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Research on the Spatial Accessibility of Public Medical and Health Services

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Abstract

Based on the census and related data from medical and health institutions, this paper uses spatial interaction theory and models to obtain the spatial distribution of public medical and health services accessibility in each block of the study area, and analyzes the relationship between the hospital grade coefficient and the accessibility in detail. The influence of the index provides auxiliary decision support for the development plan of the medical and health industry.

Keywords

Public medical and health services; spatial interaction model; accessibility.

1. Preface

With the deepening of my country's medical system reform and the stable and rapid development of the social economy, the research on the equity of health services has gradually attracted the attention of health policy researchers and decision makers, and has gradually become a research hotspot in the field of health reform [1]. With the enrichment of digital data and the development of GIS technology, it is possible to obtain the distribution of medical and health institutions and population at a higher resolution. This article is based on the collection of population data, hospital data and spatial data of the streets in the study area to quantitative analysis Mainly, starting from the two aspects of supply and demand, according to the characteristics of the classification and grading of my country's medical institutions, this paper analyzes the accessibility of public health resources for residents in various neighborhoods, and provides a scientific basis for social members to obtain fair and effective health services.

2. Spatial distribution of study area

The study area is surrounded by the front and back channels of the Pearl River system study area. The river bank line is 47.35 kilometers long. It is the only closed island area in the study area. The district covers an area of 90.45 square kilometers and has a total population of 1,237,300. There are 18 administrative streets within its jurisdiction, facing Liwan, Yuexiu, Dongshan, Tianhe, Huangpu, Fangcun, and Panyu across the river. The medical institutions in the study area are relatively good both in terms of quantity and quality. According to the second-level and above medical institutions in the study area published by the study area's health information network, there are 12 second-level and above hospitals in the study area. It can be clearly seen from the distribution map of hospitals that almost all medical institutions are located in the old urban area, while the allocation of medical institutions in the urban-rural fringe and Xinjiao Town is obviously lacking. In other words, residents in the old city have obvious advantages over residents in the fringe area in enjoying public medical and health services.

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3. Basic model

As early as the 1940s and 1950s, social economists and geographic scientists put forward a universal gravitational model that expresses the interaction between two places in regional science and location theory. Similar to the gravitational model, the concept of potential is introduced into geography, forming a potential model of geography.

If there are two regions i and j, the potential for a particular activity in region j is proportional to the activity scale of region j, and proportional to the division function between the two regions. It can be expressed as a mathematical formula:

$$Aij=\propto Ej \quad Aij\propto 1/f(tij)$$

Therefore:

$$Aij=Ej/tb \tag{1}$$

Among them: Aij ——Potential of a certain activity in area i with respect to area j

Ej——Activity scale in area j

tij ——Commuting time or distance b-index between area i and j

Then the total potential of the area is:

$$\sum Aij=\sum Ej \quad ijj=1,2,\ldots\ldots,n \tag{2}$$

There are n regions, there are n potential values. If we apply the potential formula to the potential of a medical institution to the population in a certain area, then E is the number of technicians in the hospital. For patients, the more nearby hospital doctors are, the more distant hospital doctors have accessibility, and the greater the weight. But in this simple model, only the potential generated by the "supply" side of the hospital is considered, and the "demand" side is not considered. Many scholars have proposed improved models on this basis, the formula is as follows:

$$A_i^o=\sum_{j=1}^{n}\frac{E_j\bar{t}_{ij}^{\beta}}{V_j} \tag{3}$$

4. Conclusion and future work

This article applies spatial interaction theory and model, taking the research area as an example, and discusses the accessibility of public medical and health services for residents in various neighborhoods. Studies have shown that in the urban-rural fringe of the study area, there is a relatively lack of public medical and health services, and it is an area where medical and health institutions should be set up with priority.Due to the reasons of data acquisition, in the research work of this article, the calculation processing has been simplified. The calculation of spatial distance is theoretically a function of transportation distance, transportation time and transportation cost, but here we directly use the straight-line distance to calculate, and assume that the population of each block is evenly distributed. In addition, the society's demand for public medical and health services is not only related to the total population, but also has a lot to do with the composition of the population. In the future research, if the above factors can be considered, it is believed that more effective analysis results can be obtained.

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