

Social and geographical accessibility to service, concepts and indicators in animal health care systems. An application to a farmer census dataset in Highlands of Ethiopia.

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a) Summary

The study provides a theoretical framework and revisits concepts of accessibility at the border between sociology geography and health economics [Bonnet P., 2002], [Diechmann U., 1997], [Drummond M., 1998]. It provides illustration from Ethiopian highlands farming systems, with some calculation of indicators of accessibility to health service using point patterns data at various scales (global and local analysis) and taking various perspectives (users or service providers). The use of accessibility indices is also discussed in various context.

b) Introduction

Measurement and mapping of accessibility to medical services indices should be part of the evaluation process of any health system. It is of particular importance in developing countries if we want firstly to implement pro-poor policy for better access of farmers to service [Perry B.D., 2002] and secondly for proper evaluation of health system with regards to SPS OIE-WTO agreement. Moreover accessibility indicators provide exogenous variables to explanatory Health service utilization research (access studies).

c) Objectives

The study is part of a larger research protocol to study local determinants of re-emergence of CBPP in Africa with particular focus in Western Ethiopian highlands. Determinants of herd CBPP status are firstly factors which favor spread of causative agent and secondly factors which slow down spread in the area such as use of treatment and vaccination. Therefore potential accessibility and eventual access to service was thought important to be documented.

d) Materials & Method

The local and global study on geographical accessibility to veterinary service has used census point dataset (agriculturalists, animal breeders & clinics public and private) as observed in the study area. A first geographical layer originated from a census of 6110 farmers geo referenced with GPS out of which 2390 animal breeders were used for the analysis of accessibility to service. A second layer representing the context of 16 public services out of 24 health care resources in the area was used. In local analysis, and with farmer's perspective we computed minimal distance to service, number of resources in a given radius using GIS facilities & mapping with interpolation. Additionally social accessibility was addressed firstly duplicating study

with selection of some categories of farmers (Figure 2: <5 cattle) and comparison. Secondly distance to service was compared with other distance data originated from study of distance patterns within social networks (exchange of animals between farmers as a proxy variable for socio-spatial behavior). In local analysis with provider viewpoint we computed resource density indices using administrative lattice and reconstructed health districts with Delaunay triangulation. The tessellation with construction of Voronoi polygons leads to new theoretical clinic catchment areas. This illustrates the redrawing of administrative maps into Health decision maps. The global analysis was computed with centrophraphic analysis of both clinic and farmer dataset. Mapping of centrophraphic analysis with metric Euclidean distance indices was computed with Crimestat© [Levine N., 2002]. Mean center and Standard distance Mcsd, Standard deviational ellipse Sde and median center MdnCntr, nearest neighbor analysis NNA were applied with Mapinfo© in metric UTM projection. It provides ability to look at global balance of the health system when comparing relative location of central points.

e) Results

Structural Heterogeneity of accessibility in the area is documented with some maps [Cislaghi C., 1998] at global and local scales. At local scale and with farmers perspective (Figure 1) study of distance to nearest clinic provides a first relief map which displays same data as statistical distribution but gives emphasis on bearing effects & allows detailed study of local configurations of inaccessibility when applying other GIS layers on the area (relief, rivers acting as natural barriers). The average value for minimal distance was 4800 m +-1880 (SD).

Figure 1(left): 3D mapping of Farmer's Minimal distance to public clinic (Rectangular Interpolation method) & Distance distribution

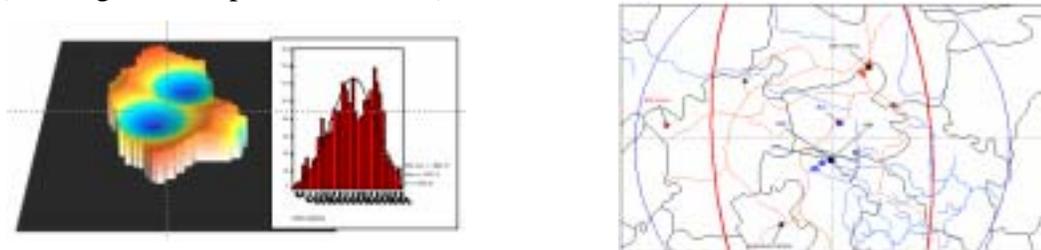


Figure 2 (right): Centrophraphic comparison of central mean points of public clinics (red = Mc_clinic) & farms points (all = black) & (small breeders = blue).

Global accessibility taking dual perspectives is better addressed with centrophraphic analysis & maps and allows multiple comparisons between health districts. Global accessibility with provider perspective is documented with indexes on density of resources given number of potential users and should be used in various lattice configurations. Distance between farmers and health resources mean points was found 7 km in the area.

f) Discussion

Geographical accessibility studies alike Health economics studies (and social accessibility studies) requires to take a viewpoint to carry out any analysis and use multi-scale approach. Indices when provided from farmer's perspective are better

used for revising pro poor policy, whereas indices from provider's or societal perspective should be used for optimal health planning. We recommend use of both to cover full understanding of accessibility matters, as it is the case in economic evaluation of health programs before decision is made. We also recommend the use of relative distances of accessibility. Indices computed in the paper are absolute measures of accessibility that one may compare with proxy measurement of social distance. When using e.g. distance computed from study on exchange of animals between farmers which represents a proximity service, one find that average minimal distance to health post is 2 times the social distance of animal exchange (2500m) at the threshold of 87% of farmers in the cumulative distribution.

Social accessibility also relates to financial barriers and should be addressed in conjunction with spatial evaluation of accessibility when existence of socio-spatial clusters of farmers is assumed (poor farmer clusters with remarkable location should be targets for credit programs).

No network analysis based on transport means was undertaken since the importance of tracks roads in the very rural West Wellega zone is found minor as compared to other factors. Global indices of accessibility at national level should complement the study figures to better compare countries or large regions to each other. Local indices of accessibility can be used as exogenous variables in explanatory studies on use of services i.e. access studies.

Other geographical models issued from economic geography should complement the figures like the use of Huff and Reilly Gravitational models particularly when addressing health planning issues & resources allocation based on catchment areas. Finally the equitable delivery of health care services and as well the ability to develop and evaluate appropriate and efficient national disease surveillance systems and adopt good health planning are closely related to the knowledge of indicators on average or specific accessibility to health resources (generic or specific service) and spatial behavior of farmers and animals.

g) References

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