



Land use perception of self-reported health: Exploratory analysis of anthropogenic land use phenotypes



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ABSTRACT

This paper investigates the spatial heterogeneity of self-reported health in the Greater Toronto Area in relation to its land use. This is implemented by means of local spatial autocorrelation of response types of the Canadian Community Health Survey (CCHS) and land use. Spatial heterogeneity was tested by assessment of the stratified responses of the survey, ranging from excellent to poor. A total of 8212 collected surveys from the CCHS master file for 2010 were used. Georeferenced surveys were agglomerated at census tract level, and spatial autocorrelation followed assessing of frequency distribution. The geography of the hotspots of surveys per response type was conducted. The resulting hotspots were compared to the properties of their land use types as to understand what the influence on surrounding land use on self-reported health is. A significant spatial autocorrelation exists over the region area concerning health perception, forming clusters in certain regions. A negative influence on self-reported health was found in commercial and industrial land use, while open spaces, on the other hands show significantly positive responses. While resource and industrial land use share a negative influence of self-reported health, open spaces and parks and recreational areas may lead to a better health perception. From a landscape and planning perspective, we argue that land use plays a crucial role in the complex social factors of health self-report. Geographic Information Systems and spatial analysis may allow to better understanding the combination of health factors and land use, as to allow a better planning of infrastructure and anthropogenic land use phenotypes for increasing health self-perception and wellbeing in developed countries.

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Introduction

Individual perception of health is of great importance to foster subjective wellbeing, which has a direct relation to economic growth in North America (Graham et al., 2010). Welfare, working conditions and socio-economic interactions play an important role to foster this wellbeing (Bambra et al., 2014). A combination of stimuli to welfare, within the health system can foster not only wellness, but also continued economic prosperity and a general perception of individual human health as is the case of its effect on morbidity (Ford et al., 2008). The complexity of economic growth however, has direct influences on the landscape, in particular in rapidly growing urban economies (Yue et al., 2013). A strong link between economic growth and land use change is shaping as an increasing

factor of loss of human health and wellbeing (Owringi et al., 2014). The consequence of land use change therefore, is not only an environmental concern, but also a complex interaction with liveability (Foley et al., 2005). With a direct repercussion on trauma, injuries have become a leading cause of mortality, with over 5 million deaths per year in the world as well as illnesses. Many of those are a consequence of rapid urbanization, calling forth for adequate planning and design in particular as a consequence of the interaction of pedestrians, traffic and response time (Zargar et al., 2001). Injuries and trauma have a direct influence on self-reported perception of health (Cott et al., 1999), a result of observation and witnessing as well as interacting with trauma (Hemenover, 2003). This is progressively the case in population dense environments, have long been considered to be strongly linked to health (Schmitt, 1966). In the Canadian metropolises and their rapidly changing population dense environments, this poses a risk to increase of trauma, but also on self-perceived health. Of particular concern are rapidly changing regions, such as is the case of the Greater Toronto Area,

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one of the most economically active regions in North America and a region in profound commercial transformation as well as structural changes in its transportation systems (Buliung et al., 2007). Canada, is registering an increasing concern regarding its public health system with an increasing in the number of traumatic injuries are the leading contributor for life loss before the age of 65, particularly in urban environments (Cusimano et al., 2010). The positive perception of one's own health must be fostered, while maintaining a general social perception of safety of urban regions by integration of natural land use environments and green spaces (de Vries et al., 2003). Regretfully, it is expected that injuries will continue likely to be a growing cause of concern in Canada. The co-relation between health-perception can be mitigated by means of creating a perception of safer environments. Land use, plays a crucial role in perception of health, as it defines the typology of environment and its geographical structure relating to health and place (Cummins et al., 2007). Such strategies to foment and understand the self-perception of health are thus an important reaction for local and regional wellbeing that must be understood in line with land use and gains a geographical expression (Breerton et al., 2008). Knowledge of the spatial distribution of self-perception of health allows thus for an ex-ante support system to integrate within the planning agenda (Corburn, 2003). This supports more sustainable cities, and fostering community driven wellbeing in line with the growing concern of injuries resulting from land use dynamics. The psycho-geographical aspects of self-perceived health therefore, strongly links with land use and must be comprehended from a locational perspective. In this sense, government and private sector can have a positive role in contributing to more liveable environments in particular given the increasing urbanization many North American cities have witnessed in recent years (Schneider and Woodcock, 2008). In this sense, land use configuration and residential environment have had a strong and ubiquitous impact on promoting health and wellbeing (Fuller et al., 2007). According to this perception of the importance of land use, in particular anthropogenic land use types and natural environment, recent years have fostered an increasing importance in urban and environmental planning to promote collective health in residential areas (Hartig and Lawrence, 2003). More dense urban areas are consistently linked to less liveable human environments. This leads to the necessity of monitoring rapidly expanding urban regions as to manage economic, environmental and social sustainability, but also promote an agenda of efficient public health through planning (Frumkin, 2002). Activities such as walking and cycling, the possibility of short distance travelling in line with diversified physical activity, has a cumulative effect on individual health, improvement of air quality, reduction of greenhouse emission (Giles-Corti et al., 2010). The role of transportation as such, known to be a strong indicator of anthropogenic land use, plays a decisive role on the commutes carried out and liveability of a region (Hino et al., 2013). This is extended to the role of neighbourhoods and place, an important role in line with wellbeing but also manifests itself as a collective experience of healthier living (Ellen and Turner, 1997). Nevertheless, the importance of land use in health self-perception has deserved limited attention, in line with spatial analysis and land use change. As pointed out by Dannenberg et al. (2003), background research has been carried out in several streams of this integrative subject, nevertheless, further investigation on the relationship between health and anthropogenic land use should be fostered. This unprecedented change in land use witnessed over the last decades, have led to a concerning amount of injuries, cardiac diseases and impacts on human as well as natural environment. The growing concentration of population in metropolitan regions as well as the changing nature of commercial retail and infrastructure in North America, suggest a continued growth in economic streams with growing risks, if not aligned with a multi-dimensional tier corresponding to

environmental and human sustainability. Land use types are intrinsically spatial, and evolve over time given land use dynamics that procure optimization mostly for economic activity, and evaluate complex interactions with the environment, landscape and sustainable development. Neighbourhoods as a result change dramatically and very rapidly, in particular when concerning urban expansion and loss of natural land.

North America has witnessed in certain metropolitan areas an unprecedented economic growth, in detriment of other regions, which have lagged significantly. The Golden Horseshoe is one of these regions (Vaz and Bowman, 2013). With an expected population increase to 11.5 million inhabitants by 2031 (Hemson Consulting, 2005), the growth rate of the Greater Toronto Area, the main urban nucleus of the Golden Horseshoe is exerting an increasing pressure on metropolitan areas. From a strategic perspective, the Places to Grow Act, attempts to circumvent this remarkable growth by sustainable choices in terms of construction, as well as readjustment on the existing infrastructure systems to support larger urban areas such as Toronto, and allow the urban cores to be more efficient (Wekerle et al., 2007). Forest areas as well as agricultural regions have become lost due to increasing urban pressure, leading to a forty per cent of urban demographic increase over the last decade. The cultural, environmental and social diversity of the region make it a unique region in Canada and the region itself should lead as an adequate example for the most efficient land use planning, transportation and sustainability (Ministry of Infrastructure Ontario, 2001). Manning in these different fronts has become an important feature in the provincial agenda. The influx of population in urban and peri-urban lands have changed the landscape concerning its urban land use, but nevertheless, continuous expansion of urban areas in detriment of agricultural areas will continue.

A concerning growth in injuries is also adding to a combined problem regarding the perception of injuries. In Canada alone, preventable injuries are a devastating and under-recognized public health problem and the greatest single contributor to potential years of life lost before 65 years of age. Unintentional injury is the leading cause of death in the population between the ages of 1 and 39. Intentional injury (including suicides and assaults) ranked as the second leading cause of death in persons aged between 15 and 39. These injuries are a natural consequence of the typology of urban dense environments, as is the case of the Toronto Census Metropolitan Area (CMA), one of the densest urban environments in North America.

As such, the objective of this paper is to explore the relation of land use types and the spatial clustering of self-reported health in Ontario. Using a comprehensive dataset from the Canadian Community Health Survey (CCHS), a spatial narrative approach is adopted for a quantitative analysis of the land use phenotypes in relation to health perception. First, the CCHS surveys are geocoded based on postal code location, enabling a spatially-explicit inference of health-perception. Second, spatial autocorrelation is calculated by means of the Local Getis–Ord statistic. A threshold is given of a z-score higher than 75%, defining hotspots for the different levels of health survey results. Each level is then assessed for the corresponding land use type, generating the land use phenotype preference. The rest of the paper is structured as follows. “Study area” delivers the study area and the interest of merging health perception to wellbeing and land use. Following this, “Methodology” addresses the integrated methodology that is used in this paper, and introduces the empirical model. “Results” advances with the discussion of the importance of land use in self-perception of health, leading to “Conclusions”, where concluding remarks and implications are provided.

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