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EVIDENCE BRIEF

Neighbourhood Walkability and Body Mass in Urban Areas

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Key Messages

- While some studies show that people in more walkable areas have lower body mass, a similar number of studies do not show a significant relationship between walkability and body mass.
- Results were mixed regardless of whether studies analyzed children, adults or older adults.
- A recent increase in longitudinal studies improves the possibility of investigating causal relationships.
- Future studies should use standardized measures of walkability to facilitate synthesis of evidence across studies.

Issue and Research Question

Worldwide, the prevalence of obesity more than doubled between 1980 and 2014.[1] In Canada, the prevalence of adult overweight and obesity was estimated at 51.9% in 2011.[2] Among Canadian children, 27.0% were estimated to be affected by overweight or obesity in 2014.[3] People with overweight and obesity are at an increased risk of chronic diseases such as cardiovascular disease, type 2 diabetes, and cancer.[1,2] Being overweight can also affect quality of life and increase the risk of premature death.[2] Given the numerous adverse health outcomes associated with overweight and obesity, many are referring to these growing rates as a public health crisis.

The rising prevalence of obesity has raised questions about the effectiveness of interventions that target individuals, such as behaviour change techniques.[4] This has led to an increase in research on factors beyond individual behaviour, notably the built environment and its association with overweight and obesity.[4,5] The built environment refers to places and spaces that are designed and built by humans, including buildings, grounds around buildings, the layout of communities, transportation infrastructure, and parks and trails.[4] In particular, interest is growing in the potential effects of neighbourhood walkability on the risk of overweight and obesity.[5] Walkability is a specific aspect of the built environment that describes how well a neighbourhood encourages walking.[6]

In this Evidence Brief, neighbourhood walkability is defined as "the extent to which characteristics of the built environment and land use may or may not be conducive to area residents walking for either leisure, exercise or recreation, to access services, or to travel to work".[7] The importance of walkability research to public health lies in the potential association between walkability and obesity and chronic disease.[5] The general hypothesis is that people who live in more walkable neighbourhoods will be more physically active, and will therefore have lower rates of obesity and chronic disease than people in less walkable neighbourhoods.[5] The objective of this Evidence Brief is to identify evidence in the literature on associations between walkability and body mass, measured by body mass index (BMI) or prevalence of overweight and obesity. The geographic focus is on Canada, the United States, Western Europe, Australia and New Zealand. These regions have relatively similar levels of affluence and similar determinants of vehicle travel,[8] which is thought to be a mechanism by which walkability influences body mass.[9]

This Evidence Brief asks: What is the relationship between neighbourhood walkability and body mass or body mass change among non-rural residents, of all ages, in Canada, the United States, Western Europe, Australia and New Zealand?

Methods

Embase, MEDLINE and CINAHL were searched on January 24, 2017 by PHO Library Services for systematic reviews published between January 1, 1974 and January 24, 2017. To cover the search period after the most recent included systematic review, this search was updated on March 15, 2017 to search for primary studies published between January 1, 2013 and March 15, 2017. English-language articles were eligible if they examined associations between body mass or body mass change and a neighbourhood walkability composite measure containing two or more of the following components: proximity of neighbourhood amenities, population or building density, land-use mix, street connectivity, and/or neighbourhood aesthetics. Eligible study populations were non-rural populations of any age in Canada, the United States, Western Europe, Australia or New Zealand.

Titles and abstracts were screened for eligibility by one reviewer and a 20% sample was screened by a second reviewer for verification. Any disagreements on inclusion were resolved by discussion until consensus was reached. Full-text articles that met inclusion criteria after review of the titles and abstracts were retrieved and reviewed as full-text documents by one reviewer. A 20% sample of the included full-text articles was screened by a second reviewer for verification. Relevant information was extracted from each included article by one reviewer and the extracted information was reviewed by a second reviewer for verification. If an article reported more than one relevant effect estimate between the same measure of walkability and body mass in the same population, only one estimate was chosen. The criteria used to prioritize unique estimates was kept consistent across articles. An ordered list of these criteria can be obtained from PHO by request.

Quality appraisal and tool selection was guided by the PHO Meta Quality Appraisal Tool (MetaQAT) and PHO's HPCDIP Knowledge Synthesis Services unit. Quality appraisal was conducted by one reviewer using the Newcastle Ottawa Scale for primary studies, and the AMSTAR tool for systematic reviews.[10,11] A second reviewer conducted quality appraisal on a 20% sample for verification, and any disagreements were resolved by consensus. The full search strategy and quality appraisal details can be obtained from PHO.

Main Findings

The search for systematic reviews identified a total of 307 articles, from which eight unique systematic reviews met the inclusion criteria for systematic reviews (flow diagram available upon request). Some primary studies were picked up in this search and two of these met the inclusion criteria for primary studies. Studies in the included systematic reviews yielded 50 separate comparisons relevant to our Evidence Brief question; however, separate systematic reviews may have included overlapping studies and therefore, some duplicate comparisons. Assessment with the AMSTAR quality appraisal tool revealed a number of methodological issues.[11] None of the systematic reviews reported that they did duplicate study selection and data extraction,[6,12-18] and only three of the eight systematic reviews performed quality appraisal of their included studies.[6,13,14]

The search for primary studies identified a total of 895 articles. After including the two eligible primary studies captured in the systematic review search, a total of 19 unique primary studies met the inclusion criteria (flow diagram available upon request). The included studies yielded 22 separate comparisons relevant to the research question. Of the included primary studies, 11 were cross-sectional and eight were longitudinal. A larger proportion of our primary studies were longitudinal compared to a 2012 systematic review of walkability and active transport and weight-related outcomes.[6] The 2012 review identified 34 relevant publications, 33 of which used cross-sectional designs and one of which used a longitudinal design. The quality of the primary studies in the current review ranged from moderate to good according to the Newcastle-Ottawa Quality Scales for cross-sectional and cohort (longitudinal) studies.[10] All 19 primary studies controlled for age and at least one other important covariate,[5,19-36] and 12 described samples that were somewhat or truly representative of the target population.[5,20,21,24,25,28-34] However, of the 11 cross-sectional studies, only four described satisfactory response rates.[5,19,20,27] Among the eight included longitudinal studies, only three described follow-up rates deemed unlikely to introduce bias.[29,30,35]

The outcome measures were based on heights and weights that were either self-reported by study participants or directly measured by researchers. The continuous outcome measures were BMI values while the categorical measures were proportions of participants who were classified as overweight or obese (BMI over 25) or classified as obese (BMI over 30).

Overall, 34 of the total 72 estimates of association were statistically significant and showed that people in more walkable areas had lower body mass. One estimate was statistically significant, but showed that people in more walkable areas had higher body mass, which is the opposite of what was expected.[13] The remaining estimates were not statistically significant. In addition to statistical significance, most of the primary studies that met our inclusion criteria reported effect sizes, with variance estimates around those effect sizes. In the following paragraphs, findings are categorized by age. While only a selection of effect estimates are discussed, all results can be requested from PHO.

RESULTS BY AGE GROUP

Four of the 25 included articles focused on children aged less than 18.[16,18,28,34] There were seven estimates of associations between walkability and body mass reported by these four articles, three of which were statistically significant associations showing that children in more walkable areas had lower body mass. One of these significant associations was from a primary study and showed that the odds of children having obesity was slightly lower if they lived in more walkable areas.[28] Twenty articles examined associations between walkability and body mass among adult populations who were primarily working age (i.e., majority aged 18 to 65).[5,6,12–15,17,20–23,25–27,29–33,36] There were 61 unique estimates of association between walkability and body mass in these 20 articles. Out of the 61 estimates, 30 were statistically significant and showed that people in more walkable areas had lower body mass and one was a statistically significant association showing that people in more walkable areas had higher body mass. Eight of the significant associations among working-age adults were from primary studies and examined differences in average BMI. The largest difference was an average BMI that was 1.1kg/m^2 lower in highly walkable areas than in less walkable areas.[5] The study population of three articles was adults aged 63 and older.[19,24,35] Of the four estimates of association reported by these articles, only one was statistically significant. It was from a primary study and showed that people in more walkable areas had BMIs that were 1.5kg/m^2 lower, on average.[24]

To summarize, slightly less than half of the relevant estimates overall and within each age group were statistically significant and showed that people in more walkable areas had lower body mass, although these associations were generally weak. Most of the remaining estimates did not show statistically significant relationships. Moreover, similar proportions of statistically significant estimates were observed regardless of whether studies were systematic reviews or primary studies, and whether the primary studies used cross-sectional or longitudinal designs (details available upon request).

Discussion and Conclusions

This synthesis found that some research showed people in more walkable areas had lower body mass than people in less walkable areas, which was the expected relationship; however, these findings were not consistent across all studies. While close to half of all relevant estimates were statistically significant and showed the expected relationship, most of the remaining estimates were not statistically significant. Similar patterns of results were observed in children, adults, and older adults, with just under half of estimates in each age group showing statistically significant associations between walkability and body mass, while the remaining estimates were mostly non-significant. Thus, we found no evidence that certain age groups were more or less likely to show an association between walkability and body mass. The mixed results identified in this synthesis do not necessarily mean that there is no association between walkability and body mass. There were a number of methodological issues that may have lead to falsely non-significant findings. For instance, studies may not have had enough power to detect an association if they included too few partipants.[37] Conversely, other methodological issues may have lead to falsely significant findings. For example, if studies did not account for people with lower body mass self-selecting into more walkable neighbourhoods, effects could have been overestimated.[38]

CONCLUSIONS

With regard to the research question, there is some evidence of a weak association between neighbourhood walkability and body mass, but this is not consistent across various studies. There is a need for higher quality systematic review-level evidence in order to better understand whether neighbourhood walkability is associated with body mass. Additionally, more longitudinal studies on walkability's relationship with body mass and other health outcomes should be conducted to better establish causal relationships. More standardized walkability measures are needed to better characterize whether neighbourhood walkability is associated with body mass and other health outcomes more generally. If these methodological issues are addressed by future research, a clear direction of the association between walkability and body mass may emerge.

Implications for Practice

The inconsistently observed associations between neighbourhood walkability and body mass should not be viewed as a barrier to public health's efforts to achieve community designs supporting greater walkability, cycling and public transit use. More walkable neighbourhoods are associated with increased physical activity[41,42] and physical activity provides health benefits independent of changes in body mass.[43,44] Public health action to achieve more walkable neighbourhoods involves working with urban planners, transportation planners and other key stakeholders to influence planning decisions addressing the core elements of walkability including density, land use mix, service proximity, street connectivity, and streetscape characteristics.[45–47]

The methodological limitations of existing studies described in this report are likely not the only reason for inconsistent associations between walkability and body mass since there are many other variables contributing to obesity beyond walkability. These include not only other sources of physical activity, but also the major changes in the food environment that have occurred over time.[48] These include abundant, cheap and convenient food that is high in calories and low in nutrients combined with their substantial marketing and promotion.[49] Analysis of data from many countries indicates that increases in food energy supply alone have been sufficient to explain the observed obesity trends.[50] The implication is that public health efforts to address obesity need to consider multiple environmental determinants, including but not limited to, those within the physical activity environment, the food environment, and the determinants of healthy eating.

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Specifications and Limitations of Evidence Brief

The purpose of this Evidence Brief is to investigate a research question in a timely manner to help inform decision making. The Evidence Brief presents key findings, based on a systematic search of the best available evidence near the time of publication, as well as systematic screening and extraction of the data from that evidence. It does not report the same level of detail as a full systematic review. Every attempt has been made to incorporate the highest level of evidence on the topic. There may be relevant individual studies that are not included; however, it is important to consider at the time of use of this brief whether individual studies would alter the conclusions drawn from the document.

Authors

Kate Thomas, Practicum Student, Health Promotion, Chronic Disease and Injury Prevention, PHO
Dr. Heather Manson, Chief, Health Promotion, Chronic Disease and Injury Prevention, PHO
Dr. Brent Moloughney, Medical Director, Health Promotion, Chronic Disease and Injury Prevention, PHO
Justin Thielman, Epidemiologist Lead, Health Promotion, Chronic Disease and Injury Prevention, PHO

Reviewers

Kara DeCorby, Senior Product Development Advisor, Health Promotion, Chronic Disease and Injury Prevention, PHO
Sue Keller-Olaman, Knowledge Synthesis Services Manager, Health Promotion, Chronic Disease and Injury Prevention, PHO
Tiffany Oei, Research Coordinator, Health Promotion, Chronic Disease and Injury Prevention, PHO

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Email: hpcdip@oahpp.ca

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