




Urban Design and Health: From Challenges to Strategies for Promoting Sustainable Cities

Adalberto S. Lopes^{a,b,c} ; Natalia V. Cunha^a ; Anelise V. Masiero^{a,d} 

^a Postgraduate Program in Environment & Health, University of Planalto Catarinense, Brazil;

^b Observatory for Urban Health in Belo Horizonte, Federal University of Minas Gerais, Brazil;

^c Urban Environment and Health Research/Study Group, Federal University of Santa Catarina, Brazil;

^d College of Dentistry and Dental Clinics, University of Iowa, United States of America

Urban environments are important determinants of health, where people-centred changes in social, natural, and built environments can promote healthier lifestyles. While each city has its own local demands and priorities, a minimum of infrastructure, safety, comfort, accessibility and diversity of services/destinations are essential for citizens to incorporate healthy behaviours into daily routines (Giles-Corti et al., 2022).

Environmental sustainability is invariably inseparable from economic progress, cultural context and educational development (Lowe et al., 2022). Cities can be dynamic and attractive, offering diverse housing, employment, and leisure options. Paradoxically, they can be noisy, unsafe, congested, lacking basic sanitation, and polluted. To a large extent, this depends on the priorities adopted by those responsible for city planning and governance. In fact, elected officials must be subject to public scrutiny, accountability, and enforcement of laws to prevent counterproductive and harmful measures. Clear public policies, feasible strategies, and effective monitoring are essential to ensure interventions positively impact society.

Citizens also have a responsibility to be engaged actively, collaborate, and advocate for strong commitment from elected officials. The principle of subsidiarity — where civil society is organized around the demands and motivations that directly impact people's daily lives — enhances the effective involvement of those most affected by public officials' decision-making.

There is no panacea for solving the often-chronic problems of cities. However, there is a considerable body of scientific evidence that points the way toward a challenging but viable path to mitigating society's real demands. One of the first steps, perhaps, is to consistently evaluate and monitor indicators (Lopes et al., 2019) and policies (Santos et al., 2024) of urban health alongside the implementation and validation of scalable interventions to improve urban opportunities (Reis et al., 2016).

Taking interdisciplinary teams and trans-sectoral action appears to be a crucial element in the equation to promote sustainable cities. Historically, researchers often worked in isolation within their departments, cities, and countries. However, the creation and strengthening of global networks, coupled with active collaboration agenda, multicentric co-creation projects, capacity-building initiatives, and innovative

technological tools, have significantly supported the resolution of real-world societal problems from diverse but convergent disciplines (Raento, 2020). Furthermore, international agencies, government bodies, private companies, financial institutions, academia, funding organizations, and civil society, each one have unique roles and must synergistically to maximize the impact of their actions (Salvo et al., 2021).

Multicentric researches in global networks targeting interdisciplinarity

Collaborations across fields such as Public Health, Epidemiology, Architecture, Urban Planning, Statistics, Engineering, Computer Science, have successfully proposed and tested strategies to mitigate urban hazards. Some networks integrate stakeholders, professionals from various contexts, nationalities, backgrounds and institutions with similar research goal: aiming to promote healthy urban living.

The first illustration of well-succeeded network is the Global Diet and Activity Research (GDAR), which focus on how urban hazards and physical, policy, natural and social environments influence diet and physical activity, to prevent non-communicable diseases in low- and middle-income countries. The GDAR network combined researchers from ten organizations in seven countries across three continents, have been funded by the National Institute for Health Research (NIHR) using the United Kingdom aid from the Government to support global health research (Oni et al., 2020).

Launched in 2017, the Urban Health in Latin America (SALURBAL) brings together researchers from Latin America and the United States, funded by the Wellcome Trust. Composed by interdisciplinary team, the network aiming to investigate the ways urban environments/policies impact the health of city residents throughout Latin America, setting a data platform for 371 cities and 1,436 sub-city units distributed in 11 countries (Quistberg et al., 2019). Currently, SALURBAL is in a stage of a five-year project that is addressing a critical need for evidence linking climate change to health outcomes.

Last but not least, the example of the International People, Health, and Place (PHP) Research Group, that examines how place-based factors contribute to health disparities locally and globally. Approaches such as this may pave the way for feasible interventions to mitigate real problems in society,

using evidence-based strategies focused on promoting inclusive and healthy places. Furthermore, PHP plans to develop studies around the world, promoting courses and programs of space- and place-based public health science. In a recent publication, the group have been uncovering relevant findings matching for importance and feasibility of research priorities in Brazil by engaging researchers with diverse expertise (Reis et al., 2025).

Emerging themes and innovative methods in a trans-sectoral collaboration for a planetary health

Urban health is a complex system with multiple interacting indicators (Rybski and González, 2022). This approach, offers a more realistic view of cities, allows a systematic contextual analysis of how sustainable a place can be in human–nature interfaces. Over recent decades substantial global advances of technologies have emerged to support relevant topics inherent to the evolution of society. Due to the coexistent action of urban functions variability, is required a cohesive trans-sectoral collaboration focused on a planetary health. Moreover, to integrate the resolution of urban health issues to robust investigation methods, researches must consider participatory approaches to optimise the study's findings dissemination, taking into account topics such as:

Climate changes is a topic related to transformations in natural environment. Rapid environmental transformations exacerbate urban hazards, requiring synergistic mitigation strategies (Garcia et al., 2025).

Liveability is a concept of city's quality for healthy urban living, in a person-environment relationship. This type of index groups indicators through innovative technologies, providing a robust practical implications for an integration trans-sectoral evidence-based (Bedi et al., 2023; Lopes et al., 2024).

Agent-based modelling, a cartesian mathematical model implemented to simulate different urban scenarios algorithm-based. The modelled system gathering of autonomous decision-making entities (agents), is responsible to assess a set of situations based on a body of rules (Cheliotis, 2020).

Geographic Information System (GIS) is a set of tools for obtaining, storing, analysing, graphically representing, and interpreting geospatial data. GIS allows mapping urban attributes, events, destinations, forms as a purpose of assess and monitor cities for sundry outcomes (Lopes et al., 2019).

Health Impact Assessment (HIA), a six-stage participatory method helps professionals from multiple sectors to work together. HIA provide decision-makers and stakeholders with comprehensive information about the consequences on health of interventions, policies, and projects (Harris et al., 2007).

Machine Learning (ML), method applied for myriads of purposes, is a subset of artificial intelligence (AI). Branched

into unsupervised learning, uses unlabelled data for the purpose of discovering urban, policy and behaviour patterns, through algorithms, allowing to generate insights into phenomenon (Wang and Biljecki, 2022).

Neural Network, another subset of AI and also ML, performs object detection and instance segmentation. That method has been used to optimize, reduce costs/time of big data gathering related to urban microscale attributes (Koo et al., 2022).

Quantum Computing, an in-depth promising method operating with qubits while traditional AI using binary bits. It seems a transformative leap technologies to complex problem-solving demanded on cities studies (Bonab et al., 2023; Yigitcanlar et al., 2025).

Conclusion

Promoting sustainable cities is a vast and necessary endeavour. Advocating for planetary health and fostering positive relationship between human–environment relationships is challenging but achievable. One of the first steps is trans-sectoral and interdisciplinary collaboration, which also helps cultivate a sense of belonging among citizens, whose engagement will be felt in all initiatives. Additionally, having robust and innovative technological resources at their disposal is essential to advancing the process of addressing scientific knowledge gaps. Emerging challenges demand concrete, tangible proposals to mitigate real urban hazards, as people's health depends on it.

Declaration regarding the use of artificial intelligence

The authors confirm that did not use artificial intelligence tools to prepare texts nor to create images or any other element of this manuscript.

CRediT author statement

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Correspondence

Adalberto S. Lopes

✉ adalberto.lopes@uniplacages.edu.br

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