HEALTH AND URBAN DESIGN: A FRAMEWORK

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ABSTRACT

This paper presents a comprehensive framework that integrates public health research with urban design practice to promote healthier, more equitable cities. Recognizing the historical ties between urban planning and health, the authors respond to the growing need for preventative health strategies by translating fragmented health research into actionable urban design strategies. Building on the Sustainable Urban Design Framework (SUDF), the proposed Urban Design Framework for Health organizes health-promoting design elements across four spatial scales—Region & City, District & Neighborhood, Block & Street, and Project & Parcel—and seven outcome domains: social cohesion, calming spaces, representing spaces, physical activity, access to healthy food and health facilities, safety and security, and environmental health.

The framework emphasizes the interdependence of mental and physical health outcomes and the multifaceted role of urban form in shaping them. It highlights how design strategies—such as mixed-use zoning, green infrastructure, and culturally resonant public spaces—can foster social interaction, reduce stress, improve mobility, and mitigate environmental hazards. The paper also introduces seven key urban design strategies on resilience and adaptability as essential components of health-supportive urban environments, advocating for flexible, community-responsive design that can evolve with changing needs.

Rather than offering a prescriptive checklist, the framework serves as a guide for urban designers, planners, and policymakers to make informed, context-sensitive decisions. It underscores the importance of community engagement and cultural identity in shaping inclusive, adaptable, and health-promoting urban spaces. By centering health in urban design, the paper calls for a collaborative, interdisciplinary approach to building cities that support well-being across the lifespan.

1 INTRODUCTION

Urban design and health have traditionally been closely related and from its origin urban design has aimed at improving public health. Some examples are the introduction of sewage systems, public housing, and the Congrès Internationaux d'Architecture Moderne's design principles of light, air, and space. In recent years, there has been a renewed interest in this relation. As urban populations grow and cities become the primary context for daily life, the environments in which people live, work, and move are playing a critical role in shaping health outcomes. Simultaneously, there is a growing shift in the health sector from curative to preventive health strategies and a better understanding of the relationship

between mental and physical health [1] and their relation to the urban environment. New health research shows that, from social cohesion and physical activity to access to healthy food and exposure to environmental hazards, the design and organization of urban space directly influences individual and community well-being.

Even though there is a growing body of literature that shows links between the environment and health effects, their findings are in many cases sectoral focused. As a result, findings, useful to support urban design decisions to improve people's mental or physical health, are scattered. There remains a significant fragmentation in the literature when it comes to providing a comprehensive, design-oriented guide for practitioners, urban designers, planners, architects, and developers, who shape the built environment. This paper seeks to address that gap by translating health-related research into actionable urban design strategies. Building on the Sustainable Urban Design Framework - SUDF [2], this paper organizes various health-impacting urban design elements around four scales typically used by urban designers. These include the Region & City, District & Neighborhood, Block & Street, and Project & Parcel. The last two categories are similar scales but vary in what is typically considered elements in the public realm (Block & Street) versus the private realm (Project & Parcel).

2 THE URBAN DESIGN FRAMEWORK FOR HEALTH

A consistent challenge to incorporating health-related factors into urban design decision making has been the fragmentation of research in the field and the lack of a comprehensive framework that synthesizes and translates findings into a format aligned with urban design thinking and process. While health-related research has typically focused on outcome domains, urban designers often weigh decisions and competing demands at specific physical scales. The Urban Design Framework for Health (Table 1a and 1b) bridges this gap by organizing, by scale, the urban design elements that impact both mental and physical health-related outcome domains. This organization helps users track the range of elements, across scales, that might impact a single outcome domain (reading the framework horizontally), while at the same time allowing users to understand all the elements impacting various outcome domains that should be considered within a single scale (reading the framework vertically). The framework addresses the multifaceted ways in which urban form influences health, acknowledging that there is often no one, critical design element that impacts desired outcomes, but instead a fluid constellation of elements that together make an impact.

Drawn from a synthesis of public health research, urban design theory, and practitioner experience, the outcome domains in the framework include:
Primarily influencing mental health:
- **Social Cohesion**: The role of public space, housing, and land use in fostering social capital and inclusive communities.
- **Calming Spaces**: The importance of nature, light, and sensory environments in supporting mental health and stress reduction.

- **Representing Spaces**: How design can reflect community identity, history, and cultural expression.

Primarily influencing physical health:

- **Physical Activity**: The influence of urban form on active transportation and recreational movement.
- **Access to Healthy Food and Health Facilities**: The spatial distribution of essential services and its impact on health equity.
- **Safety and Security**: Design strategies that reduce injury, crime, and environmental hazards.
- **Environmental Health**: Approaches to minimizing exposure to pollutants and supporting ecological health.

Overarching influence on mental and physical health:

- **Resilience and Adaptability**: The capacity of urban environments to evolve over time and support community agency.

When considering the built environment, the outcome domains are not discrete but interwoven, with some design elements having an impact on multiple health outcomes. These impacts are often positive across domains, but occasionally an urban design element may support one outcome domain while hindering another. This emphasizes the importance of an integration of design, infrastructure, land use, and nature across domains. By organizing the discussion around scales within this framework, the paper aims to provide a clear, actionable roadmap for designing healthier, more equitable urban environments. Below we describe each outcome domain in more depth and then review some of the literature that ties that outcome domain to specific urban design elements. As indicated earlier our urban areas are growing and they need to respond to changing conditions. Therefore, chapter five is added, listing seven key urban design strategies on resilience and adaptation, which support the community's health.

3 MENTAL HEALTH

Urban design is a critical determinant of mental health, as it shapes the physical and social environments in which individuals reside and interact [3–5]. Mental health, as defined by the World Health Organization (2022), encompasses a state of wellbeing that enables individuals to cope with the normal stresses of life, realize their abilities, learn and work productively, and contribute to their communities. In an effort to elucidate the relationship between urban living and mental health outcomes, Xu et al. [5] developed urban environmental profiles that model the associations between specific urban characteristics and psychological wellbeing. Their analysis revealed that factors such as high levels of social deprivation, air pollution, traffic density, street network accessibility, and urban land-use intensity were positively correlated with affective symptoms, including depression and loneliness. A second environmental profile identified associations between anxiety symptoms and features such as dense urban buildup, proximity to leisure amenities, street network complexity, terrain variation, coastal proximity, and mixed-use infrastructure.

Table 1a: Urban Design Framework for Health (Mental Health Domains)

Outcome Domains	Region & City	District & Neighborhood	Block & Street	Project & Parcel
Social Cohesion (Social Amenities)				
Uses and Spaces That Encourage Social Mixing				
Indoor Social Spaces		Land Use Mix (Indoor Social Uses)		
Housing	Compact Dev	High Density Zoning and Platting	Dense and Street Activating Buildings	Social Edges (Stoops/Steps)
		District-Scale Parking Mgt & Design	Housing Groupings	
		Mix of Housing Unit Types		
Outdoor Social Spaces		Land Use Mix (Outdoor Social Uses)	Inviting Public Realm and Parks	Welcoming Edges (Low Thresholds)
			Walkable Street Design	Semi-Public Edges (Outdoor Dining)
				Personalizable Spaces
Calming Spaces				
Presence of Nature		Land Use Mix (Parks and Open Space)	Robust Street Trees + Green Infrast.	
			Access to Water	
Access to Light and Air		Narrow and Defined Blocks	Street Height to Width Ratio	Narrow Building Types
		Platting for Light and Air Access		
Reduced Noise Pollution		Equitable Distribution of Uses and Services	Robust Health Barriers	Natural Soundscapes
			Integration of Water Features	
Representing Spaces				
Uses That Represent Identity		Land Use Mix (Representing Uses)		
Physical Design Character		Defined Districts	Representing Details / Character	Representing Details / Character
			Public Art / Murals	Historic Preservation of Buildings
			Wayfinding	
Naming / Narratives				

Table 1b: Urban Design Framework for Health (Physical Health Domains)

Outcome Domains	Region & City	District & Neighborhood	Block & Street	Project & Parcel
Physical Activity				
Active Travel	Compact Development	Robust Pedestrian Networks	Multimodal Street Design	Active Street Edges
	Robust Transit Networks	High-Density Zoning & Platting	Dense & Street-Activating Bldgs	
	Robust Bicycle Ntwrk	District-Scale Parking Mgt & Design	Site-Scale Parking Design	
		District Land Use Mix		
Activity / Exercise	See Active Travel (above) - *for increased accessibility*			
		Land Use Mix (Parks and Open Space)	Active + Attractive Open Space	
Access to Health Services / Healthy Foods				
	See Active Travel (above) - *for increased accessibility*			
		Land Use Mix (Health Srvcs/Healthy Food)	Community Gardens	Community Gardens
				Private Garden Spaces
Safety and Security				
Safety from Crashes	See Active Travel (above) - *for safer transportation design*			
Safety from Environmental Hazards	Compact Development	Robust Stormwater Networks	High Surface Permeability	Rainwater Capture & Reuse
	Avoid Flood Prone Areas	Green Infrastructure	Robust Urban Forest	
	Equitable and Safe Dist. of Land Uses	Limited Location of Point Source Pollution	Robust Health Buffers	
			Green Stormwater Infrastructure	
Security (Social Safety)		Land Use Mix (Density and Activity Generation)	Site Design for Community Safety / Incl.	Active Street Edges
		Mix of Housing Unit Types *Missing Middle)	Dense and Street Activating Buildings	Edge Design of Vacant Lots
			Adequate Lighting	
Environmental Health				
Healthy Air, Water, and Soil Quality	Equitable and Safe Dist. of Land Uses	Green Infrastructure	Robust Health Buffers	Biodiverse Plantings
			Robust Urban Forest (Non-Allergenic Species)	

Furthermore, Beenackers et al. [6] argued that urban densification can have a myriad of effects on mental health. While densification can increase opportunities for social encounters, it can paradoxically also lead to feelings of anonymity, which in turn may negatively affect social cohesion, and through that, mental health [7]. Additionally, dense and barren urban environments may illicit urban stress [8,9] and hinder recovery from mental fatigue, a process influenced by the presence of green, blue, and quiet spaces [10–13]. Green spaces have long been recognized for their restorative effects on wellbeing [14], and blue spaces, preferred for their water features, are associated with improved mood and emotional wellbeing [15]. Thus, while certain aspects of urban design and density may contribute to mental health challenges, thoughtful urban planning also holds the potential to mitigate these effects and promote psychological resilience. The following sections will further explore the complex and dynamic relationship between urban design and mental health.

3.1 Social Cohesion

Social cohesion is an essential yet frequently overlooked aspect of sustainable urban design. It encompasses the interactions among community members, defined by attitudes and norms such as trust, a sense of belonging, and a willingness to engage and assist, along with their behavioral expressions [16], and plays a crucial role in fostering resilient and sustainable cities [17]. Within each of the framework scales, the focus is on uses and spaces that encourage social mixing, including indoor and outdoor social uses, housing, and supportive amenities.

Social cohesion can be understood through the lens of social capital, typically categorized into bonding and bridging forms [18,19]. Bonding social capital refers to the connections among individuals with similar backgrounds or shared identities, such as family members, close friends, or neighbors. These ties are essential for emotional support and community resilience [17]. In contrast, bridging social capital encompasses connections that span across different social groups, enabling access to new information, opportunities, and networks. Bridging ties are particularly significant in promoting equity as they facilitate the flow of resources and opportunities across socio-economic and cultural divides [20,21]. Urban design can support both forms of social capital by shaping the public realm to accommodate both intimate and diverse social interactions, including those with "familiar strangers" encountered in everyday public life [22,23]. The following paragraphs provide examples of how indoor and outdoor uses and spaces can encourage social mixing.

The design and programming of urban spaces play a pivotal role in encouraging social mixing. A variety of indoor and outdoor uses can serve as catalysts for interaction among diverse populations. At the district and neighborhood scale, social cohesion is supported through strategic land use planning, housing density, and housing diversity. Mixed-use zoning that incorporates indoor social uses—such as community centers, libraries, and

recreational facilities—alongside indoor support uses like clinics and social services, creates opportunities for both bonding and bridging social capital [24,25].

Other indoor social uses such as restaurants, cafes, pubs, and nightclubs provide informal settings where individuals from different backgrounds can interact. These venues, particularly when paired with associated outdoor dining areas, contribute to a vibrant public realm and extend the social function of adjacent streets and plazas [26,27]. Similarly, concessions, kiosks, and retail stores activate the street edge and invite spontaneous encounters [28].

Beyond commercial uses, indoor facilities that combine social mixing with social support, including schools, community centers, clubhouses, religious institutions, libraries, and childcare facilities, serve as critical nodes of community life. These spaces not only offer essential services but also foster inclusive environments where diverse groups can gather, collaborate, and build mutual understanding [23,29,30].

Housing design also significantly influences social cohesion. District & Neighborhood decisions help create high density and diverse housing types through zoning and platting, limited height restrictions, as well as limited parking requirements. These higher residential densities, when thoughtfully implemented, can increase the frequency of social encounters without leading to overcrowding. Design strategies at the District & Neighborhood as well as the Block & Street scale such as clustering units, providing a variety of housing types and lot sizes, and relaxing height and parking restrictions can support a more diverse and intergenerational population [31–33]. This also can allow people of different socio-economic backgrounds to live in proximity. Such diversity in the residential fabric enhances the potential for social engagement and integration as well as equitable access to community resources [34]. Dense, street-activating buildings and thoughtfully grouped housing units also encourage casual encounters among neighbors and support the development of familiar, trust-based relationships [35].

Concepts such as "aging in place" or "community care" [36] and multigenerational housing (e.g. kangaroo housing) further enhance social continuity and support. At the Project & Parcel scale, semi-public social edges or spaces associated with housing, such as porches, stoops, and steps, act as transitional zones between private and public realms, encouraging casual interaction and neighborhood 'Eyes on the Street' [37,38].

Outdoor public and semi-public spaces are also essential for fostering social cohesion. At the District & Neighborhood scale, land use decisions designate outdoor social spaces such as parks, plazas, and commercial streets while at the Block & Street scale design decisions can create inviting and inclusive areas. At the project and parcel scale, finer-grained design interventions can significantly enhance social cohesion by shaping the interface between private and public spaces. Welcoming edges such as wide, ungated park entries, distinct pavement treatments, and seating at the periphery of public spaces, can reduce perceived barriers and invite participation [22,39]. To be most effective in inviting social mixing, public spaces must be accessible without payment and should allow for personalization and informal use, such as outdoor dining, gardening, and the display of personal items in front yards or stoops [23,26,40]. Semi-public edges, including outdoor

dining areas and shared courtyards, provide transitional spaces that support informal socialization and help bridge social divides [41]. These micro-scale design elements, though often overlooked, are essential in reinforcing both bonding and bridging forms of social capital.

Moving to the block and street scale, the physical form and arrangement of buildings and public spaces play a pivotal role in shaping everyday social interactions. The design of the public realm—particularly its walkability and visual appeal—also influences social cohesion. Research has shown that walkable neighborhoods, whether designed for leisure or as destinations, are associated with higher levels of social capital [42,43].

As social interaction is easiest when people are moving at walking speed and can pause to engage, the public realm should be pedestrian-oriented and include amenities such as benches, trees, shade structures, water features, and plazas that support lingering and interaction. Green spaces enable individuals to form close-knit ties and can facilitate interactions across diverse social groups [44]. Parks with playgrounds, picnic areas, walking paths, and sports facilities provide inclusive settings for both structured and unstructured social engagement [27,45]. Depending on the surrounding context, these spaces can play a critical role in creating opportunities for social interaction between different socio-economic classes. Community gardens, dog parks, outdoor markets, and cultural installations (e.g., street art, music pavilions, and public sculptures) further enrich the social fabric by offering diverse opportunities for participation and expression [46–48].

Moreover, these environments contribute to mental and physical health by encouraging physical activity and reducing social isolation, factors closely linked to improved well-being and reduced depression [42,49,50].

3.2 Calming Spaces

Calming spaces are those that reduce stress, promote mental restoration, and offer sensory relief from the intensity of urban life. These spaces are often characterized by the presence of nature, access to light and air, and the mitigation of individual's perception of environmental stressors such as noise and pollution [11].

The presence of nature, including parks, trees, gardens, and open spaces, has been consistently linked to improved mental health outcomes [8,51,52], reduced stress, and increased opportunities for physical activity [42,48,49]. The location and distribution of parks and open space is decided by land use decisions at the District & Neighborhood scale. At the Block and Street scale, street trees and green infrastructure not only provide shade and improve air quality but also contribute to a sense of tranquility and improved mental health [53]. This calming and restorative effect may be partly attributed to the protective nature of these spaces that tend to reduce social interactions [54]. Also at this scale, design that allows direct access to water features, such as rivers, fountains, or coastal edges, further enhances the calming potential of public spaces [13,55].

Access to natural light and air is another critical component of calming environments [56]. Urban form decisions at the District & Neighborhood scale, particularly lot size,

building typologies, and decisions at the smaller scales such as street height to width ratios, setbacks, and – at the Project & Parcel scale – the width of building types can either facilitate or obstruct access to natural light and ventilation [57]. Design strategies that prioritize solar access, cross-ventilation, and open sightlines contribute to both physical comfort [58] and psychological well-being [59,60].

Noise pollution, a pervasive stressor in dense urban areas, can be mitigated through thoughtful spatial planning [61]. At the District & Neighborhood scale, the equitable distribution of land uses can keep residential areas away from auditory stressors such as factories, roads, and train corridors. At the Block & Street scale, robust health buffers, and the integration of natural soundscapes, such as water features, can reduce stress and promote a sense of rest [62]. These strategies are particularly important in communities historically burdened by environmental injustice, where exposure to noise and pollution is often disproportionately high [50,63].

3.3 Representing Spaces

In addition to providing calm, urban spaces can also contribute to mental health by reflecting the identities, histories, and aspirations of the communities they serve. Representing spaces, those that tell community stories, are essential for fostering cultural continuity, civic pride, and a sense of ownership [64]. At the District & Neighborhood scale, land uses that reflect community identity are critically important. These include restaurants, bodegas, bathhouses, and other businesses aligned with local customs, as well as public spaces that support rituals, religious groups, festivals, and performances. Museums, sacred spaces, farmers markets, and craft venues serve as cultural anchors, reinforcing shared values and traditions [27,33,47]. These spaces are shaped through both physical design and the programming of uses that align with local customs and narratives.

Placemaking and place-keeping are central to this process. While placemaking emphasizes the creation of meaningful places through community engagement, place-keeping focuses on sustaining cultural identity, often in the face of displacement [65,66]. Place-keeping ensures that development honors existing communities rather than erasing them.

At the Block & Street and the Project & Parcel scale, physical design elements play a key role in representing identity. Features such as vernacular architecture, decorative pavement, custom bike racks and benches, public art, murals, and culturally resonant wayfinding systems contribute to a unique sense of place [46,67]. Wayfinding and signage, both in its content and its aesthetic, can reinforce local character, while historic preservation efforts make visible the layered narratives embedded in the built environment [68].

Finally, naming and narrative are powerful tools for embedding meaning in place. While these are not specific design interventions, this type of programming draws from and helps strengthen the weight of the built environment in shaping community identity. Initiatives such as the University District Legacy Loop in Spokane, the Freedom Trail in

Boston, or the Mariposa District in Denver exemplify how names and stories tied to the built environment can shape collective memory and civic identity [69,70].

4 PHYSICAL HEALTH

Urban design plays a pivotal role in shaping physical health outcomes by influencing patterns of mobility, opportunities for physical activity, access to resources, safety and security, and environmental exposures [71–73]. Urban environments can either facilitate or hinder healthy behaviors, depending on how they are structured [74]. For instance, walkable neighborhoods with mixed land use, accessible public transit, and proximity to parks and recreational facilities have been associated with higher levels of physical activity and lower rates of obesity, cardiovascular disease, and type 2 diabetes [75,76]. Conversely, car-dependent urban layouts, limited green space, and poor air quality have been linked to sedentary lifestyles, obesity, and increased risk of chronic illness [77,78].

Moreover, environmental exposures such as air and noise pollution—often concentrated in densely populated or industrialized urban areas—pose significant risks to respiratory and cardiovascular health [79,80]. Heat island effects, exacerbated by impervious surfaces and lack of vegetation, further compound health risks, particularly in sprawling metropolitan areas and for vulnerable populations such as the elderly and those with pre-existing conditions [81,82]. However, urban design also offers powerful tools for mitigation. The integration of green infrastructure, active transportation networks, and equitable access to health-promoting amenities can significantly enhance population health and reduce disparities [71]. The following sections will examine the multifaceted relationship between urban design and physical health, highlighting both the risks and opportunities embedded in the built environment.

4.1 Physical Activity

The role of urban design in the promotion of physical activity is well-documented, with strong evidence linking dense, mixed use, and pedestrian friendly environments to increased rates of walking, biking, and recreational exercise [83,84]. Accessibility, defined as the ease with which individuals can reach destinations, is a foundational principle. It is closely tied to land use mix, density, and connectivity, all emphasized in the SUDF as key strategies for reducing energy use and greenhouse gas emissions through active travel [2].

Active travel, including walking and biking, is supported by compact development, multimodal street design, and dense, mixed-use neighborhoods. These elements reduce trip distances and increase the viability of non-automobile modes [85]. At the District & Neighborhood scale, features such as small block sizes and high intersection density (both of which create robust pedestrian networks), high-density zoning, and limited parking requirements are critical to encouraging active transportation [77,86]. At the Block & Street scale, multimodal street design, dense and street activating buildings, and parking design that limits auto-oriented environments all support active pedestrian neighborhoods [87].

Recreational physical activity is strongly influenced by the location and accessibility of parks and open space [88]. It is also influenced by the level of activity and attractiveness of those spaces with parks, plazas, and greenways that are well-maintained, attractive, and equitably distributed providing essential venues for exercise and play [89]. It is critical that these spaces provide amenities suitable for diverse demographics, such as playgrounds for young children, fields and courts for young adults and adults, picnic areas for families, and benches and walking paths for older adults [90–92].

4.2 Access to Healthy Foods and Health Facilities

Access to healthy food and healthcare is a critical component of health equity and is deeply intertwined with mobility and land use with the same design elements that contribute to active travel also contributing to increased and easier access to goods and services. Additionally, a robust land use mix at both the Region & City scale and the District & Neighborhood scale is essential for ensuring that residents can reach essential services without reliance on automobiles.

Healthy food access is also supported by integrating food-related uses into the urban fabric. At the District and Neighborhood scale, this includes the location of community gardens, urban agriculture, local markets, and even street food vendors, which can provide culturally relevant and affordable options [93]. At the Block & Street and the Project & Parcel scale, the design of community gardens and private garden spaces can expand access to healthy foods. Additionally, these community gardens, kitchens, and urban agriculture can also add to social capital [94]. Mixed-use zoning that allows for local grocery stores and fresh food outlets within walking distance of residences is a key strategy for reducing food deserts and promoting dietary health [95]. Veerman, Barendregt, and Mackenbach [96] showed the importance of affordable food options, such as reducing the price of fruit and vegetables would mainly increase demand amongst low income groups.

Access to health facilities, including hospitals, clinics, and pharmacies, requires thoughtful regional and District & Neighborhood scale planning. These services must be equitably distributed and accessible by walking, biking, or transit. This is a core equity and health concern, noting that proximity and connectivity to healthcare infrastructure are essential for reducing disparities in health outcomes. By taking a wider definition of health facilities, also the earlier mentioned "community care" and multigenerational housing comes into focus.

4.3 Safety and Security

Safety in the urban environment encompasses both protection from physical harm, such as traffic collisions and environmental hazards, the broader perceived safety that enables people to move freely and confidently through public space, and their likelihood of doing physical exercise [97].

Traffic safety is a major concern in urban areas, particularly for pedestrians and cyclists. Again, the same range of design interventions at various scales that improve active travel can also improve safety for transit users, cyclists, pedestrians and motorists. Things such as complete streets, traffic calming, and active street edges, can reduce vehicle speeds and improve visibility, thereby lowering crash risk [98,99].

Environmental hazards, including flooding, extreme heat, wildfire smoke, and drought, are increasingly relevant in the context of climate change. At the Region & City scale, urban design can mitigate these risks through strategies such as compact development, avoiding flood prone areas, and the equitable and safe distribution of uses. At the other design scales, green infrastructure, tree canopy expansion, and the preservation of permeable surfaces can help limit the impacts of environmental hazards. Equitable climate adaptation strategies, including managed retreat and heat mitigation, are essential to ensure that vulnerable populations are not disproportionately affected [70].

Safety, or social safety, defined as protection from crime and violence, is shaped by both the physical design of spaces and the social dynamics they support. Crime Prevention Through Environmental Design (CPTED) principles offer a framework for enhancing perceived and actual safety through design [100].

Key CPTED strategies include:
- Clear sight lines and visibility
- Adequate lighting
- Minimization of concealed or isolated routes
- Avoidance of entrapment areas
- Mixed land uses that generate activity throughout the day
- Informational signage and wayfinding
- Use of durable, high-quality materials and regular maintenance

However, CPTED has also been critiqued for its potential to exclude marginalized groups and reinforce surveillance-based approaches to safety [101]. A more inclusive approach to safety must balance surveillance with community ownership and cultural expression.

Urban form also plays a role in social safety. Dense, street-activating buildings and active ground-floor uses increase "eyes on the street" and foster informal surveillance [37]. Here site design for community safety matters, for instance areas of multifamily dwellings with poor visibility and insecure entryways can reduce the perceived safety [97,102]. By improving visibility and lighting in communal stairways, and the security of entryways of large government housing or apartment complexes can improve the perceived safety [97,103,104]. Similarly, the design and maintenance of vacant lots, through greening, fencing, and community stewardship, can reduce crime and improve perceptions of safety [105].

Finally, housing typology may influence social cohesion and safety. Some studies suggest that high-rise housing, particularly when poorly maintained or socially isolated,

may be associated with increased crime or reduced well-being [74]. Alternatives such as mid-rise, clustered, or courtyard housing may offer more supportive environments.

4.5 Environmental Health

A healthy urban environment is one that protects residents from harmful exposures and promotes restorative ecological functions. This includes minimizing pollution, managing noise, and ensuring the integrity of air, water, and soil systems.

Protection from pollution and contaminants begins at the City and Region scale with equitable and safe land use decisions that prevent the siting of hazardous or noxious uses, such as industrial facilities or major highways, near housing, schools, or other sensitive land uses. This includes limiting the location of point source pollution, particularly in proximity to vulnerable populations is critical for physical health. This principle is reflected in policies such as California's 300-foot buffer requirement between freeways and schools, which serves as a model for spatial health buffers.

At the Block & Street scale, robust health buffers, similar to ecological buffers, can take the form of spatial setbacks, vegetative screens, or noise barriers. These buffers reduce exposure to airborne pollutants, mitigate noise, and provide psychological relief from adjacent land uses [106]. At that same scale, the urban forest plays a critical role in improving air quality, sequestering pollutants, and reducing the urban heat island effect. Here attention needs to be given to the tree distribution and type to ensure species do not increase the concentration of irritants or pollutants [107].

Bioremediation strategies, including green infrastructure, phytoremediation, and soil restoration, can further enhance environmental health. The selection of plant species must be done with care, as some species may exacerbate allergies [108]. Biodiverse planting schemes have less similar plants, resulting in a lower concentration of pollen. Similarly, construction practices should be managed to minimize dust, noise, and soil compaction, all of which can have lasting health impacts [109].

5 RESILIENCE AND ADAPTABILITY

Resilient urban environments are those that can adapt to changing conditions, whether environmental, social, or economic, while maintaining core functions and supporting community well-being. Flexibility in design is not only a matter of good planning but also a matter of health equity, as it allows communities to respond to evolving needs and challenges.

Design for adaptability includes both physical and social dimensions. Physically, this means creating urban forms that can accommodate change over time, such as buildings that can be repurposed, lots that can support a variety of uses, and infrastructure systems that are decentralized and modular [2,110]. Socially and in terms of the planning and design process, it means ensuring that communities have a voice in shaping their environments and the ability to influence how spaces evolve [111]. Additionally, many of the urban design strategies effective for social cohesion can also be helpful in terms of resilience and

adaptability as during times of natural disasters, there is a positive correlation between social cohesion and resilience [112].

Key strategies for resilience and adaptability include:
- Leaving spaces "undesigned" to allow for community-led adaptation and programming
- Designing with cycles in mind, such as multigenerational housing or flexible public spaces
- Supporting distributed systems for stormwater, energy, and food production, which increase redundancy and reduce vulnerability
- Providing a variety of lot sizes, block sizes, and street types, which enables a diversity of building typologies and land uses over time
- Incorporating alleys and mid-block connections, which offer future flexibility for access, services, and infill development
- Ensuring street connectivity, which supports mobility, emergency access, and social interaction
- Providing (temporary) indoor or outdoor places for shelter against heat, floods or other natural disasters.

Finally, at the Project & Parcel scale, personalization opportunities, such as the ability to modify front yards, porches, or shared spaces, enhance residents' sense of ownership and agency. These small-scale interventions contribute to broader resilience by fostering attachment, stewardship, and adaptability at the neighborhood level [22,33].

6 CONCLUSIONS

As cities continue to grow and evolve, the role of urban design in shaping public health outcomes is becoming increasingly critical. While the connections between health and the built environment are well established in public health literature, the findings are often siloed. Faced with the useful findings, but scattered among different sectoral literature, there is a need for a comprehensive, design-oriented framework that translates these insights into actionable strategies for urban designers, planners, and developers. This paper has sought to fill that gap by organizing a broad set of health-related design considerations into a coherent structure that facilitates both current research and practical application.

The framework presented here is organized around seven interrelated domains: social cohesion, calming spaces, representing spaces, physical activity, access to healthy food and health facilities, safety and security, and healthy environments. Each domain highlights specific design strategies that support health, equity, and sustainability, while also acknowledging the complex trade-offs and synergies that exist between them.

Importantly, this framework is not intended as a prescriptive checklist, but rather as a guide to create awareness of the role urban design can play to improve people's mental and physical health and to inform design thinking and decision-making. It recognizes that context matters, that what works in one community may not be appropriate in another, and that meaningful community engagement is essential to creating environments that are not only healthy, but also inclusive, adaptable, and reflective of local identity.

Centering health in the design of urban environments and aligning research findings with scales of intervention facilitates design and planning. It can help practitioners to create places that support well-being across the lifespan, reduce disparities, and build resilience in the face of social and environmental change. The proposed framework is a first pass at organizing existing research around outcome domains and design scales. While it is a step forward, it also points to the need for ongoing research in this area. This work is truly both urgent and ongoing, and it calls for continued collaboration between designers, public health professionals, policymakers, and communities.

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