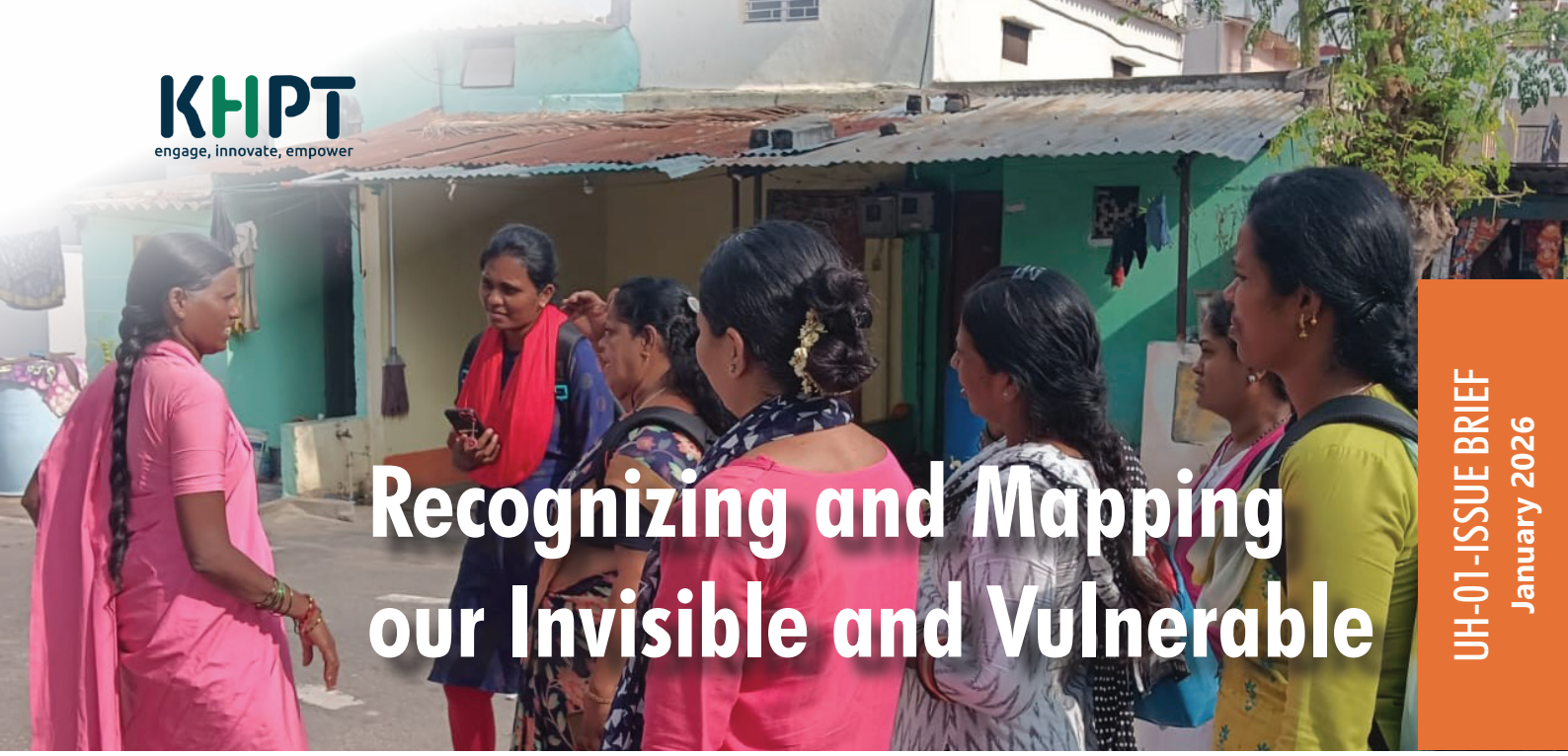

Recognizing and Mapping our Invisible and Vulnerable

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Historically, the mainstream urban health discourse has operated with a tangential and mixed understanding of 'vulnerability' in cities. **Who is vulnerable, what constitutes vulnerability, and what are the underlying systemic and socio-economic determinants that frame vulnerability?** In more recent years, the appreciation that vulnerability in urban contexts is fundamentally multidimensional, shaped by the intersection of residential precarity, occupational and environmental hazards, social invisibility, and systemic exclusion from health and welfare infrastructure, has begun to emerge.

The global urban health community is also increasingly recognizing that cities harbour multiple, overlapping factors that cannot be reduced to, say, housing conditions alone. Density can vary dramatically across neighborhoods within the same city. High-rise developments with spacious indoor and outdoor spaces soar into the sky adjacent to compact, sprawling informal settlements. Low-resource areas within cities often experience the highest population densities packed into small areas, and this spatial inequality encompasses both demographic and socioeconomic determinants. From the favelas of Sao Paulo to the informal settlements of Nairobi, urban populations face a web of deprivation[1], where economic insecurity compounds environmental health risks, where social marginalization intersects with inadequate access to services, and where the very informality that enables urban survival simultaneously exposes populations to exploitation and harm.

As India speeds toward becoming a predominantly urban nation, with projections suggesting that close to half its population will live in urban areas within the next decade[1], we are witnessing the emergence of new forms of marginalization that defy traditional categorization. The urban poor residing outside of recognized or notified slum areas, in administratively undefined and unrecognized non-slum areas, represent not an anomaly or sheer coincidence, but a structural feature of contemporary, unplanned urbanization; a feature that demands we fundamentally reimagine how we conceptualize, measure, include, and respond to emerging needs, gaps, and priorities.

The National Urban Health Mission framework[2] has established systematic processes for identifying and assessing vulnerable urban populations in relation to their availability of and access to services, and infrastructure and environmental determinants. The framework supports evidence-based planning to understand health needs, behaviours, barriers, and gaps faced by marginalized populations, and make primary health care services, outreach efforts, and welfare benefits reachable to populations often excluded from formal systems, such as migrants, homeless communities, and informal workers. The guidelines define vulnerability across three dimensions: residential (housing type, hazardous locations), social (migration status, disability, marginalized identities), and occupational (informal work, hazardous conditions).

In this context, KHPT developed and implemented a comprehensive vulnerability mapping methodology [across catchment areas around multiple urban primary health centres (UPHCs), feasibly using these areas as a proxy for urban settings] in Bengaluru and Mysuru[3] cities in Karnataka *(Mapping Vulnerable Populations in Non-Slum Areas of Cities: Example from Mysuru, India).* The aim was to identify and document vulnerable populations in both urban slum and non-slum areas (*see footnote), to systematically capture the three dimensions of vulnerability utilizing methodology that included transect walks, community consultations, social mapping, and detailed surveys. **The exercise revealed lessons that our frontline health workers have long known and what decision makers must formally acknowledge - that urban sprawl, poverty, and health precarity exist along a continuum, not within fixed boundaries.** Unlike recognized slums (and despite having similar needs and priorities related to health and determinants of health), public interventions

and services for those who reside in highly informal settlements that are slum-like or "non-slum" are fragmented and lacking [for example, the recruitment of Accredited Social Health Activists (ASHAs) is limited to slum areas only.]

The significance of conducting a vulnerability mapping exercise extends far beyond a single city. It is not merely that it identifies "invisible populations", but that it poses a fundamental consideration related to the architecture of urban health systems and governance. Slum improvement measures, health systems, welfare schemes, and community outreach mechanisms, designed and structured around framed and demarcated areas (predominantly slum populations), now, must be inclusive of those who live within the city's formal geography yet remain outside its circle of care and benefits. In Karnataka, for example, the *Karnataka State Slum board* data estimates a total population of **40.50** lakhs across slums in the State (making up **~22.56%** of the State's urban population). KHPT's exercise across **6** **UPHC areas in Bengaluru and Mysuru** mapped a total **76** **vulnerable areas,** of which **37%** **were non-slum areas where vulnerable populations reside,** while **63%** were slums (notified and non-notified). These **76** vulnerable areas had an estimated **1,63,062** total population; with **the non-slum areas accounting for an estimated 37,504 residents (23% of the vulnerable population mapped).**

Understanding urban vulnerability beyond slum geographies

Health and social initiatives tend to exclude entire populations outside stated administrative boundaries (i.e. slum areas); these constitute people who have precarious lives and occupations, may not be included in social protection systems, and remain invisible to health care delivery and surveillance mechanisms. Addressing urban health equity requires expanding our focus beyond mapped slum boundaries to capture the full spectrum of urban vulnerability, ensuring that health systems reach all those who need them, regardless of how neighborhoods are notified and classified.

Limitations related to primary health care services and frontline health workers in non-slum areas creates a blind spot in urban health surveillance and service delivery. Frontline workers serve as early warning systems for disease outbreaks, are connectors between communities and formal health services, and are trusted intermediaries who can navigate the social determinants of health in ways that facility-based care is unable to. When ASHAs, the backbone of India's community health infrastructure, are absent in non-slum vulnerable populations, we lose not just service delivery points but the bidirectional information flow that enables responsive health systems. Then there are occupational vulnerabilities that can point to larger structural challenges. Informal workers form the invisible web that sustains urban economies in India[4]- construction workers building smart cities they cannot afford to live in, domestic workers maintaining middle-class households while their own families lack basic services, street vendors and informal service workers operating in a perpetual state of social, economic, and legal precarity[5].

India's labour landscape

It is significant though, that **India's labour landscape is undergoing a fundamental transformation,** and as of November 21, 2025, Indian government has consolidated **29** labour laws and has announced the implementation of the four Labour Codes - the Code on Wages, 2019, the Industrial Relations Code, 2020, the Code on Social Security, 2020 and the Occupational Safety, Health and Working Conditions Code, 2020[6].

This sweeping reform modernizes decades-old regulations to address contemporary employment realities, strengthens worker protections, and creates an adaptive legal framework that responds to the changing nature of work while supporting India's vision of economic self-reliance and industrial resilience.

For the first time, we formally recognize gig and platform workers, while mandating aggregators (i.e. platform economy players) to contribute **1-2%** of annual turnover (capped at **5%** of worker payments) to their welfare.

Aadhaar-linked accounts will enable access to welfare benefits across states, addressing the mobility- and migration-related vulnerabilities that come with informal work.

Global recommendations: toward adaptive urban health systems

The findings from KHPT's vulnerability mapping exercise offer a window to a global challenge that demands systemic, forward-thinking responses:

Reimagining urban health infrastructure for informal and mobile populations: Cities should consider moving beyond fixed-point service delivery models toward adaptive, mobile health architectures. This could mean investing in technology-enabled outreach that combines geospatial mapping with real-time health data, deploying community health workers based on multiple vulnerability indices rather than administrative boundaries, and creating pop-up health access points in labour markets, transport hubs, and other spaces where informal workers congregate.

Creating pathways for occupational health focused under urban primary care: Given the dominance of informal wage labour in our megacities, urban health systems can consider developing specialized capacities to address occupational health as a core component of primary care. This would entail the collaboration of public-private capacities to equip and train health workers to conduct occupational risk assessments, and establishing referral pathways for work-related injuries and illnesses. Initiatives to create surveillance systems that can detect occupational health patterns in informal economies can be developed, alongside facilitating access to specialized health care service as needed. Such initiatives to help identify and track occupational health risks and outcomes and build capacities among healthcare workers could be conceptualized based on the vision and operations of the Ayushman Bharat Digital Mission (ABDM)[7], which aims at convergence of health information across health care domains (from preventive to curative and rehabilitative, and facilitates linkages with other national health, providers, and facility registries and platforms).

Building recognition systems for the administratively invisible: As an evolving society, we could take on the challenge of identifying and tracking vulnerability profiles in urban areas. This should involve periodic community-led enumeration processes and participatory mapping initiatives with the utilization of multiple verification mechanisms beyond fixed addresses and formal identity documents.

Creating integrated dashboards with vulnerability indicators: Urban health, with all its complexities, cannot be addressed by health departments alone. Integrated data platforms that connect health indicators with housing conditions, occupational status (formal and informal labour market participation), climate and hazard vulnerability[8], and social/ health protections coverage, can be imagined, and can in turn enable civil society, the private sector, academia, and the government to make recommendations based on more a more holistic understanding of needs and vulnerabilities.

Conclusions

Comprehensive and systematic mapping exercises, especially in our mega cities, and tier-one and emerging tier-two cities in India, can help create an atlas of urban health vulnerabilities, needs, and precarities that can inform resource allocation, capacity building, and targeted interventions. **This work will require innovation alongside replication.** Future iterations should integrate intensive and innovative digital technology platforms and tools, and climate vulnerability mapping given that informal workers and non-slum populations often face disproportionate exposure to urban heat effects, flooding, and air pollution. Mental health vulnerabilities, particularly among populations facing chronic economic insecurity, should be considered. Gender-disaggregated occupation-related data can aim to examine how women's concentration in domestic work and informal care economies creates specific health risks that remain unaddressed.

It is then possible, that such undertakings could also aim to catalyse a fundamental shift in how we can imagine urban health governance. We could envision branching out from slum-centric models to vulnerability-responsive frameworks that adapt to the spread-out, deep, and dynamic reality of urban informality and poverty in modern India. This could also lend to earmarking of flexible funding mechanisms to respond to evidence based on vulnerability-centric needs identified, community health worker deployment strategies based on comprehensive vulnerability mapping, and accountability frameworks to measure health equity outcomes across all urban populations.

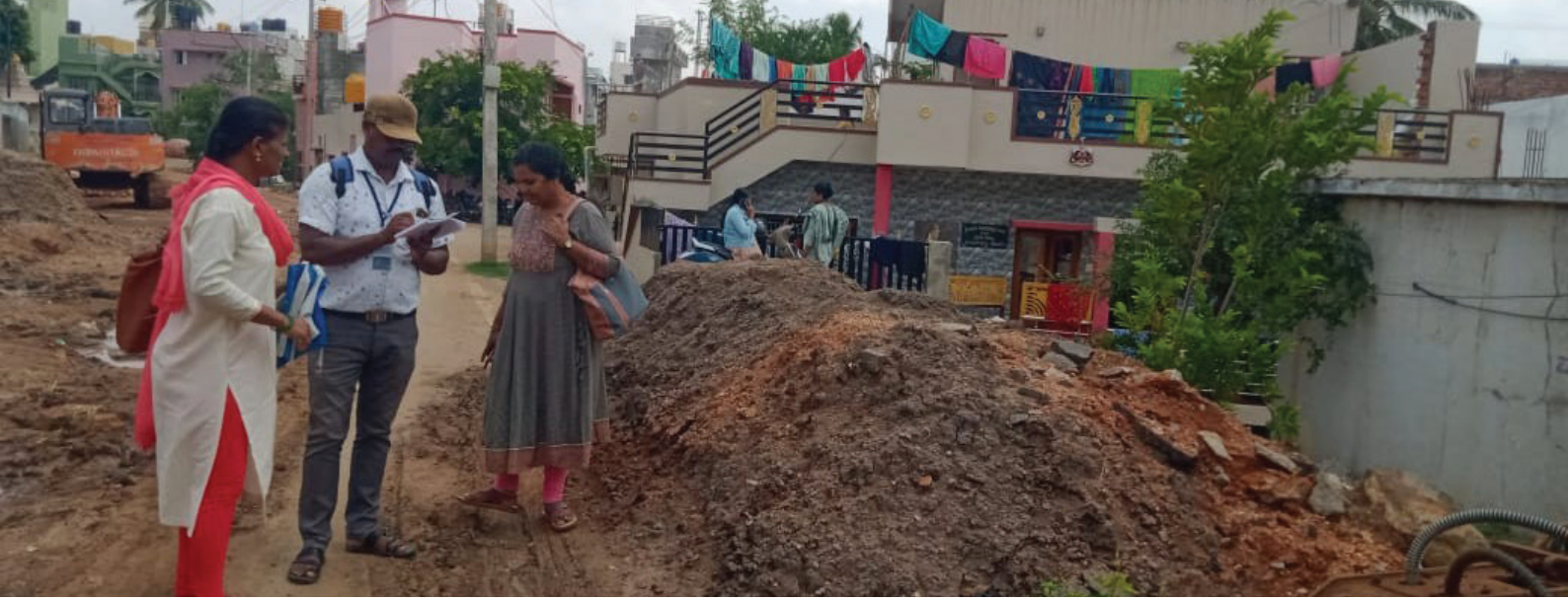
The invisible cityscape is an emerging face of urban India. Our health systems must evolve to see it, guidelines and frameworks of action must be redesigned to reach it, and our commitment to health equity must extend to all who call the city their home, regardless of how they are categorized or where they reside.

*Footnote: Dimensions of vulnerability for non-slum areas-

Residential Vulnerability: This included populations living in informal or substandard housing, including those residing on roadsides, under bridges, near railway tracks, or in temporary settlements.

Social Vulnerability: This included socially vulnerable groups such as the elderly, women-headed households, widows, people with disabilities, and individuals suffering from debilitating illnesses.

Occupational Vulnerability: This included residents of non-slum urban areas who work in the informal sector, engaging in hazardous or low-paying jobs such as rag-picking, rickshaw pulling, construction work, or other daily wage labour.



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