Constructing Area-based Composite Index for Social Service Planning

- A Case Study of Sheffield, England -

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사회서비스 계획을 위한 지역혼합지수 구축 및 활용에 관한 연구

- 영국 셰필드 지역의 사례를 중심으로 -

김 영 훈* · 막스 크라글리아**

ABSTRACT : The purpose of this paper is to construct an area-base index of children's needs for serving the basis of policy-making in respect of social services. For constructing area-based index, an arithmetic composite indicator is developed in which areas are scored on several variables and the scores are combined to identify those areas that are consistently high across all variables. This index is calculated at Neighbourhood that were created by Sheffield City Council for their town planning and management purposes. The indices are calculated using both counts and rates because from a service planning and prioritising perspectives, it is important to know both the areas that have a large number of children in need, and the areas where the number of children in need relative to the total number of children is high or low. Next, the results are supported by comparing them with the Office of the Deputy Prime Minister (ODPM)'s Index of Multiple Deprivation 2004. The advantages of the arithmetic transparency are first that it enables local authorities and agencies to make easy to assess the needs in town and regional planning. Second, although the methods in this paper does not attempt to explain directly about the underlying social processes that lead to any particular outcome, this approach is ideal for use by relevant analysts and decision-makers to highlight areas of their city that deserve closer scrutiny to understand such social process and prepare remedial actions. Therefore, the underlying premise of the type of spatial analysis in this paper is that in a context of finite resources, it is necessary to identify where resources may be targeted geographically across multiple departments and agencies to address particular sets of issues (health, education, employment, deprivation and welfare).

Key words : social service planning, multiple needs analysis, area-based composite index, urban planning

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요약 : 본 논문의 목적은 도시지역내의 사회복지 서비스의 효율적 공급을 위한 지역혼합지수 방법에 대한 적용 가능성을 살펴 보는 것이다. 이를 위해서 영국 셰필드 시를 대상으로, 해당 시 정부의 사회 복지 및 보건 관련 부서에서 정기적으로 구축해 온 관련 행정정보(보건, 교육, 복지, 범죄, 고용지수)를 지역혼합지수(area-based composite index) 방법을 이용하여 분석하고, 이와 더불어 2004년 현재 셰필드 지역의 빈곤화 지수(Index of Multiple Deprivation 2004)와의 상관 관계를 살펴 보았다. 영국의 경우, 지난 1999년 중앙정부 행정 백서(The 1999 White Paper)를 통해서 중앙정부 및 지방정부의 현대화 계획을 공표하고, 모든 중앙 및 지방정부의 전자 정부화 및 각 지역 주민들의 삶의 질을 향상시키기 위한 중앙-지방간, 부처별, 부서별 협력 기능체제 구축에 대한 미래 영국 중앙-지방정부의 청사진을 발표하였다. 이 과정의 하나로 각 지방정부의 행정 정보의 전산화 및 디지탈화를 통해서 도시공간내의 사회복지 서비스 소외 계층및 지역 상황 파악, 도시내 낙후지역 선정을 위한 행정 정보의 지리정보화가 진행되고 있다. 이를 위해서 본 논문에서는 셰필드 시의 사회 서비스 관련 행정 정보와 2001년 영국 인구센서스 자료를 이용하여 100개 지역으로 구분된 셰필드 권역(Neighbourhood area level)을 바탕으로 각 지역별로 분포된 이들 정보들을 지리정보화하고, 기본적인 지리정보 분석방법(aggregation, point-in-polygon, summarization, quintile grouping)을 통해서 사회 빈곤화 지수를 측정하였다. 분석 결과를 바탕으로 지리정보의 효율적인 이용 방안과 도시내 사회 서비스 소외 지역에 대한 효과적인 지리정보 분석 기법의 이용 가능성을 제시하였고 셰필드 시의 사회 서비스 소외 지역은 도시내의 다른 빈곤화 지수와도 상관관계가 높다는 것을 발견했다. 그러나 본 연구의 한계는 이들 소외지역의 통계적 신뢰 및 지역별 클러스트 분석(analysis of statistically significant clusters)이 시도되지 않았다는 점이다. 이 부분은 차후 연구에서 충분히 논의될 수 있다. 본 연구의 분석 방법은 한국의 도시 서비스 소외 지역 및 지역 빈곤화 계수 측정에도 손쉽게 이용될 수 있으며, 무엇보다 시 당국의 업무 담당자 및 분석가를 위해서 필요하다고 할 수 있다.

주제어 : 도시 사회 서비스 계획, 소외 및 빈곤 공간 분석, 지역 혼합지수

Ⅰ. Introduction

In the United Kingdom, the 1999 White Paper *Modernising Government* (Cabinet Office, 1999) launched attempting to improve service delivery and policymaking in area that affect people's quality of life, such as health, education, employment, crime, and welfare. The central objective of this plan is a 'joined-up government' approach to increase cross-departmental collaboration and deliver responsive public services that meet the needs of citizens rather than the convenience of service providers (e.g. central and local governments).

The requirement for different agencies and departments within local government sectors to work together in identifying area of need, targeting intervention, and monitoring outcomes has implications for the flow of information across all levels, in terms of greater availability of information, greater

accessibility to exchange in each agency, and better integration and analysis. The focus of this paper is on the integration and analysis of area-based data coming from different agencies in local government level and the development of composite indicators to prioritise area for intervention.

The broad issues of data integration and analysis on geographical basis come from a wide range of sources and agencies. This topic reflects current efforts of exploring the use of indicators of social variables. The use of indicators to provide a measure or synthesis of social variables for the purpose of addressing welfare issues through coordinated social policy and area-based policy initiatives is well established throughout diverse approaches such as bydeveloping urban social indicators (Smith, 1973; Coates et al., 1977; Knox, 1987). For deprivation in urban area, in the U.K., several indices are commonly used as a measures of deprivation. The Jarman index (Jarman, 1993), the Townsend material Deprivation Score (Townsend et al., 1988) and the equivalent Carstairs Score in Scotland (Carstairs and Morris, 1989) are widely used by the Department of Health and health authorities for epidemiological analyses and assessing health services. The Index of Multiple Deprivation 2004 (IMD) currently available from the Office of the Deputy Prime Minister.[1] Each of these indices has a conceptual underpinning together with a methodology for integrating the variables used.

The objective of the paper is to construct an area-based index of children's indicators that produced periodically, could serve as the basis of policy-making in respect of social services. According to the research objective, three main questions about youth people service planning were explored. First, what are the significantneeds of young age group (under 18s) in Sheffield city which affect education, employment, health and welfare? Second, what is the geographical distribution of these needs according to age, gender, and ethnicity? Third, what is the geographical distribution of children who have multiple needs? This paper has focused the second and third issues because the first issue was carried out and resolved by the Sheffield City Council (SCC). The necessary datasets have already collected and prepared to enter into a geographical information system (GIS). For data integration and analysis, the following steps have been undertaken:

1. Data cleaning and geocoding of the datasets received from SCC in preparation for analysis

1) Refer to http://www.odpm. gov.uk/stellent/groups/odpm__urbanpolicy/documents/page/odpm__urbpol__028470.hcsp.

2. Aggregation of the data at neighbourhood area level
3. Analysis of the individual datasets and preparation of relevant maps of counts and rates (%)
4. Preparation and mapping of composite indices of multiple need
5. comparison of other deprivation indices and correlative relationship

The aimsof this paper are to make available to relevant partners aggregate small area level data across a range of education, health, and welfare domains to inform research and planning decisions in relation to services for children and teenagers in Sheffield city. Section 2 reports on the methodology of construction and the results of the composite indices at neighbourhood level. Section 3 compares the results with the Office of the Deputy Prime Minister's Index of Multiple Deprivation 2004 and the results obtained are discussed in Section 4. Finally, In Section 5 this paper concludes with overall analysis and recommendations.

Ⅱ. Methodology of constructing area-based composite index and results

The core objective of the paper is the development of an area-based composite index reflecting the seven key outcome indicators of the Children's Trust,[2] low birth weight, school attendance and attainment, further education and training, teenage pregnancy, substance abuse, repeat offending. With these considerations in initial stage of this study, discussion with the steering group for the project representing the agencies involved in Sheffield City Council (SCC) resulted in the selection of the following six domains for the construction of an area-based composite index of social needs analysis:

- School attainment in primary and secondary school (Key Stages 2 and 4)
- School attendance in primary and secondary school
- Youth offences
- Low birth weight
- Young people 16 19 years of age in education, employment, or training

Each variable represents a group of young people with specific needs, and the combination of these variables points to areas where children's needs are acute. It was also decided to construct an additional set of indices which include Children in families on Income support. All five domains in the main

2) Refer to http:// www.sheffield.gov.uk/education/inside-the-lea/projects-and-initiatives/needs-analysis

index are weighted equally. Where a domain includes two variables as is the case for attainment and attendance, then each component variable is weighted 0.5.

Initially each variable was collected at postcode level, and the postcoded data are aggregated to the Neighbourhood area level which is created by Sheffield City Council based on the UKcensus track to identify geographical neighbourhood characterised community boundary. This level preserves the anonymity of individuals, however at the same time is fine enough to pick up pockets of need in Sheffield. For each variable two measures are produced: one is a count of the number of cases by area, the other is the rate for each area the number of children in a particular need category divided by the children population at risk. This reflects different policy requirements. At the operational level there is the need to identify where the largest number of children in need is located. At the strategic level, there is the requirement to identify where there are more or fewer children in need than expected. Various methods of standardisation might be employed, such as controlling for the area deprivation level, but such a form of standardisation implies an underlying casual mechanism that is premature at this stage of analysis. For this reason simple standardisation by the total number of children in the relevant age cohort is selected.

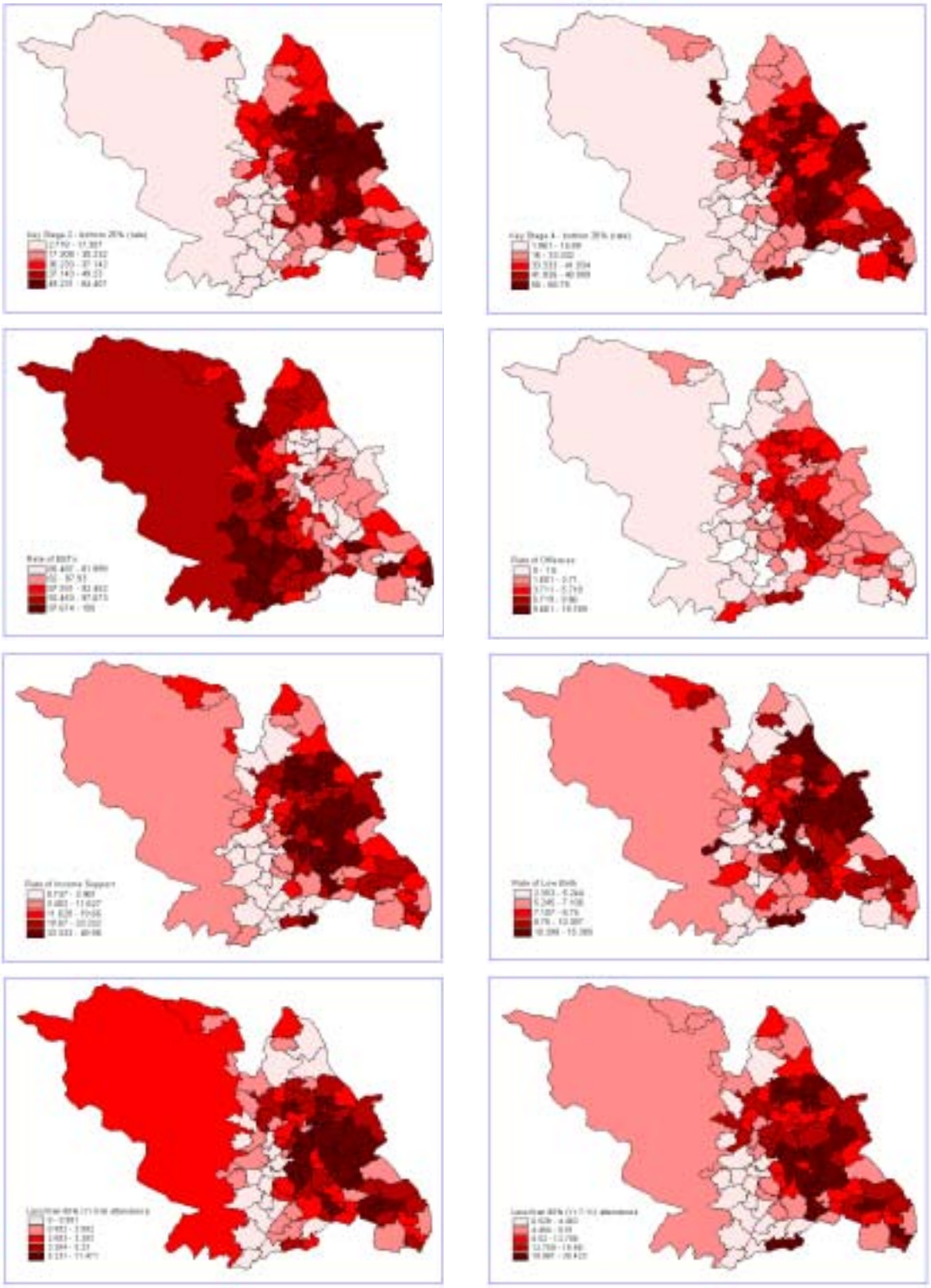
The resulting counts, population at risk, and rates for each variable is shown in 〈Table 1〉 and 〈Figure 1〉 presents the maps of the rate measures for each variable. The indicator is the combination of the six variables listed above, and measures the incidence of children and young people in need in Sheffield. We have adopted the main dimensions of need as recommended by DfES (Department for Education and Skills Home) Guidelines, and have operationalised them basedon available data. The method of constructing the indicator draws on the considerable body of work done in this field (e.g. Martin et al., 1994; Simpson, 1996). It also borrows from the concepts of multicriteria decision matrices often used in planning (Henig, 1996; Hill, 1972).

For the construction of the indices the following steps were undertaken in line with previous projects. First, for each variable, counts and rates at the neighbourhood level are calculated. Counts are mapped to show in which neighbourhoods the majority of cases fall while rates are calculated as the proportion of observed cases in each area over the total population at risk in that neighbourhood(e.g. number of low weight at birth in the neighbourhood divided by the total number children born in that neighbourhood).

〈Table 1〉 Details of the variables used to calculate the composite indicator for Sheffield city 2003~2004

ID	Variable description	Data Source	Variable criteria	Description of denominator	Number of cases	Population at Risk	Rate
1	KS 2 2003 - average points	Local Education Authority	Proportion of KS 2 scores in bottom national 25% for 2003	Total children in key stage 2	2,219	6,171	35.96
2	KS 4 2003 - average points	Local Education Authority	Proportion of KS 4 scores in bottom national 25% for 2003	Total children in key stage 4	2,108	5,638	37.39
3	EETs	Connexions	Children (aged 16-18) in Education, Employment, or Training, 2002-2003	Total number of connexions	4,942	5,585	88.49
4	Offence referrals	Community Safety Team	Incidence of youth offending (aged 10 - 17) referred to the Youth Offending Team for 2003	Total number of children aged 10 - 17	1,630	51,838	3.14
5	Children in families on Income Support aged 0-17 years	Corporate Policy Unit/Housing Benefits Service	Children in families on Income Support aged 0 - 17 years, snapshot October 2003	Total number of children aged 0 -17	22,777	110,663	20.58
6	Low birth weight	Sheffield Health Informatics	Total count of low weight births less than 2.5 kg for 1999 - 2003	Total number of children born	2,427	28,731	8.45
7	Attendance less 80% - primary	Local Education Authority	Proportion of attendance rate (year group 0 - 6) in less 80% from possible days, September 2002 - July 2003	Total children in year group 0 - 6*	1,534	41,458	3.70
8	Attendance less 80% (year group 7 - 11)	Local Education Authority	Proportion of attendance rate (year group 7 - 11) in less 80% from possible days, 2002 - 2003	Total children in year group 7 - 11*	3,643	29,097	12.52

* Note : Total attendance data itself(due to different data collection period)



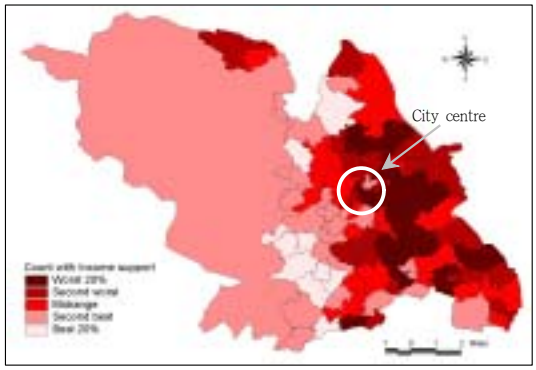
〈Figure 1〉 Maps of the rate of the variables

The threshold for the variables is also used for the calculation - below 2.5 kg for low birth weight, bottom national 25% of the average scores in the end of key stage assessments and in GCSE, less than 80% attendance rate for school attendance.

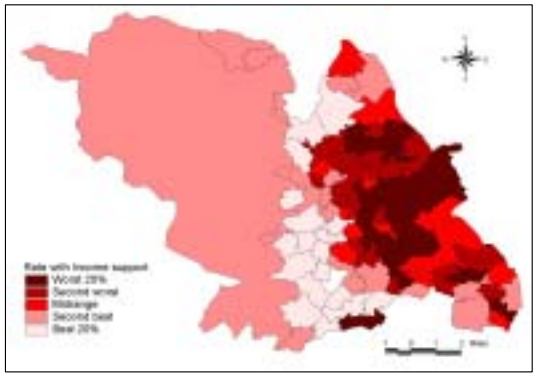
Second, for each variable the values obtained are classified into five quintile groups (e.g. worst 20%, second worst, midrange, second best, and best 20%). Neighbourhoods with no cases are excluded from the grouping and given a score of zero. Next, each quintile group is scored from 1 (best 20%) to 5 (worst 20%). Then each neighbourhood area has a score assigned for each variable for counts and rates. Note that this paper focuses on area classification using socio-economicindices at the Neighbourhood area level. Thus, we chose the quintile method for area grouping. In addition other classification methods (e.g. equal interval, natural breaks, etc) would be explored with the quintile method.

Third, the scores for the individual variables are summed (including weights where needed) to create a composite value. So a neighbourhood that consistently scored among the worst 20% in all 5 domains would reach a value of 25, while one that is consistently among the best 20% would score 5. The additional indices calculated with the introduction of a sixth domain (families with children on Income Support) yield a maximum score of 30 for those areas among the worst 20% in all 6 domains.

〈Figure 2〉 shows the results of the analysis for both counts and rates at the neighbourhood area level. In each case two indices are provided, one including Income Support and one without. We provide scores based on both counts and rates because from a service planning and prioritising perspective it is important to know both the areas that have a large number of children in need, and the areas where the number of children in need relative to the total number of children is high.



a) Count



b) Rate

〈Figure 2〉 Area-based composite index at neighbourhood level(counts and rates)

The process adopted in this paper is a way of standardizing and transforming the variables so that they have a common scale and a uniform distribution thus preventing differential scale and distributional properties of the variables influencing the composite indicator. This is not dissimilar to the process adopted for example in the Townsend index where Z-scores are calculated and some variables (unemployment and overcrowding) are log-transformed to achieve a more normal distribution. The method here has the advantage of considerable simplicity and transparency although at the price of reducing the level of measurement of the data from the ratio level to ordered categories. It is worth also noting that whilst simple, this method has been checked in the previous research for consistency of results against the Besag-Newell technique (Besag and Newell, 1991) for cluster detection of rare events.[3)]

In analysing the maps in Figure 2 it is necessary to consider that their purpose is not to explain the underlying social processes that lead to any particular outcome, but to highlight areas of the city that deserve closer scrutiny to understand such processes and put forward remedial action. The underlying premise of this type of spatial analysis is that in a context of finite resources it is necessary to identify where resources may be targeted across multiple agencies to address particular sets of issues.

Ⅲ. Comparison Needs Analysis Indices and ODPM Index of Multiple Deprivation (IMD) 2004

In April 2004 the Office of the Deputy Prime Minister (ODPM) released the result of a major study commissioned to the Department of Social Policy and Social research at the University of Oxford to update the Indices of Multiple Deprivation 2000. The new Index of Multiple Deprivation 2004 (IMD 2004) is a Super Output Area (SOA) level measure of multiple deprivation and is made up of seven SOA level Domain Indices which relate to Income deprivation, Employment deprivation, Health deprivation and disability, Education, skills and training deprivation, Barriers to Housing and Services, Living environment deprivation, and Crime.[4)]

Two supplementary indices were also created one on Income Deprivation Affecting Children, and the other Affecting Older People. The former could have been of

3) See Gragilia et al. (2003)

4) For a full description of the methodology and results, see http://www.odpm.gov.uk/stellent /groups/odpm__urbanpolicy/documents/pdf/odpm__urbpol__pdf__028470.pdf.

potential interest for this paper. However, the index only represents children under 16 living in families on Income Support, a measure already used in this study, and therefore it does not add value to this paper.

Therefore, the comparison between the IMD2004 index and the NAP index has to be treated with caution on two grounds. First issue is that different domains and variables are used to calculate the two indices (count and rate) and second issue is that to make the comparison it is necessary to aggregate the IMD index from Super Output Areas (SOA) to Neighbourhood area level.

In relation to the latter point, this in part defeats the improvements that have been introduced in the IMD2004 from its predecessor in 2000 which had been calculated at Ward level (a UK census area unit) and had been criticized because wards are by their nature very large, and often the variations in deprivation within a ward were as large as between wards. So it is with some hesitation that such aggregation has been undertaken. This has been done by calculating the population-weighted average score of each ward, as recommended by ODPM in relation to district-wide calculations.[5)]

Moreover, whilst SOA nest within the current Sheffield boundaries, they do not nest within neighbourhoods (i.e. they are often split in two or more parts). Hence aggregating at neighbourhood level has been undertaken using the geometric centroids of each SOA, which is the only process available within the spatial analysis frame in this study. These areal unit modification (between SOA and Neighbourhood) results spatial variation in the analysis process. Thus, it needs to compare the correlative relationship of the variables at area level.

With these considerations in mind, 〈Figure 3〉 presents the comparative result maps of IMD 2004 and NAP index at neighbourhood level. 〈Figure 4〉 shows the correlations and scatterplot. There is a strong and statistically significant correlation between the IMD2004 index and the area-based composite index (with Income Support) at both Neighbourhood level as shown. The comparison between the scatterplots at neighbourhood level is particularly revealing in this respect.

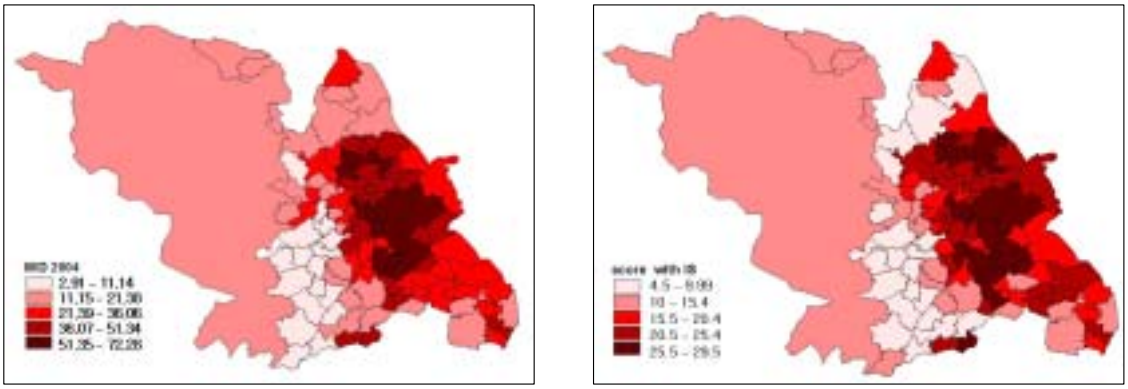
Ⅳ. Analysis and discussions

The previous sections have reported the findings of the analysis for the main Needs Analysis Project index and comparison with the ODPM Index of Multiple Deprivation. This section reviews the overall findings at

5) See the IMD report p. 51.

the neighbourhood level of aggregation and comments on the results, focusing on the identification of areas of highest level of need.

First, for the neighbourhood area level, the neighbourhoods that show the highest composite scores in respect to both counts and rates are those located to the North of the city centre, followed by a combination of neighbouring areas, and areas located to the east of the city centrearea. These



* IS : Income Support

NOTE : The NA map shown here on the right is different from that in Figure 2 (right). Although the data is the same, the data in Figure 2 is classified so that each category illustrates areas that have high scores in more than 1, 2, 3, 4, and 5 domains respectively. In this Figure instead, the data is classified into 5 categories using Mean and Standard Deviation so as to be more comparable with the classification used for the IMD2004 index on the left.

〈Figure 3〉 Comparison IMD2004 and NAP index (rates with Income Support) at neighbourhood level

Correlations

		IMD2004	SCORE_IS*
IMD2004	Pearson Correlation	1	.912**
	Sig. (2-tailed)	.	.000
	N	99	99
SCORE_IS	Pearson Correlation	.912**	1
	Sig. (2-tailed)	.000	.
	N	99	100

*SCORE_IS : a composite score including income support

**Correlation is significant at the 0.01 level(2-tailed).

〈Figure 4〉 Correlation at Neighbourhood level

neighbourhoods come at the top even when the index is recalculated and standardised by rate of Income Support (i.e not just adding this variable to the index, but calculating the observed/expected rate given similar levels of children in families on Income Support).

Second, the relationship between all variables in 〈Table 1〉 is examined to identify highly correlated for the NAP index. 〈Table 2〉 shows the correlation coefficients between all the variables. As indicated, the number of Children in Families on Income Support is strongly correlated with school achievement and attendance, and youth offending. It is as expected negatively correlated to the rate of young people in employment, education, and training (EET), and is only weakly correlated to Low Weight at Birth. For the other variables, the cross correlations are generally weaker although it is noticeable the extent to which the rate of referral to the Youth Offending Team has a positive correlation to attainment and attendance among school children in years 7-11, and as expected attendance and attainment are also correlated.

The influence of Income Support on the other variables and the resulting composite index is also demonstrated by 〈Table 3〉 which shows the results of a linear regression model between the Composite index (dependant variable) and the other variables chosen as independent. As shown, the rate of Children in Families on Income support alone, accounts for 80% of the variability (taken from the Adjusted R Square result) of the Composite index at neighbourhood level, while the other variables only add marginally to this prime variable. The rate of KS4 results comes second in importance, followed by Low Birth Weight, and the remaining variables as indicated below. As statistical analysis of the variables, statistical significance and collinerity diagnostics (e.g. Variance Inflation Factors) did not demonstrated, but this approach can be explored for further research work.

As indicated earlier in this paper, other larger area levels such as Ward (UK census track) and Corporate Areas (Sheffield city administrative area unit) are not a particularly useful level of aggregation for this type of data analysis due to larger area size and data smoothness caused by data aggregation. In this respect, the introduction of neighbourhoods is a very welcome development for Sheffield city. We would recommend that the neighbourhood boundaries are maintained as stable as possible, bearing in mind that wards boundaries are due to change soon, so as to enable longitudinal policy monitoring and evaluation.

〈Table 2〉 Correlation coefficients between variables of main NAP index

		RATE_IS	R0_6_80	R7_11_80	KS2_RATE2	KS4_RATE	R_EET	RATE_OFF	BIRTH_LRAT
RATE_IS	Pearson Correlation	1	.761**	.866**	.806**	.808**	-.796**	.810**	.520**
	Sig. (2-tailed)	-	.000	.000	.000	.000	.000	.000	.000
	N	100	100	100	100	99	100	94	100
R0_6_80	Pearson Correlation	.761**	1	.673**	.662**	.666**	-.612**	.565**	.489**
	Sig. (2-tailed)	.000	.	.000	.000	.000	.000	.000	.000
	N	100	100	100	100	99	100	94	100
R7_11_80	Pearson Correlation	.866**	.673**	1	.733**	.810**	-.793**	.785**	.542**
	Sig. (2-tailed)	.000	.000	-	.000	000	.000	.000	.000
	N	100	100	100	100	99	100	94	100
KS2_RATE2	Pearson Correlation	.806**	.662**	.733**	1	.706**	-.713**	.567**	.514**
	Sig. (2-tailed)	.000	.000	.000	-	.000	.000	.000	.000
	N	100	100	100	100	99	100	94	100
KS4_RATE	Pearson Correlation	.808**	.666**	.810**	.706**	1	-.813**	.728**	.478**
	Sig. (2-tailed)	.000	.000	.000	.000	-	.000	.000	.000
	N	99	99	99	99	99	99	93	99
R_EET	Pearson Correlation	-.796**	-.612**	-.793**	-.713**	-.813**	1	-.690**	-.377**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	-	.000	.000
	N	100	100	100	100	99	100	94	100
RATE_OFF	Pearson Correlation	.810**	.565**	.785**	.567**	.728**	-.690**	1	.425**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	-	.000
	N	94	94	94	94	93	94	94	94
BIRTH_LRAT	Pearson Correlation	.520**	.489**	.542**	.514**	.478**	-.377**	.425**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	-
	N	100	100	100	100	99	100	94	100

** Correlation is significant at the 0.01 level (2-tailed).

Variables:

R0_6_80: Rate of year group 0 6 pupils whose attendance is less than 80%

R7_11_80: Rate of year group 7 11 pupils whose attendance is less than 80%

RATE_IS: Rate of the children in families on income support over all children aged 0 17 years

KS2_RATE2: Rate of the pupils in bottom 25 percent of the Key Stage 2 score points over total pupils at Key Stage 2

KS4_RATE: Rate of the pupils in bottom 25 percent of the Key Stage 4 score points over total number of pupils at Key Stage 4

R_EET: Rate of EET over total number of 16-19 in EET or Not in Employment, Education or Training.

RATE_OFF: Rate of youth referrals over all children aged 10 17 years

BIRTH_LRAT: Rate of the birth weight under 2.5 Kg over total number born children

〈Table 3〉 Results of Linear Regression Model on Composite Score

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.898[a]	.807	.804	2.53793
2	.942[b]	.887	.885	1.94987
3	.965[c]	.931	.929	1.53083
4	.974[d]	.949	.947	1.32303
5	.978[e]	.957	.955	1.21746
6	.983[f]	.966	.963	1.10010
7	.982[g]	.965	.963	1.11026
8	.985[h]	.971	.969	1.01060
9	.987[i]	.974	.971	.97028

a. Predictors: (Constant), RATE_IS
b. Predictors: (Constant), RATE_IS, KS4_RATE
c. Predictors: (Constant), RATE_IS, KS4_RATE, BIRTH_LRAT
d. Predictors: (Constant), RATE_IS, KS4_RATE, BIRTH_LRAT, R_EET
e. Predictors: (Constant), RATE_IS, KS4_RATE, BIRTH_LRAT, R_EET, RATE_OFF
f. Predictors: (Constant), RATE_IS, KS4_RATE, BIRTH_LRAT, R_EET, RATE_OFF, KS2_RATE2
g. Predictors: (Constant), KS4_RATE, BIRTH_LRAT, R_EET, RATE_OFF, KS2_RATE2
h. Predictors: (Constant), KS4_RATE, BIRTH_LRAT, R_EET, RATE_OFF, KS2_RATE2, R0_6_80
i. Predictors: (Constant), KS4_RATE, BIRTH_LRAT, R_EET, RATE_OFF, KS2_RATE2, R0_6_80, R7_11_80

Ⅴ. Conclusions

As indicated earlier there are numerous technical and conceptual difficulties in making comparisons with other local and national indexing tools. However, the good fit between the IMD2004 and the NAP index and ranking of areas is important as it supports the process adopted for this study. Clearly the benefit of developing the NAP index is that it largely based on administrative data that can be updated regularly (annual basis), whilst the IMD relies heavily on Census data that is updated every 10 years.

From the discussion in the previoussection, we can conclude that children in Families on Income Support appears to be very important in accounting for the overall composite index, but it would by unwise to rely on this single variable alone to monitor change across areas of the city. Following from the issues stated, it is recommended to continue to use indices based on multiple domains and data sources which not only reflect better different dimensions of need, but also make the process more robust.

The two indices developed for this study also usefully identify areas of the city that deserve particular attention by policy-makers across different departments and agencies. Their findings are largely supported by the Index of Multiple Deprivation 2004, but have the undoubted advantage of being easy to update regularly through administrative processes, unlike the IMD. In light of adequate area level, it is important that neighbourhood area level is evaluated in light of this study to assess their suitability in analysing cohorts and demography effectively. Once the process in neighbourhood area level is completed, we identified that these boundaries should remain as stable as possible to allow for longitudinal analysis and policy monitoring and evaluation.

Several recommendations can be also put forward for further work. Firstly, neighbourhoods were designed to reflect natural neighbourhoods and subsequently are unequal sizes. Therefore the use of count data alone to compare neighbourhoods should be avoided, although this does allow identification of areas with high numbers. Rates are more useful for comparative analysis as this provides a standardised score across the neighbourhoods. Secondly, it is necessary that at least core sets of robust variables should be collected regularly to create a core index of policy monitoring. This is because different policy priorities and the improvement in data quality inevitably will require the construction of different composite indices to respond to different needs. If a core group of variables are however collected with

the same methodology and definition, this will allow comparison over time. Lastly, the potential drawback of thearithmetic composite indexing method is that this composite indicator disregards any spatial structure in the data and provides no measure of statistical significance. Exploratory techniques in spatial statistics would be used to identify statistically significant clusters, such as Getis-Ord statistics (Getis and Ord, 1995), STAC (Craglia et al., 2003) and Besag and Newell (Besag and Newell, 1991; Craglia et al., 2003).

Further work is necessary to understand the strengths and weaknesses of datasets contributing to the study inrelation to greater understanding as to what the data represents, to whether the datasets are a measure of needs as well as outcomes, and to data validity issues. The indexing work of the Needs Analysis needs to be better joined up with other area-based indexing work in the city, in particular, with the Successful Neighbourhoods and Health Inequalities indexing programmes. The information also needs to be considered alongside other area-based socio-economic information such as the Index of Multiple Deprivation. Finally, consideration should be given to developing this study to better support research about child vulnerability in the city. It may be worth exploring how, for research purposes only, individual child records could be brought together in order to present additional area-based information about numbers/rates of children affected by more than one risk factor.

References

Besag, J. E. and Newell, J., 1991, "The detection of clusters in rare diseases", *Journal of the Royal Statistical Society* A, 154: 143~155.

Cabinet Office, 1999, *Modernising Government*, The Stationery Office: London.

Craglia, M., R. Haining and P. Signoretta, 2003, "Identifying areas of multiple social need: a case study in the preparation of Children Service Plan", *Environment and Planning* C, 21(2): 259~276.

Carstairs, V. and Morris, R., 1989, *Deprivation and Mortality: an alternative to social class?* Community Medicine, 11: 210~219.

Coates, B. E., Johnston, R. J. and Know, P. L., 1977, *Geography and Inequality,* Oxford University Press: Oxford.

Getis, A. and Ord, J. K., 1995, "Local spatial autocorrelation statistics: distributional issues and an application", *Geographical Analysis*, 27: 286~306.

Henig, M., 1996., "Solving MCD problems: process concepts", *Journal of Multicriteria Decision Analysis*, 5: 3~21.

Hill, M., 1972, "A goals-achievement matrix for evaluating alternative plans", in *Decision-making in Urban Planning*, Robinson, I. (ed.), SAGE: Beverly-Hills, 185~208.

Jarman, B., 1993, "Identification of underprivileged areas", *British Medical Journal*, 286: 1705~1708.

Knox, P., 1987, *Social Indicators: An Introduction*, Longman, Harlow: Essex.

Martin, D., Senior, M. L. and William, H. C. W., 1994, "On measures of deprivation and the spatial allocation of resources for primary health care", *Environment and Planning* A, 26: 1911~1929.

Simpson, S., 1996, "Resource allocation by measures of relative social need in geographical areas: the relevance of the signed x^2, the percentage, and the raw count", *Environment and Planning* A. 28: 537~554.

Smith, D. M., 1973, *The Geography of Social Wellbeing*, McGraw-Hill: New York.

Townsend, P., Phillimore, P. and Beattie, A., 1988, *Health and Deprivation: Inequality and the North*, Routledge: London.

The Index of Multiple Deprivation 2004 (IMD), http://www.odpm.gov.uk/stellent/groups/odpm_urbanpolicy/documents/page/odpm_urbpol_028470.hcsp, (last accessed on 7th July 2004).

Needs Analysis Project, http://www.sheffield.gov.uk/education/inside-the-lea/projects-and-initiatives/needs-analysis (last accessed on 7th July 2004).

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