



Community deprivation, walkability, and public health: Highlighting the social inequalities in land use planning for health promotion



Shiliang Su^{a,b,c}, Jianhua Pi^a, Huan Xie^a, Zhongliang Cai^{a,c}, Min Weng^{a,c,*}

^a School of Resource and Environmental Sciences, Wuhan University, Wuhan, China

^b Collaborative Innovation Center of Geospatial Technology, Wuhan University, Wuhan, China

^c Key Laboratory of Geographical Information Systems, Ministry of Education, Wuhan University, Wuhan, China

ARTICLE INFO

Keywords:

Walkability
Walk score
Social justice
Public health
Health in all planning
China

ABSTRACT

International land use planners tend to focus on walkability that could shape both residential behaviors and health outcomes. Understanding the relationships among community deprivation, walkability, and health outcomes will provide insights into appropriate land use planning that supports public health promotion. This paper develops a revised Walk Score tool for measuring community walkability in China. Under the original Walk Score methodological framework, (1) 6 principle amenities (19 items) and their weight (utilization frequency) are first selected by expert panel evaluation and questionnaire survey; (2) a tolerance time approach is then employed to determine the decay function, and the walking travel time from community to each amenity is calculated by using the Baidu Map; and (3) three pedestrian characteristic factors (intersection density, block length, and slope) are considered to adjust the score. We apply the proposed methodology to the case of Shenzhen and discover great variations in walkability among the 8117 communities within it. The high–high clusters are located in the central blocks, while the low–low clusters emerge in the outskirts. Using spatial regression, we observe significant negative associations between community walkability and three health indicators (cardiopathy, hypertension, and liver cancer). It suggests that better health outcomes would be observed in more walkable communities. We further find that children concentrated and socioeconomically disadvantaged communities exhibit lower walkability. These results evidence the significant social inequalities in walkability among the communities of Shenzhen. Path analysis identifies complex linkages among community deprivation, walkability, and public health. For cardiopathy and hypertension, three categories of significant paths are identified: (1) residents in deprived community have worse health outcomes due to lower walkability; (2) poorer health outcomes occur in deprived communities as a result of higher PM_{2.5} exposure; and (3) less walkable communities are exposed to greater PM_{2.5} concentration and deprived communities are generally characterized by lower walkability and consequently have worse health outcomes. We argue that social inequalities in walkability should attract the attention of land use planners. In order to address this pressing issue, three areas should be given priorities in future land use planning: (1) adopting urban form-based zoning schemes; (2) economic inputs for streetscape improvements; and (3) formulating affordable and low-renting housing policies. Findings of this case should generate more generalized knowledge that enhances public health promotion within the land use planning context.

1. Introduction

During the past three decades, non-communicable chronic diseases (NCDs) as well as obesity and overweight have been increasing dramatically across the world (World Health Organization (WHO), 2011). To combat global epidemics of NCDs and reduce obesity and overweight, the WHO and United Nations have advocated the design of built environments as a key strategy that promotes the active living for the entire population (United Nations Organization, 2011; WHO, 2015).

Evidence has accumulated that built environments could shape both residential behaviors and health outcomes. In particular, recent international interest tends to focus on walkability and reports that more walkable communities present more active participation in physical activity as well as lower obesity and overweight prevalence. Although prior observations cannot generate causal inference, the Community Guide (<http://archived.naccho.org/topics/HPDP/commguide/>) has collected sufficient evidence to support a shift towards walkable community planning for recovering the urban quality and promoting active

* Corresponding author at: No.129 Luoyu Rd, Wuhan, Hubei Province, China.

E-mail addresses: shiliangsu@163.com, shiliangsu@whu.edu.cn (S. Su), wengmin@whu.edu.cn (M. Weng).

<http://dx.doi.org/10.1016/j.landusepol.2017.06.005>

Received 8 March 2017; Received in revised form 27 May 2017; Accepted 7 June 2017

Available online 28 June 2017

0264-8377/ © 2017 Elsevier Ltd. All rights reserved.

commuting. There emerges increasing emphasis on walkability as both a means and an indicator of public health promotion due to its potential as a complementary strategy to curb the rise in NCDs and obesity at population level (Sallis et al., 2012). Hence, strategies in the realms of built environment design to enhance walkability are widely recommended by the public health authorities for communities to become more walkable (US National Physical Activity Plan, 2010; WHO, 2009).

In reality, walkable community design does not fall into the scope of traditional public health responsibilities, but it is a common part of land use planning (Ricklin et al., 2012). Administered and enacted by local governments, land use zoning and plan regulate the physical attributes of built environment and control community design which can promote public health by creating opportunities for healthy living (Ricklin et al., 2012). The specific role of land use planning in public health promotion typically includes encouraging healthy living through access to destinations (e.g., planning for transport and land use that benefit walking, jogging, and active leisure) (Kelly et al., 2014; Saunders et al., 2013; Saelens and Handy, 2008), and increasing opportunities for fresh food access and healthy eating behaviors (e.g., planning for healthy food location and retailing through regulated distributions of supermarkets, grocery store, and organic retailers) (Robinson et al., 2013; Su et al., 2016a). With respect to the walkability, the New Urbanism, a well-known land use planning paradigm, advocates the creation of pedestrian friendly environments that promote walkable communities (Lund, 2003). Additionally, a number of land use plans (Appendix A) place high priorities on change in walkability, including Transportation for America (<http://t4america.org>), Smart Growth America (<http://www.smartgrowthamerica.org>), and the National Complete Streets Coalition (<http://www.completestreets.org>). In this regard, experts and practitioners in land use planning are searching for the practical and robust techniques that help reform land use, building, and zoning codes to achieve more healthy communities.

Recent literature has demonstrated a range of scoring or checklist methodologies to assess the walkability. These approaches typically employ structured interview and authority consulting to determine the evaluation factors and further yield numeric scores that enables the planners to audit communities and routes and identify the isolated neighborhoods whose walkability should be improved. These provide a means of comparing local plans with national standards and capturing the commitment to principles of walkable community design (Godschalk and Rouse, 2015). One example is the Pedestrian Environment Review System (TRL, 2009), which permits comprehensive, systematic, and robust description of walkability for a pedestrian route. Another example is the Walk Score (www.walkscore.com), a publicly accessible website, which calculates a reliable and valid score of community walkability based on distance to amenities. The developed tools have greatly advanced the connection between land use planning and public health promotion. However, conversations are still missing in the literature on three essential issues. First, research on walkability has overwhelmingly examined the developed nations, especially in the USA, Europe, Canada and Australia. Methodologies designed for land use planning in North America and Europe are not necessarily generalizable to developing countries, which should have different built environments and cultural contexts with the Western (Sallis et al., 2011). Alternative or revised approaches are seldomly developed for measuring the community walkability in developing countries. Second, it remains as controversy whether Walk Score is as a strong indicator of health disparities. Empirical findings are relatively lacking that evidence the linkage between walkability and health outcome indicators. Last, the social justice issue with respect to walkability is not adequately addressed in land use planning. The optimism about walkability should be significantly tempered if we cannot achieve a spatially equal profile of walkable communities. Understanding the relationships among community deprivation, walkability, and health outcomes will provide insights into the appropriate land use planning that supports public health promotion, and will test the assumed broader benefits of

walkable environments.

China, the world's most populous country, is experiencing an epidemic of NCDs and obesity. It is reported that NCDs account for 86.6% of the total deaths and over 70% of the total disease burdens. In particular, cardiovascular disease, cancer, hypertension, and diabetes are the leading causes of deaths. Under such alarming circumstances, designing walkable communities to promote healthy living has become a timely issue (Day, 2016). The central government has launched a 'Healthy Community' program that outlines specific built environment characteristics in shaping public health. It is thus important to understand the links between community walkability and public health to help inform the extensive health promotion efforts. However, there is minimal research auditing community walkability and examining the corresponding role in public health. At the same time, cities in China expand at an accelerating pace to accommodate the booming urban population. It requires an estimated 40,000 km² new floor space, 5000 km² new road, and 170 new mass-transit systems (The State of China's Cities, 2010). Urban capacity is heavily outstripped to provide adequate fully equipped communities with transport convenience (Wan and Su, 2017). If walkable communities are not supplied or distributed equally, it should provide critical implications for health disparities and land use planning. Specifically, capturing the deprivation characteristics indicative of restricted community walkability will allow for more delicate contextualization of the health outcomes. Unfortunately, no report has been released regarding the social inequalities of community walkability in China.

The gap in the literature that this paper seeks to address is the walkability issue in China. Using a case of Shenzhen City, we aim to: (1) develop a revised approach based on Walk Score for measuring community walkability; (2) explore the association between community walkability and public health; (3) examine the social inequalities in walkability among the communities; and (4) provide some essential implications for land use planning. This study is unique because it captures the walkability in developing countries under a methodological framework compatible with the Western nations. Findings of this case should generate more generalized knowledge that enhances public health promotion within the land use planning context.

2. Literature review

2.1. Conceptualizations

The term of walkability originates from the walking ability of human being. Scholars have proposed several definitions of walkability. For example, Abley (2005) defined walkability as how friendly the built environment was to residential living, commuting, enjoying, shopping, or spending time within neighborhood area. Leslie et al. (2006) proposed the definition that "the extent to which characteristics of the built environment and land use may or may not be conducive to residents in the area walking for either leisure, exercise or recreation, to access services, or to travel to work". Gebel et al. (2009) set forth walkability as the extent to which the area was friendly for the pedestrians. Lwin and Murayama (2011) put forward walkability as how conducive the built environment is to walking. Implicitly, the idea of walkability is that people should become more active in walking in open urban environments (Moura et al., 2017). With respect to the factors affecting walkability, many individuals have associated walkability with different terms, which can be categorized into accessibility, connectivity, suitability, and perception. Accessibility has close relation with mixed land uses that shorten the distance between destinations and residences. Connectivity, as a consequence of grid patterns of street typology, represents the diversity and directness of the routes to destinations (Moura et al., 2017). Suitability denotes the physical factors are conducive to walking, including the presence of greenspaces, number of lanes, pedestrian width, transparency, air quality, crossing improvements, buffers to moving traffic, sun or shade in appropriate

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات