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Measuring spatial proportionality between service availability, accessibility and mobility: Empirical evidence using spatial equity approach in Iran

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ABSTRACT

Spatial proportionality plays an important role in recognizing inequities, the quality of actions to reduce them, and halting complicated and unclear cycle of inequities and even reversing their increasing trend. The aim of this study is to measure spatial equity based on spatial proportionalities (SESP), taking into account three-fold factors including service availability, accessibility and mobility. The SESP identifies proportionality between the quality of service distribution and allocating opportunities and the quality of getting access to locations and people's selections according to status quo. Thus, it examines the balance between supply and demand, optimization of distance and the number of choices people make out of total services and the role of move ability to use in compensating for shortages either in terms of service capacity or the level of human deprivation and reduction of effects of distance from services and etc. Gorgan as an old and intermediate city in northern Iran was selected as the case study. The results indicated that the study area does not enjoy suitable proportionality, revealing that the central and northern districts have much more enjoyment than the southern, eastern and western districts. Thus, there is disproportionality between supply and demand, high difference in provided choices and disproportionality between less enjoyed areas and their move ability to use services and inability to create walking travel pattern in Gorgan. Understanding of spatial proportionality can help the planners and policy makers to change their passive role into active in order to reduce inequities, adding to their knowledge on the underlying factors of inequity as well as the factors that hinder and reverse the cycle of inequity.

1. Introduction

The debate of spatial equity in facilities distribution can be divided into two different approaches. One approach adopting realistic view (equity seeking) concentrated on facilities allocation to residents based on created assets (demand, attempt, and their capability). It evaluated the manner of its distribution in comparison to balanced status quo (who can have what, in what places and in what level). The status resulted by the power of developmentalism of residents have provided certain service capacity and limited opportunities for demanders over time. In this situation, urban residents must either enjoy the same share of these opportunities (Tsou et al., 2005; Oh and Jeong, 2007; Chang and Liao, 2011) or deprived people must receive much attention according to their needs (Talen, 1998; Talen and Anselin, 1998; Lindsey et al., 2001; Smoyer-Tomic et al., 2004; Kaphle, 2006; Apparicio, and Se'guin, 2006; Omer, 2006; Liao et al., 2009; Martinez, 2009; Lotfi and Koohsari, 2009; Ibes, 2015;). Accepting inequities and trying to reduce them and unequal treatment with inequalities can be seen as the outcome of such approach.

Another approach having idealistic view (desirability) evaluated facility allocating according to standardization of supply and demand and the manner of distribution in comparison to desirable status (who must have what, in what places and in what level). The standard that based on people's need regardless of city status quo, residents, amenities and limitations determines potential capacity and suggested condition for city and urban residents (top-down planning). Among these studies are: equal level of response of supply to residents' demand in all places (Dadashpoor and Rostami, 2011a; Lee and Hong, 2013); observing minimum service standards in establishing balance between population and service distribution (Nicholls, 2001; Dadashpoor and Rostami, 2011b; Taleai et al., 2014); and how much the proportionality between scale and spatial distribution of public facilities and residents distribution with different economic and social groups in reality have distance to the standard and equal situation (Dadashpoor et al., 2016). Increasing the equality and equal treatment with equals can be the outcome of such approach.

However, neither measuring shortage and surplus nor distance or nearness to services in one point of time is the issue of equity as a rule.

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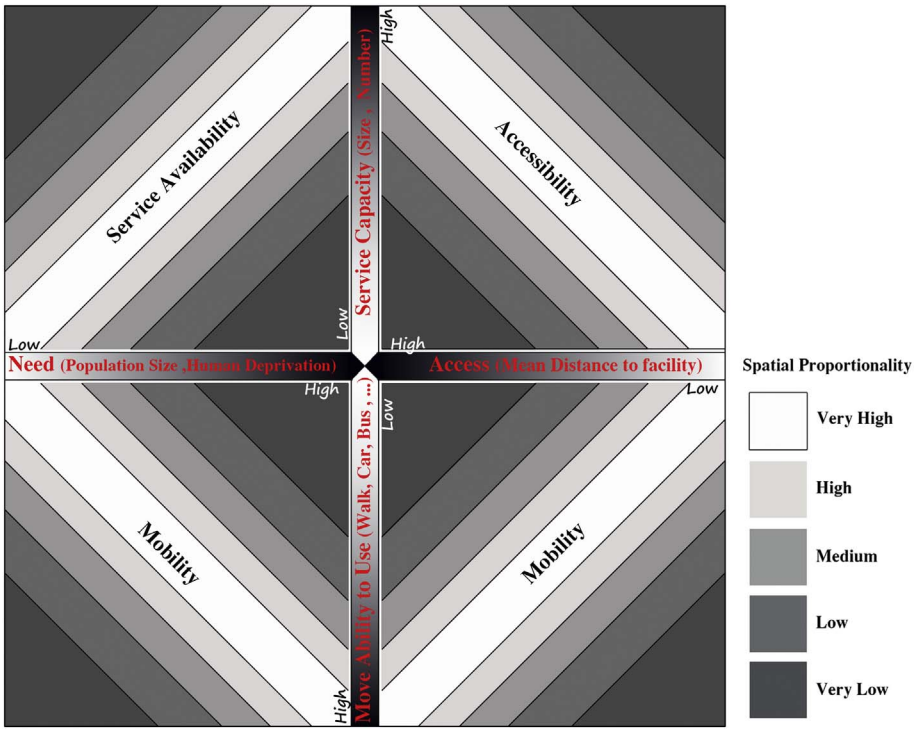

Fig. 1. Conceptual framework of spatial equity based on spatial proportionality.

Rather, the way of creation and continuation of inequalities is considered as the main debate in spatial equity. Because, some places may deserve these inequalities (due to migration, leasehold, etc.). Sometimes, reducing inequalities is led to the benefit of groups that either have significant role in creating them or receive large share of benefits resulted by equalization. Thus, to examine "how does the city adopt itself to inequalities" and "what relations in city do generate and intensify inequality?" and "what capacities does the city have to reduce inequalities?" must be the basis of any refining action. Among the contributing issues is to explore and measure the existed spatial proportionalities in city in relation to facility distribution. Understanding the spatial proportionalities can be determinant in achieving goals (preventing the plan deviation) and success of actions to reduce inequalities, whether it is top-down or participatory planning and people actions from down. Other issues have also been ignored in previous studies, such as the method of accessibility measurement and selection of services by residents, similarity of assumed travel pattern to real travel pattern and the role of move ability on service reception, which are addressed in this study.

The aim of this article is to develop a novel and integrated method for measuring spatial equity based on spatial proportionalities (SESP), taking into account three-fold factors including service availability, accessibility, and mobility. The rest of the article is organized as follows. In section 2, the concept of spatial proportionality in the framework of spatial equity is specifically explained. In section 3, measuring indexes is expressed; and, in Section 4, the methodology of research and defined indexes in one experimental example are applied and the results are interpreted. In the final section, the conclusion of the research, its limitations and suggestions for further studies are put forward.

2. Spatial proportionality and spatial equity

In recent studies, the concept of spatial proportionality is only implicitly emphasized in measuring spatial equity in facility distribution. For an example, relation between accessibility and social-economic groups distribution (Smoyer-Tomic et al., 2004; Comber et al., 2008; Boone et al., 2009; Dai, 2011; Koohsari, 2011), between objective and subjective accessibility (Lotfi and Koohsari, 2009; Wang et al., 2015a), perceived and geographic access (Wang et al., 2015b), between accessibility and mobility (Gulhan et al., 2013), between service distribution and mobility patterns (Chang and Liao, 2011; Reyes et al., 2014), between job accessibility and public transport (Geurs and Ritsema van Eck, 2001) population and service distribution (Nicholls and Shafer, 2001; Higgs et al., 2012; Zhang et al., 2011; Dadashpoor et al., 2016), between supply and demand (Oh and Jeong, 2007; Lee and Hong, 2013; Taleai et al., 2014); between spatially concentrated urban poverty and the efficacy of spatial interventions (Oakley and Tsao, 2007); Socio-demographic characteristics of users and non-users, and the political, social, historical, and economic context of facility or facility quality (Ibes, 2015) and etc. However, these studies were not conducted based on integrated measurement of spatial proportionality. Disproportionality in each method can indicate spatial inequity in the studied dimensions; but, if all of them are examined in one place (due to different and varied conditions), the same results are not likely to be achieved; and, since the main goal is to make spatial equity as the basis of policymaking and planning by the city managers and authorities, it is essential to gain a full understanding of the various circumstances and dimensions of spatial proportionality in order to do more optimal and sustainable investments.

Since the aim of the article is to measure spatial proportionality between service availability, accessibility and mobility with spatial equity approach, providing novel and multidimensional factors of spatial proportionality is indispensable. Spatial proportionality can be defined as sustainable balance between what the residents want or can have with what the city provides for them or can provide, taking into account the spatial differences and human conditions, spatial and time distance, the quality of getting access and the process of their providing.

Understanding spatial proportionality plays important role in recognizing inequities and also the quality of action to reduce them and halting the complicated and unclear cycle of inequities and reversing it's ever increasing trend. Spatial proportionality may contain various factors. In present article, the dimensions in which the proportionality has been examined are as follows:

A) Proportionality between service providing capacity (supply) and population distribution (demand);