Chapter XIV

Using GIS to Unveil Distance Effects on Hospitalizations in Victoria¹

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In this chapter, we examine travel distance and its effect on total and avoidable hospitalizations using data from the capital health region in British Columbia, Canada. We developed a GIS procedure to connect distance-to-hospital with socioeconomic contexts of patient locations. The procedure includes geo-coding hospital locations and patient locations to determine travel distance for each hospitalization, generating several geographic barriers, such as mountain crossing, to assess their impedance, and linking patient neighborhood locations to socioeconomic variables of their locations. It was found that the overall hospitalization rates have an inverse relationship with distance-to-hospital, and living too close to a hospital may encourage utilization of hospital resources. Even though low-income patients are more likely to be hospitalized for avoidable conditions, the income effect influences different dimensions to those affected by the distance effect. Thus, it explicitly confirms the two aspects of the inverse of healthcare law that work simultaneously: those with lower socioeconomic status and those living in greater distance to hospitals tend to be less likely to access hospital care. Furthermore, the inclusion of physical barriers to our evaluation enhanced our understanding of local conditions and how they may affect hospitalizations.
INTRODUCTION

Access to healthcare includes at least two dimensions: economic access in terms of affordability, and geographic access in terms of proximity to providers (Gold, 1998). The so-called inverse care law—those most in need tend to have the least access to healthcare services—also includes social and geographic dimensions (Hart, 1971). The geographic aspect of access suggests that everything else being equal, people tend to seek healthcare at a closer distance than at greater distance (Gesler & Meade, 1988). Further, people may be discouraged from seeking health care if they have to travel beyond a certain distance (Brustrom & Hunter, 2001; Parkin, 1979; Williams et al., 1983); otherwise, other aspects of their lives might be adversely affected (Yantzi et al., 2001). In the Canadian context, while efforts to reduce socioeconomic barriers to access to health care have been ongoing, policies aimed at reducing physical barriers have been less persistent, especially for hospital care. The 1970s saw the construction of numerous smaller hospitals outside of larger urban centers to help address the problem of geographically unequally distributed hospitals. However, in the late 1980s and early 1990s, many small hospitals were subsequently closed as a means of cutting costs (Liu et al., 2001).

The changes evident in the policy arena reflect a lack of understanding of the role of geography in terms of accessibility, which is due, in part, to a lack of routine data collected on geographic access measurements (e.g., distance variables) and limited methodologies. While most methodological developments using distance measurements have dealt with either potential accessibility or efficient ways of allocating hospital resources (Love & Lindquist, 1995; Mayhew & Leonardi, 1982), effective engagement requires multiple linkages and several different data sources. This could prove challenging for data collection and manipulation. With the advent of geographic information systems (GIS), greater accessibility of georeference data from multiple sources and renewed interests in local participation in healthcare planning, it is now possible to evaluate geographic accessibility based on actual distance and other geographic variables. This process also provides a mechanism whereby dialogue between geographic and socioeconomic perspectives on access to health services can begin.

This chapter explores methods for assessing distance effects on hospital utilization of GIS technologies. Previous studies (see Goodman & Fisher, 1997) generally find that hospitalization rates decline as distance to hospital increases. However, most of studies deal with a specific type of hospitalization (Mollsop, 1969) or specific population group (Mooney et al., 2000). In our case studies of general and avoidable hospitalizations, we examine the general patient population
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