

“Study Designs and Analytic Strategies for Environmental and Policy Research on Obesity, Physical Activity, and Diet”

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Research status and gaps related to environment, policy, and physical activity

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Key gaps

1. The overwhelming majority of research evidence on built environment, policy, and physical activity is cross-sectional, making it difficult to establish causal inference. Cross-sectional evidence for built environment/policy and physical activity is particularly problematic (i.e., far from causal), for many reasons, including:

- a. potential confounding is highly plausible; that is, well-established attitudinal, demographic, and other psychosocial factors that are related to physical activity likely also affect the choice of environments in which individuals select to live, work, and play and/or the way that individuals structure such environments,
- b. the high cost and effort required to bring about environmental and/or policy change sets a high bar for more definitive evidence that such change will have a significant impact on physical activity,
- c. like education-based health promotion programs that seem to only affect those who least need to change their behavior, there is concern that changing physical activity environments or policy will only impact those individuals who are already attitudinally and culturally pre-disposed to being sufficiently active.

The need for better research designs is highlighted in various primary data and review articles:

- “Many transport policy interventions constitute natural experiments, in which effects on population health could and should be evaluated using well designed prospective (and, where appropriate, controlled) studies”.¹
- “Prospective and intervention studies are particularly needed so that conclusions can be drawn regarding the possible causal nature of these environment-behavior relationships”.²
- “Prospective studies are needed to increase understanding of the interplay between self-selection, personal attributes, and environmental determinants of physical activity”.³
- “Although we statistically controlled for socioeconomic status (SES) and gender, longitudinal comparisons of participants who switch modes would provide a stronger basis for establishing causality”.⁴

There are positive derivatives of the cross-sectional evidence to date, including the identification of potential constructs to evaluate and instruments and methods to evaluate these constructs, the establishment of multi-disciplinary teams, the identification of potential confounding issues and research gaps, and hope and interest given some positive consistent cross-sectional findings in built environment and physical activity.

2. There exists little evidence that fully tests the ecological model for physical activity, resulting in significant limitations to the evidence to date. First, examinations of single environments (e.g., home or work or neighborhood or school, etc) fail to appreciate the individuals’ existence in multiple environments throughout any given day, week, month, etc. If physical activity promotion is a daily or weekly endeavor to reach recommended levels, individuals’ full environmental exposures across these timeframes need to be considered. Second, examinations often fail to appreciate the ways in which different individuals perceive and interact with the same environments (Why are their differences in physical activity between individuals who live in the same household? Are these differences completely explained by attitudinal differences or are we mis-specifying at some environmental level?) and also failing to appreciate the reciprocal determinism that exists when individuals exert influence over their environment. There is a need to move beyond considering individual-level factors as nuisance or potential confounding variables and to start to examine ways that individual-level factors are a match or mismatch with environmental factors or exposures that result in variability in individuals’ physical activity.

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3. There continue to be some important disconnects that hamper the necessary accumulation of evidence regarding built environment/policy and physical activity. First, policy and built environment changes are occurring without evaluation being conducted. This may result from the lack of resources available for such evaluation, the lack of interest in evaluation, the lack of necessary skill sets to conduct evaluation, or for other reasons. Second, the environmental factors that have been studied cross-sectionally are often not readily changeable or of interest to the community, making it less likely that local decision-makers can use this information to make policy and built environment changes. Such localization may be particularly important in marginalized communities. Third, many funding mechanisms, including both the application (e.g., too long a turnaround between application and actual funding) and timing of funding (e.g., funding is only for a brief period of time, but environmental change and resulting behavior change is often slow), are not responsive to the evaluation needs of natural experiments occurring in built environment and policy around physical activity.

4. Although natural experiments and other quasi-experimental designs are uncommon at this point in the field of built environment/policy and physical activity, we need to learn from prior failings in the use of such designs (and randomized clinical trials) in other fields. Most importantly, these include:

- a. the need to measure not only physical activity behaviors before and after environmental and/or policy changes, but actual changes in the environment and policy; this is analogous to not just assuming within a randomized clinical trial that the manipulation/intervention was implemented, but measuring to make sure that it was implemented (e.g., if policy on physical activity environments in daycare settings is changed, we need to examine how the policy change actually affected physical activity environments – how and how much did they change – and then link this to changes in daycare children’s physical activity),
- b. the need to establish systematic built environment/policy surveillance now, in order to establish more complete “baselines” and to create future opportunities for evaluating environmental/policy change effects.

5. The best empirical evidence on built environment/policy only explains a small proportion of variability in physical activity. This results likely in part from:

- a. the lack of a more accurate determination of what constitutes an individuals’ physical activity environment; for example, reliance on rigid geographies or radial buffers in examining neighborhood built environment is incomplete at best and inaccurate at worst; evidence that locates an individuals’ activity (e.g., links specific locations to specific physical activity done at that location) or lack of activity is a first step in better specifying an individuals’ environment, but more work is needed to identify an individuals’ physical activity environment and the factors that impact the determination or boundaries of this environment
- b. an incomplete specification of the environmental factors (e.g., missing some important environmental factors or the interaction of some environmental factors) or a lack of sensitivity of the built environment constructs measured (e.g., parents may not report living in a high crime area, but may be very concerned about their child’s personal safety in their neighborhood because of other activities that are not necessarily criminal).

In summary, there are numerous key gaps in the empirical evidence on built environment, policy, and physical activity. This is a critical time in which to begin to address these gaps through more innovative experimental designs, more complete evaluation of ecological model, and more specificity in environment and behavior, in order to better inform environmental and policy strategies to increase physical activity across the population.

1. Ogilvie D, Egan M, Hamilton V, Petticrew M. Promoting walking and cycling as an alternative to using cars: systematic review. *British Medical Journal*; 2004;doi:10.1136/bmj.38216.714560.714555.
2. Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: A review. *American Journal of Preventive Medicine*. 2002;22(3):188-199.
3. Librett JJ, Yore MM, Schmid TL, Kohl I, H.W. Are self-reported physical activity levels associated with perceived desirability of activity-friendly communities? *Health & Place*. 2007;13:767-773.

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4. Wener RE, Evans GW. A morning stroll: levels of physical activity and mass transit commuting. *Environment and Behavior*. 2007;39:62-74.

Published Reviews of Environment, Policy, and Physical Activity since 2002

- Badland, H. and G. Schofield. Transport, urban design, and physical activity: an evidence-based update. *Transportation Research Part D*. 10:177-196, 2005.
- Badland, H. M. and G. M. Schofield. The built environment and transport-related physical activity: what we do and do not know. *Journal of Physical Activity and Health*. 2:435-444, 2005.
- Bauman, A. E. and F. C. Bull. Environmental correlates of physical activity and walking in adults and children: a review of reviews. Review undertaken for the National Institute of Health and Clinical Excellence, February 2007.
- Brownson, R. C., D. Haire-Joshu, and D. A. Luke. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. *Annual Reviews of Public Health*. 27:341-370, 2006.
- Cao, X., P. L. Mokhtarian, and S. Handy. *Examining the impacts of residential self-selection on travel behavior: methodologies and empirical findings*: Institute of Transportation Studies, University of California Davis, Publication UCS-ITS-RR-06-18, 2006.
- Committee on Physical Activity, Health, Transportation, and Land Use. *TRB Special Report 282: Does the Built Environment Influence Physical Activity? Examining the Evidence*. Transportation Research Board and Institute of Medicine Committee on Physical Activity Health Transportation and Land Use (Ed.) Washington, DC: National Academies, 2005. Available at www.nap.edu/catalog/11203.html
- Cunningham, G. O. and Y. L. Michael. Concepts guiding the study of the impact of the built environment on physical activity for older adults: a review of the literature. *American Journal of Health Promotion*. 18:435-443, 2004.
- Duncan, M. J., J. C. Spence, and W. K. Mummery. Perceived environment and physical activity: a meta-analysis of selected environmental characteristics. *International Journal of Behavioral Nutrition and Physical Activity*. 2:11; 05 September 2005. Available doi:10.1186/1479-5868-2-11.
- Ewing, R. and Certero, R. Travel and the built environment: A synthesis. *Transportation Research Record*. 1780:87-114, 2001.
- Ferreira, I., K. van der Horst, W. Wendel-Vos, S. Kremers, F. J. van Lenthe, and J. Burg. Environmental correlates of physical activity in youth – a review and update. *Obesity Reviews*. 8:129-154, 2006.
- Foster, C., M. Hillsdon, N. Cavill, F. Bull, K. Buxton, and H. Crombie. Interventions that use the environment to encourage physical activity: evidence review. National Institute for Health and Clinical Excellence, September 2006. Available at www.nice.org.uk.
- Heath, G. W., R. C. Brownson, J. Kruger, R. Miles, K. E. Powell, L. T. Ramsey, and the Task Force on Community Preventive Services. The effectiveness of urban design and land use and transport policies and practices to increase physical activity: a systematic review. *Journal of Physical Activity and Health*. 3:S55-s76, 2006.
- Humpel, N., N. Owen, and E. Leslie. Environmental factors associated with adults' participation in physical activity: a review. *American Journal of Preventive Medicine*. 22:188-199, 2002.
- Kaczynski, A. T. and K. A. Henderson. Environmental correlates of physical activity: a review of evidence about parks and recreation. *Leisure Sciences*. 29:315-354, 2007.
- Killoran, A., N. Doyle, S. Waller, C. Wohlgemuth, and H. Crombie. Transport interventions promoting safe cycling and walking: evidence briefing. National Institute for Health and Clinical Excellence, July 2006. Available at www.nice.org.uk.
- Krahnstoever Davison, K. and C. T. Lawson. Do attributes in the physical environment influence children's physical activity? A review of the literature. *International Journal of Behavioral Nutrition and Physical Activity*. 3: 19, 27 July 2006. Available doi: 10.1186/1479-5868-3-19.
- McCormack, G., B. Giles-Corti, A. Lange, T. Smith, K. Martin, and T. J. Pikora. An update of recent evidence of the relationship between objective and self-report measures of the physical environment and physical activity behaviours. *Journal of Science and Medicine in Sport*. 7:81-92, 2004.

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- McMillan, T. E. Urban form and a child's trip to school: the current literature and a framework for future research. *Journal of Planning Literature*. 19:440-456, 2005.
- Ogilvie, D., M. Egan, V. Hamilton, and M. Petticrew. Promoting walking and cycling as an alternative to using cars: systematic review. *BMJ*. Available at: doi:10.1136/bmj.38216.714560.55 (published 22 September 2004) Accessed June 29, 2005.
- Owen, N., N. Humpel, E. Leslie, A. Bauman, and J. F. Sallis. Understanding environmental influences on walking; Review and research agenda. *American Journal of Preventive Medicine*. 27:67-76, 2004.
- Saelens, B. E. and S. Handy. Built environment correlates of walking: a review. *Medicine and Science in Sports and Exercise*. In press.
- Saelens, B. E., J. F. Sallis, and L. D. Frank. Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Annals of Behavioral Medicine*. 25:80-91, 2003.