Review summary:

How the built environment influences child health

This document provides a summary of the latest evidence on how the built environment influences child health. It is based on a review co-authored by an interdisciplinary team working within the ActEarly research project.[1]

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Image source: London Borough of Tower Hamlets

Key Messages

- The built environment has an important influence on children's health, but the way it does so is complex, and dependent on context.

- Perceptions of traffic safety, accessibility to facilities, and pedestrian infrastructure are associated with increases in physical activity and active travel.

- Motorized traffic and busy roads are associated with negative impacts on health such as reductions in physical activity, active travel, and increases in obesity

- There are 10 broad categories of BE attributes that are likely to be protective factors supporting health activities and outcomes, which should be monitored to ensure they deliver healthy places.

- When planning improvements to street environments it is vital to ensure that positive health outcomes are attained whilst any associated barriers, or risk exposures, are simultaneously reduced.

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Introduction

The spaces we live in affect how we travel, exercise, eat, socialise and interact. Unhealthy environments for children and young people are barriers to healthy living. These barriers restrict opportunities for walking and cycling – due to busy roads, lack of street connectivity, or poor-quality green spaces.[2][1,2]. Research shows associations between poorly designed neighbourhoods and child health, obesity, poor mental health and cardiovascular disease, as well as poor social connectedness with community assets such as art and cultural centres, parks, libraries, leisure centres, volunteer associations, social and community groups. Social networks and social capital are weakest in the most deprived areas. Changing local places to make it easier for disadvantaged families to live better lives may offer gains across a range of health and social outcomes.

Findings

We recently reviewed nearly 1000 research papers from the past decade to find out how the various aspects of the built environment (BE) – such as street connectivity, access to facilities, or to other people – might influence heathy behaviour or outcomes, and thus, long term health for the population.[3] We were especially focused on street design, layout and connectivity, along with neighbourhood accessibility and walkability, as we wished to a) get a sense of the types of measured used in such studies and b) examine the relationship between BE factors and child health.

We found clear associations between the built environment and children's health. Objective physical activity and self-reported active travel, or obesity, were positively associated with higher street connectivity or the more complex measure of walkability, while self-reported physical activity and play had the strongest association with reduced street connectivity, indicated by quieter, one-way streets.

We found that the same built environment attributes that enabled physical activity and travel were associated with reductions in objectively measured BMI. This might be partly because physical activity is an intervening factor between the BE and obesity, namely the built environment shapes opportunities for physical activity, and greater physical activity helps reduce obesity. We also found exposure to greenery as an important factor in shaping good health outcomes. Correspondingly, our review highlighted the value of streetscapes, street art, and street-side greenery in promoting good health and wellbeing.

We also found that safety, street connectivity, accessibility to facilities, and pedestrian infrastructure and quality of the street environments were frequently associated with positive health impacts such as increases in physical activity, active travel, and reductions in obesity.

We found that some BE attributes such as street connectivity and land-use diversity could have opposite effects depending on the health outcome. For example, in various studies greater street connectivity was related to active travel, possibly because it facilitates shorter distances from "A" to "B", whilst in other studies, lower street connectivity as assessed by one-way roads or cul-de-sacs was associated with greater physical activity in children.

Finally, we found that the category related to motorised traffic and the presence of busy roads emerged as the most frequently associated with negative impacts on health.[4]

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[2] Panter, J.; Guell, C.; Humphreys, D.; Ogilvie, D. Can changing the physical environment promote walking and cycling? A systematic review of what works and how. Health & Place 2019, 58, 102161, https://doi.org/10.1016/j.healthplace.2019.102161. And Lu, Y.; Sarkar, C.; Xiao, Y. The effect of street-level greenery on walking behavior: Evidence from Hong Kong. Social science & medicine (1982) 2018, 208, 41-49, https://doi.org/10.1016/j.socscimed.2018.05.022.

[3] Ortegon-Sanchez, A.; McEachan, R.R.C.; Albert, A.; Cartwright, C.; Christie, N.; Dhanani, A.; Islam, S.; Ucci, M.; Vaughan, L. Measuring the Built Environment in Studies of Child Health—A Meta-Narrative Review of Associations. Int. J. Environ. Res. Public Health 2021, 18, 10741 https://doi.org/10.3390/ijerph182010741.

[4] Our review found a small number of studies into interventions in the built environment. A future paper will review these in detail.

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Meta-narrative synthesis of associations of Built Environment Categories and Physical Activity, Active Travel and BMI in studies of child health
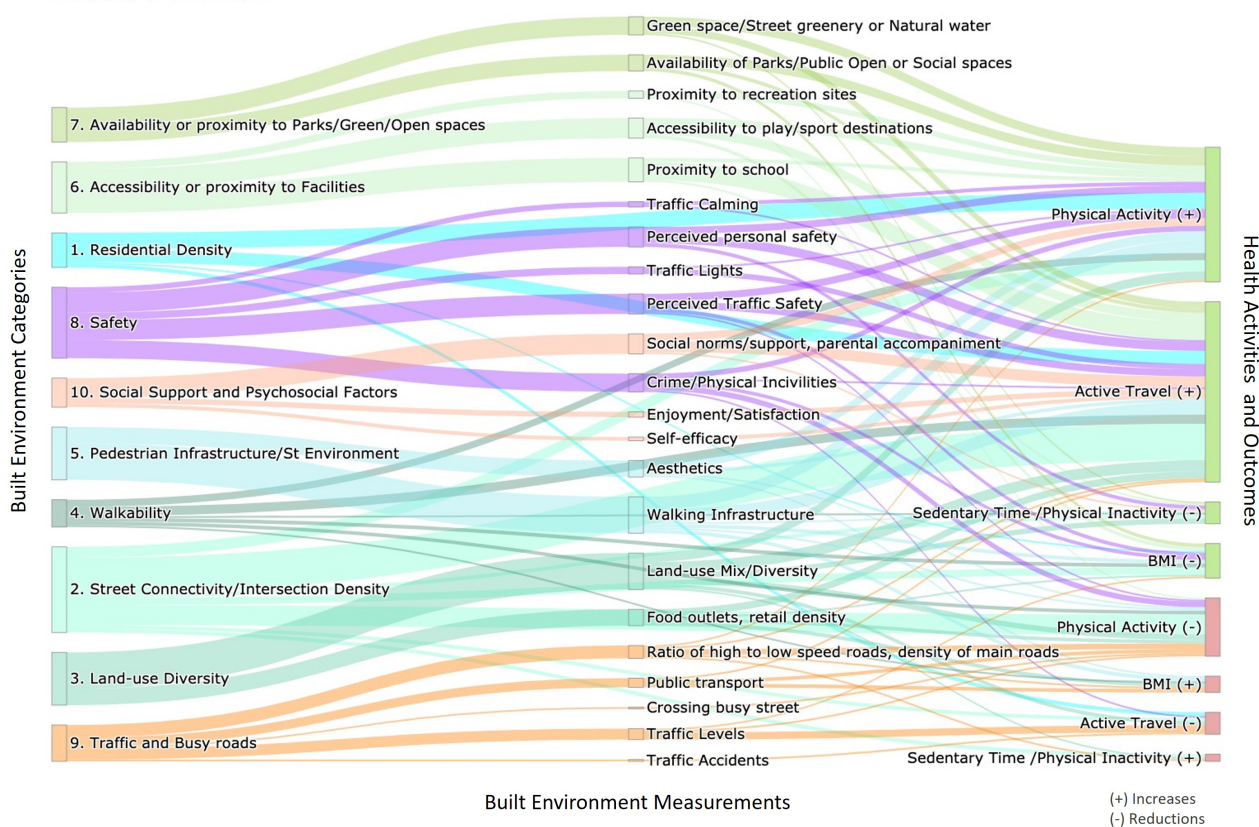
Graphical display of relationship between the built environment and child health (see Ortegon-Sanchez et al, 2021)

Despite the lack of consistency across the studies, our assessment of the interaction between the built environment and children's health, enabled us to identify 10 broad categories of BE attributes that are likely to be protective factors supporting children and adolescents' health activities and outcomes – in particular: active travel, physical activity and play, physical inactivity, or obesity/excess BMI. The following table highlights the most reliable measurements for each category:

10 most reliable measurements for research into healthy built environments[5]	
1. Residential or population density.	• Number of residents within a buffer around home, school and/or specific route.
2. Intersection density (or other measures of street connectivity).	• Number of intersections (e.g., total intersections, or cul-de-sacs, or 4-way intersections) within a buffer.
3. Land-use diversity.	• Proportion of different land-uses within a buffer. • Entropy Index (using formulas that combine land-use classifications and the proportion of land dedicated to a specific land-use).
4. Walkability (a composite measurement including the previous three attributes).	• Walkability Index (using formulas that combine residential density, intersection density and land-use mix, and other attributes such as public transit density or retail floor area ratio) within a buffer.

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[5] We strongly encourage using the most common study (or buffer) area: 800m, or around a 10-minute walk; and measuring network distance (along the street, rather than measuring distance as the crow flies).

5.	Walking infrastructure and perceptions of street environments.	• Total length of footpaths or pavements or sidewalks (and/or width of the same) within a buffer. • Network distance to nearest footpath. • Parental or children's perceived pedestrian friendliness, cleanliness and aesthetics (e.g., interesting buildings) perceptions of the hostility of the environment (e.g. graffiti).
6.	Accessibility to recreation, or play facilities, and proximity to school.	• Network distance to nearest physical activity centre, or playground, or school.
7.	Availability and accessibility to public open and social spaces and natural environments such as parks, green spaces, street greenery, and water bodies.	• Number or total area of parks/green space/ opens space within a buffer. • Mean NDVI (Normalised Difference Vegetation Index) within a buffer. • Network distance to nearest green/blue space. • Number of street-trees along a street segment/route. • Parent perceived access/quality of green/blue spaces.
8.	Perceptions of safety from traffic and crime;	• Parent and/or children perceived safety from traffic and crime. • Number of safety related measures (e.g., zebra or pedestrian crossings with traffic light, slow points, speed bumps) within a buffer.
9.	Motorised traffic levels and the presence of main roads.	• Proportion of high-speed roads to low-speed streets within a buffer. • Total length of different road types divided by the total road length within a buffer. • Presence of major/arterial roads near the child's home or school street. • Density of bus stops and/or metro stations.
10.	Social support and psychosocial factors.	• Reported parental or peers support for active travel to school or playing in the neighbourhood. • Reported enjoyment of physical activity or active travel to school

Our review underscored the relevance of psychosocial factors (e.g., perception of physical self-efficacy, social support from peers and family or social norms and enjoyment and satisfaction with active travel to school as well as other purposes). Lastly, there were few studies that systematically considered girls and boys as separate groups, but where they did, some found that girls had lower levels of physical activity or were more affected by the conditions of the environment and that boys or male teenagers were more likely to walk to school. However, due to the same limitations already discussed, it is difficult to draw any general conclusions in this regard, other than the importance of taking account of boy/girl differences in future studies.

Recommendations

Our review highlighted the many complexities inherent in understanding how the built environment impacts on children's health and how these vary depending on aspects of the context such as the activities taking place. For optional activities that provide reasons to be out and about in one's neighbourhood, the role of the BE is to provide pleasant and safe environments, such as high-quality footways and clean and green street environments. Similarly, land-use diversity or proximity to recreation sites can incentivise active travel to visit these destinations. Yet, there can be barriers to such provision, so, for example, a planned local centre that has the positive outcome of creating an attractive mix of activities for people living and working in the vicinity might lead to overcrowded and unpleasant environments and traffic congestion, especially in cultures with high use of cars for mobility.

For necessary activities such as travel to school, well-connected footways and proximity to destinations are the most effective means. Yet, there are several potential barriers, varying between low perceptions of safety from traffic and crime, problematic traffic levels and speeds, or a lack of adequate crossings. In sum, this review underscores that the provision of a health-supportive BE for children requires city planners to work with transport, public health, urban design specialists to ensure that infrastructure changes complement one another and do not lead to unintended consequences on health.