Habitat International 80 (2018) 1–10

Contents lists available at ScienceDirect

Habitat International

journal homepage: www.elsevier.com/locate/habitatint

Urban deprivation in a global south city-a neighborhood scale study of Kolkata, India

Swasti Vardhan Mishra

ADLS, Kolkata. AB-46/A, Prafulla Kanan, Kestopur, Kolkata, 700101, West Bengal, India

ARTICLE INFO

Keywords:
pca
gwpca
Neighborhood
Kolkata
Spatial statistics
R
Neighboring effects

ABSTRACT

Urban deprivation is an epistemic tool to study the geographic concentration of deprivation in different neighborhoods of a city. Studies have long associated with neighborhood research and have viewed it from multiple perspectives. Most of these researches look into ways how other factors affect a neighborhood or how a neighborhood affects other factors, commonly using global statistical measures to make inferences that only give a summation of local variations. However, in tune with Lewis Mumford' contention, this article proposes a local measure based index of deprivation that not only gives a neighborhood level results but also takes *neighboring effects* into consideration. Neighboring effects maintain that a locality seldom exists as a discrete entity rather its characteristic is made up as an amalgamation of multiple characteristics of the contiguous localities. Thus, in this study, an Index of deprivation is devised for the municipal wards of Kolkata city using Geographically Weighted Principal Component Analysis (GWPCA) loadings and compared to that devised from Principal Component Analysis (PCA) loadings. It is found that GWPCA accounts effectively for local variations and neighboring effects at the neighborhood scale. However, both the Indices have pinpointed particular wards that are at the extreme end of the urban deprivation scale irrespective of the measure used.

1. Introduction

Deprivation is a long debated and subjectively judged dimension of a society whereby its relational and contingent disposition is grounded on spatial scale chosen for the study. As a blanket term, deprivation 'implies a standard of living or a quality of life below that of the majority in a particular society, to the extent that it involves hardship, inadequate access to resources, and underprivilege' (Herbert, 1975). Therefore, engaging with the 'problem of inequality' (Norris, 1979) deprivation studies have had concentrated on poverty as an indicator (Townsend, 1962). After the 1960s, a departure in the definition of deprivation came when emotional and cultural aspects were sought in tandem with the material factors (Norris, 1979). Deprivation started to mean a fall below 'certain well-defined line' in economic, social, cultural and emotional dimensions and came to be known as Multiple Deprivation (Norris, 1979). The idea surrounding its manifold nature gradually shifted to acknowledging urban deprivation as an epistemic tool that analyses the geographic concentration of deprivation at certain locales of a city. Since then the structural questions of geography or location became more pertinent in deprivation literature as 'many forms of deprivation have spatial expression and reflect spatial qualities' (Herbert, 1975).

Consequently, the spatial underpinning of deprivation was naturally linked to different localities of a city, also defined as neighborhoods. As a 'territorial concept' (Gregory, 2009), neighborhood, has its origin in the post Industrial Revolution phase when the societies started dividing into distinct land uses (Anderson, 2017), accompanied by a change in its character from *Gemeinschaft* (informal communities) to *Gesellschaft* (formal societies) (Liu & He, 2017). The concept also finds prominence in the studies conducted by Engels in Manchester and works of the Chicago school proponent Robert Park (1952). However, the first invocation of the term neighborhood as a unit is found in Clarence Perry 's study of Radburn, New Jersey. He believed that a 'neighborhood community has greater unity and coherence than any village or city' (Perry, 2011). Concern for neighborhood unity and neighborhood planning was already two decades old when Lewis Mumford (1954) wrote his critical piece on the same theme. The after years have seen research on neighborhood both as a distinct entity on a physical space and as a social space (Keller, 1968). Even though it is known that neighborhood studies have never faded in the research and cognitive arena since then (Liu & He, 2017) the New Urban Agenda adopted in Quito has reinvigorated interest in the study of neighborhoods, parochial concerns and local solutions that can be beefed up to the global level. It emphasizes adding new compact neighborhoods to the urban landscape and vows to attain urban solutions by intervening at the neighborhood scale.

E-mail address: swastivardhanmishra@gmail.com.

https://doi.org/10.1016/j.habitatint.2018.08.006
Received 14 April 2018; Received in revised form 10 July 2018; Accepted 22 August 2018

In Neighborhood studies, *neighborhood effects* (Johnston, 1974; Martin, 2003) is a commonly used term that surfaces an existence of 'correlation between the neighborhood environment and social outcomes', where those working within the 'framework examine the impacts of the social and physical milieus immediate to residential environments upon individual behavior' (Martin, 2003). Social interaction as a neighborhood effects has an influence on the voting patterns (Agnew, 1996; Sui & Hugill, 2002), and some distinct neighborhood-based structural factors have influence on mental health and diseases (Barrington et al., 2014), and 'community vitality' (Ciorici & Dantzler, 2018). Parallel to the idea of neighborhood effects, this paper views neighborhood research from the idea of *neighboring effects*. This takes note of how a single neighborhood acquires characteristics from the contiguous neighborhoods. Thus, in place of reading a neighborhood characteristic discretely, it studies it in juxtaposition to the proximate neighborhood's characteristics. Neighboring effects in that parlance sees every neighborhood as an individual entity with a unique permutation of characteristics of different neighborhoods with which it is in spatial proximity.

For gauging the neighboring effects objectively this paper has employed a local statistic- Geographically Weighted Principal Component Analysis (GWPCA) to devise an index of deprivation. This measure, which considers neighboring effects, is compared to the global measure, PCA, which is non-spatial in character. Secondly, the indicators of deprivation does not have uniform influence on all the neighborhoods of a city. Therefore, it is imperative to give them weights as per their influence in a particular neighborhood. PCA based indices weight the indicators equally but a GWPCA based index weights each of the indicators uniquely for each of the neighborhood according to the influence compared over space. The study also takes note of the same in measuring the deprivation in Kolkata. Social processes occur in a continuous manner and are never the same in every corner of a spatial unit (Fotheringham, Charlton, & Brunsdon, 1998), i.e., 'they are not constant over space like physical processes' (Mishra, 2015). Therefore, it will be an ecological fallacy to determine their nature from a single statistic value of a global measure (Mishra, 2015). The spatial non-stationarity also maintains that social processes have different roles in different spatial subunits. Also, in the global measure, there are chances of omitting crucial variables or investigate the problem through 'incorrect functional form' (Fotheringham, Brunsdon, & Charlton, 2002). Fotheringham et al. (2002) introduced the idea of Geographically Weighted Principal Component Analysis (GWPCA).

The article contributes to urban studies literature on neighborhood by an empirical investigation of neighborhood deprivation through a local measure that considers spatially proximate effects while differentially weighting the indicators in each of the neighborhoods in Kolkata city. It keeps in mind to resolve Mumford's (1954) concern that despite engaging with neighborhood question theoretically, neighborhood research is seldom local in action.

2. Neighborhood research

Neighborhood research is fundamentally of two types based on the position a neighborhood, as a structure/agent, is assigned within the causal mechanism (Fig. 1). The first kind of studies has questioned the effects neighborhood put on health (Ellen & Turner, 1997) and society from a number of thematic vantage points. For instance, a study that reviewed 42 studies on neighborhood effects on child development and growth has critically examined the mediation and moderation effects of neighborhood on the growth conditions (Minh, Muhajarine, Janus, Brownell, & Guhn, 2017). In a broader sense, a view that neighborhood satisfaction influences quality of life (Greenberg, Schneider, & Choi, 1994; Yang, 2008) finds traction in a number of articles published on the theme (Galster & Hesser, 1981; Michelson, 1977; Wilson, 1962). In a recent study that employs primary data, it is shown how neighborhood residents in Beijing perceive life satisfaction obtained through

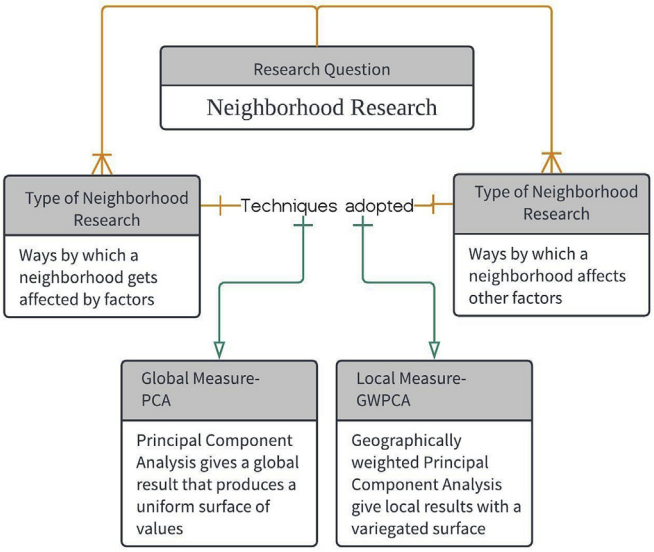

Fig. 1. The conceptual model of Neighborhood research.

physical and social milieu (Ma, Dong, Chen, & Zhang, 2017). Questions of inequality have also been studied at a neighborhood scale-a study in Quito has shown how changing spatial scale brings to light a more comprehensive understanding of inequality in public services (Wei, Cabrera-Barona, & Blaschke, 2016). While one study has looked at neighborhood satisfaction from a migrant's vantage point (Liu, Zhang, Liu, Li, & Wu, 2017), another study has reflected on the role of neighborhood and neighboring in enabling poor to negotiate their rights in the old neighborhoods in China (Liu & He, 2017). Moreover, from a different viewpoint, a study has charted a relationship between neighborhood advantage/disadvantage and park incivilities in a southeastern US county. However, a neighborhood does not influence without any catalyst factor, it needs a medium through which its quality is communicated and exchanged. A number of factors assemble to get the work done through which neighborhood influence people and their conditions (Ellen & Turner, 1997).

Another set of studies has highlighted on ways a neighborhood is affected by different factors. A morphological characteristic of historic neighborhoods is often influenced by power-bargain between local governments and local citizens (Qian & Li, 2017). Thus, the conflict of interests between state and non-state actors shapes a neighborhood morphology. Similarly, a new transit station or a mode of transport also works up to change a neighborhood. A study from nine metropolitan areas in the US establishes a case that there exists a difference between how a non-transit and a transit neighborhood changes (Nilsson & Delmelle, 2018). Studies have also found out ways how a neighborhood quality could be improved through a hierarchy of needs and meeting crime erasure as the foremost action for keeping the neighborhood in good condition (Greenberg, 1999). Policy transfers are a common phenomenon in a globalizing world, but their implementation influences neighborhood in different ways in differing contexts. Identically, constituents of New Urbanism Design has influenced neighborhoods in different ambivalent ways, and in return influenced the residential turnover (Park, 2017).

3. Research objectives

The first objective of this article is to devise an Index of Deprivation employing a global measure of statistic - Principal Component Analysis (PCA), and a local (spatial) measure of statistic - Geographically Weighted Principal Component Analysis (GWPCA). As a decomposed form of a global measure, GWPCA is recommended for initiating neighborhood-level planning. The second and the most important