

How to better target health interventions in developing countries. An illustration of the use of segregation and concentration indexes to assess socio-spatial differentiation and discuss better access to sub groups at risk.

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#### a) Summary

The study addresses some methodological tools on how to better target health interventions in a given population and look at relative location of farmer's categories when we have population characteristics data per zones. Accessibility to farmers from a provider's perspective clearly depends on ability of providers to target service users particularly for preventative interventions. Segregation indexes to be used with GIS in addition with other methods have been found interesting tools to study distribution of subgroups of farmers, after having analyzed diversity of potential users and heterogeneity within a spatial domain.

#### b) Introduction

In geography and economics of health services whether in veterinary or human health the consideration about the location of particular groups of users at risk is essential. It is important to access to marginal groups when looking at poverty reduction or when targeting vaccination. Economic evaluations of health interventions have already integrated that issue when undertaking sub group analysis for a particular program during the sensitivity analysis step. The question remains how to identify and qualify specific groups of population and study their relative distribution within a spatial domain?

#### c) Objectives

In order to address this issue in medical geography, geographers generally use various indicators to look at dispersion or concentration (Gini.). They have been used in urban geography to look at residential segregation of a given population [Duncan O.D., 1955] [Massey D.S., 1985]. It is particularly relevant to test their use in high density population areas of sub Saharan Africa such as highlands of eastern Africa although rural. The paper provides an illustration on how residential segregation indexes can be used in a purpose of targeting since they serve to understand heterogeneity of spatial distribution of sub groups as a proxy to probability of contact.

#### d) Materials & Method

The authors have used data from a geo-referenced farmer census (2390 farms owning and exchanging animals with each other) and animal movement survey (13351 movements) that has been carried out in the district of Boji, Oromia region, West Wellega zone (Ethiopia). Data are applied to polygon grid in GIS (irregular administrative lattices of Peasant association PA's). Computation of residential indexes such as evenness (within group segregation indexes indicating over or under

representation of a given group in one particular pixel, or between group dissimilarity indexes), exposure (isolation index or interaction potential between individuals within a group, or between groups), concentration (surface occupied by a given group), clustering (measure of relative contiguity of groups in pixels) have been carried out with specific Mapbasic program on Mapinfo© [Apparicio P., 1998]. It has been applied on full data set on particular types of farmers (e.g. after identifying sub populations at risk given a particular agricultural practice). We divided the 2390 farm population into three subgroups based on balance of animal exchange, categories which are E R and N, respectively farms emitting more animals than receiving (E), opposite (R), or (N) having a nil balance with regards to exchange of animals.

#### e) Results

The relative percentage of E R and N categories were found to be 12,6 % 44% 43,4% relatively. Segregation in the domain is explored by evenness indexes at first.

Table 1: IS segregation index Duncan and Duncan given E R and N categories of farmers in the study domain. Value indicate the % of the group that should move elsewhere to have perfect equal distribution between cells from irregular lattice

IS	Groups
0,092000000	E outgoing
0,127000000	R incoming
0,119000000	N neutral

A value to zero means high similarity between spatial cells when examining the distribution of one group independently from another within the domain.

Table 2: Dissimilarity index Duncan , ID in 15 PA appears to be quiet similar since the value tends to 0: spatial separation between two groups (E and R)

Group	E	R
E	0,00	0,14
R	0,14	0,00

There is high residential compatibility when looking at values between E and R categories which is not to be surprising since we assume that collaboration between farmers belonging to E or R categories is the key element of mutual aid within proximity distance. Other indices were computed like entropy and Gini.

Groupe	Groupe2	XPY_G1_G	XPY_G2_G
1		2	1
E	R	0,43	0,12

Table 3: interaction indice (exposure index) Probability that group 1 E share same lattice cell with group 2 R is relatively high giving evidence on the role of proximity when collaborating.

Table 4: Spatial aggregation White indexes

Groupe1	Groupe2	P00	P11	P22	P21	SP	RCL
E	R	4,21	4,23	4,20	4,36	0,99	-0,09

P22 indicates that there is relatively good proximity between category R and E.

#### f) Discussion

Socio spatial segregation has been studied extensively by north American authors when looking at urban areas in human health and socio-geography [Perron M., 1991], [Perron M., 1997], [Massey D.S., 1985]. Ethnicity remains a major concern there. In animal health we have tried to apply such indexes to socio-economic categories of farmers that collaborate in social networks with an intention to better understand spatial practices and socio-spatial pathogenic complex [Picheral H., 1998]. We also study the potential degree of collaboration when exchanging animals and given relative spatial distribution which relates to disease spread risk. The paper therefore discusses the use of such indexes in health service research to better target services to particular areas. In the paper it is obvious that first crude categorization needs to be improved since a balance to zero may mean different types of farmers 10 animal entry and 10 exit leading to zero & equivalent to a +1 and -1 scenario belonging to the same category N, whereas risk of disease introduction is considered quite different between two farmers.

#### g) References

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