CARTOGRAPHY VERSUS CHOSEN PROBLEMS OF UNDERREPRESENTED GROUPS OF PEOPLE

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Abstract

Cartographic presentation of spatial distribution studied demographic group in global dimension leads to determination of least number of people creating sub–groups that can be treated as unit represented by individual designation. As a consequence of diminution of background separating of two thematic elements is limited, so the level of detailenes of visual model depends from the scale of map and spatial arrangement of distracted sub–groups of studied group.

Using equal–area cartographic model right presentation of spatial distribution of population consists of many subgroups distracted and varied each other in terms of size is very difficult. In case of underrepresented (in chosen territory) group such as immigrants or confessing non dominant religion — some groups constitute just a promile part of whole society where it actually lives, when in native place are dominant.

This paper presents some author's proposals related to right cartographic presentation of chosen demographic problems.

1. INTRODUCTION

Among many types of socio–demographic groups, which are often presented in the thematic papers or even special atlases, such as "under–represented" populations still can be noticed as an exception.

On the one hand it is because the majority of these groups of people have been distinguished just in the present day (as the result of global tendencies to equalising the basic human rights) on the other hand the specific type of its spatial distribution can not be expressively visually shown with the aid of traditional cartographic methods.

Searching the best solutions we can try to revise some abandoned methodological proposals by adding modern instrumental techniques being in our disposal. Not going into appraisal of ethnical, socio–political or economical meaning of inequalities between distinguished human groups, we want mainly to order different kinds of approaches to available data with a view to right reflecting such important features as: equalisation of share, discrimination, accessibility, representativeness and others using cartographic modelling.

2. SUBJECT OF THE INVESTIGATION

From the cartographic point of view in case of "under–represented" population we have always think about a comparison between two groups of people. Various types of problems which can be enhanced using maps require some innovations in the field of data –processing

as well as visual presentation. Long list of applied characteristics is not sufficient for contemporary needs. As it has been already mentioned it appears necessary to adopt well––known solutions for precisely determined goals.

The first group of issues is being concerned with a situation when two "opposite" groups of people are considered and we want to evaluate the relative shortage of minority–group as a measure of its chance to be balanced with the second one within all sub–areas of studied territory.

More complicated case is connected with cross–division of whole population into two different pairs of component–groups, depending from two features "A" and "B" being in our interest. In present socio–demographic studies two types of problems are of special importance. The first question is the level of inequality of accessibility to some benefits "B" between two component groups: a and a' — creating one society. The second problem is the level of share the one sub–group "a" within chosen component group "b". Contemporary census as guaranteed level of share for some sub–group (of course "under–represented" one) have to be considered with the view of trials of overcoming the barriers connected with existing customarily, but also — as often not right formulated rule of equal representation within both groups of people.

Other important question is connected with cartographic presentation of global distribution of chosen population consisting of many distracted sub–groups.

3. PROPOSED METHODS

3.1. Imbalance of number of people within two sub–groups creating one population in the compact territory

For suitable evaluation of imbalance of nationality in former (1933) Polish territory it was proposed [Smoleński, 1933] to apply the relative shortage (or surplus) determined within each individually treated district. It was the basis for creating very expressive isopleth map as the visual model more useful and more credible for evaluation of "potential national conflicts" than earlier used choropleth map.

It can be observed that for this special aim it is required to enhance the spatial distribution of absolute values of data, when choropleth maps do not represent the differentiation of absolute value inside individual sub–areas. The Smoleński's proposal was concerned with a very important problem of equalisation the number of people in frame of two component groups of studied population of Polish citizens. Such type of research seems to be necessary for right evaluation of possible barriers to integration process inside two–national, two–linguistic or two–confessional societies. The two distinctly various groups are treated as two rather "opposite" than "collaborating" components of one population — source of existing or possible conflicts.

The essential element of evaluation the spatial distribution of force of "resistance" that the minority sub–population L' of L population meets on the way to quantitative levelling with the rest ($L - L'$) of society in an area P is to determine **the relative shortage** d, defined as:

$$d = \frac{L - 2L'}{P} = g\left(1 - \frac{n}{50}\right)$$

where g is a general density of an area P:

$$g = \frac{L}{P}$$

and n is the value:

$$n = \frac{L'}{L} \cdot 100$$

of percentage share of minority group in whole population that live in an area P. The special distribution of relative shortage d within studied territory can be presented using isoline model of map.

The equalisation of number of people within two sub–groups of population can be considered as the problem of relation between minority and majority in the same society.
On the figure 1 we can notice the case of single division "A".

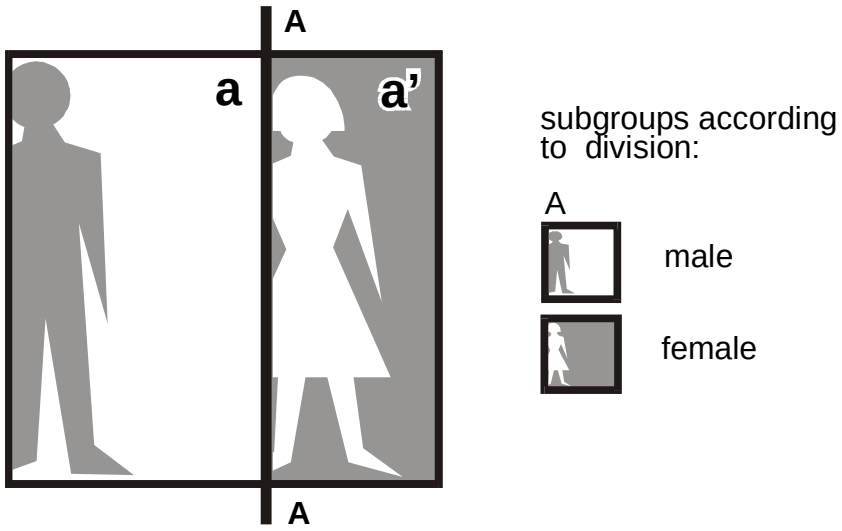

Fig. 1. Male sub–group as the majority and female sub–group as the minority in the population

Instead of presenting, using choropleth method, the percentage share of only one (for instance minority sub–population) it can be compared the percentage share each of components of the whole population, determining the measure of diversification in the form:

$$\frac{a}{a+a'} - \frac{a'}{a+a'} \text{ or } \frac{a'}{a+a'} : \frac{a}{a+a'}$$

So explicite:

$$i_d S = \left(\frac{L-L'}{L} - \frac{L'}{L} \right) \times 100 \text{ or } i_s S = \left(\frac{L'}{L} : \frac{L-L'}{L} \right) \times 100 \qquad (1)$$

where i_dS — means level of **distinctional inequality of shares**, and i_sS — means **structural inequality of shares**.

Each of these two indicators can be applied as suitable measure of inequalities of shares of two components of studied population and then choropleth map can show the spatial distribution of determined levels of inequalities, instead of separately treated cartographic presentation of each group using one of numerous comparative types of cartodiagrams, for instance bar map. For right cartographic modelling the spatial diversification of i_dS or i_sS as a background of new type of choropleth map should be used equidemic form usually called cartogram or anamorphic map, where each area of reference unit is scaled according to the level of L.

3.2. Inequalities in case of cross–division of population

The situation is more complicated when one has to observe the difference between share two sub–groups into the other one, which has been distinguished as a result of independent division of population into suitable two parts. On the figure 2, as the result of cross–division "A" and "B", four groups: ab, ab', a'b, a'b' has been determined (where the product means the participation of elements in both component — groups).

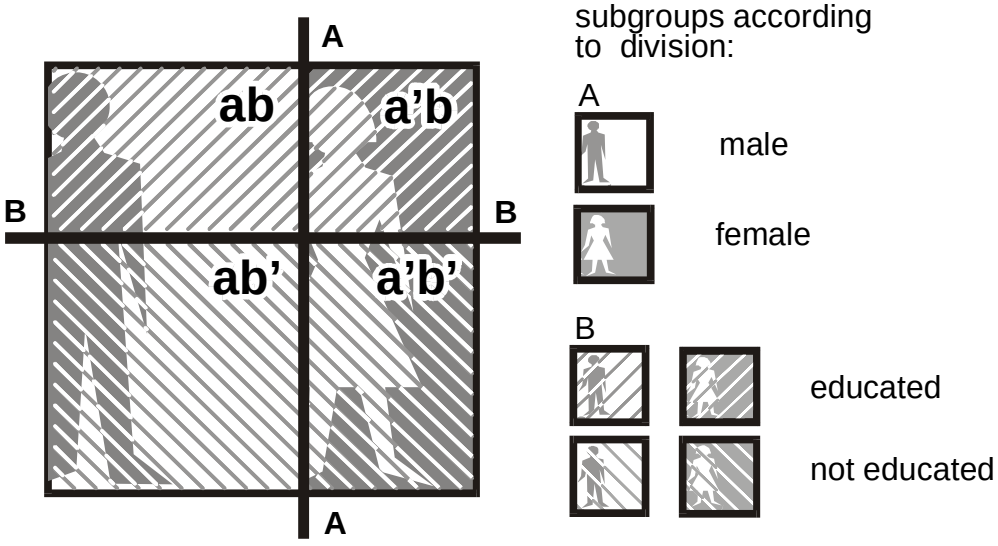

Fig. 2. Equal 60% men's and women's accessibility to education

From present social point of view the relations between them can be considered as indicators of such very important processes as integration of society, levelling of educational or cultural chances, overcoming the barriers against the development. The question that could be shown using cartographic methods are: level of accessibility and level of representation each of group — specially: guaranteed representation.

On the figure 2 we can see a cross–division AB of some population when the condition of equal shares of both distinguished groups of people has been fulfilled.

In consequence of "A" division two complementing groups a and a' have been composed. Similarly as the result of independent division "B" sub–populations: b and b' — have been determined. Using the symbols on the figure 2 the percentage share of educated men in the male sub–population is determined by the value $\frac{ab}{a} \times 100\%$ and consequently — the share of

educated women in the female sub–population by the value $\frac{a'b}{a'} \times 100\%$. In our example these two values are 60%, so of for instance group a contains 60 men, a' — 40 women and the number of educated men is 36, the number of educated women should be 24.

The figure 3 presents a case of unequal level of accessibility to education for male and female groups.

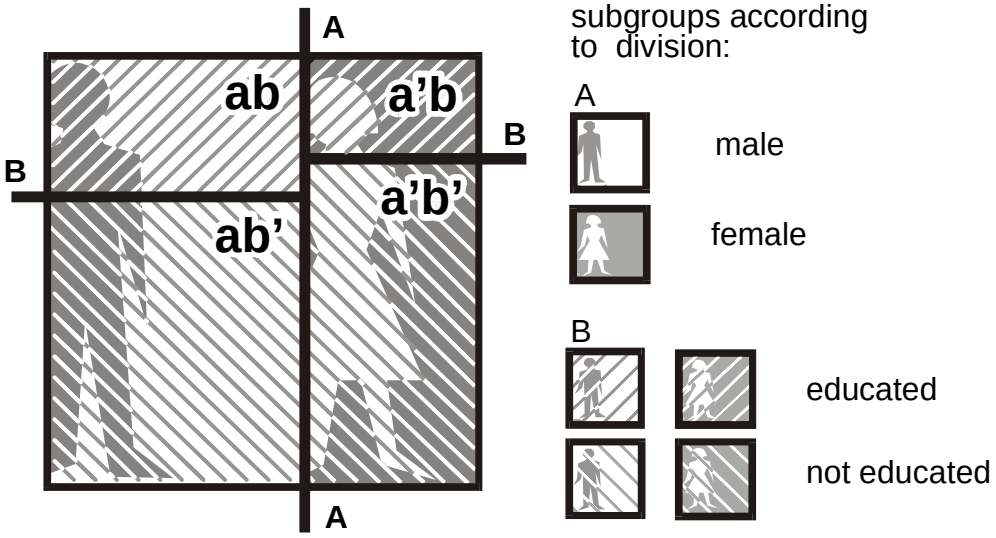

Fig 3. Unequal level (67% men's and 75% women's) of accessibility to education

We propose to determine the measure of chance to equalise the percentage shares between two sub–groups a and a' of some populations, fulfilling the same condition b being in our interest, as the value of **relative inequality of accessibility**:

$$r_i A \overset{def}{=} \begin{cases} \frac{a'}{P}\left(\frac{ab}{a} - \frac{a'b}{a'}\right) & when \quad \frac{ab}{a} > \frac{a'b}{a'} \\ \frac{a}{P}\left(\frac{a'b}{a'} - \frac{ab}{a}\right) & when \quad \frac{a'b}{a} > \frac{ab}{a} \end{cases} \tag{2}$$

or explicite: positive value from:

$$r_i A \overset{def}{=} \frac{L - L'}{P}\left[\frac{(L')'}{L'} - \frac{(L - L')'}{L - L'}\right], \; r_i A \overset{def}{=} \frac{L'}{P}\left[\frac{(L - L')'}{L - L'} - \frac{(L')'}{L'}\right],$$

where:
L — the number of persons living in a studied area P,
L', $L - L'$ — number of people belonging to each of two complementary sub–populations created in consequence of "A" division,
(L'), $(L - L')'$ — number of persons from each of two previously determined sub–populations and more over belonging to sub–population $(L')' + (L - L')'$ created as a result of independent division "B".

The measure of positive value from:

$$a_i A = L - L'\left(\frac{(L')'}{L'} - \frac{(L-L')'}{L-L'}\right),\ a_i A = L'\left(\frac{(L-L')'}{L-L'} - \frac{(L')'}{L'}\right) \tag{3}$$

is the absolute value of elements participating in one of groups necessary to equalising the percentage share of for instance educated persons, inside each of compared groups.

In our example (see: Fig. 3), when for instance 30 of 40 women and 40 of 60 men are educated (a' is 40, a'b — 30, a —60, ab — 40), the second rule of (2) can be applied, so

$$a_i A = 60\left(\frac{30}{40} - \frac{40}{60}\right) = 4{,}8\,.$$

This result means that it is necessary to complement absolute shortage on the level 5 persons within group of educated men if we want to equalise the level of "accessibility to education" for both groups of studied population.

We have to do with such type of problems when the equal accessibility for instance: to labour market, education, legislative seats or medical care within two sub–populations for instance: young and old people, men and women, state citizens and immigrants — are considered.

We have notice that only when the level of diversification of accessibility of two human groups to some kind of benefits (goods, rights), given by formula (2) reaches the value of zero, the equal accessibility could be treated as fully confirmed. Of course it does not means that the number of persons of each studied group is equal! In our example when the group of educated women consists of 30 persons, the group of educated men should consist of 45!

Representation of one sub–population in relation to the second one in the certain distinguished independently part of the same population can be treated similarly as in previously considered problem of equal share each of two component groups creating the whole society.

The particular case is when both representations reach the same share. As an example (see Fig. 2) we can compare the levels of the percentage shares female sub–population and male sub–population in the group of educated persons living in studied area. Using typical choropleth method we can show the level of share's inequalities, determining as the measure of **participation's inequality of value** in the form:

$$\left(\frac{ab}{b} - \frac{a'b}{b}\right) \text{ or } \frac{a'b}{ab},$$

or explicite:

$$i_d P = \frac{(L-L')' - (L')'}{(L')' + (L-L')'} \times 100 \text{ or } i_s P = \frac{(L')'}{(L-L')'} \times 100 \tag{4}$$

(In this case the ab + a'b group composed from only educated people within whole previously studied population can be treated as the new population being in our interest, so i_dP as well i_sP have the same meaning as i_dS and i_sS).

Similarly as in previous case the equal share each of two component — groups in the third does not means the share proportional to numbers of elements in one and the second sub–populations! Such two various questions: equal accessibility and equal "participation" are often treated not enough distinctively, specially spreading about equality of rights of both gender sub–populations, without analysis of number of people inside the one and the second group...

Such situation may occur when the question of women's commitment on policy is guaranteed e.g. in South Africa where since 1994 the ruling African National Congress party has reserved 30 percent of its national candidates for women.

(The case of guaranteed minimal percentage share of one, often treated as "under––represented" sub–group of people in the determined other, can be considered as resulting preference, because the second sub–population with a previously limited condition of participation is being 'a priori' not privileged but exactly discriminated! But reality is not so righteous and it is necessary to steer the demographic policy).

It can be finally noticed that i_sP as an indicator of structural inequality of shares of the compared groups should be used just when the limited proportional share of the group is required. Choropleth map is the best model presenting spatial distribution of diversification of i_sP within studied area. Percentage diversification of i_dP or i_sP can be similarly as in the case i_dS or i_sS shown using cartogramic equidemic type of backgrounds organisations.

3.3. Spatial distribution of chosen population contains many distracted sub–populations — as a cartographic problem

Question of right presentation many sub–populations, varied each other in terms of size, is very complicated. Some of groups constitutes just a promile part of whole society where it lives, when another are dominant. Traditional method of modelling in such case is cartodiagram or dot map. The first most popular solution seems not be the best one because of "too great" distance of some diagrams which should be compared and "too small" difference between values of some data which can be right shown. The dot method is more useful for overcome the second from mentioned barriers, but a choice of value for a dot representing very little number of persons causes that in areas of strong dots domination some of collections are not countable.

The solution suggest by Monmonier [1977] and Castner [1971] is application of method of scaling the value of reference units according to a spatial distribution of data which can be represented. We propose to join all elements of the specific methods using as backgrounds organisations an equidemic anamorphosis and then — presenting special distribution of minorities groups of studied sub–populations (for instance yellow race or English speaking) using dot's method when majorities groups — using interval–choropleth method. Each dot should express for instance one promile of whole number of persons in the sub–population. The percentage of studied sub–population in territories of its dominance should be easy transform to absolute value because of equidemic type of reference area.

4. ANALYTIC CONDITIONS RELATED TO THE BACKGROUND'S ORGANISATION IN CASE OF THEMATIC MAPS OF UNDER– –REPRESENTED GROUPS OF PEOPLE

Formulating general conception of cartographic modelling of certain hitherto marginally treated part of social demography we can not confine to methodical propositions. If we are interested in right presentation of precisely determined group of numerical attributes of distinguished population it is necessary to choose the most suitable types of map projections accordingly to the size of region and the distribution of distortion within it. Of course, previously described requirements related to the organisation of "background" in case of specific methodical solutions should be fulfilled. As the projection must determine the effectiveness of the map as a communication medium a small scale map presenting global distribution of chosen minority group of population can be elaborated in projection preserving not only recognisable region's boundaries but also not to great value of areas distortions. Such conditions are fulfilled in case of compensation projections composed for instance in case of Winkel's projection from equidistant cylindrical and Aitov transversal when in Good's — from Sansons and Mollweide projections. Detailed choice should be made after comparison of values as well as distribution of distortion within specially interesting part of mapped region in several projections or even its modification. Computer generation of map projections provides a convenient means of producing various types of projections. We can also use one of: Robinson's [1974], Mc Arthur's [1979] or Snyder [1998] projections. Among group of well–known global equal–area projection we propose to use Lambert's or Eckert's (6) projections as accessible in MapInfo as well as minimum–error polyconic — Canter's projection [Canter, 1991].

Such choice is also because of not very complicated courses of grid lines, as well as not significant change of shapes.

Distribution of chosen sub–populations on regional maps could be shown applying some conventional projections. Equidemic organisation of background is recommended in case of mapping some special distribution of population. As in this paper the problem of displacement of people's group is not taking into author's consideration a group of conformal projections, basic for cartographic presentation characteristic directions of temporary changes can not be discussed.

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