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Editorial

The influence of the built environment on transport and health

There is a growing understanding within public health, transportation engineering, and urban planning of the mechanisms by which features of the built, natural, and social environments impact physical and mental health. The World Health Organization and the U.S. Surgeon General recently announced calls to action to create and implement strategies to reduce adverse health impacts of auto dependent environments and to foster increased supply of health promoting environments for healthy aging (HHS, 2015; WHO, 2016). A special issue of the *Lancet* on Urban design, transport and health was just released focusing on ways the built environment impacts public health (Giles-Corti et al., 2016; Sallis et al., 2016; Stevenson et al., 2016). Evidence being published within the academic literature on transportation and health is finding many applications to real world decisions. Policy makers and planners are applying evidence through decision-support scenario planning tools predicting health outcomes associated with contrasting transportation and land use actions (Frank et al., 2015, 2017; SCAG, 2016).

Longitudinal studies have documented positive impacts of physical activity on a range of non-communicable diseases including type II diabetes, cardiovascular disease, cognitive impairment (Reiner et al., 2013), cancer (Goncalves et al., 2014; Wanner et al., 2014) and mortality (Kelly et al., 2014; Wen et al., 2012). Engagement in active transportation as a form of physical activity leads to improved fitness (Larouche et al., 2014) and health outcomes. A handful of studies have documented causal impacts of the built environment on walking as a form of physical activity (Knuiman et al., 2014; McDonald et al., 2012) and a few studies have even extended these impacts to non-communicable disease endpoints (Ewing et al., 2014; Hirsch et al., 2014; Hoehner et al., 2012).

However, evidence is limited in several critical areas. Finding consistency of results is hampered by different spatial methods used to measure environmental features. Objective and perceived aspects of the built environment have seldom been applied in low and middle income countries; yet many of the largest urbanized areas are in the developing world and generalizability of research from high income countries is limited. Few studies have created consistent objective measures of the built environment across the globe allowing a wider range of environmental contexts to be linked with travel and activity patterns. Most research has been on home rather than work environments yet many people spend as much time at work. In addition, the role of cycling in meeting physical activity targets and ways to address injury prevention has been limited. Pedestrian environments or “micro-scale” features such as sidewalk presence and quality, seating, vegetation, lighting, and intersection design has been understudied to date due to high “in-field” data collection costs.

This special issue addresses these important gaps in the literature. It contains new causal evidence linking walkability directly with chronic disease outcomes through a mediated physical activity pathway. Wasfi et al. (2016) in their study of 2976 Canadians found that moving to a higher walkable neighbourhood increased the odds of moderate and high utilitarian walking by 59% compared with other types of residential moves. Braun et al. (2016) also studied residential relocation but in a novel advancement extend results to include cardiometabolic risk in their CARDIA study on 1079 participants age 32–46. They found one-SD increase in walkability was associated with a 0.81 mm Hg decrease in systolic blood pressure and a 7.4% increase in C-reactive protein. Usage of biomarker data in health and built environment research will advance the understanding of not only disease onset but how environmental influences interact with individual pre-disposition to illness.

Despite the chronic disease and environmental benefits of encouraging active travel, without interventions to create safer environments, road trauma will increase (Stevenson et al., 2016). This can be managed by providing pedestrian and cycling infrastructure. Chen and Zhou (2016) found that crashes were more likely in areas with more pedestrians, and urban design features consistently shown to encourage walking (e.g. street connectivity) increase the risk of injury. This study highlighted the importance of providing pedestrian infrastructure, and the need to separate pedestrians from motor vehicles. Brown et al. (2016) evaluated cycling changes in a neighborhood receiving a bike lane, light rail, and other “complete street” improvements in Salt Lake City, Utah. Objective physical activity data collection was conducted for one week pre and post construction with results showing new start up cyclists post construction and that cyclists were more physically active than non-cyclists. Fitch et al. (2016) examine the influence of stress stemming from proximity to automobile traffic on bicycling to elementary and junior high school. Results suggest that changing the street environment to reduce traffic stress along routes along with shorter travel distances to school will increase the number of students bicycling and improve student health.

Standardization of built environment predictors and physical activity related outcomes globally and maximizing the variation of built environment features is a core feature of the International Physical Activity and Environment Network (IPEN). Christiansen et al. (2016) provide an IPEN paper which for the first time, documents strength, shape, and generalizability of relations of objectively measured built environment variables with transport-related walking and cycling in an analyses of 12,181 adults aged 18–66 years, drawn from 14 cities across 10 countries worldwide. Positive associations of walking for transport with all the environmental attributes was documented and

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the study goes further to assess the nature of the relationships in terms of linearity for specific built and natural environment predictors. Cycling for transport was also assessed globally in relation to built environment features.

A growing interest in pedestrian environment features has resulted in many studies conducting costly in field audits of streetscape features which have been shown to be significant predictors of physical activity (Bracy et al., 2014; Cain et al., 2014). Kurka et al. (2016) used Google Streetview online to assess streetscapes in a standardized manner in Phoenix. They evaluated the validity and reliability of an online version of the Microscale Audit of Pedestrian Streetscapes (MAPS) tool by comparing Google's Aerial View (AV), Street View (SV), and a composite of the two views (Composite) to in-person field audits. They conclude that online tools provide an acceptable cost and time saving alternative to in-field audit.

Conducting research in smaller regions and towns on built environment and health relationships has been difficult due to data limitations. The lack of work in this context has been a major criticism. Stewart et al. (2011) provide helpful guidance and tools for accessing and using increasingly available built environment data and address its varying quality and completeness and application within the context of public health research.

Adams et al. (2016) provide evidence on the relationship between perceptions of work environment walkability and health outcomes. In a unique study of perceived built environment and health outcomes in India, Adlakha et al. (2016) document how the four combinations of high and low residential density and SES report systematic differences in land use mix, street connectivity, aesthetics, safety from crime, and patterns of transportation related physical activity, sitting time and weight status.

A study conducted in Paris by Feuillet et al. (2016) examined relationships between land use mix heterogeneity and locations of where people walk for leisure and transport. Their results suggest that observed relationships are due to contextual effects from the combination of environmental and individual characteristics. Many westernized nations are facing a growing proportion of older adults who have a heightened sensitivity to the built environments where they live, work, and play. In a study of age and retirement differences in built environment and active travel Barnes et al. (2016) linked 3890 older adults from the Canadian Community Health Survey Healthy Aging Cycle from British Columbia ($N=3860$) with Walkscore and Transit Score at the place of residence. They found a 10-point higher Walk Score was associated with 34% higher odds of walking for transport and a 10-point higher Transit Score was associated with 37% higher odds of walking for transport.

Similarly, Fitch et al. (2016) examined the impact of traffic exposure on cycling in elementary and junior high schools students. They found that modifying urban design features around schools to reduce traffic stress, would increase the number of children who cycle to school. As the world struggles with decreasing levels of physical activity and rising levels of obesity in youth, these important intervention could positively influence the health and wellbeing of students, if done safely to reduce the risk of road trauma by separating cyclists from traffic.

This special issue advances both new research methods and provides new results conveying how features of residential, work, and recreational environments impact health; and highlights new areas for research. Methodological advancements include the standardization of approaches to objectively measure walkability and collect data in rural settings, and cost effective methods to collect pedestrian environment features globally. Causal evidence is presented documenting changes health outcomes from moving and from changes to the physical environment. Presence of biomarker data from the CARDIA study presents an important advancement to the field. The importance of perception of the built environment in predicting active transportation is explored through a developing country lens and also at worksites. An expanded understanding of factors influencing cyclist and pedestrian safety from vehicular traffic is also provided, and the importance of installing pedestrian and cycling infrastructure highlighted. This special issue offers several new advancements in our understanding of ways in which the design of the environment contributes to our health and well-being.

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