Obesity and the Built Environment: a cluster analysis of urban and peri-urban communities in the Greater Vancouver Regional District

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Abstract

The purpose of this research is to examine spatial clustering of obesity and physical activity and their relationship to specific aspects of the built environment.

Background and Relevance

The purpose of this research is to examine spatial clustering of obesity and physical activity and their relationship to specific aspects of the built environment. The prevalence of obesity in Canada has increased since the 1980's to the point that nearly 60% of adults are obese and overweight, and over a quarter is obese (Tjepkema, 2006). In order to understand the increase, researchers have attempted to construct linkages between obesity trends and the built environment (Papas et al., 2007). Several environmental variables have been cited as potential determinants of physical activity and obesity such as: presence of sidewalks, neighbourhood aesthetics, mixed land-use, street connectivity, access to recreational facilities, access to food, etc. (Frank, 2008). Assuming that the built physical environment does affect physical activity and obesity, then it would be expected that individual occurrences of high or low physical activity and obesity will be clustered. (Schuurman *et al.,* 2009). However, a remaining challenge is to determine the optimal methods for detecting clusters of both obesity and high/low physical activity.

Methods and Data

The data used were derived from the Prospective Urban-Rural Epidemiologic study, an international investigation set to identify the social and environmental determinants of obesity, diabetes, and cardiovascular disease. The cross-sectional data used in this analysis represent the built environment phase of the investigation with the objective of measuring the perceived and objective environmental determinants of health anthropometric measures, obesity, and related metabolic risk factors. 2000 men and women in 13 urban and peri-urban communities of the Greater Vancouver Regional District were recruited in 2008 and individual data were collected in 2009 . Measures of individual physical activity –recorded based on the International Physical Activity Questionnaire (short format) categories - were reported as total physical activity and converted into ordinal measurements. Obesity was determined by individual body mass index (BMI) derived from objectively measured height and weight with an intraclass correlation of .125. Participants' postal codes were geocoded using Geographic Information Systems. The challenge then was to test clustering measures. We used test

data from another study to determine pros and cons of each of several clustering methods. These included Morans I test statistic for global spatial-autocorrelation, Anselin's Local Moran statistic for local spatial-autocorrelation, and Geographic Weighted Regression (GWR). In each case, tests were conducted to detect potential clusters of point-based physical activity and BMI measurements. For the local test a row standardized, inverse-distance weighted spatial weights matrix was used based on manhattan distance. A bivariate version of Anselins's Local Moran statistic was also conducted to detect spatial dependency among participants' BMI and total physical activity.

Results

Preliminary results indicate that higher BMI and lower physical activity are somewhat correlated at the local level, however not correlated to the degree that was hypothesized (Schuurman *et al*., 2009). Generally, the local clustering measures were more efficient – given the resolution of neighbourhoods. Higher incidences of obesity and their relationship to physical activity may be linked to specific environmental variables that will be addressed in subsequent research. We expect that when we run these tests for each of the cities, we will find similar results.

Conclusions

Results from this research show that physical activity and obesity are clustered but further examination is required to extract the finer relationships between them. In addition, it indicates that local clustering measures may be more suitable for teasing out possible relationships between physical activity, obesity and the built environment. The relationship from this experiment begs us to consider other methods of analysis for more specific elements of the physical built environment. Elements such as land-use mixture, pedestrian connectivity, accessibility to recreational facilities, and accessibility to food outlets should be considered for the influence on physical activity and obesity. Other variables such as gender, age, deprivation measure, and primary mode of travel could also be used to elicit a more finite factor in trends of obesity.

References

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