



Green space and the built environment: Optimising health benefits in rapidly emerging cities of the global South

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Urban green space and the built environment can promote healthy behaviours, increase wellbeing and reduce socio-economic health disparities. Yet most evidence for these links comes from high-income countries, with little from low- and middle-income countries.

New research in Colombia's second city, Medellin, addresses this gap, along with a review of research into the links between urban biodiversity and health. The findings identified optimum densities of residential population, road junctions and amenities in relation to people's cardiovascular and metabolic health. There are also associations between floral biodiversity and health. However, people with lower socio-economic status derive fewer health benefits from green spaces.

These findings can inform policy to optimise people's physical and mental health in cities across the global South. Urban planners and health officials should coordinate policies to promote equitable, inclusive access to quality urban green space, and tackle underlying health disparities, so all city dwellers can benefit.

Understanding how urban environments impact health

Urban green space and the built environment can promote healthy behaviours, increase feelings of wellbeing and reduce health disparities based on socio-economic status. Yet most evidence for these links comes from high-income countries, with little research having taken place in rapidly emerging cities in low- and middle-income countries (LMICs).

New evidence from Colombia addresses this gap, revealing the impacts of the built environment and urban green space on health in developing urban contexts. Along with a review of research into the links between urban biodiversity and health, its findings can help inform policies that shape more inclusive and healthier cities across the global South.

Key results: coordinated policies to shape health-promoting cities

- In Colombia's second city, Medellin, the research found densities of residential population, road junctions and amenities that were optimum in relation to people's cardiovascular and metabolic health.
- Urban green space, mobility and land use affect people's levels of physical activity – in turn having significant effects on their health. There are also associations between floral biodiversity and health – particularly subjective wellbeing and self-reported health.
- The lower a neighbourhood's socio-economic status, the fewer health benefits its residents derive from green spaces. Plans to increase equitable access to green space therefore need underpinning by wider efforts to tackle health disparities.
- Urban planners and health officials should coordinate policies to shape urban features in ways that promote increased activity levels and optimise people's physical and mental health.
- Policies should promote equitable access to biodiversity and quality green space across cities, in all socio-economic strata, with careful coordination to ensure greening does not inflate property prices and displace low-income households.

Addressing the knowledge gap: urban layout and health in the global South

Rapid, unplanned urbanisation in low- and middle-income countries (LMICs) produces crowded living environments lacking green space and offering residents inequitable access to nature, particularly in areas of greater deprivation. These urban development patterns also contribute to sedentary lifestyles and unhealthy diets, with harmful long-term effects on residents' health.

Large, dense city populations raise policy questions over how urban planning can balance trade-offs between development and health-promoting features of the built environment. Walkable neighbourhoods have been shown to improve population health through opportunities for physical activity and social interaction, while reducing psychological stress and depression. Urban green space has also been linked to health through promotion of healthy behaviours such as walking and cycling among different segments of the population, with potential to reduce health disparities based on socio-economic status.

However, much of this evidence comes from high-income countries. Little research has

been carried out in LMICs, where most future urbanisation and related health challenges will emerge. Yet findings from high-income countries may not be relevant in LMICs, where differing social, political and environmental contexts may influence population health in different ways. Policymakers in the global South lack robust evidence to support decision-making on issues linking city layout with residents' health. For example, there is limited understanding of the relationship between the built environment and cardiovascular risk in LMICs, or of links between green space, biodiversity and health, and the mechanisms through which these might operate.

“Walkable neighbourhoods have been shown to improve population health through opportunities for physical activity and social interaction, while reducing psychological stress and depression”

Exploring how the built environment, nature and health interact

To inform urban policymaking for more inclusive and healthier cities, policymakers in the global South need high-quality evidence on how the built environment affects people's health in developing urban contexts. Three PEAK Urban research projects address this knowledge gap:

- A study in Medellín, Colombia's second city, drawing on official health records to examine the relationship between features of the built environment and the mortality risk from cardiovascular diseases and diabetes.
- A review evaluating existing literature in the emerging field of research defining the role of urban biodiversity in supporting health and wellbeing.

- Research in Colombia's third-largest city, Cali, using satellite imagery and face-to-face interviews to investigate the relationship between green space and health, and whether physical activity could be an underlying mechanism.

The projects' findings show key links between human health and characteristics of the built environment in the global South, including optimum urban density, features supporting physical exercise, and the benefits of green space and biodiversity. However, the health benefits of green space were greater in more affluent areas, suggesting the need for interventions to tackle underlying health disparities based on inequality.

“The projects' findings show key links between human health and characteristics of the built environment in the global South...”

Key findings

1 In Medellin, the research identified optimum densities of residential population, road junctions and amenities, in relation to people’s cardiovascular and metabolic health

The research adds to the evidence for clear associations between urban environments and cardiovascular and metabolic health in cities in LMICs. It showed urban density, in terms of population or neighbourhood amenities, as beneficial to health up to a certain point, beyond which it becomes health-inhibiting.

There was a strong relationship between residential population density and the mortality rates for diseases of the circulatory system, ischemic heart disease and cerebrovascular disease. A high population density was associated with low mortality rates, but an extremely high density was positively associated with the mortality rates in all disease groups. The findings indicate that a population density of 60,000 people per square kilometre is a suitable upper threshold in relation to cardiovascular health in Medellin, beyond which mortality rates for these diseases begin to increase. Yet only 10 of the city’s 245 neighbourhoods achieve this density, accounting for less than 7 per cent of the population.

There was also evidence linking a higher density of neighbourhood amenities with reduced mortality rates from cardiovascular and metabolic diseases – but beyond a certain point, more amenities are linked to greater mortality rates. This implies that concentration of amenities could encourage city residents to walk to reach them, but an extremely high density of amenities could reflect more street congestion and overcrowding, with negative effects on people’s overall health. The health-promoting effects of neighbourhood amenities therefore

need balancing with health-inhibiting factors, such as pollution from traffic, noise and light.

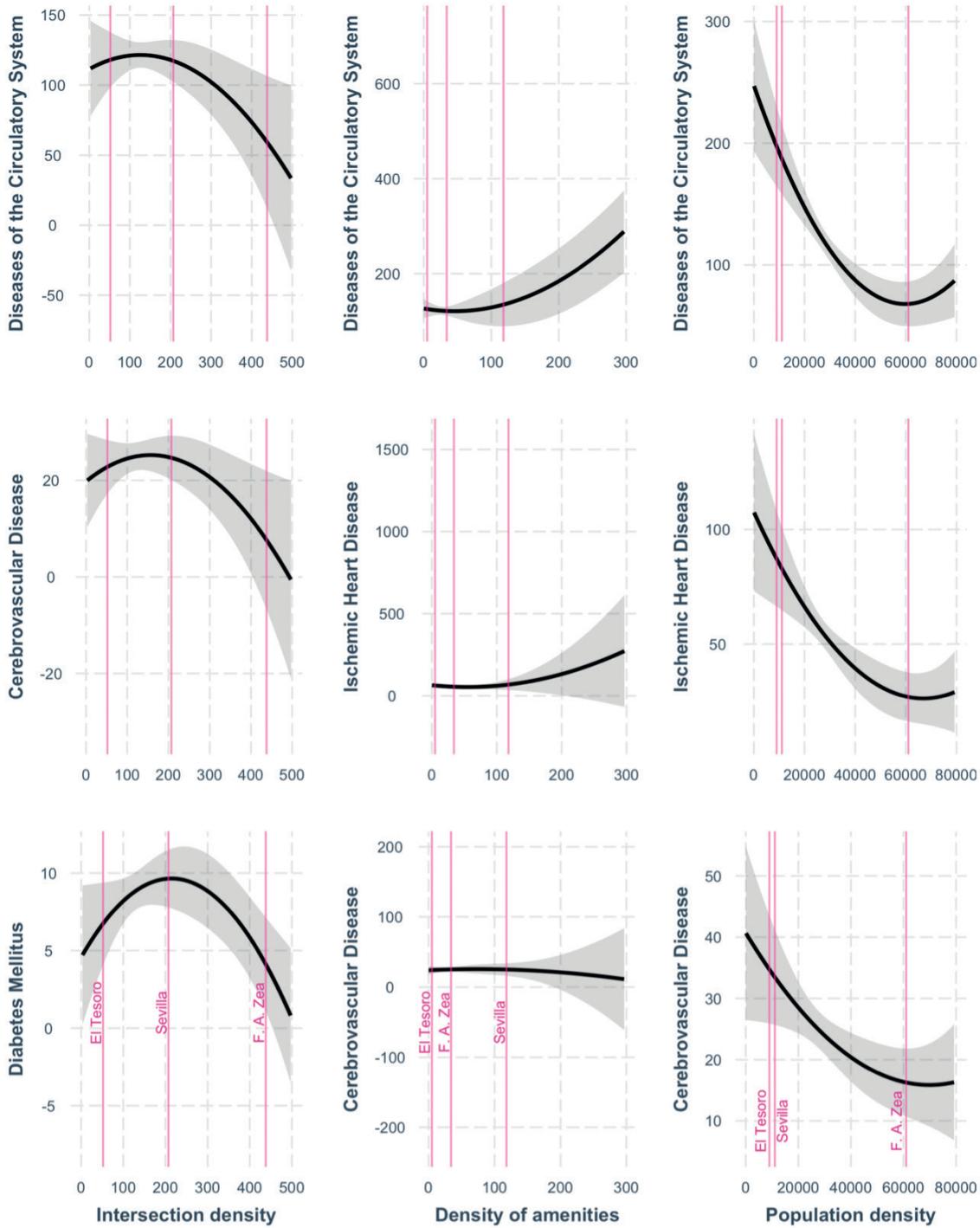
Similarly, a very high density of street junctions was associated with lower mortality rates from cardiovascular diseases and diabetes in Medellin, with better connectivity encouraging people to walk more. However, this benefit ceases beyond densities of 200 junctions per square kilometre, possibly because walking becomes too interrupted by road crossing.

The relationships between density and health for junctions, amenities and population in three different neighbourhoods of Medellin, Colombia.



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“However, this benefit ceases beyond densities of 200 junctions per square kilometre”



El Tesoro

Sevilla

Francisco Antonio Zea



2 Urban green space, mobility and land use affect people's levels of physical activity – with significant effects on their health

The research findings emphasise the importance of urban design and green space on people's physical activity levels, and therefore on their health.

In Medellín's hilly neighbourhoods, steeper slope was associated with increased mortality risk, possibly because higher gradients deterred people from walking in their daily lives. Greater shares of industrial land use within a neighbourhood were less linked with mortality, associated only with cerebrovascular disease, but not to mortality rates for either heart disease or diabetes. This was unexpected, as previous studies have reported adverse health effects from living close to industrial complexes, mainly due to noise pollution and poor air quality. However, living close to workplaces such as factories minimises commuting times and promotes active modes of transport, meaning people maintain higher levels of physical activity, in turn reducing the risk of heart diseases and diabetes.

The strongest association between Medellín's built environment and the mortality measures was found for neighbourhood greenness or the presence of vegetation, with urban green spaces clearly linked with lower mortality rates from cardiovascular diseases, although

the relationship was not clear for diabetes. Likewise, the research in Cali found that neighbourhood greenness was positively associated with self-rated good health and negatively linked to physical problems. This echoes the results of studies from high-income countries on the association between green space and self-reported health, although the association in Cali was larger than in high-income countries.

The findings in Cali also suggest that physical activity may be an important underlying mechanism linking green space to health. People in affluent neighbourhoods exercised in green spaces more than people in deprived areas, with a significant positive association between physical activity and self-rated good health.

The study also found a small association between green space and mental distress, which was surprising, given that the mental health benefits of green spaces are well documented. This might be due to the quality of green spaces varying by neighbourhood. In deprived neighbourhoods, green spaces can be poor quality, and used for gang activity and drug dealing, in contrast to the safe, high-quality green spaces in affluent neighbourhoods.

"...steeper slope was associated with increased mortality risk, possibly because higher gradients deterred people from walking in their daily lives."

"...physical activity may be an important underlying mechanism linking green space to health."

3 There are associations between floral biodiversity and health, particularly subjective wellbeing and self-reported health – but the lower a neighbourhood’s socio-economic status, the less benefit its residents derive from green space

The research into biodiversity and urban health provides further evidence that biodiversity is a potentially important factor in how humans obtain health benefits from urban green spaces.

Although the absolute number of publications on biodiversity and health is still relatively small, the research found an exponential increase in the number of relevant publications per year, reaching over 250 by 2019. However, this growing research interest is focused mainly in Western countries.

The analysis of existing literature covered five previous reviews and 17 original studies into biodiverse environments and health, green space and health, and urban biodiversity and mental health. The most relevant, published in 2018, targeted green space, biodiversity and aspects of both physical and mental health. Most of the studies support associations between health and floral biodiversity, with the strongest results observed for outcomes of subjective wellbeing, followed by self-rated general health.

However, the research suggests the links between biodiversity, green spaces and health are not straightforward. Some of the studies reviewed suggested that subtle differences in biodiversity may not be observable to most people, whereas more extreme variation is easier to identify and could potentially yield greater health benefits. Others suggested that biodiversity relates to individual aesthetic preference, implying a complex relationship between health and exposure to different plant species.

The research in Cali revealed a further complexity in people’s relationships with urban biodiversity and green space. It found clear variations in the health benefits of green space according to neighbourhood socio-economic status. More local greenness was most strongly associated with self-rated good health for participants living in neighbourhoods with mid- to high-socio-economic status. The association was weaker for people living in neighbourhoods with low socio-economic status.

“...the research suggests the links between biodiversity, green spaces and health are not straightforward”

“It found clear variations in the health benefits of green space according to neighbourhood socio-economic status”



Plaza de Caicedo, Cali, Colombia.

Policy insights

The research findings highlight the importance to health of urban planning policies that achieve optimum density in the built environment and provide equitable access to green space – underpinned by policies that reduce health inequalities.

1 To optimise cardiovascular and metabolic health, urban policies should seek an optimum balance in densities of residential population, amenities and street junctions

To reduce deaths from cardiovascular disease and diabetes, policymakers in large cities like Medellin should control population density within the band in which mortality rates in all disease groups are lowest. Although density has been related to more physical activity and non-motorised trips in cities of the global North and China, and to lower levels of cardiovascular risk factors, the research showed that in cities like Medellin, policymakers should stick to an upper population density of 60,000 people per square kilometre, to avoid adverse health effects.

The finding that planners should aim for density of up to 200 junctions per square kilometre translates to square city blocks about 70 metres in length – a suitable distance to encourage walking. Policymakers should prompt further investigation into

the effect of density of amenities, including which types of amenity promote healthy behaviours such as walking, and whether concentrations of amenities reflect neighbourhood overcrowding.

The findings in Medellin offer valuable insight for urban planners, health officials and local authorities in similar cities shaping policy to achieve healthier urban environments and minimise non-communicable diseases. However, long-term research is required in LMICs to understand the combined impacts of factors in the urban environment associated with neighbourhood differences in mortality. This will help policymakers identify a context-specific balance between health-promoting and health-inhibiting factors in urban environments.

“...planners should aim for density of up to 200 junctions per square kilometre translates to square city blocks about 70 metres in length”

2 City officials should coordinate urban planning and health policies, to actively encourage increased activity levels across city populations

To best promote city residents' health, urban planners and health officials should coordinate their work, drawing on the key contribution to people's health and wellbeing which the built environment can make. (This coordination should also extend to tackling health disparities so people can derive greatest benefit from the creation or upgrading of green spaces – see Point 3 below).

Together, health and planning officials should investigate challenges to residents' mobility around the city and their physical activity, and ways in which urban interventions could be designed to address both in conjunction, rather than as separate issues. For example, initiatives such as Medellín's street elevator system can help encourage people to choose walking as their mode of transport in areas which they would otherwise deem too steep.

The evidence for reduced mortality from cardiovascular disease and diabetes in

neighbourhoods close to industrial land suggests that policymakers in developing countries should also support people living close to the factories and industrial sites where they work. This proximity can encourage active modes of transport, such as walking or cycling.

While the availability of green space may not be a necessary condition for physical activity, the links found in both Medellín and Cali between green space, physical activity and self-reported health confirm the importance of urban planning that allows all city residents easy access to quality green space. Although infrastructures such as dedicated walking and cycling paths may be equally relevant for physical activity, in the absence of such infrastructures, safe, well-kept green spaces in low-resource settings may play an important role in increasing opportunities for physical activity and other health-related behaviours such as outdoor relaxation and socialising.

“Together, health and planning officials should investigate challenges to residents' mobility around the city and their physical activity, and ways in which urban interventions could be designed to address both in conjunction, rather than as separate issues.”



3 Equitable urban health planning requires policymakers to provide access to quality green space across socio-economic strata, carefully coordinated so as not to inflate property prices, and underpinned by measures to address health disparities

The clear association between green space and health in Cali provides strong evidence for the positive health effects of green space in LMICs. However, the finding that the health benefits of green space appear stronger for people living in wealthier neighbourhoods than in poor neighbourhoods highlights the importance of considering health disparities when planning future green infrastructure in the global South.

Given the variations in the quality and safety of green spaces, inequitable access to green space due to neighbourhood socio-economic status could present significant challenges in using green space to mitigate health disparities in cities such as Cali. These disparities are more likely to increase as urbanisation intensifies, further shrinking existing green spaces in poor neighbourhoods. Policymakers should seek context-specific information on how local cultural, political and economic contexts affect the health impacts of people's interaction with green space. Policy also needs to be founded on robust evidence about specific features of urban green spaces – including their size and location, and the quality and quantity of biodiversity – to understand how and why health benefits may be obtained through nature-based solutions.

While addressing the inequitable distribution of urban green spaces, planners should

avoid the risks of uncoordinated creation of green space in low-income neighbourhoods. The positive relationship between green space and health is much stronger for people living in neighbourhoods with mid-to high-socioeconomic status. This implies that more green space might not benefit residents of deprived areas unless there is also serious effort to address socio-economic health disparities. In addition, research from higher-income countries shows that uncoordinated creation of urban green space can inflate property values, displacing low-income households through a process of "green gentrification". It is therefore vital that policymakers carefully coordinate urban greening initiatives, both across cities and with health policies, to ensure that people at all socio-economic levels benefit.

Given such coordination, equitable provision of urban green spaces has strong potential to improve people's physical health and tackle the significant disparities in resource allocation common in many cities in LMICs. Policymakers should develop context-specific strategies that promote physical activity and exposure to biodiversity, while also reducing health inequalities, so that all citizens benefit from access to urban green spaces.

"The clear association between green space and health in Cali provides strong evidence for the positive health effects of green space in LMICs. "

Policymakers should develop context-specific strategies that promote physical activity and exposure to biodiversity, while also reducing health inequalities, so that all citizens benefit from access to urban green spaces

Further reading:

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About us

The PEAK Urban programme aims to aid decision-making on urban futures by:

1. Generating new research grounded in the logic of urban complexity;
2. Fostering the next generation of leaders that draw on different perspectives and backgrounds to address the greatest urban challenges of the 21st century;
3. Growing the capacity of cities to understand and plan their own futures.

In PEAK Urban, cities are recognised as complex, evolving systems that are characterised by their propensity for innovation and change. Big data and mathematical models will be combined with insights from the social sciences and humanities to analyse three key arenas of metropolitan intervention: city morphologies (built forms and infrastructures) and resilience; city flux (mobility and dynamics) and technological change; as well as health and wellbeing.

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Our framework



The PEAK Urban programme uses a framework with four inter-related components to guide its work.

First, the sciences of **Prediction** are employed to understand how cities evolve using data from often unconventional sources.

Second, **Emergence** captures the essence of the outcome from the confluence of dynamics, peoples, interests and tools that characterise cities, which lead to change.

Third, **Adoption** signals to the choices made by states, citizens and companies, given the specificities of their places, their resources and the interplay of urban dynamics, resulting in changing local power and influencing dynamics.

Finally, the **Knowledge** component accounts for the way in which knowledge is exchanged or shared and how it shapes the future of the city.

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