Diabetes and the built environment: Contributions from an emerging interdisciplinary research programme

Allanah Li (Meds 2012), Ashley Kim (Meds 2013), and Emma Farley (Meds 2013)
Faculty reviewer: Dr. Neil Arya, Director of Global Health, UWO

Introduction

Diabetes has become a global epidemic and rates continue to increase. Over 3 million Canadians have diabetes and approximately 90% of them have type 2 diabetes. Diabetes can lead to a reduced life expectancy and quality of life, and an increased risk of cardiovascular disease, kidney disease, blindness, and amputation. In addition to these personal health costs, diabetes may cost the Canadian healthcare system $16.9 billion per year by 2020.1

The epidemic of type 2 diabetes is closely associated with a rise in obesity, poor diet quality, and physical inactivity. The failure of individual-level interventions such as medications and dietary counselling to forestall the epidemic has led to a strong interest in population-level approaches.2 There is growing recognition that aspects of the physical and social environment can have a powerful influence on health and health-related behaviours, at the individual, neighbourhood, and population levels. This article will explore the emerging interdisciplinary study of health with respect to the built environment and will discuss some of the important contributions of this field to understanding and addressing the diabetes epidemic.

What is the study of the built environment?

An interdisciplinary programme of study has emerged in the literature that examines the influence of the built environment on health outcomes. The built environment describes the physical layout of communities and encompasses land-use patterns, homes, schools, workplaces, stores, parks, roads, and transportation systems.3 Studies of the built environment acknowledge that aspects of our physical surroundings can shape choices about diet and physical activity – both important contributors to the development of diabetes.

Research in this field involves many diverse disciplines, including public health, epidemiology, nutrition, urban planning, geography, economics, sociology, anthropology, and leisure studies. Each of these disciplines has its own approach, expertise, and methodology when it comes to examining the relationship between health and the built environment. This article focuses particularly on the contributions of urban planning and geography. Study methodology generally falls into three categories: 1) interviews or questionnaires on residents’ perceptions of their environments; 2) systematic observations of area characteristics (i.e. number and type of restaurants in a given neighbourhood); and 3) analysis of existing data sets, often using Geographic Information System (GIS).4 GIS allows the integration, presentation, and analysis of data with spatial references, for example overlaying a database of supermarkets with a map of census boundaries. These disciplines and methodologies can reveal unique information about the diabetes epidemic and provide potential targets for intervention.

What can studies of the built environment tell us about patterns of diabetes?

One of the key associations between diabetes and the built environment is through food choices and diet. Studies have looked at how the food environment, which includes supermarkets, food stands, convenience stores, and restaurants, can differ by neighbourhood and how this relates to various health outcomes. One study of food store availability and neighbourhood racial composition found that none of the predominantly African-American census blocks examined in East Harlem had supermarkets or grocery stores.5 Another study found that fast-food restaurants were more likely to be found in lower income and higher traffic areas in King County, WA.6 Neighbourhood fast-food exposure has been associated with poorer diet quality and increased body mass index (BMI), particularly for local residents who do not own cars.7 According to a 2009 review article, residents with more access to supermarkets and limited access to convenience stores and fast-food generally have better diets and lower obesity rates.8 Moreover, those most affected by disparities in access to healthy food tend to live in low-income, minority, and rural neighbourhoods.9 These studies suggest that food choices and diet are influenced by multiple aspects of the built environment, including number and type of food stores, and that differences in neighbourhood access to healthy foods often reflect other demographic features (i.e. race, socioeconomic status).

The built environment has also been studied in relation to physical inactivity, another important contributor to obesity and the development of diabetes. Aspects of the built environment related to physical activity include access to recreation facilities, neighbourhood safety, open spaces, walking and cycling infrastructure, and length and nature of commute.4 Researchers in California established an association between obesity, physical inactivity, and commute time, as well as between obesity and vehicle miles of travel.10 One study found that greater neighbourhood physical activity resources were associated with lower insulin resistance, even after adjusting for age, sex, race/ethnicity, family history of diabetes, education, and income.11 The same study found that insulin resistance was also inversely related to neighbourhood healthy food resources, although this association was less robust.11 Furthermore, a longitudinal study found that better
neighbourhood resources, based on a composite score for healthy foods and physical activity, were associated with a 38% lower incidence of type 2 diabetes. Thus, certain features of contemporary North American urban design, such as a strong dependence on motorized transport and neighbourhood features that exclude opportunities to stay active, may be fuelling the diabetes epidemic.

A highly comprehensive study of diabetes and neighbourhood environments was conducted in Toronto and released in 2007. It received attention in the popular press, reflecting the nation’s growing recognition for interdisciplinary solutions. The researchers examined 140 Toronto neighbourhoods, and assessed the relationship between diabetes and factors such as socioeconomic status, ethnic composition, crime rates, car ownership, public transportation, access to healthy food, opportunities for physical activity, and access to health care and other services. Neighbourhoods with high rates of diabetes tended to have a higher proportion of visible minorities, immigrants, and low socioeconomic status residents. Features of the built environment, however, played a significant role in mediating these effects. For example, poor, immigrant neighbourhoods had lower rates of diabetes than expected if they were found to be activity-friendly with good infrastructure, whereas more affluent neighbourhoods tended to have low rates of diabetes regardless of whether they were activity-friendly or had good access to healthy foods. Neighbourhoods with the highest rates of diabetes were in the more suburbanized northwest and east parts of the city, where there were not only high levels of poverty and visible minority residents, but also worse public transit, few opportunities for physical activity, poor access to healthy food, and low concentration of family physicians and diabetes education programs. The complex relationship between diabetes, socioeconomic status, and neighbourhood resources was also shown in a Scottish study in the year 2007. Deprived areas were found to have lower than expected rates of type 2 diabetes when they were surrounded by less deprived areas with better resources.

What are the implications of built environment research on controlling the diabetes epidemic?

Urban sprawl has been linked to a variety of health-related concerns including air pollution, water quality, traffic accidents, and mental health issues. The studies described above indicate that urban design and aspects of the built environment can play an important role in the development of type 2 diabetes and its risk factors. Tackling the diabetes epidemic will require more than simply advising people to lose weight, eat better, and exercise more. There are features of our physical surroundings that can shape our individual and collective health and health-related decisions. These features include proximity of grocery stores, safe and pleasant opportunities for physical activity, and time spent commuting. The implications of this research are that changes can be made to the built environment to positively influence health outcomes. Neighbourhoods could be made more activity-friendly by improving sidewalks and bicycle paths, building recreation spaces, and instituting mixed land-use patterns in more suburban areas to provide better walking destinations. Diets may be improved by providing incentives for grocery stores to move into high-need areas, improving public transit so at-risk people can access healthy food, and developing policies that promote healthier choices at fast-food restaurants. However, making these kinds of changes would require collaboration between a diversity of stakeholders at all levels, including city planners, public health researchers, policymakers, community organizations, and grassroots initiatives.

Conclusion

The interdisciplinary study of health and the built environment is an important and growing field that can offer a unique contribution to chronic disease research. The built environment affects health at the individual, neighbourhood, and population level and can account for many of the spatial and demographic patterns in diabetes prevalence. Looking at diabetes rates from the perspective of the built environment can enhance our understanding of the emerging epidemic and can identify new targets for disease control and prevention.

References

6. Hurvitz PM, Moudon AV, Rehm CD, Streichert LC, Drewnowski A. Arterial roads and area socioeconomic status are predictors of fast food restaurant density in King County, WA. Int J Behav Nutr Phys. 2009;6(46).
7. Moore LV, Diez Roux AV, Nettleton JA, Jacobs DR, Franco M. Fast-food consumption, diet quality, and neighbourhood exposure to fast food: the multi-
Diabetes and the built environment

Interdisciplinary collaboration