

Validating the Accuracy of GIS-Based Accessibility Analysis in Determining Public Primary Health Care Demand in Metropolitan Areas

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Abstract

Geographical access is an important aspect of the health care planning process. GIS-based accessibility analysis is a logical method which can be applied to test the degree to which equitable access to services and facilities is obtained. The GIS analysis is, however, based on the assumption of rational choice, i.e. a person will always go to the closest facility. Inputs to the analysis are supply (facility capacity) and demand (population) estimates. In South Africa primary health care (PHC) is a dual system made up of private and public health care facilities. Private PHC is expensive and only affordable to affluent citizens or people with medical insurance, and does not form a part of this study. Two challenges regarding GIS-based accessibility analysis for public PHC services within a South African context that emerge are: (a) how accurate is a rational choice-based model compared to people's actual decisions; and, (b) what method is best in determining demand in the absence of accurate databases indicating public versus private health care usage? GIS demand profiling tools were applied to determine three distinct demand scenarios based on a combination of three variables: (a) household income category; (b) age; and, (c) average visits. A GIS-based form of catchment area modelling was used to determine catchment areas for each facility, allocating demand to the closest facility and limiting access based on facility capacity and access via a road network. Results indicate that there is no significant difference in the spatial extent of the catchment areas of the facilities across the three scenarios but that there is a significant demand increase per scenario: scenario 1 (6 711 292) < scenario 2 (6 828 738) < scenario 3 (7 120 648). An electronic tuberculosis (TB) patient register and facility headcounts based on actual visits were compared to the results of the catchment area modelling. The comparison results show that almost 45% of the patients did not use their nearest facility as a first point of contact. The headcounts showed that the method used for scenario 3 is ideal for determining primary health care demand. GIS is not the complete solution to understanding all the issues of access to public health care services but is a useful tool to support planning by spatially identifying where interventions are needed most, especially in the absence of accurate and geo-referenced patient registers.