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Do wealthier neighborhoods have better conditions for walking? A comparison study in Springfield, Massachusetts, USA

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ABSTRACT

A growing literature supports a link between characteristics of the neighborhood environment and the extent to which neighborhood residents engage in physical activity such as walking and biking. This study modified an existing integrated index for operationalizing walkability using parcel-level information. This study examined six neighborhoods in Springfield, Massachusetts, in Western New England, and took into account the prevalence of vacant housing and the relatively high crime rates in the city to create two modified walkability indices. These indices were tested against field investigations of the neighborhoods to verify other characteristics, such as the presence of graffiti and litter.

1. Introduction

Urban planners and related professionals have found that neighborhoods with greater housing density, greater land use mix, and greater connections among the street network allow for higher levels of walking and biking (Sallis, Frank, Saelens, & Kraft, 2004; Frank et al., 2010). Van Loon and Frank provide a comprehensive overview on the existing literature on urban form and physical activity, with a focus on youth relationships [2011]. Underlying this research is the idea that the physical environment can affect behavior. Hou et al. (2010), for example, found that in lower density urban environments, the number of street connections influences how physically active residents are. People who live in neighborhoods that allow for this greater amount of physical activity tend to be less overweight than their peers in more suburban, car-dependent developments, which has important implications for public health because of the relationship between physical activity and certain chronic diseases such as diabetes (Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003; Frank, Andresen, & Schmid, 2004). A transportation planner may set out to facilitate efficient automobile travel, but this planner is also making decisions that have real impacts on health—from the amount of automobile travel and the effects of vehicular emissions on local air quality, to whether the built environment allows for a safe and comfortable walking environment.

Building on previous studies, Frank et al. (2010) created an index to operationalize walkability using parcel-level information (data identifying land in a quantity for the purposes of taxation). The index integrates net residential density, street connectivity, land use mix and retail floor area ratio to determine level of neighborhood walkability, with mixed-use, connected streets, high residential density and pedestrian-oriented retail making neighborhoods more walkable. While this

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Table 1
Neighborhood characteristics.

Neighborhood	Area (sq.mi.)	Population (2010)	Population density (per sq.mi.)	Median housing price	Median household income
McKnight	0.73	5760	7867	$147,090	$25,262
Pine Point	2.53	11,453	4519	$133,447	$34,239
Upper Hill	0.71	7600	10,693	$126,603	$33,880
East Forest Park	2.43	10,443	4297	$190,586	$64,552
Forest Park	3.93	25,116	6390	$175,104	$40,281
Sixteen Acres	7.93	22,125	2791	$199,733	$56,730

index arguably lacks integration of other walkability factors such as pedestrian needs, opportunities, perceived costs and benefits, and habits, as shown in Steg and Vlek's framework (2009), or issues related to level of walkability for specific purposes, Frank's walkability index allows for measurements, and comparisons of measurements, of walkability in any city where parcel-level data is available. The walkability index can answer the question of how walkable is a particular block, neighborhood, city, and so forth. By using a walkability index, researchers can then investigate relationships between measurable walkability and other research areas of interest, such as obesity, childhood asthma, neighborhood satisfaction, and life expectancy.

When attempting to make a connection at the neighborhood level between walkability and many of these variables, an additional consideration must be given to the social differences between neighborhoods. Neckerman et al. (2009) found that lower income neighborhoods in New York City tended to have lower rates of physical activity among their residents and also tended to be less aesthetically attractive environments. These neighborhoods, with their increased crime risk and traffic hazards, fewer street trees, and greater presence of trash/litter, were places where residents were less physically active than the average New York City resident, despite the neighborhoods having other characteristics that are associated with increased walkability, such as high population density and a mix of land uses (Neckerman et al., 2009). Sallis et al. (2011) reached a similar conclusion with their studies of Seattle, Washington, and Baltimore, Maryland. Notably, a study in Brisbane, Australia, had contrary findings, where residents of lower income neighborhoods reported greater levels of walking for transport (Turrell, Haynes, Wilson, & Giles-Corti 2013).

The study area is Springfield, Massachusetts, a city located in Western New England, and which had a population of 153,703 as of 2013 (U.S. Census, 2014). Between the 2000 and 2010 Census, Springfield grew by only 0.5% (U.S. Census, 2014). Springfield long had a legacy of being an industrial city, but urban renewal-era decisions, such as the building of the I-91 interstate along the Connecticut Riverfront, and the loss of the city's manufacturing base contributed to economic decline in the city in the latter half of the twentieth century. A 2011 tornado led to further economic decline and physical abandonment in the city as homes and businesses experienced $140-million in damages (Yee, 2011). Additionally, Springfield has a high rate of poverty; between 2008 and 2012, Springfield had a poverty rate of 28.7%, compared to the overall rate in Massachusetts of 11% (U.S. Census, 2014). For further context, it is important to note that Springfield is composed of seventeen neighborhoods, which, aside from the downtown area, are largely residential in nature.

2. Methods

Six neighborhoods in Springfield, MA were chosen for this study: the three neighborhoods with the lowest median housing price and the three neighborhoods with the highest median housing price, as housing price was chosen as a proxy for wealth.[1] These neighborhoods included McKnight, Upper Hill, and Pine Point in the low category and East Forest Park, Forest Park, and Sixteen Acres in the high category. Notable for planners, McKnight was the first planned residential neighborhood in the United States. The size and other characteristics of these neighborhoods are found in Table 1.

This study utilized both statistical and observed measures to examine the association of walkability (and to a more limited extent, bikeability) and neighborhood characteristics. The observed measures included field verification of the neighborhoods studied to examine factors such as: building setbacks, sidewalk presence, sidewalk conditions, road conditions, bike lane presence, presence of a strip of land between the sidewalk and road, presence of graffiti and litter, and other physical and social incivilities.

2.1. Calculation of walkability

The main data for this study were the data collected using Geographic Information Systems based on the 2009 City of Springfield parcel data and 2010 U.S. Census data. Census block group data was used for all calculations to allow for the finest grain of information available. Frank et al.'s (2010) walkability index was adapted for this study, which, along with earlier versions, has been widely used for measuring walkability (e.g., du Toit, Cerin, Leslie, & Owen, 2007; Frank, Schmid, Sallis, Chapman, & Saelens, 2005; Leslie et al., 2007; Owen et al., 2007; Wood, Frank, & Giles-Corti, 2010) and validated through field tests in both North America and Australia. Below is the walkability index formula from Frank et al. (2010) and its four walkability components:

[1] Median household income can also be used as a proxy for wealth and would result in the same six neighborhoods.

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