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Exploring climate change and environmental determinants of child health in Mumbai's informal settlements: Pilot study findings

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Sheetal Rajan
Jennifer Spencer
Sushmita Das

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Introduction

Climate change is widely recognized as a critical determinant of child health, with far-reaching impacts on survival, development, and overall well-being. In urban contexts like Mumbai, where socio-economic disparities, inadequate infrastructure, and environmental stressors intersect, children living in informal settlements face heightened vulnerabilities. However, the specific pathways through which climate-related factors influence child health in these settings remain under-explored.

The Society for Nutrition, Education and Health Action (SNEHA) has been working in Mumbai's urban informal settlements to improve maternal and child health outcomes through community-based interventions and partnerships with public health systems. Recognizing the increasing global and national focus on climate change and health, SNEHA initiated an exploratory pilot study to understand how environmental factors—linked to climate variability and urban living conditions—are perceived to impact child health in vulnerable urban communities.

This pilot study was conducted with the following objectives:

1. To understand from practitioners and parents the pressing environmental issues they perceive to affect children's health in urban informal settlements.
2. To assess whether key climate-related indicators—such as urban flooding, pollution, and heat—are reflected in the lived experiences and concerns of the community.

This report presents key findings from the pilot, aiming to inform future research directions and programmatic interventions that address the interconnected challenges of urban environmental conditions, health inequities, and climate resilience.

Methodology

This qualitative pilot study was conducted in and around an urban informal settlement in Kurla, central Mumbai, characterized by multiple environmental vulnerabilities. The area was purposively selected for its unique risk factors—proximity to the Mithi River, known for its monsoon season flooding and high content of pollutants, high levels of air and noise pollution from nearby construction activities and the city's only international airport in the vicinity, and persistent challenges in waste management. Additionally, SNEHA's ongoing maternal and child health and nutrition (MCHN) program was not active in this area, providing an opportunity to explore new intervention sites for future work.

Participants included public and private paediatricians and parents of children under 12 years. Public facilities were purposively sampled based on their location in the vicinity of the area under study. Private facilities were purposively sampled based on their location in the vicinity of the area under study, among which selection was based on convenience and availability. Parent participants were selected based on convenience sampling, of those waiting at outpatient paediatric departments of the selected facilities. Since direct community sampling of parents was not feasible for this pilot, parents were included from those attending these healthcare facilities.

A total of 10 participants were interviewed including:

- 6 paediatric practitioners (2 from public health facilities, 4 from private hospitals/clinics).
- 4 parents/family members of children under 12 years attending outpatient departments.

An iterative interview guide was developed and refined during the course of data collection to allow for emergent themes and participant-driven insights. Interviews were conducted in clinical settings, including private clinics and hospital outpatient departments. Detailed notes were taken during the interviews, which were subsequently transcribed and analysed using a thematic approach to identify key patterns, perceptions, and suggestions relevant to child health and environmental factors.

Findings

The insights from this pilot study are presented thematically, synthesizing perspectives from both healthcare practitioners and parents. The findings highlight commonly reported child health issues, perceptions of environmental and climate-related factors, and systemic challenges associated with urban living conditions.

1. Common Illness Patterns among Children

Across interviews with both practitioners and parents, upper respiratory infections, lower respiratory infections, viral infections, and gastric infections emerged as the most commonly reported illnesses among children in the community. Practitioners noted age-specific differences in illness patterns:

- Infants (0–6 months) were more susceptible to viral infections.
- Toddlers (1–2.5 years) frequently presented with gastric and respiratory issues.
- Older children (>5 years), particularly those attending school, were more prone to respiratory infections and gastrointestinal ailments, often attributed to exposure to outside food and group interactions at school.

Children under five years of age were consistently identified as the most vulnerable, with practitioners observing that immunity tends to strengthen as children grow older. However, opinions varied on whether the overall incidence of childhood illnesses had worsened over time. Some practitioners felt that certain diseases followed cyclical peaks and troughs (e.g., dengue peaking a decade ago), while others perceived a gradual worsening of common ailments.

Beyond infections, practitioners highlighted emerging concerns such as behavioural disorders (e.g., attention deficit hyperactivity disorder, irritability, tantrums), often attributed to excessive screen time and mobile phone usage. A few practitioners also observed an increase in cognitive and developmental delays among children under two years, though these were not explicitly linked to environmental factors.

2. Perceptions of Climate Factors and Child Health

When asked about climate change, participants did not perceive any considerable change in Mumbai's climate over the years. The concept of "climate change" as a broader environmental phenomenon was

not recognized or considered relevant in the context of child health. Instead, participants tended to dismiss climate change as a factor affecting children's health, focusing more on specific weather changes, particularly during monsoon and seasonal transitions as triggers for common childhood ailments. However, these were not linked to a larger understanding of climate variability or long-term environmental changes.

The monsoon season was universally acknowledged as the peak period for illnesses, particularly for viral fevers, gastrointestinal infections, and vector-borne diseases such as dengue and malaria. Parents and practitioners alike recognized a seasonal pattern of increased ailments during the monsoons, often linked to water contamination and vector proliferation.

In contrast, heat-related illnesses were not viewed as a significant concern. While a few parents mentioned issues like prickly heat and heat-induced vomiting in children, practitioners largely dismissed heat impacts, reasoning that children in these communities had limited direct sun exposure. Only isolated mentions of boils and dehydration during summer were noted. The winter season was associated with relatively fewer sickness episodes, although some practitioners did report respiratory conditions such as bronchitis and viral infections during this period.

Overall, participants tended to view illnesses as year-round occurrences with seasonal peaks, rather than attributing them to broader climatic changes.

3. Urban Systems Impacting Child Health: Water, Sanitation, and Waste

While climate change was not explicitly linked to child health in participants' responses, urban infrastructural systems—particularly water supply, sanitation, and waste management—were consistently highlighted as critical determinants of child health outcomes.

In particular, contaminated water supply in Kurla's informal settlements was widely reported as a primary cause of waterborne illnesses such as typhoid, hepatitis A, jaundice, and gastroenteritis among children. Both practitioners and parents mentioned that municipal works (e.g., road digging) and sewage overflows during monsoons often led to mixing of sewage and drinking water supplies.

At the household level, unsafe water practices were common. Many families did not boil water, relying instead on straining tap water, a practice viewed by practitioners as inadequate for ensuring water safety.

Vector-borne diseases, such as dengue, malaria, and leptospirosis, were frequently linked to stagnant water pools, open drains, and irregular garbage collection, especially during the monsoon season. Parents described stagnant water and plastic waste accumulation as mosquito breeding grounds, while practitioners emphasized the role of poor urban waste management in perpetuating these health risks.

Garbage heaps near residential areas, schools, and health facilities were seen as contributing to poor hygiene conditions, leading to both waterborne and vector-borne diseases in children.

4. The Urban Living Environment and Health Vulnerabilities

Participants widely acknowledged that the overall urban living environment in Mumbai's informal settlements significantly contributed to child health issues. Overcrowded and congested housing, poor sanitation infrastructure, lack of timely waste disposal, and exposure to environmental pollution were seen as everyday realities that adversely affected children's health.

Practitioners noted that air pollution, driven by vehicular emissions, unregulated construction activities, and constant infrastructural development, correlated with an increase in respiratory infections among children, particularly those under five years of age. Specific urban development projects—such as the Bandra-Kurla Complex (BKC) expansion, Mithi River desilting work, and metro pillar construction in Kurla—were cited as exacerbating dust and pollution in the area. Proximity to the airport was also mentioned as a source of continuous noise pollution, further deteriorating the local environment.

In informal settlements, poor sanitation and hygiene practices were frequently linked to recurrent infections, stunting, and weakened immunity in children. The lack of adequate toilets, improper waste disposal facilities, and limited living space were described as key factors that made it difficult for families to maintain basic hygiene, particularly for infants. Improper handling of feeding bottles for children under two years was specifically highlighted as a cause of gastrointestinal illnesses.
Overcrowded slum environments were also associated with exacerbating respiratory illnesses, due to poor air circulation and cramped indoor conditions. One practitioner emphasized that slum redevelopment projects had inadvertently worsened conditions for families relocated to temporary transit camps, where essential services like clean water and sanitation were often inadequate.

Nutritional challenges compounded these health risks. Parents and practitioners mentioned that financial constraints limited access to nutritious food, while the easy availability of junk food in slum areas contributed to poor dietary habits among children. Excessive consumption of outside food was associated with weakened immunity and frequent stomach infections.

Terminologies associated with environment degradation such as "pollution" were used more broadly by participants to describe the urban living environment- not just air pollution but also food adulteration, waste accumulation, and dirty surroundings.

Many participants drew comparisons with rural life, describing villages as healthier environments for children due to cleaner air, safer water sources (such as borewells), more open spaces, and simpler food habits with fewer options for outside or junk food. This contrast highlighted the perceived burden of urban living conditions on child health in low-income settlements.

5. Cross-Cutting Factors Influencing Child Health Outcomes

Beyond environmental and infrastructural determinants, participants emphasized a combination of individual, behavioural, and socio-economic factors that influence child health outcomes. Practitioners highlighted nutrition and immunity levels as critical factors determining a child's susceptibility to infections. Malnourished children or those with pre-existing health conditions were considered more vulnerable to recurrent illnesses, regardless of external environmental triggers.

Lifestyle factors, such as increased screen time and mobile phone use, were frequently mentioned as contributing to behavioural issues like irritability, tantrums, and attention deficits in children. Poor dietary habits, including excessive consumption of junk food and street food, were also cited as weakening children's immunity and increasing their susceptibility to gastrointestinal infections.

Overall, participants viewed child health outcomes as the result of an interplay between environmental exposures, infrastructural deficits, individual immunity, and family-level behaviours.

6. Health System Dynamics and Care-Seeking Behaviours

The pilot study also shed light on care-seeking behaviours, a notable trend was the preference for private practitioners among parents, with public health facilities often being approached only in cases where private treatment was ineffective or when illnesses became severe. Care-seeking behaviours were also influenced by family size- some practitioners mentioned that due to poor family planning and the practice of having multiple children, parents often struggled to provide adequate attention to the health of all their children, in turn affecting health-seeking behaviours and consistent care practices.

Practitioners reported a significant increase in the number of paediatricians practicing in the area, rising from four to over twenty within a small radius of 1–2 kilometres. This saturation was associated with "patient hopping", where caregivers frequently shifted between practitioners. One doctor mentioned that if too much advice is given, patients tend to leave and prefer switching to another practitioner who offers quicker solutions. This dynamic was seen as a barrier to promoting preventive health behaviours and addressing long-term child health concerns within clinical interactions.

7. Suggestions for Interventions

Participants offered several suggestions at the community, school, and policy levels to address child health concerns arising from environmental and hygiene-related factors.

At the community level, there was an emphasis on raising awareness regarding safe water practices, particularly encouraging households to boil water and avoid using only strained tap water. The distribution of water filters was also suggested by a public sector practitioner as a feasible intervention. Addressing waste management issues was considered crucial, with recommendations for door-to-door garbage collection to prevent the formation of waste heaps, which were identified as breeding grounds for vectors. Awareness campaigns focusing on better hygiene and lifestyle—such as handwashing, cleaning nails, sanitizing feeding bottles, and discouraging the consumption of junk food and outside food—were recommended. Some participants suggested collaborating with community health volunteers (CHVs) to gather information from slum communities and support behaviour change initiatives.

At the school level, suggested interventions included incorporating awareness sessions on Water, Sanitation, Hygiene (WaSH) and health practices within school curriculums. Ensuring proper hygiene within classrooms, particularly promoting hand hygiene among children, was emphasized. Participants also recommended restricting the availability of junk food in and around school premises, providing access to filtered drinking water within schools, and encouraging parents not to send children to school when unwell to prevent the spread of infections.

At the policy level, suggestions included making vaccines for common ailments like Hepatitis A and influenza available free of cost, regular fogging to control vector populations, routine testing of water supply quality, and improving water and waste management services in slum areas. Some participants also advocated for stricter regulations on the sale of junk food, especially in proximity to schools.

Next Steps and Way Forward

Based on the findings from this pilot study, several potential directions for further research and intervention were identified:

One approach is to focus on WaSH in relation to child health within urban informal settlements. Issues such as unsafe water supply, poor waste management, and sanitation-related hygiene practices were repeatedly highlighted by participants as contributing to child illnesses. Given that these are also priority sectors under the Mumbai Climate Action Plan, a WaSH-focused intervention could serve as an entry point for addressing child health in the context of climate resilience. This direction also presents an opportunity to design and implement a pilot intervention in a focused geographical area. However, it is important to note that WaSH and health linkages are already well-documented, and positioning this as a fresh area of research may present challenges.

An alternative strategy is to frame the research around understanding environmental determinants of child health from the perspectives of practitioners and community health workers. This would allow for a broader exploration of factors like pollution, urban infrastructure, and lifestyle-related influences on child health, even if these are not always directly recognized as climate-related by community members.

Another possible area of focus is extreme heat and child health, which remains a relatively underexplored topic, especially in Mumbai's context. While heat-related illnesses did not emerge as a significant concern in this pilot, a more detailed inquiry could help understand less visible impacts of heat on child well-being. However, the challenge here would be the limited resonance of heat as a pressing health issue among participants, which may affect the depth of community responses.

Focusing on school-going children as a primary target group presents an opportunity to link child health interventions with educational outcomes. A school-based intervention could address a range of factors such as WaSH practices, nutrition, screen-time behaviours, and hygiene awareness. However, its direct linkage to climate change would be difficult to frame, unless the focus remains on WaSH and environmental hygiene within school environments.

Apart from climate change -related research and interventions, the study also highlighted the need to focus on nutrition – an issue well-identified but persistent in affecting child health inspite of awareness and behaviour interventions, as well as new emerging concerns in child health- particularly related to adverse behavioural and cognitive impacts due to excessive screen time and mobile phone usage.

Conclusion

This pilot study provided preliminary insights into the perceptions of practitioners and parents regarding environmental factors affecting child health in urban informal settlements. It showed that while practitioners and parents did not directly associate changing climate with child health, urban systems integral to both accentuating climate change impacts and contributors to mitigation efforts- such as water supply, sewage, waste management were key factors impacting child health. Participants' conceptualisations of environment and pollution were framed by immediate, visible conditions rather than broader scientific concepts. Urban living environments particularly for vulnerable populations living in urban informal settlements were confirmed to exacerbate health concerns among children, pointing to the need to address gaps in urban infrastructure and basic services for ensuring better sustainability and climate resilience. The findings will inform the design of a more detailed study and help identify feasible intervention strategies aligned with community needs and local contexts.