► Water scarcity</td>
<td>► Tuberculosis and other respiratory illnesses</td>
</tr>
<tr>
<td>Less than 50% have public sewer, septic tank, pour-flush latrine or ventilated pit latrine</td>
<td>► Increased rat density</td>
<td>► Diarrhoeal diseases, cholera, typhoid, hepatitis</td>
</tr>
<tr>
<td></td>
<td>► Open or broken sewers</td>
<td>► Poor hygiene and bacterial skin infections</td>
</tr>
<tr>
<td></td>
<td>► Inadequate or inappropriate municipal services (eg, waste disposal, policing)</td>
<td>► Water-borne or vector-borne diseases</td>
</tr>
</tbody>
</table>

*The UN created a unifying operational definition of the physical and legal characteristics shared by slums in 2002.
Box 1 Other features of slums settings

State level
- Absence or inadequate state recognition
- Lack of political will or interest (eg, ethnic, racial or political reasons)
- State occupied with other demographic or political priorities (eg, conflict, political or economic transitions, natural disasters, HIV/AIDS epidemics)
- Unable to keep pace with rapid or uncontrolled urban growth or reach geographically challenging locations
- Weak political or public infrastructure
- Community/neighbourhood level
- Vulnerable groups: high proportions of young people, migrants, refugees or internally displaced groups, exploited groups (informal/child labourers, sex workers)
- Generalised unemployment due to geographic limitations, legal (informal/illegal residents or vulnerable group) or lack municipal resources (eg, public transportation)
- Threat of violence due to gangs, political or ethnic conflicts, crime
- Patchwork of unregulated health services and poor access to health centres, antenatal care, skilled birth assistance
- Lack of public infrastructure, including food scarcity or scarcity of healthy food choices, electricity, educational services, recreational areas
- Household/individual level
- High unemployment and low levels of educational achievement and health literacy
- Working single parents, often daily wage earners with irregular pattern, hazardous work (eg, rag picking, recycling, sex trade)
- Absence of extended family and social support
- Breakdown of traditional values
- Gender-based violence
- High levels of illness and recurrent illness, and disproportionately affected by diseases with long-term outcomes, for example, low birth weight, malnutrition, STDs and HIV/AIDS
- High levels of risk behaviours, for example, sexual risk and diet

Box 2 Health outcomes linked to childhood socioeconomic environment

All-cause mortality
Cause-specific mortality
- Alcoholic cirrhosis
- Cancer, smoking-related
- Cancer, stomach
- Cardiovascular diseases
- Diabetes
- Respiratory diseases
- Cardiovascular disease
- Carotid atherosclerosis
- HTN
- Coronary artery disease
- Ischemic heart disease
- Myocardial infarction
- Stroke
- Metabolic disease
- Insulin resistance
- Obesity
- Type 2 diabetes
- Mental illness
- Depression
- Post-traumatic stress disorder
- Behavioural outcomes
- Alcoholic or drug abuse
- Smoking
- Poor diet
- Other outcomes
- Functional limitations
- Inflammatory markers
- Periodontal disease
- Self-rated health
- Revised from Braveman 2009

density, household overcrowding and poor nutrition. Several studies demonstrate lower rates of complete immunisation in slums compared with other urban areas, as well as a shortage of health centres and immunisation programmes near slums. The lack of information and low levels of education among mothers also contribute to poor vaccination coverage in slums. Immunisation coverage in Niger was 35% in slums compared with 86% in non-slum urban areas. Slum conditions may also facilitate other non-vaccine preventable respiratory diseases by respiratory droplets or airborne transmission, such as respiratory viruses (eg, SARS, H1N1, N meningitidis) and tuberculosis. For instance, in squatter settlements in Manila, children were nine times more likely to have tuberculosis than other urban children. HIV/AIDS

Studies have previously suggested that poverty was protective against risk of HIV infection in urban areas. New disaggregated data shows that some urban poor, particularly women, have significantly higher risks of HIV infection than their urban non-poor counterparts. In Kenya, sexual experience before age of 15 confers a 62% higher risk of HIV in slum residents, where girls in this age group had higher likelihood (14.8%) of having sex compared with their counterparts in non-slum areas (8.7%). In these slum communities, the prevalence of HIV was more than eight times higher for all adolescents in slums aged 15–19 years (5.0%) compared with adolescents from non-slum urban areas (0.6%). The risk to adolescents in urban poor communities may be exacerbated by the limited availability of recreational facilities, absence of parental or community supervision, and influence of community norms. Urban poverty and residence in informal settlements have also been associated with poor prenatal care and prevention of mother-to-child transmission in areas of high HIV prevalence and less access to antiretroviral therapy. Lastly, families weakened by illness and poverty are also limited in their ability to diminish the impact that HIV/AIDS has on affected children.

Non-communicable diseases

Malnutrition
Malnutrition makes a central contribution, up to 56%, to child mortality worldwide and is a recognised problem in informal settlements. Compared with their urban counterparts,
children in slums are more likely to be undernourished and stunted. These findings may be due to prolonged or recurrent episodes of hunger or specific nutritional deficiencies (e.g., caloric, protein, micronutrient), and also to persistent or recurrent ill health. In Nairobi, the prevalence of stunting is 57% for children in slums compared with 28% in urban Kenya as a whole. Similar findings are present in Ethiopia, Niger and India. Malnutrition in slum children is closely associated with maternal education and breastfeeding practices. Mothers in informal settlements may not breastfeed due to work, lack of knowledge or education, and breakdown of traditional practices. Poor nutrition in slums may have long-term effects on infectious disease risk and cognitive development. There is also evidence that childhood nutritional stunting is associated with obesity, and slum communities have a mixture of undernutrition and over-nutrition. Children from informal settlements are at higher risk of obesity from poor diet, lack of healthy food options and recreation facilities, and have higher rates of obesity-related conditions, such as obstructive sleep apnoea.

Accidental and non-accidental injuries

The built and natural environment in informal settlements is frequently dangerous for children. Slums are vulnerable to natural disasters from the combination of poor material and construction, overcrowding and precarious geography, as was dramatically demonstrated in the earthquake in Haiti in 2010. Children are extremely susceptible to injury and death, and can account for up to one-third of the victims of disasters. Pollution and environmental conditions also have detrimental effects on child health outcomes, such as asthma. Insecure residential status also makes it difficult for families to advocate for safer conditions, respond to and recover from disasters. The built environment also provides few safe play spaces, and puts children at risk for accidental injuries due to falls, drowning, electrocution, exposure to pollutants and road traffic injuries, the latter of which is the second leading cause of death for children aged 5–14 years worldwide. Violence is also a notable threat to children and adolescents in slums. For example, the rates of violent deaths in adolescents in Brazilian slums are higher than in wealthier parts of the same cities.

Mental illness

Living in slums presents children and their families with various stresses, including overcrowding, noise and environmental pollution, domestic and community violence, scarce formal employment opportunities and limited future prospects. Slum residents emphasise the negative impact of these stresses on the quality of their lives. There are important links between conditions of slum life and mental health, and a WHO literature review found that slum residents suffer from higher rates of mental illness and suicide than other urban residents. Children exposed to slum settings may also suffer from behavioural and emotional problems and poor school performance. Child labour is also more frequent among children in slums and exposes them to work-related injuries, physical and other abuse and traffic-related injuries, and have deleterious effects on the well-being of children and adolescents. Moreover, children and adolescents in slums are more vulnerable to sexual exploitation.

FUTURE DIRECTIONS AND IMPLICATIONS FOR PAEDIATRICIANS

The growth of slums poses important challenges to those who are charged with caring for children, from parents to their paediatricians and public health advocates. Ultimately, many improvements will require changing political and economic policies and addressing broader structural or ‘upstream’ factors. However, there are more immediate actions that may improve understanding of the problem and allow for short-term advocacy and interventions to mitigate child health disparities in cities.

Data collection and research

The scale of intraurban inequalities in child health is still largely unknown. More than one-third of children born in urban areas are not registered at birth, including nearly 50% of children in urban areas of sub-Saharan Africa and South Asia. It will be important to collect reliable and disaggregated urban data.Even disaggregated city data or census data that include slums may miss the most vulnerable ones that are frequently not counted. Methodologies, such as expanded or focused data collection, over-counting specific urban areas, and standardising measures or gradients of socio-economic status in areas of generalised poverty must also be explored to capture these populations. Important research questions also remain unanswered on the ways that conditions of slum life affect child health at the level of the individual or household, and the potential neighbourhood effects on health outcomes. Studies of slum-upgrading interventions have been limited by inadequate study designs and inconsistent health and social outcomes between studies. More research is needed on which interventions would give the most benefit to child health, improve utilisation for families and their children, and employ the most efficacious delivery channels.

Address the social determinants as well as the disease

While investment in child health infrastructure is necessary, not all solutions will come from treating the child. The health of children depends greatly on the health and well-being of their mothers and families, and their ability to provide for an adequate education and safe areas to play and grow. For instance, the presence of family planning may be a simple and effective intervention to improve maternal health and reduce infant mortality. It is important to recognise and address the complex forces driving slum growth; however, good urban governance and simple interventions in water and sanitation, health education and infrastructure may have important and immediate life-saving effects.

Improve and involve the entire community

In informal settlements, as elsewhere, the health of children is closely related with the well-being of mothers. Maternal education and literacy have been shown to influence the likelihood of complete immunisations and the mother’s use of antenatal care and skilled birth assistance in slums. Mothers and families in slums often have few accessible and affordable sources of healthcare for their children, which is closely linked to child health practices, such as immunisation uptake. Many slums
are renowned for their industry, such as Dharavi in Mumbai, and community leaders can make important contributions to urban transformation. Community training and participation have also proved successful in many informal settlements, from preventing HIV to curbing violence.26

**SUMMARY**
Existing data suggests that the child health benefits of living in cities are attenuated in slums. Emphasising the urban health advantage may no longer be appropriate in heterogeneous modern cities, particularly in the setting of slums. Many indicators of child health are worse in slums than in neighbouring urban areas or even rural ones. The conditions of slum life concentrate the ill effects of extreme poverty, inadequate living conditions and sanitation, and deleterious social forces. Addressing demographic, socioeconomic and political factors will also be central to long-term improvements of child health in slums. There are many areas illuminated above that may be targets for immediate action to mitigate the effects of slums on child health. Further attention to measuring child health in slum settings and addressing social determinants of disease are important priorities for paediatricians and those committed to child health worldwide.

**Acknowledgements** The author would like to thank Lee Riley and Nick Brown for their contributions.

**Competing interests** None.

**Provenance and peer review** Commissioned; externally peer reviewed.

**REFERENCES**


**10** Fotos JK. Child health inequities in developing countries: differences across urban and rural areas. Int J Equity Health 2006;5:9.


**42** Magadi MA. The disproportionate high risk of HIV infection among the urban poor in sub-Saharan Africa. AIDS Behav 2013;17:1645–54.


