

INTRODUCTION

TWO INSTRUMENTS TO SCORE ENVIRONMENTS FOR NEIGHBORHOOD WALKABILITY

November 15, 2005

Anne Vernez Moudon, Dr. es Sc., University of Washington
Chanam Lee, Ph.D., Texas A&M University
Allen D. Cheadle, Ph.D., University of Washington
Cheza Garvin, Ph.D., Seattle-King County Public Health
Donna Johnson, Ph.D., University of Washington;
Thomas L. Schmid, Ph.D., Centers for Disease Control and Prevention;
Robert D. Weathers, Ed.D., Seattle Pacific University

ACKNOWLEDGMENTS

This study, the WALKABLE AND BIKABLE COMMUNITIES (WBC), was supported by Cooperative Agreement Number 1- U48/CCU209663 from the Centers for Disease Control and Prevention through the University of Washington Health Promotion Research Center. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention. We thank Dr. Jean-Ives Courbois for statistical and Mr. Phil Hurvitz for GIS support. Jason Scully, Jeanine Cavalli, and Gwen Rousseau were Research Assistants on the project.

Background

Walking is the most popular form of exercise, and serves as an environmentally friendly mode of transportation for short trips. The frequency and amount of walking depend on the detailed characteristics of physical environments. Empirically based, validated instruments are needed to assess the current physical environmental conditions for walking, and to determine future environmental intervention strategies to improve walkability.

Objectives

This website presents two instruments to score neighborhoods for their walkability, the Neighborhood Walkability Score Survey and the Neighborhood Walkability Score GIS, addressing lay and professional audiences, respectively. This introduction summarizes the methods used for developing the tools, and describes the design and target users of the two instruments.

Methods

Data sources included a telephone survey (n = 608) with questions on walking behaviors, socio-demographic and household characteristics, and attitudes toward and

perceptions of the neighborhood. The physical environment was measured using parcel-based and network Geographic Information System (GIS) data. Buffer measures around each respondent's home captured general neighborhood characteristics. Proximity measures included distances from home to individual and groups of potential walking destinations. Multinomial logit models were fitted estimating the odds of walking sufficiently to meet recommendations for health (150+minutes per week) and moderately (1-149 minutes per week), relative to not walking. The models identified environmental variables most associated with walking, controlling for the survey variables. Environmental variables were further evaluated for ease of measurement before being included in the two audit instruments.

Results

Twelve GIS-based environmental variables were found to be significantly associated with walking, including availability of, or distance to various potential destinations. Grocery stores, eating and drinking places, and retail stores, were positively, and offices and schools were negatively associated with walking in the neighborhood. Smaller block size, more extensive sidewalk networks along main streets, and higher parcel-level density were positively associated with walking.

The two audit instruments measure environmental characteristics at individual residential locations, corresponding to the unit of analysis in the statistical models. Neighborhood walkability scores or the probabilities of walking for an area, such as a neighborhood and a city, are estimated by applying the audits to samples of individual respondent home locations in the area of interest.

The **NEIGHBORHOOD WALKABILITY SCORE Survey Tool** translates the 12 objective environmental measures into 22 questions, including: (a) total counts of and distance to destinations, (b) size of street blocks, (c) sidewalk length, and (d) residential densities. The tool is designed for simplicity and ease of use, geared toward the general public, community residents, and demographic sub-groups (e.g. older adults). The paper or the electronic version of the tool can serve in a variety of settings with minimum preparation and administration. Answers from individual respondents are combined to estimate overall neighborhood walkability. The instrument was tested for validity and reliability using a sample of 50 volunteers.

The **NEIGHBORHOOD WALKABILITY SCORE GIS Tool** is a non-obtrusive audit method that may be promising for surveillance efforts. It includes 17 simple GIS queries (e.g., overlay and buffering) that a professional can respond to using publicly available parcel and network GIS databases. Responses are entered in a spreadsheet that automatically computes the expected probabilities of walking for each observation point, which can then be aggregated up to any geographic area of interest.

The NEIGHBORHOOD WALKABILITY SCORE GIS Tool offers the capacity of mapping graphical representations of neighborhood walkability. Its surface modeling function can create continuous surfaces showing the spatial patterns of likelihood of walking. The maps can also simulate the impact of "before and after" intervention scenarios on the probability of walking, or on the probability of walking for particular segments of the population. This tool can assist local jurisdictions in assessing the relative levels of walkability across different neighborhoods or areas. The scores and maps can also be

used to identify particular neighborhoods to target public investments for improving walkability.

Conclusions

The two audit instruments described in this poster are based on easily measurable attributes of the physical environment. The Neighborhood Walkability Score Survey is a simple tool that can be used by non-experts. The Neighborhood Walkability Score GIS provides a more precise, and unobtrusive approach to measuring walkability. Both instruments are geared toward all but the lowest density environments in urban and suburban areas. These tools have the potential to serve as part of a national surveillance system, given adequate testing in other metropolitan regions and rural areas.

Further References on the Research That Lead to the Development of the Two Instruments

- Moudon, AV, C Lee. 2003. "Walking and Biking: An Evaluation of Environmental Audit Instruments." *American Journal of Health Promotion* 18, 1 (September): 21-37.
- Lee, C, AV Moudon. 2004. "Physical Activity and Environment Research in the Health Field: Implications for Urban and Transportation Planning Practice and Research." *Journal of Planning Literature*. 19:2 (November): 147-181
- Lee, C, AV Moudon, J-Y Courbois. 2005. "Built Environment and Behavior: Spatial Sampling Using Parcel Data." *Annals of Epidemiology*. Jul 5;[Epub ahead of print]
- Moudon, AV, C. Lee, A. Cheadle, C. W. Collier, D. Johnson, T. L. Schmid and R. D. Weathers. (In press). "Cycling and the Built Environment, a U.S. Perspective." *Transportation Research D*.
- Moudon, AV, C. Lee, A. Cheadle, C. W. Collier, D. Johnson, T. L. Schmid, R. D. Weathers, and L. Lin. (In press). Operational definitions of walkable neighborhood: Theoretical and empirical insights. *Journal of Physical Activity and Health*. Supp. Issue 2006.
- Lee, C, AV Moudon. (In press). Environmental correlates of walking for transportation or recreation purposes. *Journal of Physical Activity and Health*. Supp. Issue 2006.
- Lee, C. A. Cheadle, C. W. Collier, D. Johnson, T. L. Schmid, R. D. Weathers (in press). The 3Ds+R: Quantifying Land Use and Urban Form Correlates of Walking. *Transportation Research-B*
- Moudon, AV, C. Lee, A. Cheadle, C. W. Collier, D. Johnson, T. L. Schmid and R. D. Weathers. (under review). Attributes of Environments Supporting Walking. *American Journal of Health Promotion*

For further information please contact
Prof. Anne Vernez Moudon (moudon@u.washington.edu)
Urban Form Lab Gould 410 Box 355740
Seattle, WA 98195
206-685-4057 / 206-616-7308

