Chapter 38
Potential of GIS and Spatial Knowledge in Health Care and Public Safety

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ABSTRACT
Geographical Information Systems (GIS) are a relatively new tool in health care services and organizations. However, health-care professionals who know how to utilize GIS and other spatial tools get a powerful decision support tool. This chapter presents an overview of the GIS and spatial simulation in the health care environment. In the first section, an introduction to the situation is provided. Then, in the second section, the key terms are introduced: access in health care, GIS, and spatial simulation. In the third section, different cases where GIS supports decision making in the health care services are shown. In the fourth section, two examples of spatial simulation are shown. Finally, future research directions and conclusions are discussed.

INTRODUCTION
Geographical Information Systems (GIS) appear to have nothing in common with health-care service providers or health care authorities. A GIS is basically a computerized extension of geography. As Ricketts (2003) pointed out “the description of spatial differences in human activities, whether disease or health-care delivery, has long been the subject of inquiry by geographers”. Therefore, it is not surprising that health care professional believed that when it comes to spatial data, even the understanding of health related issues was in the hand of geographers.

Rushton, Elmes and McMaster (2000) mention that despite massive support by different authorities and institutions in GIS as a health related tool, “considerable skepticism exists in many quarters about the role of mapping and spatial analysis in the analysis of disease patterns and resource allocation”. GIS had a difficult start with the health-care community, though, we believe that
times has changed, and GIS and spatial simulation have much better chances to be embedded in the activities of health care organizations. A more recent review by Joyce (2009) indicates that “On the whole, interviewees were positive about the value of GIS in public health practice,” but one should bear in mind that GIS is not a wonder tool, and it cannot solve all problems that public health is facing.

This chapter discusses cases where GIS and spatial simulation indeed support the decision making process of health care professionals. We emphasize the role of GIS and spatial simulation in emergency services, as we believe that many reviews about GIS in health care give only a little attention to the profound support of GIS and spatial simulation to the emergency services. This chapter can provide a good introduction to readers familiar with either health care or GIS and who wish to explore how GIS and spatial simulation can contribute to health care organizations.

BACKGROUND

To understand the contribution of GIS and spatial analysis to improving health care satisfaction, some basic concepts, which are relevant to the topic, must be introduced. At first, the basic concept of access in health care is introduces, as GIS can support elements with spatial implications, like distance between a patient and the nearest hospital. The second concept we introduce is GIS. In order to understand how GIS can support health care, one must have an initial understanding about the concept and possibilities of GIS. The last concept which is introduced is the simulation in spatial context.

Access Definition

Access in health care can be defined in many different ways. Aday and Anderson (1981) suggested that:”Access describes people’s ability to use health services when and where they are needed”. Andersen, McCutcheon, Aday, Chiu, and Bell (1983) created a model with two potential access dimensions and two realized access dimensions. The potential access dimension “is influenced by structural characteristics of the delivery system itself and the nature of the wants, resources, and needs that potential consumers may bring to the care-seeking process” (Andersen et al., 1983, pp. 50). The first potential access dimension is the delivery system. This dimension has spatial and community characteristics. The spatial characteristic deals with the availability component, which refers to the volume and distribution of health care facilities in an area, such as the availability of practitioners and hospitals. The community characteristic deals with demographic measures regarding the community (or census track) such as rural or central city residence. The second potential access dimension is the characteristics of individuals, such as age, race, income, insurance, etc. Other characteristics are related to health care needs; for instance people with diabetes, and other determinants that can affect the need of health-care services, such as smoking, alcohol consumption, etc.

Aday and Andersen (1974) add health policy to this concept. Health policy is viewed as the starting point for consideration of the access concept as it takes into account the political sides of this issue. In health policy, resources can be reallocated to improve accessibility of health care services for instance through a subsidy to reduce the cost of the health insurance to make it more affordable.