

ORIGINAL RESEARCH

Differences in the Community Built Environment Influence Poor Perceived Health Among Persons With Spinal Cord Injury



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Abstract

Objective: To assess the association between characteristics of the built environment and differences in perceived health among persons with spinal cord injury (SCI) using objective measures of the local community derived from Geographic Information Systems data.

Design: Secondary analysis of cross-sectional survey data.

Setting: Community.

Participants: Persons with chronic SCI enrolled in the Spinal Cord Injury Model Systems database (N=503). All cases were residents of New Jersey, completed an interview during the years 2000 through 2012, had a complete residential address, and were community living at the time of follow-up.

Interventions: Not applicable.

Main Outcome Measure: Perceived health.

Results: Bivariate tests indicated that persons with SCI residing in communities with more (vs less) mixed land use and small (vs large) amounts of open space were more likely to report poor perceived health. No associations were found between perceived health and differences in the residential or destination density of the community. Adjusting for variation in demographic, impairment, quality of life, and community socioeconomic characteristics accounted for the gap in the odds of reporting poor health between persons living in areas with large versus small amounts of open space (odds ratio [OR], 0.54; 95% confidence interval [CI], 0.28–1.02). However, even after accounting for individual background differences, persons living in communities characterized by more heterogeneous land use were twice as likely to report poor health compared with persons living in less mixed areas (OR, 2.14; 95% CI, 1.12–4.08).

Conclusions: Differences in the built characteristics of communities may be important to the long-term health and well-being of persons with SCI who may have greater exposure to the features of their local area because of limited mobility. The results of this study suggest living in a community with more heterogeneous land use was not beneficial to the perceived health of persons with chronic SCI living in New Jersey. Further investigation is needed to assess if the relationships observed in this analysis are influenced by differences in infrastructure and resources across communities. Further research is also needed to investigate the role built environment plays in the long-term health and well-being of persons with SCI in other geographic locales.

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Return to the community after rehabilitation is not met with equal success by all survivors of traumatic spinal cord injury (SCI). In addition to impairment-related complications to adjustment, research finds that long-term differences in health and well-being after SCI are also influenced by social factors. Specifically, persons who are disadvantaged because of sex, low socioeconomic status (SES), ethnic minority background, and older ages are more

likely to report poorer health outcomes; diminished quality of life (QOL); and limitations to functioning, mobility, and social participation.¹⁻⁴ Some people are also geographically disadvantaged in that the conditions of the communities and neighborhoods where they live are detrimental to health and well-being.^{5,6} Several recent studies of the SCI population demonstrate that living in socially and economically disadvantaged communities has negative implications for physical activity, participation, and QOL,⁷⁻¹⁰ suggesting that community characteristics may influence differences in long-term outcomes after injury. To date, few studies have investigated the influence that differences in the physical infrastructure of communities, often referred to as the built environment, may have on outcomes after SCI.¹¹

A number of studies in the general population suggest that certain aspects of the built environment are positively associated with morbidity and mortality. Evidence demonstrates that greater land use mix (ie, community development that mixes multiple residential, commercial, and recreational uses in the same area), residential density, and proximity of recreational destinations are associated with more physical activity and lower rates of health problems (eg, obesity, cardiovascular disease).¹²⁻¹⁹ The natural features of communities—often referred to as open or green space—may also benefit health and well-being. Analyses of population-based data suggest that higher proportions of green space in the residential area are associated with lower rates of mortality,²⁰ common morbidities,²¹ and perceived poor health.²² Researchers attribute these associations to natural areas supporting healthy behaviors (eg, physical activity, social interaction).²³⁻²⁵ Additionally, proximity to viewable open space may be psychologically beneficial based on evidence that open space attenuates the relationship between stress and poor health for vulnerable populations.^{20,26,27} This suggested mechanism may have particular relevance to the well-being of persons with SCI because the high rates of mobility limitations, participation restrictions, and unemployment²⁸⁻³¹ that are common after injury may result in more exposure to the conditions of local communities.

Evidence supports the salience of built environment to vulnerable groups (eg, older adults, persons with mobility impairments).³²⁻³⁵ Specifically, features related to poor infrastructure (eg, broken sidewalks, unsafe parks, lack of public transportation) are associated with the increased likelihood of reported mobility^{36,37} and participation limitations,³⁸ whereas better connected neighborhoods have been associated with less reported disability among older adults.³⁹ Clarke and George³⁴ identified that living in neighborhoods characterized by mixed land use predicted greater functional independence among persons >65 years of age. To our knowledge, few studies have investigated the effect of open space on disability-related outcomes or among disabled groups. An exception is a recent analysis by Botticello et al¹¹ demonstrating that adults with chronic SCI living in

communities with large portions of open space were more likely to report full physical, occupational, and social participation.

Although research attention for the built environment has increased, investigations of the relevance of community characteristics to the health and well-being of chronically impaired populations (eg, SCI) are few. Awareness of the influence that places have on outcomes is critical to understanding the potential complications to successful adjustment after injury and the prevention of further disability. The objective of this study was to explore the relationship between the built environment and perceived health in SCI to assess the relevance of community differences for a relatively unexplored segment of the disabled population. This analysis investigated several aspects of the built environment, including residential density, land use mix, destination density, and open space, reported to influence health-related outcomes. Perceived health is an important global indicator of morbidity and mortality,⁴⁰⁻⁴² and studies of community effects on perceived health have widely demonstrated that exposure to disadvantaged economic, social, and physical community conditions increase reports of poor perceived health.^{43,44} The relationship between the built environment and perceived health was analyzed by linking survey data from the national Spinal Cord Injury Model Systems (SCIMS) database⁴⁵ with Geographic Information Systems (GIS) data on the built environment.

Methods

Participants

This analysis involved a sample of 577 SCIMS database participants from New Jersey. SCIMS database participants are persons who complete inpatient rehabilitation for traumatic SCI at a collaborating SCIMS center and consent to participate in follow-up interviews 1 year postdischarge and at subsequent 5-year intervals. Cases were included if the participant was age ≥ 18 years at the time of injury, completed a follow-up interview between 2000 and 2012, and had a valid residential address. SCIMS data collection is longitudinal. In cases where participants contributed multiple interviews over time, the last completed interview was selected for cross-sectional analysis. Of the 540 cases identified that met these criteria, 97% of the addresses were successfully geocoded (ie, matched to spatial coordinates), enabling linkages of survey and geographic data. Unmatched cases because of incomplete address information and cases with systematically missing values on the outcome variable were excluded from the analysis, yielding a final analytic sample of 503. The protocol for this study was approved by the primary author's local institutional review board.

Communities

Communities were defined by analytically constructing 5-mile (8.05 km) buffer zones around residential addresses. Information on built environment characteristics was obtained from GIS data published by the New Jersey Department of Environmental Protection and spatial data published by the Environmental Systems Research Institute.⁴⁶⁻⁴⁸ The buffer areas for a 8.4% portion of the sample extended over state lines, requiring supplementation with GIS data published by the United States Geological Survey.^{49,50} Both data sources classify land use/land cover (LU/LC) using

List of abbreviations:

CI	confidence interval
GIS	Geographic Information Systems
LU/LC	land use/land cover
OR	odds ratio
QOL	quality of life
SCI	spinal cord injury
SCIMS	Spinal Cord Injury Model Systems
SES	socioeconomic status
SWL	satisfaction with life

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