A Descriptive Model for Spatial Accessibility to Health Care Services Employing Two Step Floating Catchment Area (2SFCA) Method: The case of Region 10 of Esfahan Municipality

Lavi M.
M.A. in Urban and Regional Planning, Shahid Beheshti University

Mamdoohi A. R.*
Assistant Prof., Dep. of Transportation Planning, Tarbiat Modares University

Received: 02/08/2010 Accepted: 07/03/2012

Extended Abstract

Introduction
Accessibility is a complex concept and has various dimensions, based on the phenomenon being modeled. Quantification of this concept with the proper dimensions in mind, calls for mathematical indices and models. Spatial accessibility is one of the principal concepts of geography and transportation planning, especially in the social aspects, like justice. Since health is of major concern, universally, including also the developing countries, its inappropriate distribution can lead to unjust supply of its services, and unequal opportunities in accessing them. Spatial accessibility can generally be measured using the two criteria of regional availability and regional accessibility, as was first suggested to be used simultaneously in 1984. Regional Availability, a common index in health care services, measures the number of doctors and other medical experts available per population in need of them. Regional accessibility, on the other hand, characterizes the spatial or geographic distribution of health care services offered to the public in the form of health care centers, presenting the idea of distance from the demand to the supply as an impedance to access them.

Methodology
In this paper, the concept of accessibility is discussed and a descriptive model is presented for analyzing spatial accessibility, employing the Two Step Floating Catchment Area (2SFCA) method, which is also implemented for region 10 of Esfahan municipality. This method as the

*E-mail: armamdoohi@modares.ac.ir Tel: 021-82884925
name suggests analyzes the catchment area or radius of influence of different services in two different and consecutive stages. The first is per capita of medical personnel in a defined radius of their service center is computed and in the second stage, these ratios are added for each residential area (statistical blocks here), considering and reflecting the overlapping supply of service centers, in the vicinity of the residential areas exposed to such circumstances. The main objective of this paper is to analyze quantitatively, spatial equity (or inequity) between different statistical blocks, using mathematical models. The research methodology adopted, is analytical and descriptive. Research data includes geographic information, number of the medical personnel serving in each health care center, population of the statistical blocks, and the road network information, which are organized in the form of appropriate data base and analyzed by the Network Analysis Module of Arc GIS software package.

Results and Discussion
Results of the paper indicate that, in terms of personnel number, region 10 as a single entity, is in good situation with sufficient personnel, but the inappropriate spatial distribution of health care centers and their personnel in the region cause inequity of accessibility to these services. The magnitude of the mean and standard deviation of the accessibility index (0.00461 and 0.00655, respectively), shows noticeable difference between the statistical blocks in accessibility to these services. As an example, the accessibility index of 68 percent of the blocks is below the mean value of the region, indicating different opportunities for the citizens in accessing these services. Eastern blocks, generally, have weaker accessibility to health care services as compared with the western blocks. Results also reveal that the western blocks are more uniform and homogeneous in accessing health care services as compared with the eastern blocks. The paper emphasizes quantitatively the fact that poor accessibility can also be due to inappropriate geographic distribution of the service centers.

Conclusion
The method employed in this paper can also be used for analyzing spatial accessibility to different kinds of services and their geographic distribution, in a mathematical and quantitative form, determining the status quo, identifying the limitations, and planning for their elimination. Considering the data limitation of this research study, it is suggested to gather more detailed data at a larger scale, particularly a whole city in contrast to a part of it, to implement the model and analyze the results. It is also advisable to devise a model to optimize (rather than describe) the geographic distribution of such services, based on a combination of criteria.

Keywords: Spatial Accessibility, 2 Step Floating Catchment Area, Spatial Distribution of Services.