Accessibility to Health Care in Rural Ireland

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ABSTRACT

This paper examines the geographical variations in access to health care in rural Ireland using the static components of SMILE a spatial microsimulation model. The static spatial microsimulation components of SMILE are combined with accessibility measures in a GIS to provide an indication of health care accessibility in rural Ireland. Using accessibility parameters, and health care utilisation parameters we look at the demand for health care in rural areas using attributes such as age, disability, and health status. The results from this accessibility analysis will then be mapped in a GIS. Finally, a change in government policy with regard to rural development will be simulated to access its effect on accessibility to health care in Irish rural space.

Key words: Static spatial microsimulation, Accessibility, Accessibility Measures, GIS, Rural Ireland, Health care Analysis

1. INTRODUCTION

Health care is a particularly emotive issue, given that it is one of the only public service that it utilized by everyone at one point or another. Acute hospitals in Ireland are currently experiencing significant difficulties in the delivery of their services. These difficulties include; increased attendances at A&E departments, increased waiting time for A&E treatment, and inpatient beds and widespread cancellation of elective procedures. Given these problems it is unsurprising that the provision of, and accessibility to acute hospital service in Ireland has become an important issue. Thus, in this paper, we will look at the issues that effect accessibility to acute hospitals in rural Ireland.

At its simplest level, accessibility is the ease of reaching opportunities or the ease of being reached. Accessibility is an attribute of people and goods rather than transport modes or service provision, and describes integrated systems from a user viewpoint. A clear and precise definition of accessibility would be hugely beneficial to rural planners. The ability to objectively quantify differences in levels of accessibility among population groups, and areas would provide invaluable information to policy makers.

This paper takes a quantitative approach to the study of acute hospital accessibility in rural Ireland. Few quantitative analyses of acute hospital services have been undertaken in Ireland. This work hopes to draw on those studies (Kalogirou & Foley, 2006), using spatial interaction models to analysis accessibility to acute hospital services in rural Ireland.

2. METHODOLOGY

SMILE is a spatial microsimulation model developed by Teagasc, and the Leeds school of Geography. SMILE currently produces attributes at the house-level; however, SMILE now needs to be developed to include household interactions. At the moment nothing is known about individuals demand for health care. If health status attributes were added to SMILE, we would have a powerful model of household interactions with health care services in Ireland. This paper seeks to bridge the gap by adding health demand attributes to SMILE, so that accessibility to acute hospitals in rural Ireland can be modelled.

There are numerous methodologies available to measure accessibility to acute hospital services. Simple accessibility indicators include, Euclidean distance measure, travel time or travel cost. Model-based indicators are based on predicted levels of interaction as calculated by either discrete-choice models or spatial interaction models. Spatial interaction models are formulated to quantify the interactions between origins and destinations. In this paper, the origins are residence zones (EDs) and the destinations are acute hospitals. Clarke et al (2002) use the following spatial interaction model to examine shopping flows, which can easily be adapted to analysis accessibility to acute hospitals:

$$S_{ij}^m = O_i^m A_i^m W_j^{\alpha^m} \exp(-\beta^m d_{ij})$$

(1)

Where:

S_{ij}^m = expenditure by household type m in residence zone i at destination j

O_i^m = level of consumer expenditure of household type m in residence zone i

A_i^m = Is the combined attractiveness of accessibility of all the acute hospital opportunities to residents of area i. A_i^m is a balancing factor that counteracts the negative effect of distance decay. A_i^m is calculated as:

$$\sum_j S_{ij}^m = O_i^m$$

(2)

This is in turn calculated as:

$$A_i^m = \frac{1}{\sum_j W_j^{\alpha^m} \exp(-\beta^m d_{ij})}$$

(3)

Where:

W_j = the attractiveness of destination j

α^m = a parameter reflecting the perception of a destinations attractiveness by household type m

d_{ij} = the distance between origin i and destination j

β^m = the distance decay parameter for household type m

The interaction system for an acute hospital model is comprised of three elements; demand, supply and interaction. The demand side is calculated as follows:

$$O_i^m = e^m H_i^m$$

(4)

Where:

e^m = the average weekly grocery expenditure by household type m,

H_i^m = the number of households of type m in residence zone i, from the 2000 Census of Population

The supply element of the spatial interaction represents the attractiveness of an acute hospital outlet. In general, a proxy measure of attractiveness, based on acute hospital size is used.

Once a spatial interaction model has been developed and calibrated, it is possible to predict flows from residential zones to acute hospital destinations. Model based indicators are more relevant to accessibility analysis because they are based on movements of consumers rather simply on the geographical location of service options that are available to residents in a particular zone. Thus, spatial modelling allows

planners and policy-makers to consider a range of factors in a decision-making, based on the interaction of consumers and individual. However, this information alone does not inform us of spatial variation in accessibility to acute hospital outlets.

3. RESULTS

In this paper we need to assess how the residents of an area interact with the acute hospitals. The main sets of outputs from the spatial interaction model are a set of performance indicators, which are able to quantify spatial variation in accessibility. There are a number of performance indicators available however in order to identify the extent to which poor access to acute hospitals is a problem in rural Ireland, one can use effectiveness indicators.

Bertuglia et al (1994) outline effectiveness indicators as indicators that are used in relation to residential location, and relate the ways in which residents are served by organisations or facilities. They continue by introducing an aggregate level of provision indicator and a level of provision per household indictor which can be used to measure the effectiveness of delivery to acute hospital outlets. The indicator for aggregate level of provision in an area is given as:

$$ w_i^m = \sum_j \frac{S_{ij}^m}{S_{*j}^m} W_j $$

(5)

This indicator (5) involves taking the proportion of provision at j which is used by the residents of i and then summing it to obtain a measure of total service provision for residents of the rural area i. The results of the performance indicator can be analysed as follows:

- If service provision for a particular area is low, but population is also low then the area may not be classified as a problem zone
- If an area has relatively low provision and population is high then the performance area will establish this area as a problem area
- Also, it is possible that an area with high provision and high population will appear to be poorly served because the indicator is a measure of the share of a facility that a residence area has

Relating this aggregate provision indicator to population in an area will allow the identification of areas where a significant number of households suffer poor accessibility to a particular service. Level of provision per household is an indicator that divides the aggregate level of provision by the number of households in the residence zone, as follows:

$$v_i^m = \frac{w_i^m}{H_i^m}$$

(6)

In the case of this indicator, zone i is individual households rather than EDs. This indicator provides a measure of accessibility at the household level to key services in rural Ireland.

4. CONCLUSION

The outcome of this paper is a set of accessibility indicators, which are used to assess accessibility to acute hospital outlets in rural Ireland. Using these indicators policy-makers and planners can assess which areas of rural Ireland are under-serviced with regard to acute hospital outlets.

5. BIBLIOGRAPHY

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