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Statistics and Geography**

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Topic (iii): Spatial analysis

RESIDENTIAL DIFFERENTIATION STUDIES BY GIS

Submitted by Statistics Finland¹

Invited paper

ABSTRACT

The study on residential differentiation and segregation has for a long time remained aspatial because it has been difficult to add a third dimension, location, to an already complex system of population and housing characteristics. The use of GIS linked with the census data enabled geographical specificity to be incorporated into the study. The aim of this paper is to demonstrate how both dimensions - the social and the spatial - are essential when processes in urban or countrywide regional developments are examined. In addition, a methodological point is made on how the use of GIS actually enables the combination of not only different types of statistical data but also qualitative and quantitative data.

In the case of Helsinki, the use of small area units, 250m x 250m census grid cells provided by Statistics Finland, makes it possible to see small local variations and thus deepens the understanding of spatial processes related to residential differentiation. Even if the Helsinki metropolitan area is a fairly balanced urban area, unwanted segregational processes are identifiable – but only if the unit of analysis is small enough. The recognition of these local developments is, however, essential to the formulation of preventive urban policies.

I. SOCIAL AND SPATIAL ELEMENTS PROVIDE INFORMATION ABOUT THE DIFFERENCES IN SOCIETAL STRUCTURES

1. There are two essential dimensions of differences in the research on social differentiation and segregation: the social and the spatial. There can thus be differences in social or in spatial resources available to different households in neighbourhoods, or in both. Also, the trends emerging from the cities on social inequality and spatial segregation can be manifold.

2. Even if social and spatial differentiation are closely connected, it is important to examine them independently. Several international examples have shown how the increase in social inequality leads to an increase in spatial differences. The fear behind this kind of development is based on the idea that increasing spatial segregation will lead to increasing separation of different social classes. This would, in turn, produce additional local negative developments and finally result in the disintegration of urban society (Fortujin et al. 1998). To prevent this kind of development, both social and spatial policies are necessary.

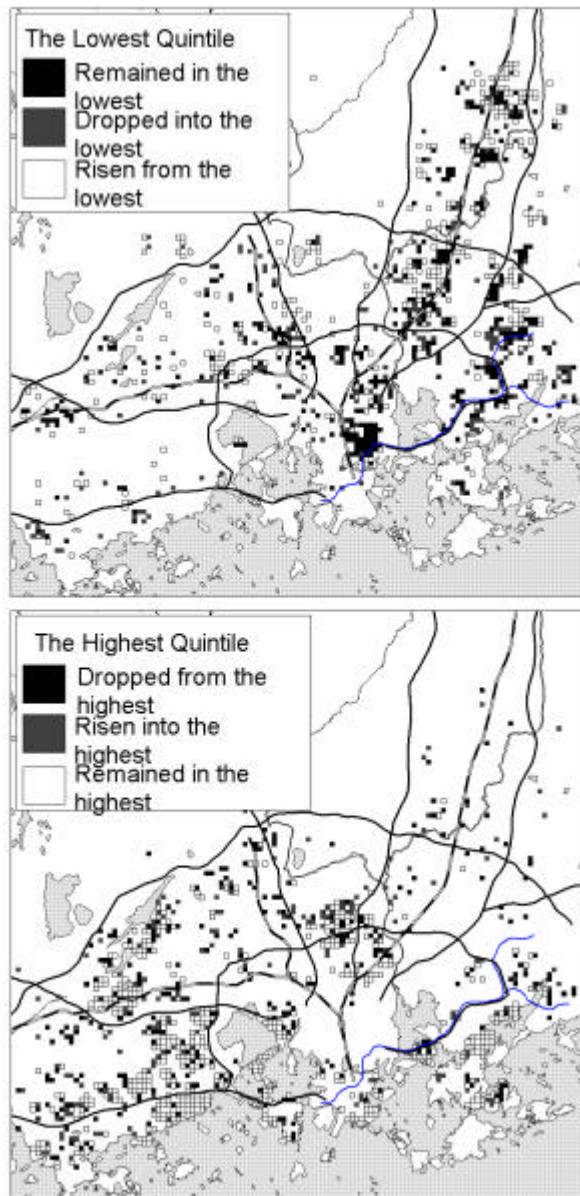
¹ Prepared by Mari Vaattovaara.

3. Because one basic assumption, from a geographic standpoint, is that location itself is of great importance in any pattern of human behaviour, the use of GIS in the examination of social spatial patterns is crucial. This can be demonstrated effectively through the examination of a study from Helsinki. Even if there really have not been any societal changes in terms of a widening gap between the top and the bottom in the social structures in Helsinki, notable spatial processes resulting in a more divided city can be seen. The appearance of such spatial developments is, however, possible only if the spatial unit of analysis is small enough; the use of GIS in this task is essential.

4. As an example of these developments, income distribution is examined in more detail. It is important to note how income disparity has changed during the reference period. The starting point is the assessment of relative income disparity based on both quintile and decile distribution. There were two main results. Firstly, the inter-quintile (and inter-decile) ratio was examined. There was no change between 1980 and 1994; the ratio was 2.1 in both years, and the result is the same whether measured by quintiles or deciles. In international comparative materials there are significant differences: in Toronto city centre, the corresponding decile changed from 2.8 in 1970 to 4.1 in 1990 (Murie 1998), and in London, the ratio in the total population was 3.9 in 1978-1980 and 8.17 in 1989-1991. As regards households where the reference person was employed, the ratio had increased from 3.1 to 4.2 (Hamnett 1995). It seems that, contrary to the results in several international comparisons, in Helsinki general income disparities have been stable during the reference period. This may result from the Nordic welfare state, taxation and income transfer.

5. Taking this into account, it is interesting that variations in income disparities in different areas have become more marked during the same period, i.e. between 1980 and 1994. The new findings (Vaattovaara 1998) provide new cause to discuss the spatial differentiation of the urban structure. It seems that between 1980 and 1994 small weak areas began to spread and become concentrated in eastern and northern suburban housing estates. The variables fall into a mosaic-like structure but in such a way that the majority of new weak areas have emerged next to the old ones (see Figure 1). This means that, although the overall income distribution has not changed, people are distributed more clearly according to income.

6. In that study, fine grid cell census data sized 250m x 250m, supplied by Statistics Finland, was used (Vaattovaara 1998). It is important to note that these kinds of patterns are not apparent when larger units of analysis are used.



**Figure 1. Change in income 1980 – 1994 in the metropolitan area of Helsinki
(Data: Statistics Finland)**

II. FROM SOCIAL EQUILIBRIUM TOWARDS A DIFFERENTIATED CITY

7. The past development of the Helsinki region seems somewhat exceptional on an international level: in contrast to the international debate on how to interpret growing urban inequalities (Sassen 1991, Fainstein et al. 1992, Hamnett 1994 and 1998, Boregård et al. 1998), the development of the Helsinki region has rather been characterised by a slow but steady levelling out of spatial socio-economic differences (Lankinen 1998). International comparisons link the result to the exceptional political traditions of the country: the 'Nordic welfare state' has created one of the most equal income distributions in the western world and it has been accompanied – on the local level - by a persistent policy of social mixing, inhabiting different social strata in the same neighbourhoods - as a means to prevent segregation

(see MacIntosh et al 1999). As a result, at the turn of the 90's the region was experiencing its best socio-economic balance of recorded history (Lankinen 1998).

8. In the 90's, however, the development of the region turned towards increasing urban inequalities. During the late 80's spatial unemployment differences were virtually non-existent, but now traits of a permanent spatial concentration of unemployment have emerged (Kortteinen – Vaattovaara 1998; Lankinen 2001). A drastic turn towards growing inequalities has also emerged in spatial income distribution (Lankinen *ibid.*). All this has happened with no obvious political event that could account for it. The Finnish version of the Nordic welfare state survived well over the depression and its aftermath, and the political pursuits of the City of Helsinki have persistently been designed to prevent segregation from emerging. In spite of this, a historical trend towards increasing inequalities has emerged.

9. At least four different but related phases in regional development can be identified. Firstly, at the beginning of the 90's, Finland experienced a recession deeper than that of any other OECD country since World War Two. In the course of three years, labour shortage was replaced by mass unemployment reaching about one fifth of the labour-force. The eastern suburbs, built during the strong wave of urbanisation in the 60's and 70's, possessed from the start a social structure that was somewhat less educated and more working-class than on average. The socio-economic distinctions didn't, however, grow over time but rather diminished. During the depression this changed: the rise in unemployment was exceptionally fast and strong in areas that were socio-economically the weakest.

10. Secondly, economic growth after the recession has been quite unique. The information sector has been the main engine of economic growth in the Helsinki region after the depression. About two thirds of new economic growth - measured by the number of people employed - is based on the information sector after 1993. Most firms of the new information sector are situated to the centre of the city or in the western section surrounding the Technical university. Practically all firms responsible for the new growth of the region are situated around the bay of Ruoholahti, i.e. in the western part of the peninsula of Helsinki. Additionally, this new growth has clearly strengthened the interrelation or link between high level education and high incomes (Kortteinen – Lankinen – Vaattovaara 2000). A historical analysis of the development of the region has revealed a slow educational divide which began already in the early 60's (Vaattovaara 1998). If the educational status of an area is described on the basis of the percentage of people with a university degree, the educational social structure of the city has, with time, become increasingly polarised. As the link between high education and high income became stronger during the 90's, this educational divide began to produce growing spatial income differences (Kortteinen – Lankinen – Vaattovaara 2000). One way of interpreting these observations is to conclude that the new growth, based on the information sector, emphasises the role of education as a labour market resource. As a result, the growth lifts up different areas at different paces, depending mainly on the educational standard of the population. The less educated and more working-class areas are lagging behind and the western areas with a better educated population are leading the upswing. Consequently, the educational divide of the city is gradually breeding both unemployment and income differences.

11. Thirdly, there are distinctive differences in terms of migration to the region. The Helsinki region as a whole is the main centre for economic growth in the country, attracting young, well-educated people to migrate south from other parts of the country. A separate study on the incoming migration has shown how selectively migration works: the eastern and north-eastern parts of the region are clearly in a different position compared to the south and to the west. If we look at the educational structure of the people who moved into detached owner-occupied houses, we obtain a rough picture of how people value different areas. In the west, over a third of the incoming migrants have a university degree but in the eastern and in the north-eastern parts of the region the proportion is about one-tenth. (Vaattovaara – Vuori 2000). In addition, the pattern of migration from foreign countries (Former Soviet Union and Africa) has also revealed a spatially clustering pattern – but with opposing locations.

12. Fourthly and finally, in addition to the developments described above, there is a regional locational shift in the distribution of the local pockets of poverty. The existence of small pockets of

poverty is linked with the national traditions of social policy and the resulting peculiar structure of the city. Already since the 50's, the planning of suburbia was based on a principle of social mixing: the occupier owned and rental houses existed in the same areas, but in different blocks or parts of the area. In the 70's, a new policy was adopted with the aim of mixing the different types of housing within the blocks with no distinctions in architecture. As the inhabitants of public rental housing are selected on socio-economic grounds and as public rental houses are scattered here and there all around the region, the underprivileged in the area are quite evenly dispersed. There are several new features of the 90's that have produced new differentiation within these pockets of poverty, mainly linked to the prolonged unemployment and its consequences. As the structure of urban poverty is dispersed, the development of these 'black holes' cannot be detected in any analysis using sub-areas as research units. The 'black holes' of urban development exist, but they are the size of a block, a house or of a stair-case, not of a neighbourhood or a housing area.

III. TRIANGULATION – A COMBINATION OF DIFFERENT DATA AND METHODS

13. As the structure of these pockets of poverty is diffused, these negative segregation processes are invisible if the unit of analysis consists of any of the traditional administrative areas. At the time of writing, some 'black holes' of urban development exist, but they are, as mentioned above, the size of a block, house or even a staircase, not a neighbourhood. A somewhat high correlation exists between these locations and some buildings of public rental housing. To understand local segregation processes in the case of Finland, a more in-depth examination of local developments is required. Although GIS is a computerised system to help deal with spatially referred data, its use is essential to the study of segregation in Helsinki.

14. To better understand this phenomenon, different types of data are combined. The combination of the data is undertaken by asking similar (not identical) research questions and by location. The methodological limitations on this research process are acknowledged. These methodological problems can be avoided by the use of a theoretical framework and concepts such as central tools in the analysis of the problem. The study on residential differentiation and segregation in Helsinki consists of four phases (Figure 2).

15. As the residential differentiation and segregation processes are analysed and understood on regional and grid-cell (250m x 250m) levels, a more detailed statistical analysis based on data from questionnaires and City of Helsinki statistical records is used. A survey is sent to all the social housing buildings within Helsinki. Furthermore, a survey of households is sent and subsequently researched. Finally, inhabitants in different houses are individually interviewed. Thus a better understanding of local segregation processes is achieved. A greater knowledge of segregation processes and individual experiences in different types of areas and neighborhoods is gained.

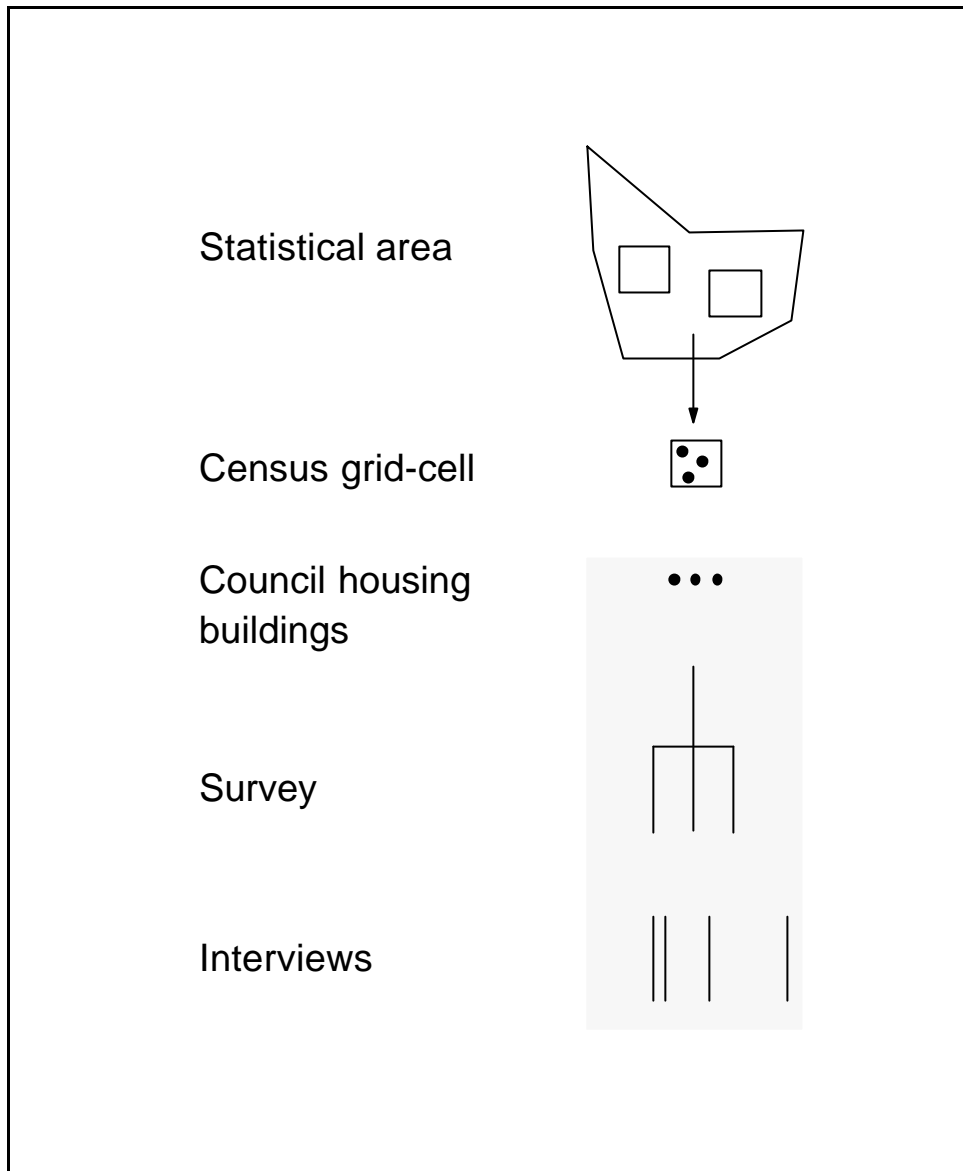


Figure 2. Combination of different data and methods through location

IV. CASE CRIMINALITY

16. As a final illustration of the use of GIS for spatial analysis of statistical data sources, an example of crime data is introduced. Traditionally, the statistical records on criminal activity kept by the police have been recorded using crime as a statistical unit and location as one of the variables. The use of location data has so far been non-existent, since there are several problems in relation to the data. In an experimental study from Helsinki, crime data was combined with socioeconomic data. As criminality is not a spatially large phenomenon in Helsinki, events from the three following years were combined for the analysis. The socioeconomic data for the police districts was aggregated from the 250m x 250m grid cell data provided by Statistics Finland. Thus, the correlation between criminal assaults in private places and, for example, the unemployment rate was calculated (0.79). As this information presents a negative image to distinctive areas, the results are not mapped or incorporated into the GIS system, but only expressed in statistical charts (Fig. 3).

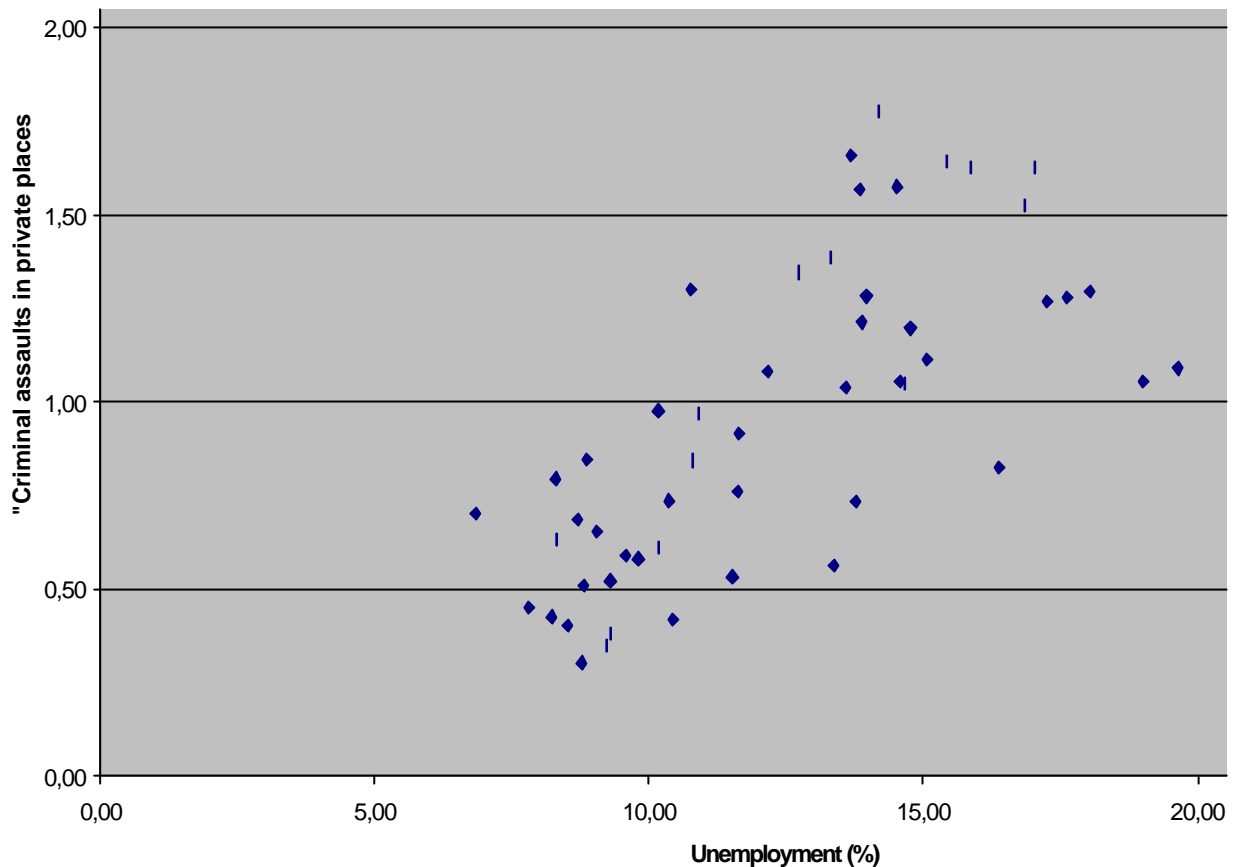


Figure 3. Spatial correlation between unemployment and criminal assaults in private places in Helsinki

V. CONCLUSIONS

17. In this paper, few examples of the use of GIS in spatial residential analysis are demonstrated. The case study area has been Helsinki, where the internationally distinctive urban structure requires the use of small units of analysis. The appropriate unit 250m x 250m census grid cell provided by Statistics Finland, makes it possible to see small local variations and thus deepens the understanding of spatial processes related to residential differentiation. Knowledge of location and the use of GIS enables the combination of different statistical data, for example crime data and qualitative data.

BIBLIOGRAPHY

Bertaux, Daniel & Susan McIntosh (eds.) (1999). *BETWIXT. Between Integration and Exclusion: a Comparative Study in Local Dynamics of Precarity and Resistance to Exclusion in Urban Contexts. Reviews of Literature on Precarity, Poverty and Social Exclusion in Seven European Countries.*

Fortuijn, Joos Droogleever, Sako Musterd and Wim Ostendorf (1998). International migration and ethnic segregation: impacts on urban areas – introduction. *Urban Studies* 35:3, 367-370.

Hamnett, Chris (1998). Social polarisation, economic restructuring and welfare state regimes. Teoksessa Musterd, Sako & Wim Ostendorf (eds.) *Urban segregation and the welfare state. Inequality and exclusion in western cities.* s.15-27. Routledge, London.

- Hamnet, C. (1994). Social polarisation in Global Cities: Theory and evidence. *Urban Studies* 31(3), 401-424.
- Kortteinen, Matti & Mari Vaattovaara (1999). Pääkaupunkiseudun kehityssuunta on kääntynyt. *Yhteiskuntapolitiikka* 1999:4, 342-351.
- Kortteinen, Matti, Lankinen, Markku & Mari Vaattovaara (1999). Pääkaupunkiseudun kehitys 1990-luvulla: kohti uudenlaista eriytymistä. *Yhteiskuntapolitiikka* 1999:5-6, 411-422.
- Lankinen, M. (1997). Asumisen segregaation tila ja kehityssuunnat. In Taipale K. & Schulman H. (eds.) *Koti Helsingissä, urbaanin asumisen tulevaisuus p. 171-200. City of Helsinki Urban Facts.*
- Murie A.(1998). Segregation, exclusion and housing in the divided city In Musterd, Sako & Ostendorf Wim (eds.): *Urban Segregation and the welfare state. Inequality and exclusion in western cities.* London, Routledge.
- Sassen, S. (1991). *The Global City: New York, London, Tokyo.* Princeton. Princeton University.
- Vaattovaara, M. (1998). Pääkaupunkiseudun sosiaalinen erilaistuminen. (Residential differentiation within the metropolitan area of Helsinki, Finland – environment and spatiality. *City of Helsinki Urban Facts Research Series* 1998:7.
- White, Paul (1998). Ideologies, social exclusion and spatial segregation in Paris. Teoksessa Musterd, Sako & Wim Ostendorf (eds.) *Urban segregation and the welfare state. Inequality and exclusion in western cities.* s.148-167. Routledge, London
- Vaattovaara, Mari & Pekka Vuori (2000). Muuttoliike muovaa pääkaupunkiseudun sosiaalista rakennetta. *Hyvinvointikatsaus* 1/2000.