



Original Article

Predictors of discordance between perceived and objective neighborhood data

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ABSTRACT

Purpose: Pathways by which the social and built environments affect health can be influenced by differences between perception and reality. This discordance is important for understanding health impacts of the built environment. This study examines associations between perceived and objective measures of 12 nonresidential destinations, as well as previously unexplored sociodemographic, lifestyle, neighborhood, and urbanicity predictors of discordance.

Methods: Perceived neighborhood data were collected from participants of the Survey of the Health of Wisconsin, using a self-administered questionnaire. Objective data were collected using the Wisconsin Assessment of the Social and Built Environment, an audit-based instrument assessing built environment features around each participant's residence.

Results: Overall, there was relatively high agreement, ranging from 50% for proximity to parks to more than 90% for golf courses. Higher education, positive neighborhood perceptions, and rurality were negatively associated with discordance. Associations between discordance and depression, disease status, and lifestyle factors appeared to be modified by urbanicity level.

Conclusions: These data show perceived and objective neighborhood environment data are not interchangeable and the level of discordance is associated with or modified by individual and neighborhood factors, including the level of urbanicity. These results suggest that consideration should be given to including both types of measures in future studies.

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Introduction

There is growing evidence that the built environment has far-reaching impacts on many health-related behaviors and outcomes, including physical activity, obesity, mental health, and quality of life [1–8]. Despite this progress, methodological challenges regarding measurement and characterization of the built and social environment remain. Although many types of measures (surveys, geographic information systems-based and objective audits) have demonstrated associations between various aspects of the built environment and health outcomes [1,3,9–12], the relative strengths and weaknesses of each type of measurement approach in terms of providing reliable and valid measurements, as well as relative importance in predictability of health impacts, remains unclear. How one perceives their environment compared with what is observable by others can have different impacts on health-related

behaviors and outcomes. Furthermore, the impact of the mismatch between the two is important in understanding the myriad of pathways by which neighborhoods can affect health [13]. Improved measurement is needed to disentangle the complex relationships between how one perceives and responds to their environment and other social influences relative to actual features, as well as how these relationships operate in varying geographic and social contexts [13–16].

Several previous studies have found moderate to poor agreement between perceived and objectively collected data [17–22] with varying associations of health outcomes [23]. Gebel et al. [18] provide evidence that discordance between measurement types is associated with weight gain, suggesting that characterizing discordance is important for understanding how the built environment affects health. Furthermore, identifying perceived versus objective determinants of concordance is important for designing effective interventions aimed at improving health. In some circumstances, increasing awareness, rather than (or in addition to) modifying the physical environment may prove more effective [24]. Conversely, it is possible that by modifying surroundings, behavior changes may follow, regardless of how people perceive their environment.

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Previous studies of predictors of discordance between individual perceptions and objectively measured built environment features have been mixed. Older individuals, those with low income and education, less physically active, shorter duration of time in residence, and cohabitation have been shown to be associated with higher discordance [8,17,21]. However, these studies collected only basic demographic and other individual characteristics, and other more detailed information on psychosocial or geographic determinants has not been explored. This limits the ability to comprehensively assess potential behavioral, psychosocial, and neighborhood-level predictors of discordance. In addition, most previous studies have focused on high-density urban areas (characterized by dense housing, grid-like street networks, and mixed-use zoning [25]), and few have explored the role of the built environment in suburban or rural communities [8,9,24]. The built environment varies dramatically between urban, suburban, and rural settings, and this is a crucial but largely neglected aspect of built environment research [3].

This article presents analysis of associations between perceived and objective measures of the built environment within a representative sample of the statewide population of Wisconsin. Levels of agreement between perceived and objective built environment data, using presence/absence of nonresidential destinations, were assessed. In addition, we explored whether lifestyle, health status, neighborhood perception, and neighborhood-level characteristics predict or modify the level of discordance between perceived and objective built environment assessments. The comprehensive data sets used in this study allow for greater exploration of the effects of individual and neighborhood-level predictors on discordance, including specific behavioral and health predictors, as well as neighborhood satisfaction variables which have not been examined in previous studies. Furthermore, the use of a statewide survey allows exploration of the effects of urbanicity on discordance between perceived and objective data.

Methods

Data

This study uses data from the Survey of the Health of Wisconsin (SHOW), an ongoing, annually representative, cross-sectional, statewide household-based interview and examination survey in Wisconsin that collects data on a wide array of health-related topics [26]. During the summer of 2011, past SHOW participants' households were revisited and the Wisconsin Assessment of the Social and Built Environment (WASABE) audit was conducted.

Study sample

A total of 652 households were assessed using the WASABE audit tool during the summer of 2011, corresponding to 943 individual SHOW participants who are part of the 2010 annual sample. Participants who completed the entire SHOW study in 2010 and for whom WASABE data were collected were included in present analysis ($n = 838$).

Perceived measures of nonresidential destination

In addition to a broad range of sociodemographic, psychosocial, and lifestyle factors, SHOW participants are asked approximately how far 20 nonresidential destinations are from their residence (0–10 and 11–20 minutes, and so forth) in walking distance. Participants are also asked to rate their community as a place which is conducive to physical activity, safe from crime and traffic, well maintained, and interesting. Measures of perceived destinations are

calculated as binary variables, in which a destination is considered present if a participant indicated the destination was within a 10-minute walk and absent if distance was reported as missing or greater than a 10-minute walk. Safety and aesthetics were measured by participant's level of agreement with the statement that the neighborhood is safe from crime or traffic, or well maintained.

Objective measures of nonresidential destinations

The WASABE instrument gathers objective neighborhood-level data around the household of each SHOW participant. The instrument includes validated measures of the social and built environment covering five domains (destinations/land use, connectivity, social environment, transportation environment, and neighborhood characteristics). A 400-m buffer (or about a quarter mile, approximately equivalent to a 5- to 10-minute walk) [2,7,24] was drawn using Street Network Analyst in Arc Map 9.3 (ESRI, Redlands, CA). Trained raters systematically gathered data on the number and type of destinations for each segment within the specific buffer.

Predictors

Three broad categories of self-reported or examination-based predictors of discordance of SHOW participants' perceptions with objective assessments were analyzed: sociodemographic/lifestyle, health and mental health status, neighborhood perception, and urbanicity levels. Sociodemographic/lifestyle variables analyzed were age, race/ethnicity, gender, marital status, years of residence in household, number of people in household, and education. Health status variables included depression [27], body mass index (weight (kg) divided by height (m) squared), chronic disease status, physical activity level [28], and dog ownership (as a proxy for neighborhood walking) [29,30]. Neighborhood variables included perceptions of the neighborhood for physical activity based on safety from crime or traffic, neighborhood well maintained, and feelings regarding neighborhood as a place to be physically active.

A narrow definition of "urban," as a densely populated, urban center with a grid-like street network [25] adapted for use specifically with Wisconsin U.S. census block groups [31] was used for this study. This definition, based on a population density approach, focuses on differentiating between urban, suburban, and rural by accounting not only for the population density of a specific block group but also incorporating density measures from surrounding block groups. This measure was selected, to gain insight into generalizability of results *vis-à-vis* previously conducted studies in densely populated centers [3]. Finally, the number of destinations was included as an indicator variable to adjust for density and normalize comparisons of discordance across different geographies.

Discordance

Discordance between perceived and objective data is the primary outcome for analysis in this study. For example, a participant who perceives that a grocery store is within a 10-minute walk, but no grocery store is recorded in the objective audit would be coded as discrepant with respect to grocery stores. Discordance is defined as the presence of such a discrepancy for two or more destinations versus no discrepancy or discrepancy on only one measure.

Statistical analysis

All analyses were run using SAS 9.3 (SAS Institute, Cary, NC). The PROC FREQ and the SURVEYLOGISTIC procedures in SAS

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