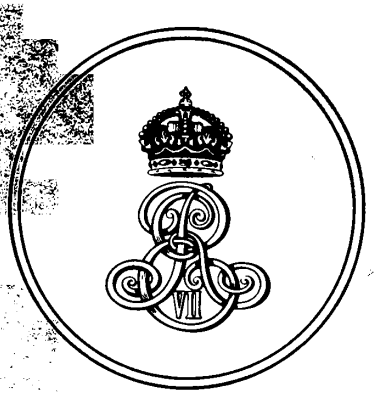

Information for health services planning from the 1981 census

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Small area statistics from the 1981 Census are an important and in some cases the only source of demographic information about particular neighbourhoods. The statistics are available from the Office of Population Censuses and Surveys, and some health regions and districts have bought them. The figures are very detailed, and their availability is not widely known within the health service. At the London School of Economics we have recently analysed some of the small area statistics for England and Wales. The purpose of this publication is to explain how our results and other information from the census may be used in health services planning.

Since 1974 local health authorities in England and Wales have had the task of securing a comprehensive health service for their residents. A planning system was established in 1976 to promote development of services. Health authorities record information about the services they provide, for instance they know how much they spend, how many people they employ, how many hospital beds they provide and how many patients they treat. From their records they know about patients, but not about other residents of the area they serve. Such knowledge is essential if planning by district health authorities is to be effective, because it enables consideration of a possible mismatch between the needs of a population and the services currently provided.

The chief value of census statistics for health service planning is as a source of information about small geographical areas and their residents. Choosing census figures of greatest relevance is to some extent arbitrary because there is no established definition of need for health services. Perceptions of need are diverse and there are substitutable forms of care. Crude measures of need for health services can be devised on simple assumptions, such as that need is related to the size and age composition of a population. Another assumption is that areas of adverse social conditions need more resources to enable the National Health Service to provide adequate services.

Census statistics can help planners identify areas of adverse social conditions but cannot determine what, if any, changes should be made because there is insufficient theoretical basis to specify in detail the quantity and mix of services appropriate for a given

population. Although decision making in the NHS is too complex to reduce to a mathematical formula, statistical data from the census and other sources can provide an informed basis for choice.

Underprivileged areas

Our analysis of the 1981 census is intended to assist the development of NHS services in the community in areas of adverse social conditions. Recommendation 28 of the 1979 Report of the Royal Commission on the National Health Service was that additional financial resources should be provided to improve the quality of primary care services in declining urban areas. The General Medical Services Committee of the British Medical Association in 1982 established a subcommittee on underprivileged areas (UPA) which has taken an interest in our work, and many health authorities have obtained figures from us for their areas. This publication is based on a King's Fund seminar in 1983 for health authority members and officers.

The purpose of our census analysis is reflected in the choice of data outlined in the descriptive list of variables on page 23. Six of our variables correspond to those used by the Department of the Environment to identify urban deprivation, and a comparison is shown in table 1. The Department of the Environment selected a variety of weights to combine variables into compound indicators, and we have produced an index which we call the UPA score. The UPA score is an attempt to combine five factors (related to the elderly, young families, economic and housing factors and migration) into an index of need for primary health care. It gives a high weight to the elderly. Variables associated with urban poverty (unemployment, low skill, overcrowded housing, lacking amenities, many immigrants and one parent families) are individually assigned low weights but their overall impact is high because of their number - six variables compared with two for the elderly.

Our main analysis is of electoral wards in England and Wales, and table 2 is a summary of the data. Table 3 shows the location and other features of electoral wards having the highest values. Three London wards appear in table 3 for their high percentages of one parent families (in Brent), overcrowded households (in Tower Hamlets), and New Commonwealth and Pakistan immigrants (in Ealing). Neither Brent nor

Ealing is an inner London borough. Some areas in Wales and the north of England also have on the evidence of table 3 very adverse social conditions, and some coastal towns such as Eastbourne and Worthing have many elderly residents. The census figures give precise measurements for what may be well known in a less exact form, and in particular they show that multiple deprivation is not confined to inner city areas.

Map 1(a) shows electoral wards in Liverpool with a UPA score above twenty, and figure 1 shows that only about fifteen per cent of wards in England and Wales have UPA scores higher than twenty. We calculated also a compound indicator using the weights in the social index of the Department of the Environment. For fifteen per cent of wards in England and Wales the social index was above six and the Liverpool wards above six are marked on map 1(b). We have found that the social index is more sensitive to peripheral council estates and less sensitive to retirement areas than the UPA score, and that both indicators register high values in inner city areas. Figure 2 shows that the majority of wards in inner London, for instance, have a UPA score above twenty, the level used in map 1(a) for Liverpool.

An example

To illustrate the use of our figures in planning health services we have chosen a district in outer London, Waltham Forest Health Authority, which has the same boundary as the London borough of Waltham Forest. Map 2(a) shows the district's location in relation to other London boroughs and map 2(b) relates it to the North East Thames Regional Health Authority. Maps of areas wider than a district are helpful for analysing and predicting cross boundary flows of patients to receive treatment outside their area of residence, and a knowledge of the NHS in geographical terms is essential for evaluating how proposed changes in services will affect residents.

Maps 3(a) and (b) show for Waltham Forest the wards with high scores using the same criteria as for Liverpool. Both the UPA score and the social index identify the southern half of Waltham Forest as a deprived area. The figures in table 4 enable us to examine wards in detail and for each ward a further breakdown into enumeration districts is possible, as in table 5. The data in tables 4 and 5 are a small selection of what can be derived from the census small area statistics,

and illustrate the variables underlying our UPA calculations. A large amount of data tends to be overwhelming and, as the census can provide only part of the information needed for planning, there is no point using more census figures than necessary. For local planning our selection of variables may be too small, but it is sufficient to illustrate the principles of census analysis for planning.

The first principle is to link the figures to maps. The data in tables 4 and 5 cannot be of practical use unless the areas to which they relate can be identified. Maps 4 and 5 serve that purpose: the names and boundaries of electoral wards in Waltham Forest are shown in map 4, and the enumeration districts of Valley ward are outlined in map 5. Enumeration districts are known by number only, and the Office of Population Censuses and Surveys can supply maps and statistics for them and for electoral wards.

The second principle is to compare local figures with a regional or national standard. Table 6 shows that compared to England and Wales Waltham Forest has a large immigrant population and inadequate housing. The third principle is to examine each ward in a national context (as in table 7, where Cann Hall ward is shown to be at or above the national average for every variable, but not close to any of the highest values observed) and in a local context (as in table 8 where Cann Hall ward is shown to be at or above the district average for every variable except the percentage of over 65s and is fairly close to some of the highest values observed in the district).

The fourth principle is to examine local variation in any variable of particular interest, such as young children or the elderly. In Waltham Forest, for instance, Hatch Lane ward has compared with some of the other wards almost twice as many residents over 65, and only a third of the children under 5. This type of information is relevant when planning services for children or the elderly. If a positive action programme is planned for ethnic minorities, then a census variable could identify where they are concentrated. Equally it may be important to identify concentrations of children or elderly people and pockets of urban poverty.

The fifth principle is to disaggregate data to the smallest possible areal units whenever detailed information is needed and if resources permit. Table 5 illustrates, for instance, the high

concentration of young children in four enumeration districts (18, 19, 20 and 21) of Valley ward which is not apparent from the ward data in table 4. For practical reasons, we chose wards as our units of analysis for the UPA study but we recognise the greater value of enumeration district data for local planning. To have undertaken and published an analysis of the hundred thousand enumeration districts in England and Wales would have called for many more resources than our analysis of 9265 wards.

The sixth principle is to link census analysis with other relevant material. Maps can show, for instance, the location of services to compare with demographic information. Informed debate about the need for services is more likely when the supply and potential demand for health care are considered together.

The seventh and last principle is that the product of any analysis should be related to its purpose, and no single analysis or map should be expected to service every purpose equally well. Our figures have the advantage of being ready now and although they were designed for a national identification of underprivileged areas, they may be good enough to help local planning of health services in areas where more suitable analyses are not yet available.

If it is accepted that urban deprivation and certain age groups tend to increase the demand for NHS services in the community, then our results may be useful for identifying areas where special help may be needed. Even if it is acknowledged that primary care services need urgent improvement in some areas it will not follow necessarily that those improvements will be made. Like the RAWP formula the UPA analysis is designed to help implement a policy of change by providing an objective measure of need based on information not about services but about the people who are or should be served.

In 1983 the government announced an extra £9 millions for general practice and community health projects in selected inner city areas. Further funds to improve the quality of primary health services may be forthcoming even during the present retrenchment of the National Health Service, and census small area statistics could help district health authorities to identify declining urban areas and stimulate plans for the development of community services.

Table 1 - Weights combining variables into indicators of deprivation

	Department of the Environment				Under
	Basic index	Social index	Economic index	Housing index	Privileged Areas*
OVER 65	0	0	0	0	2.5
PENSIONERS ALONE	1	2	1	1	2.6
UNDER 5	0	0	0	0	1.9
ONE PARENT	1	2	1	1	1.2
UNSKILLED	0	0	0	0	1.5
UNEMPLOYED	2	2	4	2	1.3
LACKS AMENITY	1	1	1	2	1.4
OVERCROWDED	1	1	1	2	1.2
CHANGED ADDRESS	0	0	0	0	1.1
ETHNIC MINORITY	1	1	1	1	1.0

* For easier comparison with other columns UPA weights here are reduced by a factor of 2.5, and the actual weights are given with technical details in the appendix.

Table 2 - The minimum, average and maximum values of twelve variables for electoral wards in England and Wales

WARD	POP	OVER 65	PENSIONER ALONE	UNDER 5	ONE PARENT	UN SKILLED	UN EMPLOYED	LACKS AMENITY	OVER CROWDED	CHANGED ADDRESS	ETHNIC MINORITY	UPA SCORE
		%	%	%	%	%	%	%	%	%	%	
Minimum	56	1	0	1	0	0	0	0	0	2	0	-74
Average	5200	15	5	6	2	5	10	3	7	9	5	0
Maximum	41900	55	25	17	12	26	41	51	53	65	85	90

Table 3 - The location and other features of electoral wards having the highest value in England and Wales on one of twelve variables

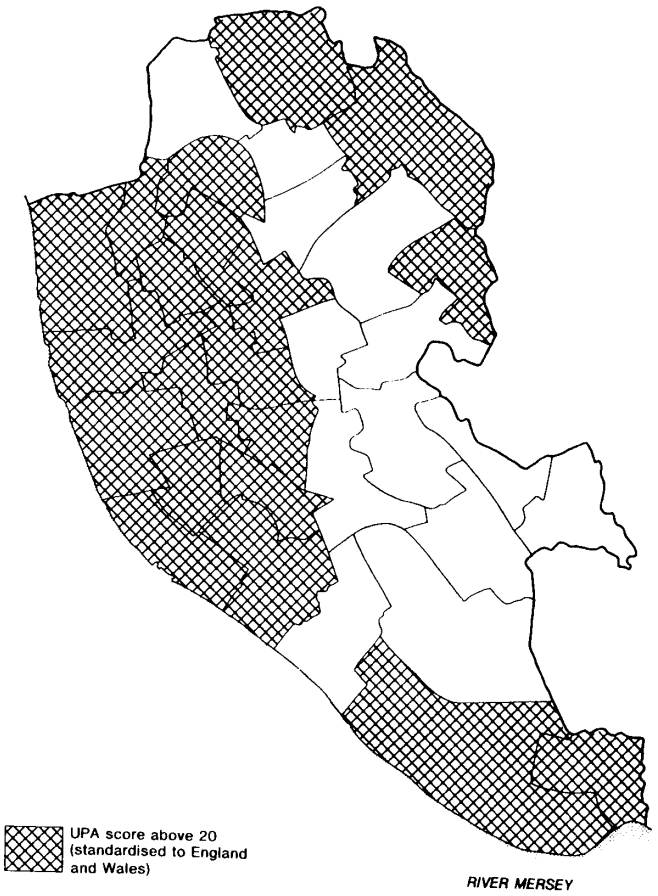
LOCATION OF WARD	POP	OVER 65	PENSIONER ALONE	UNDER 5	ONE PARENT	UN SKILLED	UN EMPLOYED	LACKS AMENITY	OVER CROWDED	CHANGED ADDRESS	ETHNIC MINORITY	UPA SCORE
		%	%	%	%	%	%	%	%	%	%	
Birmingham	41900*	13	5	6	4	5	13	1	9	9	3	12
Eastbourne	5800	55*	22	1	1	1	6	4	2	15	3	51
Worthing	7200	48	25*	2	1	3	10	9	2	16	2	71
Blyth Valley	7100	1	0	17*	2	2	8	0	3	13	1	-29
Brent	7000	14	7	9	12*	9	21	4	20	12	31	67
Gwynedd	500	18	9	6	2	26*	19	5	11	7	2	44
Derwentside	4400	16	7	6	4	11	41*	1	11	10	0	37
Kingston upon Hull	5800	13	5	11	4	9	24	51*	15	11	1	69
Tower Hamlets	6400	11	5	10	2	7	21	15	53*	17	63	73
Richmondshire	2200	3	1	13	1	4	2	2	5	65*	3	4
Ealing	13400	6	1	10	1	13	15	10	50	7	85*	37
Blackburn	6400	16	7	11	3	16	30	27	32	12	38	90*

* Highest value

The analysis was based on 9265 wards. The City of London was treated as one ward because 16 of its 25 wards had fewer than 50 residents and its total population was only 4700.

A definition of the variables appears in the descriptive list of variables.

Map 1(a) - Electoral wards in Liverpool where the UPA score is above 20



Map 1(b) - Electoral wards in Liverpool where the social index is above 6

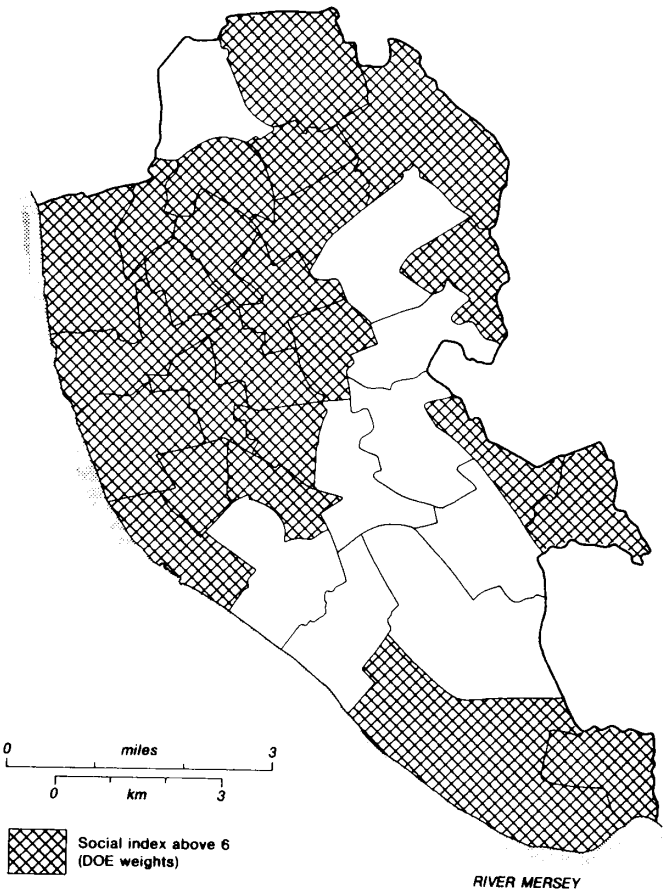


Figure 1 - Distribution of UPA score in electoral wards of England and Wales

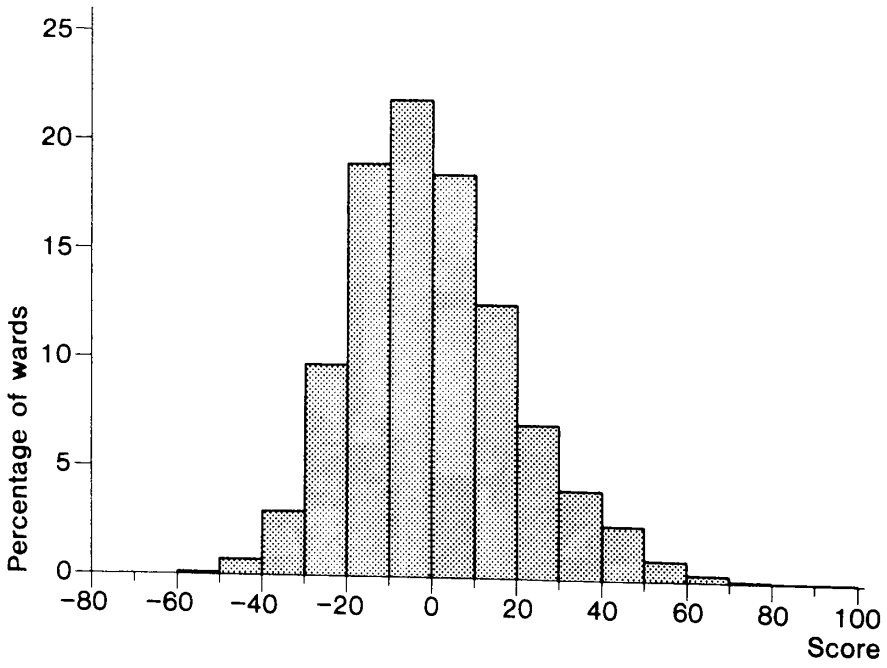
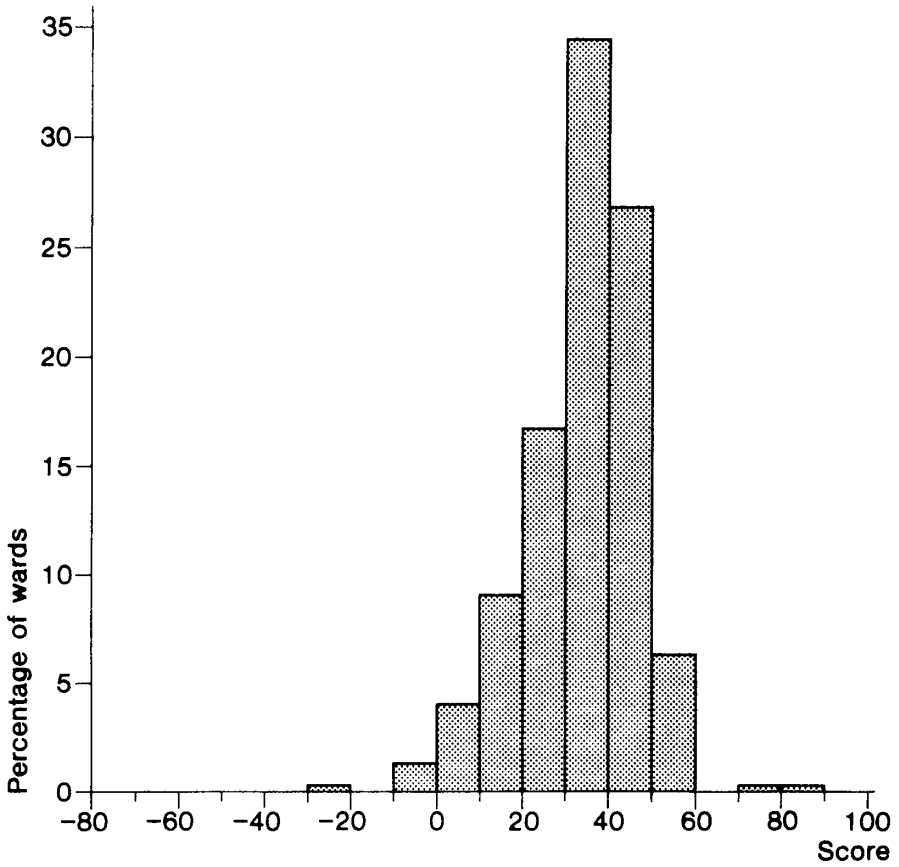
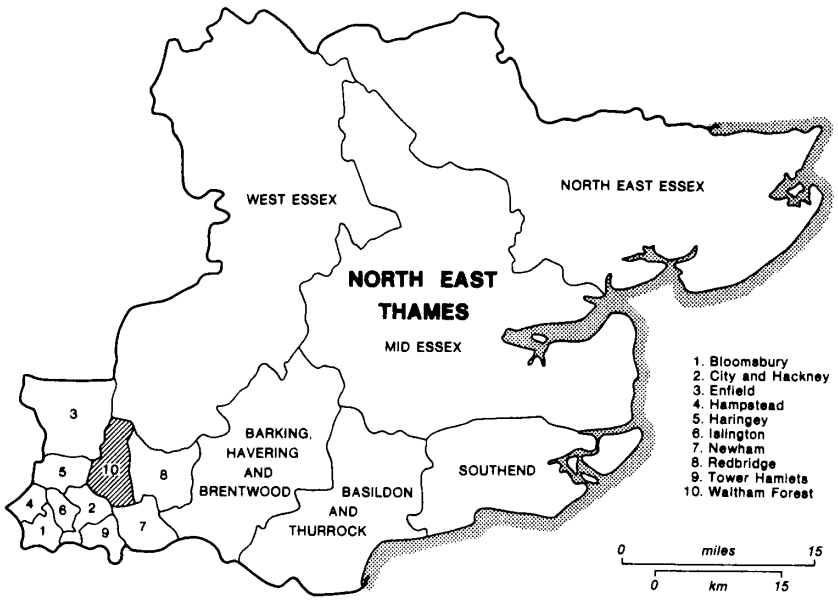


Figure 2 - Distribution of UPA score in electoral wards in inner London

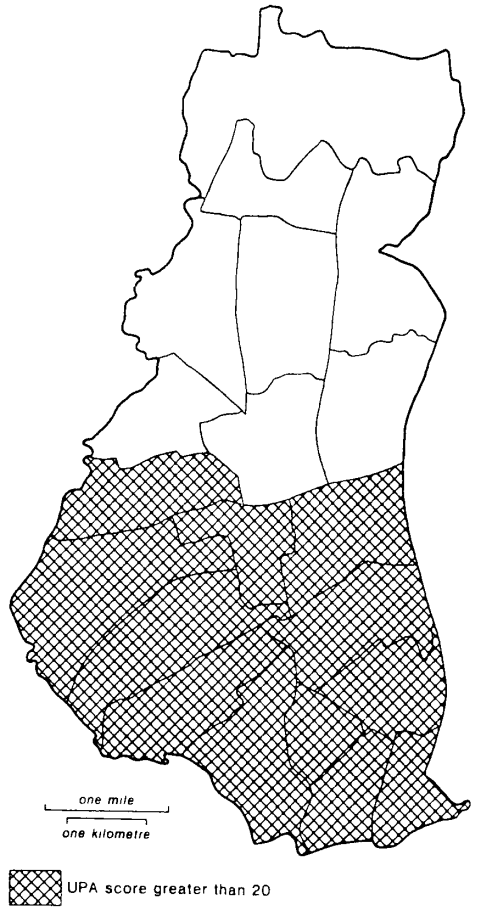


Map 2(a) - The location of Waltham Forest in relation to Greater London

Map 2(b) - The location of the Waltham Forest Health Authority within the North East Thames Regional Health Authority



Map 3(a) - Electoral wards in Waltham Forest where the UPA score is above 20



Map 3(b) - Electoral wards in Waltham Forest where the social index is above 6

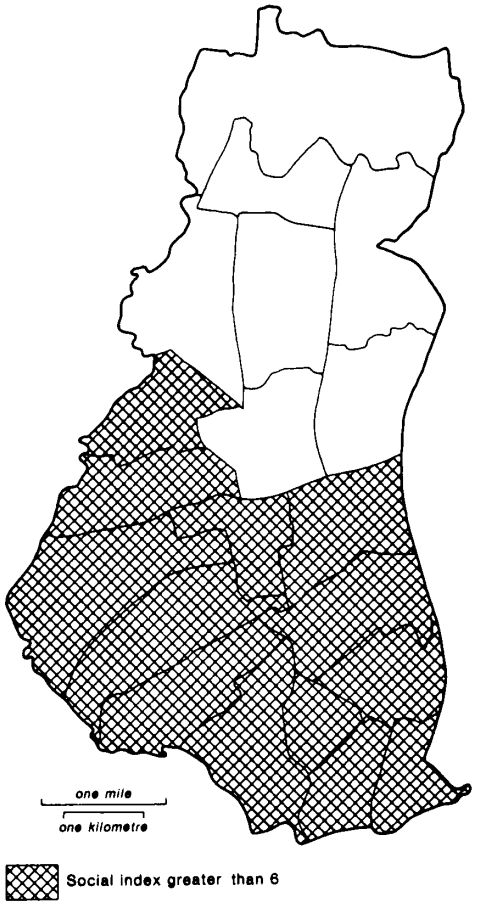


Table 4 - An example of information derived for health authorities from the 1981 Census

WALTHAM FOREST HEALTH AUTHORITY

WARD	POP	OVER 65	PENSIONER ALONE	UNDER 5	ONE PARENT	UN SKILLED	UN EMPLOYED	LACKS AMENITY	OVER CROWDED	CHANGED ADDRESS	ETHNIC MINORITY	UPA SCORE
		%	%	%	%	%	%	%	%	%	%	
Cann Hall	10100	15	6	7	4	6	11	18	13	9	22	42
Cathall	11600	13	5	9	6	5	13	12	16	11	32	48
Chapel End	10800	19	6	6	1	5	6	7	7	7	9	16
Chingford Green	11500	17	6	4	1	2	6	2	5	8	2	-5
Endlebury	8000	16	5	5	2	1	5	1	4	7	3	-14
Forest	11300	14	5	6	2	6	9	9	12	8	27	23
Grove Green	11000	16	6	6	2	5	8	16	13	7	30	34
Hale End	7300	18	5	5	1	2	5	3	5	6	4	-5
Hatch Lane	10800	24	8	3	1	4	7	1	6	6	2	4
Higham Hill	6800	15	4	5	3	8	11	4	17	6	7	14
High Street	11100	19	8	6	2	5	9	13	15	8	24	38
Hoe Street	11600	16	7	7	2	6	10	9	15	8	28	38
Larkswood	11800	18	5	5	2	2	5	2	4	6	4	-6
Lea Bridge	10600	19	7	6	2	5	9	11	13	8	24	34
Leyton	11800	13	5	9	6	6	13	9	13	9	28	40
Leytonstone	11400	14	5	7	2	4	11	11	14	11	27	28
Lloyd Park	11100	18	7	6	4	5	10	9	12	8	12	33
St James Street	12600	13	5	8	3	4	11	11	16	8	26	33
Valley	11700	14	4	7	5	3	8	1	9	7	10	11
Wood Street	11600	18	7	6	3	4	9	7	10	8	15	29

A definition of variables appears in the descriptive list of variables.

Map 4 - The names and boundaries of electoral wards in Waltham Forest

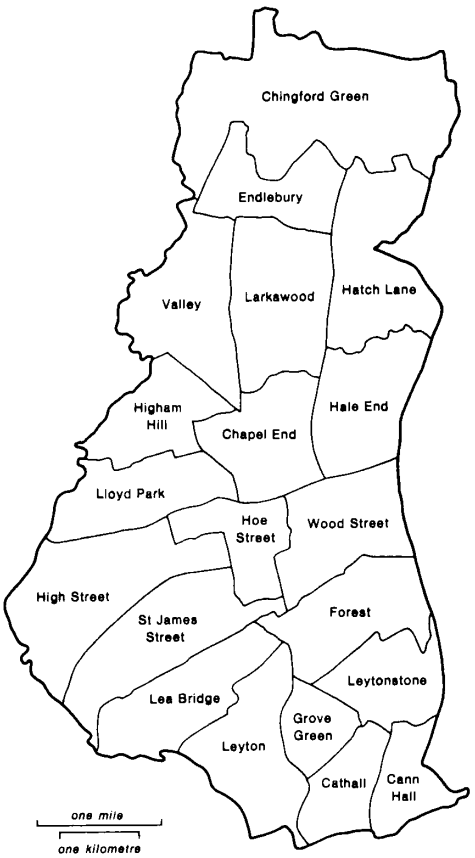


Table 5 - An example of the more detailed analysis available for enumeration districts within an electoral ward

VALLEY WARD IN WALTHAM FOREST HEALTH AUTHORITY

ENUMERATION DISTRICT	POP	OVER 65	PENSIONER ALONE	UNDER 5	ONE PARENT	UN SKILLED	UN EMPLOYED	LACKS AMENITY	OVER CROWDED	CHANGED ADDRESS	ETHNIC MINORITY
		%	%	%	%	%	%	%	%	%	%
1	500	14	3	4	1	0	4	0	3	2	4
2	480	19	5	3	2	0	2	0	3	4	2
3	490	19	5	5	1	0	4	1	1	4	1
4	360	29	12	3	3	0	4	0	6	5	3
5	500	17	4	6	1	4	5	0	2	7	4
6	500	23	6	6	1	0	3	1	5	5	4
7	470	19	5	5	0	0	3	1	4	7	3
8	600	16	3	4	0	8	3	0	4	3	2
9	450	11	3	6	3	0	5	0	1	8	2
10	510	19	5	5	1	0	4	1	4	5	3
11	430	24	11	3	1	0	2	0	4	5	2
12	470	12	5	7	2	0	4	5	2	7	2
13	480	14	5	5	1	0	6	0	8	8	5
14	530	14	4	4	0	9	4	2	13	5	9
15	560	16	6	6	2	8	6	2	9	8	7
16	590	14	3	7	4	0	9	6	6	6	9
17	570	10	3	6	6	9	16	0	21	7	15
18	460	2	1	21	21	14	27	0	17	13	33
19	540	1	1	17	19	0	21	3	22	8	37
20	480	1	0	20	20	8	28	1	24	10	35
21	470	1	2	19	20	0	27	0	19	15	32
22	520	12	3	6	1	7	9	3	14	5	5
23	400	15	5	6	1	14	5	4	12	7	14
24	340	16	5	5	3	0	5	3	3	7	10

A definition of variables appears in the descriptive list of variables

Map 5 - The codes and boundaries of enumeration districts in Valley ward

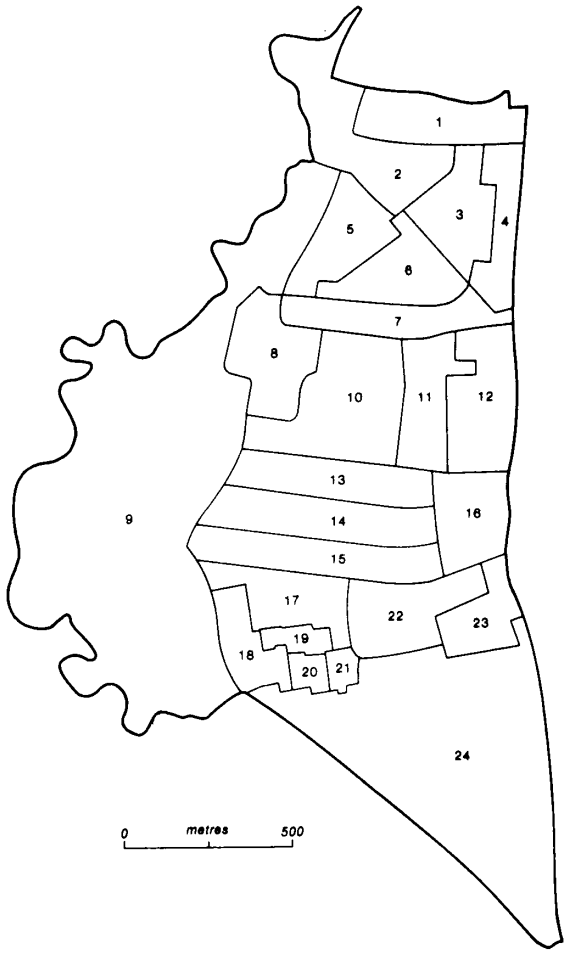


Table 6 - A comparison of Waltham Forest Health Authority with England and Wales

Percentages*

	Waltham Forest Health Authority	England & Wales
OVER 65	16	15
PENSIONER ALONE	6	5
UNDER 5	6	6
ONE PARENT	3	2
UNSKILLED	4	5
UNEMPLOYED	9	10
LACKS AMENITY	8	3
OVERCROWDED	11	7
CHANGED ADDRESS	8	9
ETHNIC MINORITY	17	5

* For details see the descriptive list of variables

Table 7 - A ward of Waltham Forest Health Authority set in a national context

	Percentages*			
	E & W Minimum	E & W Average	Cann Hall	E & W Maximum
OVER 65	1	15	15	55
PENSIONER ALONE	0	5	6	25
UNDER 5	1	6	7	17
ONE PARENT	0	2	4	12
UNSKILLED	0	5	6	26
UNEMPLOYED	0	10	11	41
LACKS AMENITY	0	3	18	51
OVERCROWDED	0	7	13	53
CHANGED ADDRESS	2	9	9	65
ETHNIC MINORITY	0	5	22	85

* For details see the descriptive list of variables

Table 8 - A ward of Waltham Forest Health Authority set in a district context

Percentages*

	WFHA Minimum	WFHA Average	Cann Hall	WFHA Maximum
OVER 65	13	16	15	24
PENSIONER ALONE	4	6	6	8
UNDER 5	3	6	7	9
ONE PARENT	1	3	4	6
UNSKILLED	1	4	6	8
UNEMPLOYED	5	9	11	13
LACKS AMENITY	1	8	18	18
OVERCROWDED	4	11	13	17
CHANGED ADDRESS	6	8	9	11
ETHNIC MINORITY	2	17	22	32

* For details see the descriptive list of variables

Descriptive list of variables

Abbreviated name	
POP	Resident population
OVER 65	People aged 65 or more as a percentage of all residents in private households
PENSIONER ALONE	Pensioners (females over 60, males over 65) living alone as a percentage of all residents in private households
UNDER 5	Children under 5 as a percentage of all residents in private households
ONE PARENT	People in households consisting of one person over 16 and one or more children under 16 as a percentage of all residents in private households
UNSKILLED	People in households headed by a person in socio-economic group 11 as a percentage of all residents in private households
UNEMPLOYED	People aged 16 or more seeking work or temporarily sick as a percentage of the total economically active population
LACKS AMENITY	People in households lacking exclusive use of a bath and inside WC as a percentage of all residents in private households
OVERCROWDED	People in households living at more than one person per room as a percentage of all residents in private households
CHANGED ADDRESS	People aged 1 or over with a usual address one year before the census different from present usual address as a percentage of total residents
ETHNIC MINORITY	People in households headed by a person born in the New Commonwealth or Pakistan as a percentage of all residents in private households
UPA SCORE	An index based on the ten variables which are listed above as OVER 65 to ETHNIC MINORITY. Details are given in the appendix.

Appendix

The UPA Score

The construction of the UPA score was prompted by the availability of small area statistics from the 1981 census. Three major technical influences were (a) prior work on previous censuses, (b) the resource allocation working party's formula, and (c) a national survey following the Acheson enquiry in London.

Major influences

In an exemplary paper in Applied Statistics in 1972, Craig and Driver reported their work on the 1966 census to help the Home Office identify small areas of adverse social conditions for the Urban Aid Programme.[1] Holtermann's analysis of 1971 census data to find areas of urban deprivation in Great Britain for the Department of the Environment appeared in Social Trends in 1975,[2] and a review by Hakim of social and community indicators from the 1971 census was published by the Office of Population Censuses and Surveys in 1978.[3] Hakim found that area-based studies which stated explicitly the criteria used in selecting variables were in the minority, and yet despite weak or non-existent theory and reliance on judgement the results of such studies have been found useful in central and local government. Census-based indicators derive their value from the census itself which as an objective source of information can introduce an element of rationality into what otherwise might be purely political decisions on where to spend public funds.

The resource allocation working party (RAWP) produced a formula which since 1976 has influenced the annual distribution of funds from the Department of Health and Social Security to the regional health authorities, which pass on the money to districts.[4] One of the components of the RAWP formula is a measurement of need for community health services. It is a very simple measure, expressed as an adjusted population and calculated by taking account of age-sex composition and standardised mortality ratio. The RAWP formula sets a precedent by measuring need without reference to the particular services supplied under the heading of community health.

The third influence on our index was the Acheson report[5] and what followed. The Acheson committee had found that certain social

characteristics of the inner London population (such as elderly people living alone) were widely considered to generate a higher need for primary care. A committee member subsequently sent a questionnaire to a random 10% sample of general practitioners in the United Kingdom inviting them to score a list of factors on a scale from 0 (no problem) to 9 (very problematical) according to the degree to which each factor increased workload or contributed to the pressure of work when it was present. The response rate of 77% was high for a postal survey. The selection of variables in our index has been based on the survey, and the averages of the general practitioners' scores have been used as weights.[6]

Small area statistics

The 1981 census small area statistics for enumeration districts are available free of charge to academic researchers at London and other university computer centres, under an arrangement between the Office of Population Censuses and Surveys and the Economic and Social Research Council (ESRC). There are 43 standard tables and the cells of the tables have been numbered by OPCS. The first of the standard tables is shown as table A1, and at the bottom of the first column is cell 43, from which we have obtained the resident population of each area. Table A2 shows the standard table 21 from which we obtained data on the population aged over 65 years of age in private households. The same table could also yield information on how many were over 75 years. Communal households (such as hospitals) were not recorded in much detail and many of the small area statistics relate only to private households. Guides to the technical details of the census are available.[7, 8]

The OPCS produces small area statistics for electoral wards but these are not covered by the arrangement with the ESRC, and we aggregated enumeration districts to wards. Digitised ward boundaries will be available at university computer centres in 1984, and used in conjunction with a mapping program will enable ward scores and other variables to be represented on maps of district health authorities and family practitioner committees. We are seeking funds to do this.

Definition of variables

Variables may be defined in several ways. For instance, the elderly alone could be measured in relation to all households, or to the elderly population, or to all residents. Percentages are used in preference to absolute numbers because areas vary in size. With the exception of the measurement of unemployment, for which we have used the conventional definition in relation to the economically active population, our variables are percentages of all-ages populations. The definition of variables in terms of cells of the 1981 census small area statistics and their weights derived from Jarman[6] are as follows:

(a) OVER 65

$$100 \times \frac{(\text{cell } 1789 + \text{cell } 1796 + \text{cell } 1803 + \text{cell } 1810 + \text{cell } 1817)}{\text{cell } 1684}$$

Weight = 6.19

(b) PENSIONER ALONE

$$100 \times \frac{(\text{cell } 2508 + \text{cell } 2509 + \text{cell } 2510 + \text{cell } 2511)}{\text{cell } 937}$$

Weight = 6.62

(c) UNDER 5

$$100 \times \frac{(\text{cell } 2011 + \text{cell } 2014 + \text{cell } 2017 + \text{cell } 2020 + \text{cell } 2023)}{\text{cell } 937}$$

Weight = 4.64

(d) ONE PARENT

$$100 \times \frac{(\text{cell } 1581 + \text{cell } 1582 + \text{cell } 1586 + \text{cell } 1587)}{\text{cell } 1574 + \text{cell } 1576 + \text{cell } 1577}$$

Weight = 3.01

(e) UNSKILLED

$$100 \times \frac{\text{cell } 4986}{\text{cell } 5007}$$

Weight = 3.74

(f) UNEMPLOYED

$$100 \times \frac{\text{(cell 401 + cell 408)}}{\text{cell 387}}$$

Weight = 3.34

(g) LACKS AMENITY

$$100 \times \frac{\text{(cell 937 - cell 938)}}{\text{cell 937}}$$

Weight = 3.60

(h) OVERCROWDED

$$100 \times \frac{\text{(cell 947 + cell 948)}}{\text{cell 937}}$$

Weight = 2.88

(i) CHANGED ADDRESS

$$100 \times \frac{\text{cell 642}}{\text{cell 43}}$$

Weight = 2.68

(j) ETHNIC MINORITY

$$100 \times \frac{\text{cell 2920}}{\text{cell 2875}}$$

Weight = 2.50

Calculation of UPA score

The process of calculating ward scores involves transformation and standardisation of each variable before combining in a weighted sum, mathematically represented as

SCORE = $w_1x_1 + w_2x_2 + \ldots + w_{10}x_{10}$

where $w_1, w_2, \ldots, w_{10}$ are the weights listed above

and $x_1, x_2, \ldots x_{10}$ are the standardised transformed variables.

Each of the variables had initially a skewed distribution, which we made more symmetric by applying the angular (arcsin) transformation - see figures A1 and A2. We standardised by subtracting the national mean and dividing by the standard deviation of each transformed variable - see table A3. We did not attempt a principal component analysis because we had no use for the weights it would have

provided. We were aware of the interrelationship of some of the variables, and table A4 reveals two clusters of variables, one relating to the elderly and the other to urban poverty.

Comparison with existing measures

The RAWP formula is not intended to identify small areas of high need. The standardised mortality ratio, for instance, is not available for areas smaller than local government and health districts. The RAWP formula is designed to measure the total need of a district, and the allowance for age-sex composition in the community health element of the formula is made by reference to national statistics on the use of services. Those statistics are categorised by the age and sex of the patient but not by social factors. Lack of appropriate information therefore prevents extension of the RAWP technique into a social index of need. By including the age groups 0-4 and 65+ our index follows RAWP in recognising that age is in itself a relevant factor.

The Department of the Environment published in 1983 its analysis of urban deprivation based on the 1981 census.[9] It had intended to produce a basic index using seven equally weighted variables for each census enumeration district (which would consist of about 150 households). Information on low skill was not available at the time of analysis and so six variables were used, with equal weights except that unemployment was double weighted to compensate for the missing variable. We have been able to include all seven variables in our index, although some definitions vary because of our decision to relate variables to individuals not households. Bearing in mind the variety of potential uses for its analysis, the Department of the Environment produced a set of alternative measures by altering the weights to emphasise housing, economic or social factors. Those weights are shown in Table 1 with the UPA weights scaled down to make comparison easier. Our interpretation of the table is that the UPA weights are closest to the social index. The Department of the Environment transformed and standardised variables before combining them linearly, and apart from using logarithmic transformations, the technique is the same as ours. Logarithimic and arcsin transformations are equally effective for enabling percentages to have an approximately normal distribution, and the choice is a matter of taste.[10]

Change of address is the only one of our ten variables which cannot be justified by reference to RAWP or the Department of the Environment. The case for including population mobility in the index is that it is easier to plan and provide services for a stable community because less effort is required in keeping medical records and achieving a consistently good standard of care, including a high uptake in preventive medicine.

Preliminary analysis

Four family practitioner committee (FPC) areas were selected for preliminary analysis. They were chosen because they covered different types of areas and because for each of them there was at least one general practitioner on the UPA subcommittee who knew the area well and was willing to assess whether the results reflected observable realities in his part of the country. The areas were Kensington, Chelsea & Westminster FPC, Liverpool FPC, Bedfordshire FPC and Mid Glamorgan FPC. Family practitioner committees were chosen in preference to district health authorities because they were easier to define in terms of census geography: family practitioner committees consist of one or more local authorities whereas district health authorities are sometimes composed of parts of local authorities.

In each area the wards with the highest scores (above 20) were immediately recognisable as deprived areas. In Liverpool, for instance, those areas matched well the area of urban deprivation selected as a special area by the Department of the Environment under the 1978 Inner Urban Areas Act.[11] Immigrant areas of the towns of Luton and Bedford with overcrowded housing, were thought to be the worst in Bedfordshire; and in the Rhondda valley in Mid Glamorgan, a bleak council estate with high unemployment featured prominently. Different types of need were evident in central London, some wards had many elderly people living alone while others had much overcrowding. Validation by reference to health services utilisation statistics for each ward was not possible because disaggregated data was unavailable.[12]

Limitations of UPA score

The index cannot measure the quality or adequacy of existing services because it takes no account of them. That assessment would have to be made by another means. It is possible that the services in some decaying urban areas are no worse than in the suburbs;[13] it is not claimed that the index is infallible. Our index has in common with other area indicators of need or deprivation the drawback that (a) not all the people living in areas identified as deprived are themselves deprived, and (b) not all deprived people live in deprived areas. The most that can be claimed for area indicators is that they identify areas in which deprivation or need is concentrated to some extent.[14]

Table A1 - Standard table 1 of the 1981 census small area statistics

All persons present; plus absent residents* in private households

PERSONS	TOTAL	In private households		Not in private households	
		Males	Females	Males	Females
1 All present res	1	3	4	6	7
2 All absent res	8	10	11	xxx	xxx
3 All visitors	15	17	18	20	21
Res in UK	22	24	25	27	28
Res outside UK	29	31	32	34	35
ALL PRESENT 1981 1971 BASE (1 + 3)	36	38	39	41	42
All RESIDENT 1981 1981 BASE (1 + 2)	43	45	46	48	49

The figures in the table are the cell reference numbers.

* Persons returned as usually resident but absent on census night in private households with one or more other person(s) present

Source: 1981 Census User Guide 52, OPCS, 1982

Table A2 - Standard table 21 of the 1981 census small area statistics

Residents in private households

Age	TOTAL PERSONS	Males SWD	Males Mrr'd	Females SWD	Females Mrr'd
TOTAL	1684	1686	1687	1689	1690
0-4	1691	1693	xxx	1696	xxx
5-9	1698	1700	xxx	1703	xxx
10-14	1705	1707	xxx	1710	xxx
15	1712	1714	xxx	1717	xxx
16-19	1719	1721	1722	1724	1725
20-24	1726	1728	1729	1731	1732
25-29	1733	1735	1736	1738	1739
30-34	1740	1742	1743	1745	1746
35-39	1747	1749	1750	1752	1753
40-44	1754	1756	1757	1759	1760
45-49	1761	1763	1764	1766	1767
50-54	1768	1770	1771	1773	1774
55-59	1775	1777	1778	1780	1781
60-64	1782	1784	1785	1787	1788
65-69	1789	1791	1792	1794	1795
70-74	1796	1798	1799	1801	1802
75-79	1803	1805	1806	1808	1809
80-84	1810	1812	1813	1815	1816
85+	1817	1819	1820	1822	1823

The figures in the table are the cell reference numbers.

SWD: Single, widowed or divorced

Source: 1981 Census User Guide 52, OPCS, 1982.

Figure A1 - Distribution of ten variables in electoral wards in England and Wales

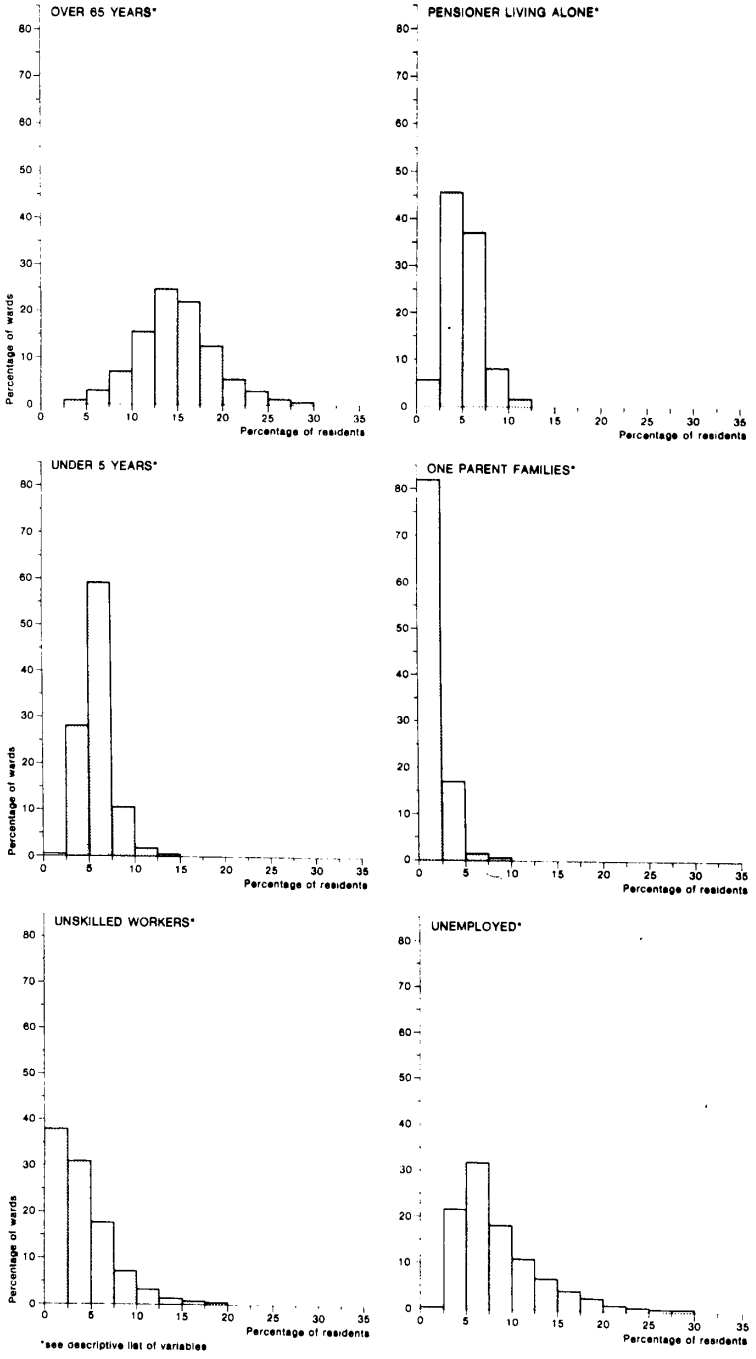
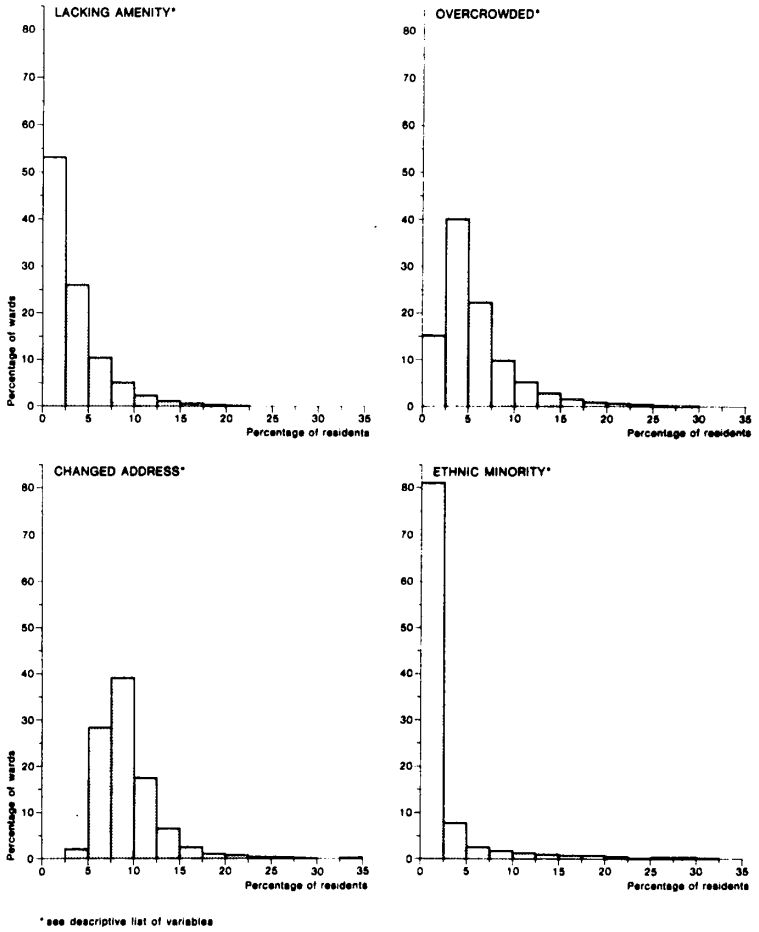
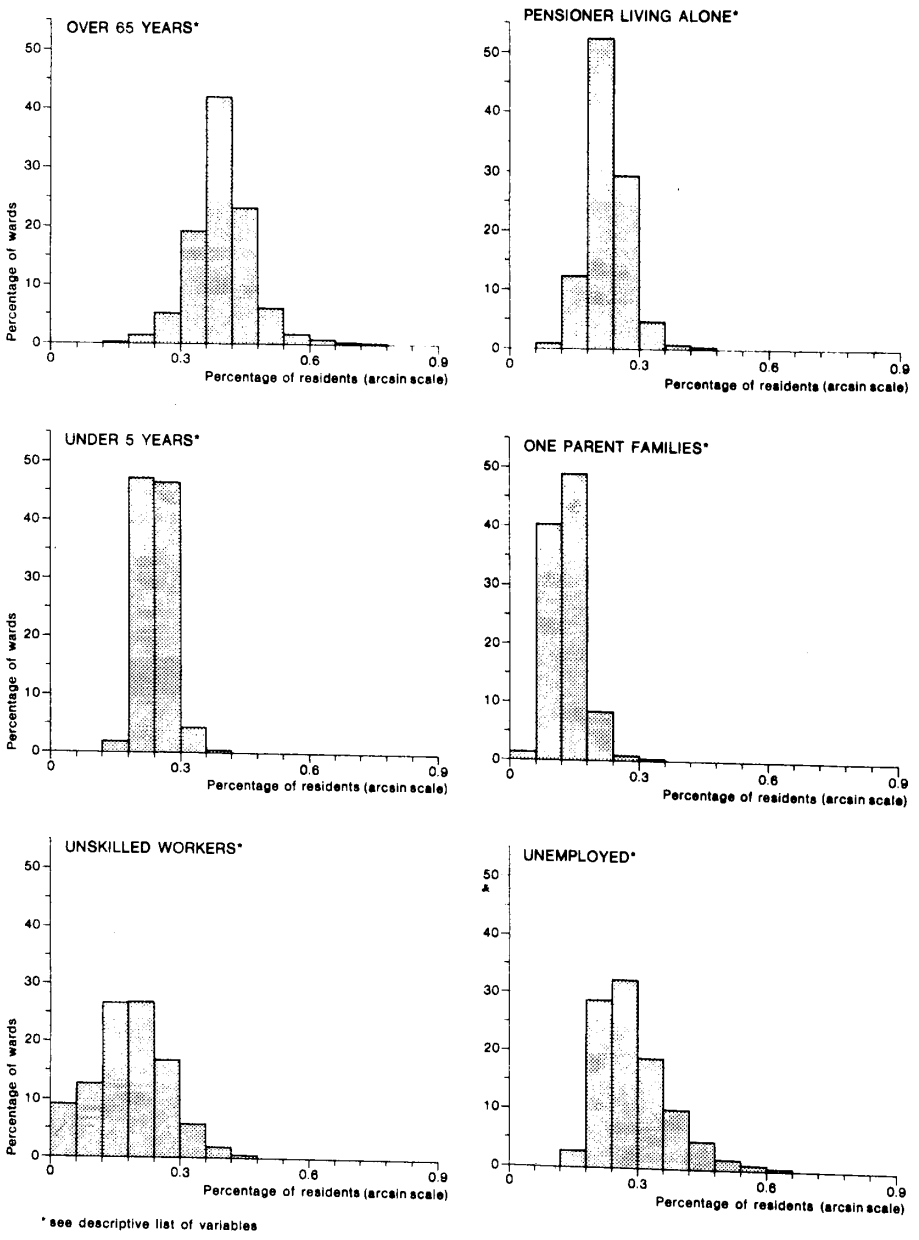


Figure A1 (continued)



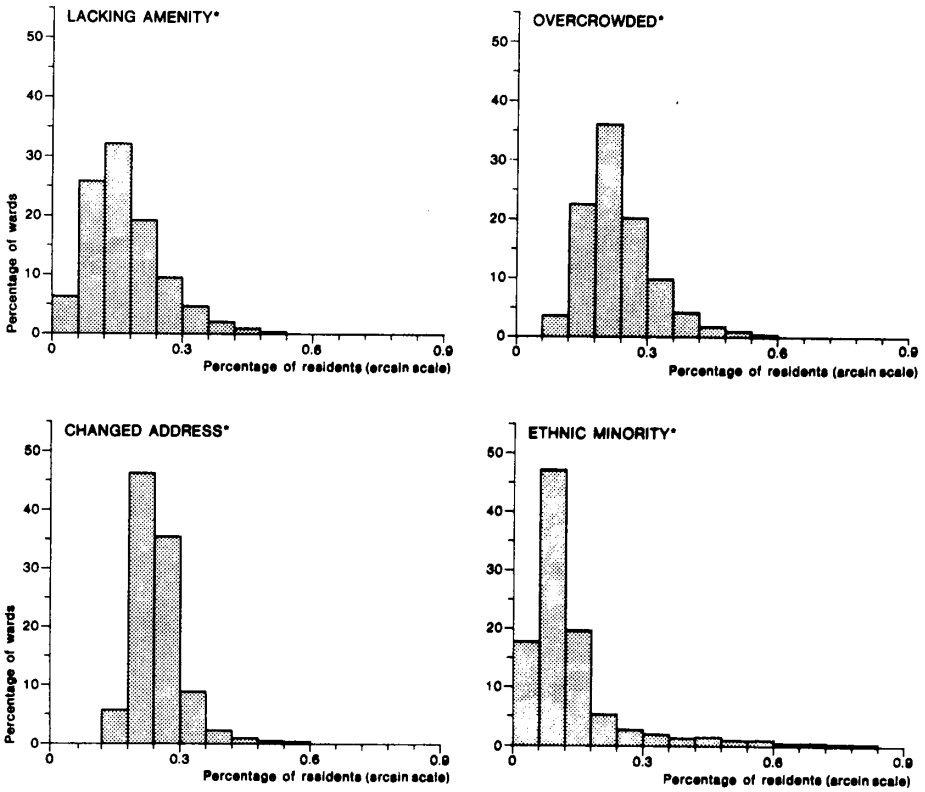
Maximum and minimum values are shown in table 2 on page 7.

Figure A2 - Distribution of transformed variables in electoral wards in England and Wales



* see descriptive list of variables

Figure A2 (continued)



* see descriptive list of variables

Means and standard deviations are shown in table A3 on page 38.

Table A3 - Means and standard deviations of transformed variables* based on electoral wards in England and Wales

	Mean	Standard deviation
OVER 65	0.397	0.0696
PENSIONER ALONE	0.226	0.0457
UNDER 5	0.243	0.0320
ONE PARENT	0.131	0.0371
UNSKILLED	0.181	0.0891
UNEMPLOYED	0.288	0.0783
LACKS AMENITY	0.166	0.0831
OVERCROWDED	0.231	0.0809
CHANGED ADDRESS	0.307	0.0567
ETHNIC MINORITY	0.130	0.1156

* The transformation is arcsin of the square root of p, where p is a proportion

The analysis was based on 9265 wards. The City of London was treated as one ward because 16 of its 25 wards had fewer than 50 residents and its total population was only 4700.

Table A4 - Correlation coefficients based on electoral wards in England and Wales

	POP	OVER 65	PENSIONER ALONE	UNDER 5	ONE PARENT	UN SKILLED	UN EMPLOYED	LACKS AMENITY	OVER CROWDED	CHANGED ADDRESS	ETHNIC MINORITY
OVER 65	-0.2										
PENSIONER ALONE	0.0	0.9*									
UNDER 5	0.2	-0.6*	-0.5*								
ONE PARENT	0.4	-0.2	0.1	0.3							
UNSKILLED	0.2	-0.1	0.1	0.2	0.5*						
UNEMPLOYED	0.3	-0.0	0.2	0.2	0.6*	0.6*					
LACKS AMENITY	0.0	0.2	0.3	0.0	0.1	0.2	0.3				
OVERCROWDED	0.4	-0.2	0.0	0.3	0.6*	0.6*	0.7*	0.4			
CHANGED ADDRESS	0.0	-0.0	0.1	0.3	0.2	0.0	0.1	0.1	0.1		
ETHNIC MINORITY	0.3	-0.1	0.0	0.2	0.3	0.2	0.3	0.3	0.7*	0.2	
UPA SCORE	0.3	0.4	0.7*	0.1	0.6*	0.6*	0.7*	0.5*	0.6*	0.3	0.5*

* Correlation coefficients of 0.5 and above or of -0.5 and below

Note that the correlation matrix of transformed variables reveals the same pattern, namely, two groups of intercorrelated variables; (a) OVER65, PENSIONER ALONE and UNDER5, and (b) ONE PARENT, UNSKILLED, UNEMPLOYED, OVERCROWDED and ETHNIC MINORITY.

The analysis was based on 9265 wards. The City of London was treated as one ward because 16 of its 25 wards had fewer than 50 residents and its total population was only 4700.

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