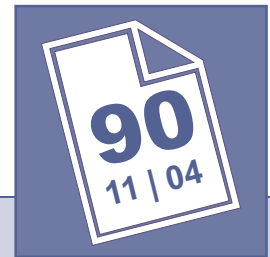




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# **Neighbourhood Inequalities in the Patterns of Hospital Admissions and their Application to the Targeting of Health Promotion Campaigns**

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# Neighbourhood Inequalities in the Patterns of Hospital Admissions and their Application to the Targeting of Health Promotion Campaigns

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## Abstract

For many years indicators of deprivation have played a pivotal role in the process whereby government assesses the relative level of resources required to meet local health needs. The formulae that have been developed for this purpose recognise that the local level of need for health resources varies among different population groups, such as the elderly or people with young children<sup>1</sup>. The formulae also recognise the strength of the relationship between health and deprivation. Over a hundred years ago public health officials first recognised differences in the rates of mortality among different occupations. Likewise today's funding formulae recognise the special needs of local areas with high proportions of particularly deprived groups such as overcrowded households, persons without access to a car or people who are unemployed. As the focus of the health service increasingly extends beyond the treatment of patients to an attempt to improve the health of local populations through preventative campaigns, the focus of targeting extends likewise to the identification of neighbourhoods at highest risk of particular diagnoses. To this end the National Health Service has recently commissioned a number of pilot exercises<sup>2</sup> to assess the effectiveness of postcode classification systems in the targeting of health promotional material. In order to assess which types of neighbourhood are most suitable for specific communications programmes, the Hospital Episode Statistics have recently been coded by Mosaic, the UK's most widely used postcode classification system. This paper summarises the key differences that have been found to exist between these Mosaic types, both in terms of overall level of admissions and type of diagnosis. The paper also evaluates the extent to which the classification system may be an efficient method not just of targeting specific health campaigns but also for assessing levels of need by type of service at a highly local level.

## 1 : The classification of residential neighbourhoods

The concept of a national classification of residential neighbourhoods was pioneered in the United Kingdom during the mid 1970s by the then Office of Population Censuses and Surveys (OPCS). It was OPCS who commissioned the Centre for Environmental Studies to undertake a number of multi-variate classifications based on small area statistics from the 1971 census. This commission included classifications of local authority districts<sup>3</sup>, of parliamentary constituencies<sup>4</sup>, of wards and parishes<sup>5</sup> and of census enumeration districts<sup>6</sup>). These classifications used around a hundred different census indicators, by no means all relating to deprivation, to organise these different sorts of areal unit into 'clusters', each cluster being as homogeneous as possible across the input variables used to build the classifications. Although the identification of areas of deprivation was not the principal purpose of the classifications, it has been surprising if the various classifications had not identified a number of clusters that were characterised by high levels of deprivation on one or more policy domains.

Since 1979 the neighbourhood classifications which had been developed by government to identify areas of need started to be used by commercial organisations to identify neighbourhoods to which they should be targeting their promotional material<sup>7</sup>. By linking the classifications to the home addresses of their survey respondents, market research companies became able to quantify the extent to which different types of neighbourhood differ in terms of a wide variety of measures of consumption. Evidence of the strength of this link between type of neighbourhood and private consumption persuaded a number of large commercial organisations to append these classifications to their own customer records. By this means they were able to learn more about the profitability and responsiveness of customers in different types of neighbourhood and to target the manner in which they promoted new and existing products to existing customers.

Retail chains started to use the evidence of the relationship between neighbourhood and consumer expenditure on different products and services to improve the quality of their estimates of the sales potential for their products of local shop catchment areas. This information was then used both to select optimal locations in which to open new outlets and to match the assortment of products that they stocked to the preferences of local customers.

These activities were further facilitated by the development of small area statistics based on sources other than the census. These made it possible both to use the unit postcode rather than the census output area as the basic geographic unit of the classifications and to update the classification allocated to individual postcodes during the inter-censal period where these data source showed significant changes in their character.

During the 1990s organisations, in both the private and the public sector, began increasingly to recognise the potential research value of the administrative records which they maintained. Using the postcode fields of customer or client records, organisations began to recognise that they could identify not just the localities and or types of neighbourhood in which their users were disproportionately located but they could use transactional information to identify the different ways in which people living in different types of neighbourhood tended to use their services.

Table one provides a list of the 61 UK Mosaic classifications together with the percentages of both GB and England population resident in each type<sup>8</sup>. It should be noted that the small size of type 40, 'Sharing a Staircase', is the consequence of this of neighbourhood being located almost exclusively in Scotland.

Mosaic types 1 - 30			Mosaic types 31-61		
	Population	%		Population	%
A1. Global Connections	330,183	0.66	E32. Dinky Developments	419,138	0.84
A2. Cultural Leadership	513,832	1.03	E33. Town Gown Transition	351,255	0.71
A3. Corporate Chieftains	691,385	1.39	E34. University Challenge	244,809	0.49
A4. Golden Empty Nesters	720,020	1.45	F35. Bedsit Beneficiaries	139,114	0.28
A5. Provincial Privilege	831,310	1.67	F36. Metro Multiculture	982,948	1.98
A6. High Technologists	1,111,793	2.24	F37. Upper Floor Families	713,309	1.44
A7. Semi-Rural Seclusion	1,184,547	2.38	F38. Tower Block Living	118,368	0.24
B08. Just Moving In	240,471	0.48	F39. Dignified Dependency	347,342	0.70
B09. Fledgling Nurseries	598,964	1.21	F40. Sharing A Staircase	9,948	0.02
B10. Upscale New Owners	796,492	1.60	G41. Families On Benefits	717,687	1.44
B11. Families Making Good	1,270,871	2.56	G42. Low Horizons	1,341,502	2.70
B12. Middle Rung Families	1,608,160	3.24	G43. Ex-Industrial Legacy	1,171,976	2.36
B13. Burdened Optimists	1,043,245	2.10	H44. Rustbelt Resilience	1,215,040	2.45
B14. In Military Quarters	107,159	0.22	H45. Older Right To Buy	987,335	1.99
C15. Close To Retirement	1,624,029	3.27	H46. White Van Culture	1,713,432	3.45
C16. Conservative Values	1,491,283	3.00	H47. New Town Materialism	1,363,092	2.74
C17. Small Time Business	1,544,954	3.11	I48. Old People In Flats	214,662	0.43
C18. Sprawling Subtopia	1,836,956	3.70	I49. Low Income Elderly	563,027	1.13
C19. Original Suburbs	1,397,708	2.81	I50. Cared For Pensioners	505,654	1.02
C20. Asian Enterprise	767,064	1.54	J51. Sepia Memories	253,114	0.51
D21. Respectable Rows	1,299,588	2.62	J52. Childfree Serenity	537,514	1.08
D22. Affluent Blue Collar	1,613,003	3.25	J53. High Spending Elders	717,409	1.44
D23. Industrial Grit	2,040,729	4.11	J54. Bungalow Retirement	565,859	1.14
D24. Coronation Street	1,390,977	2.80	J55. Small Town Seniors	1,201,247	2.42
D25. Town Centre Refuge	425,918	0.86	J56 Tourist Attendants	107,416	0.22
D26. South Asian Industry	716,609	1.44	K57. Summer Playgrounds	74,948	0.15
D27. Settled Minorities	961,159	1.93	K58. Greenbelt Guardians	953,770	1.92
E28. Counter Cultural Mix	674,624	1.36	K59. Parochial Villagers	673,946	1.36
E29. City Adventurers	502,623	1.01	K60. Pastoral Symphony	496,190	1.00
E30. New Urban Cobnists	701,182	1.41	K61. Upland Hill Farmers	120,617	0.24
E31. Caring Professionals	549,448	1.11	99. Unclassified	276,477	0.56
E31. Caring Professionals	549,448	1.11	Total	49,684,431	100.00

Table one : List of the 61 UK Mosaic neighbourhood types

In parallel with these commercial developments, geographers of a more quantitative bent became increasingly interested in measuring the extent to which spatial variations in the distribution of measurable social behaviour could best be explained statistically using 'multi-level' modelling. This led to the recognition that the characteristics of the neighbourhood in which an individual lives can have a significant explanatory power over and beyond their person and household level demographics in explaining their relative risk of different life experiences. Such modes of analysis confirm that people living in the more disadvantaged Mosaic neighbourhood types have a measurably greater risk of adverse social outcomes than could be explained solely on the basis of their personal characteristics such as age, income or occupational class.

## **2 : Linking Mosaic to the Hospital Episode Statistics**

The Hospital Episode Statistics (HES) is a database maintained by the Department of Health which records information on all patients in England who are admitted to hospital. These records contain information among other things on a patient's age, sex, diagnosis and home postcode. The Primary Care Trust in which the patient is resident is also recorded via a look up table based on the postcode. The records from the Hospital Episode Statistics used in the following analyses were supplied by the National Health Service to the Medical Statistics Unit at Queen Mary Hospital which is part of Imperial College London. Because these records pertain to individual 'episodes' Imperial College have undertaken considerable cleaning of the database to identify and to eliminate from the database instances of multiple admissions of the same individual for the same diagnosis.

To facilitate this study 16,923,845 de-duplicated records were extracted, one for each Admission during the period between 1<sup>st</sup> January 2000 and 31<sup>st</sup> December 2002. This represents 5.64 million Admissions per year. Only episodes which had been finished were extracted and only elective, emergency and maternity Admission methods. These Admissions were then coded by Mosaic, a classification developed by the information services company Experian, which divides each of Britain's 1.4 residential postcodes into one of 61 different types of neighbourhood. The version of Mosaic used for this exercise was the one launched by Experian in November 2003. This incorporates statistics from the 2001 census and covers Wales, Scotland and Northern Ireland<sup>9</sup> as well as England.

Though the data extract included information on all Admissions to hospital over this period, the records did not necessarily record every detailed diagnosis code. Overall records were coded in one of 21 classes as set out in table two. Because the diagnostic classification is hierarchical, many Admissions will have been classified at more than one level.

Within the set of 16.92 million records extracted for analysis there were a number which could not be used. For example there were a 9,223 records with no record of age and a further set of 134,101 for which either there was no recorded postcode or the postcode could not be recognised in the standard list used to build the Mosaic classification.

<b>Diagnosis Groups</b>	code
<b>All inpatients</b>	99
<b>All cancers</b>	00
Breast cancer	01
Lung cancer	02
Cervical cancer	03
Bowel cancer	04
Other cancers	05
<b>Aged 65+ Emergency admissions (exc mental health)</b>	10
Injuries and poisoning	11
<b>Influenza</b>	20
<b>Asthma in under 45s</b>	30
<b>Stroke</b>	40
<b>Heart disease</b>	50
<b>COPD</b>	60
<b>Diabetes</b>	70
<b>Teenage pregnancy</b>	80
<b>Mental health</b>	90
Affective disorders	91
Schizophrenia	92
Alcohol and drug abuse	93
Other mental health disorders	94

*Table two : Diagnosis groups*

In addition it was decided to remove a further 181,072 records which were in the Mosaic type 'Unclassified'. This Mosaic type is designed to identify non private households where the population lives in some form of institutional arrangements such as a hospital, a nursing home, a prison or a boarding school.

For this remaining set of 16,599,797 records counts of Admissions were produced for every permutation of gender, five year age cohort, diagnosis, Mosaic type and 309 English Primary Care Trusts.

### 3 : Variations in overall Admissions rates by type of neighbourhood

In order to calculate overall admissions rates by each of the 61 different types of residential neighbourhood it was necessary to compare the total number of admissions by type of neighbourhood with the corresponding numbers of people resident in each type of neighbourhood at the time of the 2001 census. Table three shows both the count and the percentage of people and of admissions by each of the 61 types of neighbourhoods. The rates for each type of neighbourhood are then expressed in index form, or in the form of an admissions rate which is relative to the English average (which is denoted by a value of 100). Note that the admissions data refers to all persons, both male and female, and at this stage the standardisation process does not take into account variations in the age distribution of the different Mosaic types.

Mosaic type	Admissions		Population		Index
	Count	%	Count	%	
A1. Global Connections	60,549	0.365	330,183	0.668	55
A2. Cultural Leadership	123,122	0.741	513,832	1.040	71
A3. Corporate Chieftains	142,386	0.857	691,385	1.399	61
A4. Golden Empty Nesters	198,058	1.192	720,020	1.457	82
A5. Provincial Privilege	242,583	1.461	831,310	1.683	87
A6. High Technologists	230,300	1.387	1,111,793	2.250	62
A7. Semi-Rural Seclusion	299,017	1.800	1,184,547	2.397	75
B08. Just Moving In	24,629	0.148	240,471	0.487	30
B09. Fledgling Nurseries	121,381	0.731	598,964	1.212	60
B10. Upscale New Owners	151,627	0.913	796,492	1.612	57
B11. Families Making Good	296,971	1.788	1,270,871	2.572	69
B12. Middle Rung Families	407,162	2.452	1,608,160	3.255	75
B13. Burdened Optimists	281,570	1.695	1,043,245	2.111	80
B14. In Military Quarters	25,450	0.153	107,159	0.217	71
C15. Close To Retirement	431,959	2.601	1,624,029	3.287	79
C16. Conservative Values	544,589	3.279	1,491,283	3.018	109
C17. Small Time Business	486,695	2.930	1,544,954	3.127	94
C18. Sprawling Subtopia	561,402	3.380	1,836,956	3.718	91
C19. Original Suburbs	366,023	2.204	1,397,708	2.829	78
C20. Asian Enterprise	207,258	1.248	767,064	1.553	80
D21. Respectable Rows	401,097	2.415	1,299,588	2.630	92
D22. Affluent Blue Collar	525,394	3.163	1,613,003	3.265	97
D23. Industrial Grit	706,586	4.254	2,040,729	4.130	103
D24. Coronation Street	574,547	3.459	1,390,977	2.815	123
D25. Town Centre Refuge	196,841	1.185	425,918	0.862	137
D26. South Asian Industry	289,098	1.741	716,609	1.450	120
D27. Settled Minorities	265,406	1.598	961,159	1.945	82
E28. Counter Cultural Mix	195,247	1.176	674,624	1.365	86



E29. City Adventurers	90,193	0.543	502,623	1.017	53
E30. New Urban Colonists	151,886	0.914	701,182	1.419	64
E31. Caring Professionals	150,765	0.908	549,448	1.112	82
E32. Dinky Developments	94,766	0.571	419,138	0.848	67
E33. Town Gown Transition	88,014	0.530	351,255	0.711	75
E34. University Challenge	30,478	0.184	244,809	0.495	37
F35. Bedsit Beneficiaries	52,309	0.315	139,114	0.282	112
F36. Metro Multiculture	313,862	1.890	982,948	1.989	95
F37. Upper Floor Families	334,898	2.016	713,309	1.444	140
F38. Tower Block Living	64,270	0.387	118,368	0.240	161
F39. Dignified Dependency	222,752	1.341	347,342	0.703	191
F40. Sharing A Staircase	4,987	0.030	9,948	0.020	149
G41. Families On Benefits	290,770	1.751	717,687	1.453	120
G42. Low Horizons	620,173	3.734	1,341,502	2.715	137
G43. Ex-Industrial Legacy	611,329	3.681	1,171,976	2.372	155
H44. Rustbelt Resilience	487,230	2.934	1,215,040	2.459	119
H45. Older Right To Buy	444,382	2.676	987,335	1.998	134
H46. White Van Culture	608,428	3.663	1,713,432	3.468	106
H47. New Town Materialism	489,250	2.946	1,363,092	2.759	107
I48. Old People In Flats	198,985	1.198	214,662	0.434	276
I49. Low Income Elderly	269,100	1.620	563,027	1.140	142
I50. Cared For Pensioners	422,669	2.545	505,654	1.023	249
J51. Sepia Memories	187,815	1.131	253,114	0.512	221
J52. Childfree Serenity	206,642	1.244	537,514	1.088	114
J53. High Spending Elders	295,858	1.781	717,409	1.452	123
J54. Bungalow Retirement	280,394	1.688	565,859	1.145	147
J55. Small Town Seniors	497,688	2.997	1,201,247	2.431	123
J56 Tourist Attendants	50,441	0.304	107,416	0.217	140
K57. Summer Playgrounds	30,851	0.186	74,948	0.152	122
K58. Greenbelt Guardians	256,022	1.541	953,770	1.930	80
K59. Parochial Villagers	217,656	1.310	673,946	1.364	96
K60. Pastoral Symphony	151,136	0.910	496,190	1.004	91
K61. Upland Hill Farmers	35,726	0.215	120,617	0.244	88
Total	16,608,672		49,407,954	100.000	100

Table three : Admissions rates by type of neighbourhood

On the basis of this evidence the pattern of admissions is, as one would expect, closely associated with variations both in age and income. High admissions rates are found in neighbourhoods with the highest concentrations of old people, whether in social housing (types I48 – I50) or living in their own homes (J51-J56). Within these groups the very highest levels occur in areas characterised by the very elderly (I50 – ‘Cared for Pensioners’, most of whom live in sheltered accommodation managed by local authorities and J51 – ‘Sepia Memories’, most of whom live in small privately owned flats and many of whom are widows or widowers); in I48, ‘Old People in Flats’, a neighbourhood type which is characterised by local authority accommodation in flats which tends to occur in

hard to let estates in the older inner areas of large cities and in F39, 'Dignified Dependency', a type of neighbourhood containing local authority housing with a mixture of low rise and high rise tenancies.

High admissions rate are also typical of areas of neighbourhoods with large numbers of households on low incomes, particularly those with large numbers of people of later working age living on low rise estates originally built by local authorities in old industrial towns. Example of these types are G43, 'Ex-Industrial Legacy', G42 'Low Horizons', and H45 'Older Right to Buy'.

Despite the close association between admissions age and income, it is evident that admissions rates in better off retirement neighbourhoods, such as J54 'Bungalow Retirement' and J55 'High Spending Elders,' are relatively low when taking into account the proportion of old people in their populations. By contrast G41, 'Families on Benefit', which is arguably the most deprived of all the 61 types and which contains areas of low rise council housing with the largest proportions of single parents, unskilled workers and people who are unemployed, has lower levels of hospital admission than many less deprived neighbourhoods. Type F36, 'Metro Multiculture', which consists mostly of multi ethnic council estates in inner London, also has a much lower level of admissions that would be expected on the basis of its deprivation ranking. By contrast D25, 'Town Centre Refuge', a type of neighbourhood that is found mostly close to the centres of smaller towns and which contains large numbers of hostels and refuges as well as small privately rented flats above shops or in subdivided large old houses, is a type of neighbourhood where admissions are significantly higher than would be expected on the basis of the proportions of old people or the level of deprivation.

The relationship between levels of hospital admissions and other variables is nicely illustrated in table four. This table summarises the results of an exercise whereby the levels of hospital admissions in each of 61 types of neighbourhoods is correlated with levels of some 1150 other behaviours or conditions, contained in a library of profiles which have been cross tabulated with Mosaic.

Table four identifies from this set of 1150 conditions and behaviours the ten with the highest positive correlation with the level of hospital admission and the ten with the highest negative correlation. Not surprisingly the answers to the question on health in the 2001 census feature very highly in the list, the correlation between admissions and poor health being  $r=+ 0.8765$ . The table also shows strong spatial association between admission levels and the proportions of people whose family status is widowed and of households that contain a single pensioner. The high correlation with social grade E is explained by this occupational classification including the retired as well as the unemployed.

The table shows that the areas with the highest risk of hospital admissions are ones in which crosswords, puzzles, bingo and watching the television are common leisure activities and where people are afraid of walking alone after dark. By contrast these are not areas where people tend to own personal computers, have access to the internet or

make use of e.mail. Nor are they areas where people pay off their credit cards or choose to have self catering holidays. All these indicators suggest that hospital admissions are highest in neighbourhoods which have old people or poor people or, most particularly, have large proportions of people who are both poor and old.

Whilst it is important to recognise the possibility that associations at the neighbourhood type level may not necessarily hold at the level of the individual person, the likelihood that the relationship at the area level does not hold at the person or household level is lessened by the fact that postcodes have been grouped into classes on the basis of their similarity rather than their geographical contiguity. Grouping postcodes on the basis of similarity does result in a much higher level of statistical variability being retained than is the case when demographically dissimilar postcodes are groups into territorial units such as Primary Care Trusts.

Correlation with level of Hospital Admissions (R : =)		Variable	Source
Highest	0.8808	Marital Status : Widowed	2001 census
	0.8765	Health : Poor	2001 census
	0.8471	Household Composition : Single, pensioner	2001 census
	0.8429	Social grade : E Lowest level of subsistence	2001 census
	0.8110	Interests : Crosswords and puzzles	Target Group Index
	0.7447	Qualifications : No qualifications	2001 census
	0.7318	Employment status : Permanently sick	2001 census
	0.7299	Walking alone after dark : Very Unsafe	British Crime Survey
	0.7288	Interests : Bingo	Target Group Index
	0.7263	TV Viewing : Heavy	Target Group Index
Lowest	-0.8935	Health : Good health	2001 census
	-0.8121	Personal Computing : Connected to the Internet	Target Group Index
	-0.7871	Personal Computing : Personal computer	Target Group Index
	-0.7776	Interests : Self catering	Target Group Index
	-0.7672	Personal Computing : Email at home	Target Group Index
	-0.7661	Credit : Usually pay in full	Experian Credit Bureau
	-0.7411	Interests : Book holidays via internet	Target Group Index
	-0.7391	Interests : Home computing	Target Group Index
	-0.7373	Credit : Monthly balance £501-1000	Experian Credit Bureau
	-0.7370	Interests : Using Internet	Target Group Index

Table four : Correlations between the level of hospital admissions and other conditions and behaviours at the level of the 61 Mosaic neighbourhood types

#### 4 : Controlling neighbourhood type admission rates for differences in age distribution

The presence on the HES extract file of patients' ages makes it possible to examine not just the overall level of admissions by type of neighbourhood but also the admissions rates within each type of neighbourhood for individual five year age cohorts.

To convert total admissions by age into age specific admissions rates for individual Mosaic types one needs to know the proportions of the population of each Mosaic type in each age cohort recorded on the HES database.

When Experian developed the Mosaic classification, each of the 61 types of neighbourhood were analysed by five year age groups up to the age of 65 and by ten year

Mosaic types 1 : 31	Raw Admissions rate	Age Standardised Admissions rate	Mosaic types 32 : 61	Raw Admissions rate	Age Standardise Admissions rate
A1. Global Connections	54.5	59.1	E32. Dinky Developments	67.2	82.
A2. Cultural Leadership	71.3	69.4	E33. Town Gown Transition	74.5	107
A3. Corporate Chieftains	61.2	64.7	E34. University Challenge	37.0	95.
A4. Golden Empty Nesters	81.8	71.1	F35. Bedsit Beneficiaries	111.8	136
A5. Provincial Privilege	86.8	76.3	F36. Metro Multiculture	95.0	110
A6. High Technologists	61.6	73.0	F37. Upper Floor Families	139.6	158
A7. Semi-Rural Seclusion	75.1	75.1	F38. Tower Block Living	161.5	162
B08. Just Moving In	30.5	37.0	F39. Dignified Dependency	190.7	201
B09. Fledgling Nurseries	60.3	67.7	F40. Sharing A Staircase	149.1	201
B10. Upscale New Owners	56.6	68.7	G41. Families On Benefits	120.5	144
B11. Families Making Good	69.5	78.8	G42. Low Horizons	137.5	151
B12. Middle Rung Families	75.3	87.0	G43. Ex-Industrial Legacy	155.1	143
B13. Burdened Optimists	80.3	91.9	H44. Rustbelt Resilience	119.3	125
B14. In Military Quarters	70.6	88.3	H45. Older Right To Buy	133.9	117
B15. Close To Retirement	79.1	78.6	H46. White Van Culture	105.6	113
C16. Conservative Values	108.6	84.5	H47. New Town Materialism	106.7	122
C17. Small Time Business	93.7	91.7	I48. Old People In Flats	275.7	133
C18. Sprawling Subtopia	90.9	87.8	I49. Low Income Elderly	142.1	131
C19. Original Suburbs	77.9	80.6	I50. Cared For Pensioners	248.6	108
C20. Asian Enterprise	80.4	87.9	J51. Sepia Memories	220.7	88.
D21. Respectable Rows	91.8	95.0	J52. Childfree Serenity	114.3	92.
D22. Affluent Blue Collar	96.9	97.0	J53. High Spending Elders	122.6	82.
D23. Industrial Grit	103.0	108.4	J54. Bungalow Retirement	147.4	91.
D24. Coronation Street	122.8	134.2	J55. Small Town Seniors	123.2	105
D25. Town Centre Refuge	137.4	140.1	J56 Tourist Attendants	139.7	113
D26. South Asian Industry	120.0	138.0	K57. Summer Playgrounds	122.4	105

D27. Settled Minorities	82.1	95.8	K58. Greenbelt Guardians	79.8	83.
E28. Counter Cultural Mix	86.1	98.2	K59. Parochial Villagers	96.0	92.
E29. City Adventurers	53.4	74.7	K60. Pastoral Symphony	90.6	91.
E30. New Urban Colonists	64.4	74.4	K61. Upland Hill Farmers	88.1	88.
E31. Caring Professionals	81.6	94.6			

*Table five : Age standardised Admissions rates by type of neighbourhood*

age groups thereafter. This information was based on the results of the 2001 census which fortuitously coincides with the midpoint of the period for which the HES admissions were extracted. However it is important to record that these distributions were calculated for the whole of Great Britain, not just England. We therefore have to rely on the assumption that the age distribution of English postcodes within each of the 61 types of neighbourhood is the same as the age distribution for the corresponding types across the whole of Great Britain.

To achieve consistency between the HES extract and the Mosaic age distributions, the 18 five year age bands recorded on HES were consolidated into 16, grouping together the aged bands 65-69 and 70-74 in a 65-74 age band and the age bands 75-79 and 80-84 into a 75-84 age band. In this way it was possible, for each type of neighbourhood, to compare the total number and percentage of admissions in each of the 16 bands on the HES with corresponding numbers and percentages of population from the 2001 census.

The admissions rates for each combination of age and type of neighbourhood were then compared with two national averages, the first the admissions rate for the entire population of England and second the admissions rate for the corresponding age cohort in England. From these results it was then possible to examine within any individual type of neighbourhood the age bands which had a higher or lower than average level of admissions compared with the national average for that age band. Alternatively it was possible to take an individual age band and to identify how admissions rates for that age band varied between types of neighbourhood.

In order to obtain an overall age standardised admissions rate for a type of neighbourhood we simply average the age standardised admissions rates for each of the 16 age bands within that type of neighbourhood.

After standardising for age the range of admissions rates narrows considerably as is shown in table five. The rank order of types of neighbourhoods on age standardised admissions now follows much more closely the ranking of neighbourhoods by deprivation. Types of neighbourhood with the highest admissions rates are now found in the Mosaic group 'Welfare Borderline' (F35 – F40), in the Mosaic group 'Municipal Dependency' (G41 – G43) and in the Mosaic group 'Low Income Elders' (I48 – I50), all three of which are characterised by high proportions of local authority housing.

Outside this core we find high standardised admission rates in various areas of older, often privately rented housing such as D24 ‘Coronation Street’, D25 ‘Town Centre Refuge’ and D26 ‘South Asian Industry’.

By way of contrast admission rates are rather lower than one might expect, at least on the basis of conventional indicators of deprivation, in a number of types of neighbourhood which occur predominantly in London. These are F36, ‘Metro Multiculture’ (mostly inner London council housing with a high proportion of non white residents), E28 ‘Counter Cultural Mix’ (mostly areas of poor, multi-occupied housing with students and transient singles as well as minority ethnic groups) and D27, ‘Settled Minorities’ (mostly areas of turn of the century terraces inhabited by the more successful and stable minority ethnic groups other than Asians). Analysis of the food questions on the Target Group Index shows very clearly how much better the diet in these neighbourhood types is than it is in other low income types of neighbourhood.

Controlling for age raised the level of admissions in E34 ‘University Challenge’ (mostly halls of residence), which has one of the lowest unstandardised admissions rates, to a level close to the average. Rates in B08, ‘Just Moving In’, are by contrast unreliable due to the fact that these are areas of post 2001 housing for which both population counts and age distributions are unlikely to be reliable. Likewise the sample size of F40, ‘Sharing a Staircase’ may be unreliable – this is a type of neighbourhood uncommon outside Scotland.

Whilst it is natural to focus on the types of neighbourhood which have high admissions rates, it is interesting to note that the type with the lowest admissions rates, A01 ‘Global Connections’ is arguably the most affluent Mosaic type. Like many others with low admissions rate it is a London based cluster. The low admissions rate in this type of

Correlation with level of Hospital Admissions (R : =)		Variable	Source	Coverage
<b>Highest</b>	<b>0.903</b>	<b>Health : Permanently sick</b>	<b>2001 census</b>	<b>UK</b>
	<b>0.894</b>	<b>Health : Working age people, long term illness</b>	<b>2001 census</b>	<b>UK</b>
	0.854	Shops Visited : Farmfoods	Target Group Index	GB
	0.848	Employment status : Unemployed	2001 census	UK
	0.846	House Value £20001 to £30000	Land Registry	England and Wales
	0.830	Council Taxation Band A	Council Tax data	GB
	0.825	Current Accounts : Card, no cheque book	Target Group Index	GB
	0.823	State Benefits : Income Support	Target Group Index	GB
	0.823	Types of Banking : Pay bills at Post Office	Target Group Index	GB
	0.820	Interests : Betting	Target Group Index	GB
	0.819	Interests : Competitions	Target Group Index	GB
	0.819	Below Tax Threshold	Target Group Index	GB
	0.808	TV Viewing : Heavy	Target Group Index	GB

0.798	Shops Visited : Kwiksave	Target Group Index	GB
0.798	Occupation : Personal service	2001 census	UK
0.791	Qualifications : No qualifications	2001 census	UK
0.788	Average Customer Indebtedness Index	Experian	GB
0.785	Newspapers : Sunday Sport	Target Group Index	GB
0.781	Tenure : Public rented	2001 census	UK
0.781	Marital Status : Divorced	2001 census	UK
0.780	Interests : Bingo	Target Group Index	GB
<b>0.776</b>	<b>Health : Poor health</b>	<b>2001 census</b>	<b>UK</b>

*Table six : Behaviours associated with neighbourhoods with high Admissions rates*

neighbourhood may be due to the high reliance in this type of neighbourhood on private medicine. The average admissions rates of the five types of neighbourhood with the lowest standardised rates is around two thirds of the national average, approximately one half that of the standardised admissions rate in top fifteen types.

## **5 : Neighbourhood variations in Hospital Admissions by diagnosis**

So far we have examined variations between neighbourhoods in terms of overall Hospital Admission rates, both in terms of raw (unstandardised) rates and after controlling for variations in the age distribution of the different types of neighbourhood.

These overall rates conceal considerable differences between different diagnoses. Diagnosis specific admissions rates have been calculated for each of the 61 Mosaic neighbourhoods for 19 admissions codes. These rates are expressed in the form of index values, whereby a value of '100' indicates a level of admissions for that diagnosis equal to the national admissions rate (on a per capita basis).

Within these admissions categories, some diagnoses are more unevenly distributed by type of neighbourhood than are others. In other words health inequalities are greater in respect of certain diagnoses than they are in respect of others. In order to assess the relative magnitude of these inequalities a standard deviation was calculated for the distribution of index values for each Mosaic type for each of the 19 diagnoses. The same statistic was also calculated for total admissions.

On this measure of neighbourhood inequality, Chronic Obstructive Pulmonary Disease (COPD), has the most unequal distribution, with a standard deviation of 138. This is followed by Schizophrenia (126), Injuries and Poisoning (124) and Emergency Admissions (117). By contrast the diagnoses which are most evenly dispersed across all types of neighbourhood are cancers, All Cancers (32), Breast Cancer (42) and Cervical Cancer (46). The standard deviation of index values for the total admissions rate is 46.

The significance of these figures is that the higher the standard deviation of the index values for a diagnosis, the more appropriate some form of neighbourhood targeting is likely

to be for its corresponding health promotion campaign. COPD, Schizophrenia and Injuries and Poisoning are forms of ill health which are particularly concentrated in a limited set of areas within English cities and towns. Cancer, by contrast, is a condition whose sufferers are so dispersed in terms of the types of neighbourhood they live in, that neighbourhood is a much weaker predictor of risk and therefore a less effective framework around which to build communications campaigns.

It is interesting to consider how the level of variation between types of neighbourhood in the overall rate of hospital admissions compares with the level of variation in the rate of other indicators of social disadvantage. The standard deviation in the rate of Hospital Admissions (46) is broadly similar to the standard deviation in the level of poor health as measured by the census (48). It is higher than the variation in the proportions of adults with no qualifications (43) but lower than the variations in the distribution of adults who are permanently sick (67), of households with no access to a car (70), of lone parents (73), of households with two or more county court judgments (76) or of adults who are unemployed (81). Area based initiatives would therefore seem somewhat less appropriate in relation to health than in relation to incapacity, transport deprivation, debt and unemployment.

	All admissions	COPD	Schizophrenia	Injuries and poisoning	Emergency	Alcohol and drug abuse	Mental Health	Stroke	Teenage Pregnancies	Heart Disease	Other mental disorders
<b>Standard deviation</b>	<b>46.3</b>	<b>138.3</b>	<b>126.6</b>	<b>123.5</b>	<b>117.4</b>	<b>110.7</b>	<b>92.7</b>	<b>91.7</b>	<b>90.3</b>	<b>84.4</b>	<b>79.7</b>
A1. Global Connections	55	35	78	74	56	41	56	58	23	46	45
A2. Cultural Leadership	71	36	60	107	79	43	53	86	33	63	53
A3. Corporate Chieftains	61	21	32	79	58	32	36	68	23	54	37
A4. Golden Empty Nesters	82	38	33	122	95	39	46	103	23	87	48
A5. Provincial Privilege	87	50	47	115	99	42	53	106	36	92	52
A6. High Technologists	62	22	26	37	37	35	39	45	48	51	44
A7. Semi-Rural Seclusion	75	41	38	88	72	39	49	81	36	67	57
B08. Just Moving In	30	21	32	17	18	30	29	16	40	22	26
B09. Fledgling Nurseries	60	15	24	17	15	28	34	21	45	26	40
B10. Upscale New Owners	57	12	21	19	17	30	31	22	47	28	39
B11. Families Making Good	70	30	37	37	36	48	51	42	66	48	60
B12. Middle Rung Families	75	39	40	36	40	53	55	49	92	59	58
B13. Burdened Optimists	80	38	69	34	34	85	87	40	106	45	103
B14. In Military Quarters	71	8	11	17	10	28	28	14	85	10	38
C15. Close To Retirement	79	43	35	65	66	42	48	74	53	80	50
C16. Conservative Values	109	93	41	125	134	44	59	135	41	138	64
C17. Small Time Business	94	67	44	100	95	56	64	102	58	95	75
C18. Sprawling Subtopia	91	75	42	90	94	50	58	93	54	94	59
C19. Original Suburbs	78	46	55	80	72	49	58	78	48	71	59
C20. Asian Enterprise	80	47	82	47	66	62	64	67	66	91	55
D21. Respectable Rows	92	75	92	86	82	88	97	85	84	83	96
D22. Affluent Blue Collar	97	76	49	72	83	67	70	88	84	104	78
D23. Industrial Grit	103	94	72	80	87	102	92	90	118	96	100
D24. Coronation Street	123	122	168	89	92	219	177	93	193	102	178
D25. Town Centre Refuge	137	129	373	165	131	371	321	149	215	123	298
D26. South Asian Industry	120	77	169	52	83	89	115	78	197	107	110



D27. Settled Minorities	<b>82</b>	71	184	53	64	90	115	73	108	72	97
E28. Counter Cultural Mix	<b>86</b>	96	254	73	74	151	159	76	88	69	117
E29. City Adventurers	<b>53</b>	36	144	49	40	81	96	48	49	35	83
E30. New Urban Colonists	<b>64</b>	48	96	61	55	66	78	59	44	49	78
E31. Caring Professionals	<b>82</b>	62	165	73	65	122	134	65	109	62	138
E32. Dinky Developments	<b>67</b>	38	102	37	35	91	96	42	80	42	100
E33. Town Gown Transition	<b>75</b>	64	226	69	61	145	153	62	139	54	136
E34. University Challenge	<b>37</b>	34	102	30	27	69	73	27	130	22	71
F35. Bedsit Beneficiaries	<b>112</b>	90	570	97	77	409	395	94	250	75	367
F36. Metro Multiculture	<b>95</b>	111	270	68	77	155	161	79	145	75	109
F37. Upper Floor Families	<b>140</b>	153	376	82	87	372	312	91	376	101	283
F38. Tower Block Living	<b>162</b>	269	452	148	157	516	402	152	347	155	335
F39. Dignified Dependency	<b>191</b>	423	527	227	249	479	412	215	229	221	329
F40. Sharing A Staircase	<b>149</b>	202	412	80	104	250	282	111	340	139	283
G41. Families On Benefits	<b>121</b>	102	162	41	46	218	178	49	367	73	190
G42. Low Horizons	<b>138</b>	207	147	81	108	220	166	103	269	134	158
G43. Ex-Industrial Legacy	<b>155</b>	293	170	154	195	200	176	170	183	196	171
H44. Rustbelt Resilience	<b>119</b>	162	79	80	107	132	112	106	167	135	137
H45. Older Right To Buy	<b>134</b>	205	80	151	183	95	102	168	89	180	113
H46. White Van Culture	<b>106</b>	124	95	89	103	100	104	98	112	108	103
H47. New Town Materialism	<b>107</b>	100	102	48	59	138	125	63	187	84	140
I48. Old People In Flats	<b>276</b>	771	254	577	618	226	246	467	48	468	208
I49. Low Income Elderly	<b>142</b>	214	158	187	193	139	151	172	96	168	153
I50. Cared For Pensioners	<b>249</b>	671	186	561	589	145	187	440	26	428	178
J51. Sepia Memories	<b>221</b>	312	102	641	492	75	127	437	28	326	116
J52. Childfree Serenity	<b>114</b>	111	146	226	169	99	125	175	57	114	110
J53. High Spending Elders	<b>123</b>	93	49	242	192	47	66	196	31	150	66
J54. Bungalow Retirement	<b>147</b>	170	40	232	243	48	67	221	33	223	73
J55. Small Town Seniors	<b>123</b>	128	90	180	162	87	107	163	77	140	118
J56 Tourist Attendants	<b>140</b>	106	129	253	190	140	131	203	96	155	136
K57. Summer Playgrounds	<b>122</b>	83	59	175	147	81	82	173	67	131	82
K58. Greenbelt Guardians	<b>80</b>	47	35	94	77	39	47	90	35	75	50
K59. Parochial Villagers	<b>96</b>	72	48	112	102	54	64	112	55	100	81
K60. Pastoral Symphony	<b>91</b>	49	46	95	84	47	60	102	41	82	74
K61. Upland Hill Farmers	<b>88</b>	45	45	91	79	53	62	95	52	79	83

Table seven : Admissions rates for different diagnosis by type of neighbourhood : Index values (England average = 100)

However when we examine the individual diagnoses we find that nine of the 19 have a standard deviation in excess of 80, a higher level of variation at the neighbourhood level even than unemployment, and a further four a standard deviation in excess of 70. Only asthma, influenza and the various forms of cancer have lower variations by type of neighbourhood than for example, households with no access to a car. Strategies for targeting types of neighbourhood, whilst not necessarily more appropriate for addressing health inequalities than for other forms of deprivation, are nevertheless highly appropriate when applied to campaigns to tackle specific types of admission.

COPD, Injuries and Poisonings and Emergency Admissions, as would be expected, are particularly concentrated in those Mosaic types with the highest proportion of very old people, namely 'Old People in Flats', 'Cared for Pensioners' and 'Sepia Memories'. However it is noticeable that the concentration of both diagnoses in these types of

neighbourhood is greater than the concentration of persons of very old age. For these diagnoses differences in the levels of admissions between these neighbourhoods and those characterised by somewhat younger and fitter pensioners, is considerable.

There are grounds for supposing that part of the reason for these very high concentrations is not just that these are types of neighbourhoods have disproportionate numbers of old people but that it is into these neighbourhoods that pensioners most at risk of illness tend to move. Both 'Old People in Flats' and 'Cared for Pensioners' are Mosaic types into which older people tend to be re-housed by local authorities from other social housing as they become less able to cope on the own. Likewise 'Sepia Memories' is a type of neighbourhood into which many older owner occupiers move (or are helped to move by their children) either after bereavement or when the demands of looking after homes and gardens in seaside bungalows become too onerous.

Compared to COPD, the distribution of admissions for Injuries and Poisoning is much higher in 'Sepia Memories' relative to the neighbourhoods of old people in council accommodation.

Schizophrenia, another highly concentrated admissions type, is particularly concentrated in areas of difficult to let publicly rented accommodation, particularly that which takes the form of flats rather than houses and which lies in inner city locations rather than disadvantaged peripheral estates. Schizophrenia also occurs in areas of very poor elderly council tenants and in inner city areas of privately rented accommodation, particularly in inner London ('Counter Cultural Mix'), in and around university areas of large provincial cities ('Town Gown Transition') and in the older cores of smaller towns ('Town Centre Refuge'). As appeared to be the case with Injuries and Poisonings, it would appear that a significant reason for schizophrenia being highest where it is is the concentration in many of these areas of large, easily dividable older houses, many of which have been arranged as privately rented flats for poorer transient single people. These are the sorts of areas where dwellings lend themselves to conversion by local authorities into refuges which accommodate the mentally ill.

The distribution of admissions resulting from Drugs and Alcohol Abuse is very similar indeed to the distribution of admissions for Schizophrenia, the correlation between the two distributions being as high as  $r=0.93$ . As with Schizophrenia, Drug and Alcohol Abuse is a particular phenomenon of the older cores of smaller towns ('Town Centre Refuge') especially those that once had pretensions to being seaside resorts and which have experienced the deterioration of what were once hotels and boarding houses. Hastings is a good example of a town with an especially high proportion of neighbourhoods of this sort. One quite likely reason for the concentration of both Schizophrenia and Drug and Alcohol Abuse in such neighbourhoods is the fact that they tend to lie in places which are surrounded by neighbourhoods which provide little appropriate accommodation for poor young people, especially those who have for one reason or another fallen out with their parents. Poor quality rented flats above shops close to the town centre, older terraces backing onto yards of high street multiples and

large Victorian properties in mixed use environments are the only types of location where many of these people can easily find a place to live.

To the extent that there are differences between the distribution of Schizophrenia and the distribution of Drug and Alcohol Abuse, we find high levels of Schizophrenia relative to Alcohol and Drug Abuse in areas that are predominantly Asian (both 'Asian Enterprise' and 'South Asian Industry') and in cosmopolitan areas of inner London ('Counter Cultural Mix' and 'City Adventurers'). By contrast Drugs and Alcohol Abuse are relatively more common in low rise peripheral and smokestack council estates where there is relatively little to interest young people. Areas of better off elderly people can also experience above average levels of Schizophrenia and significantly lower than average levels of Drug and Alcohol Abuse.

The neighbourhood distribution of admissions from Strokes tends to be more up-market than those of Emergency Admissions or COHD, with much higher levels of risk in many of the affluent neighbourhoods where people are approaching retirement (such as 'Conservative Values'). 'Old People in Flats', 'Cared for Pensioners' and 'Sepia Memories' all have very similar levels of admissions to each other and we find rather higher admissions than one might otherwise expect in the two types of neighbourhood associated with holiday accommodation and summer homes ('Summer Playgrounds' and 'Tourist Attendants').

Teenage Pregnancies have a distribution much more closely aligned with social exclusion than they do with age. The most serious levels of risk are both in the run down inner city areas of social housing – though to a much lesser extent in London ('Counter Cultural Mix') – and in the large peripheral council estates ('Families on Benefit') that are so common in England's larger provincial cities and where one finds particularly high concentrations of large families, single parents and young offenders. The more socially conservative white estates in former mining towns experience significantly higher than average Teenage Pregnancies but levels which are not outstanding bearing in mind their income and occupational profiles. Teenage Pregnancies are also particularly common in areas of poor Muslims ('South Asian Industry'), which tend also to be ones with high proportions of teenage marriages and which for this reason are less likely to be unplanned, but not in neighbourhoods colonised by better off Asians ('Asian Enterprise'). One again 'Town Centre Refuge' stands out with very much higher levels than would be expected from its level of occupational status and proportions of young people. Here, once again, it looks as though high rates are the result of vulnerable groups choosing to live in such a neighbourhood rather than of the neighbourhood having concentrations of demographic groups that are generally at high risk.

Lung Cancer and Diabetes are two admission categories which, rather as did Schizophrenia and Drug and Alcohol Abuse, distribute themselves in a similar manner ( $R=0.94$ ), with highest concentrations in areas of poor, older people. The only major exceptions to this alignment are the areas of Asian populations, both the better off Hindi ('Asian Enterprise') and the poorer Muslims ('South Asian Industry'), whose high level of diabetes is explained by diet and low levels of lung cancer by a lack of employment in

traditional mining jobs. By contrast the minority ethnic groups making up ‘Settled Minorities’ have relatively low levels of admissions from Diabetes. Low levels of Lung Cancer are also characteristic of ‘Families on Benefit’, perhaps the most disadvantaged of all the 61 Mosaic categories.

Influenza and Asthma have neighbourhood distributions which are broadly similar. One type of neighbourhood which suffers especially from both complaints are areas of poor Asians (‘South Asian Industry’). Both are high in any type of neighbourhood dominated by social housing, with particularly high levels in areas of ‘Families on Benefit’. Curiously influenza is a health hazard more likely to affect old people in small towns and tourist resorts than in other areas of retired people. The complaint also seems to affect the residents of ‘Military Bases’.

Cancer, as we have seen, is the most evenly distributed cause of Hospital Admissions, with lower than average rates in neighbourhoods that have been recently developed for young families with children and in inner city areas predominantly populated by students and other single people. Among the cancers it is evident that Cervical Cancer tends to be more common in the poorer, low rise council estates and in neighbourhoods with very poor quality older terraced housing (‘Coronation Street’). Bowel Cancer by contrast is much more common in areas of better off people nearing retirement as well as in retirement. This is a particular complaint of ‘Bungalow Retirement’ as well as of ‘Sepia Memories’ and can also be the scourge of the late middle aged people who live in better off, quieter suburbs such as ‘Conservative Values’ or who live in luxurious neighbourhoods such as ‘Cultural Leadership’, ‘Golden Empty Nesters’ and ‘Provincial Privilege’.

## **6 : Variations between types of neighbourhood in age standardised admissions rates**

In section three we have seen how the much of the variation in health resources consumed by different types of neighbourhood can be explained by variations in the distribution of different age groups. We have also seen how it is possible to control for age when creating standardised admissions rates for individual Mosaic categories. In section four we have seen again how the different causes of admission at different stages of the life cycle result in differences in the mix of admissions in different types of neighbourhood.

Knowing, as we do, the age distribution of each of the 61 Mosaic neighbourhood types and using information from the Hospital Episode Statistics on the age distribution of persons admitted, it is possible to compare the number of admissions for each age group within each Mosaic type with the corresponding distribution of the base population, thereby generating age specific hospital admission rates for each Mosaic (or Mosaic standardised admission rates for each age group).

Clearly it is impossible to comment on all 1200 of these values. However it may be interesting to consider for the purpose of illustration differences in admissions risks for two of the Mosaic types and two of the 18 age cohorts.

Figure one shows variations in age specific overall admissions rates for two of the 61 types of neighbourhoods. We have discussed 'Town Centre Refuge' in some detail. By contrast 'Settled Minorities' is a type of neighbourhood particularly common in inner London, where many second generation ethnic minority groups have taken over late Victorian and Edwardian terraced streets and are enjoying a significantly improved lifestyles compared with their parents. Such neighbourhoods tend to have higher concentrations of Afro-Caribbeans, of Hispanics, of Turks and of Greek Cypriots than of people of Asian origin. These neighbourhoods have a particularly young age distribution.

Despite the high ranking of 'Settled Minorities' on the new Index of Multiple Deprivation, it is evident that in general these neighbourhood have admissions rates which are broadly typical of the country as a whole across the overall age distribution. Overall admissions rates, on a per capita basis, are indeed below average in these neighbourhoods, principally as a result of their youthful age structure. However even after stripping out this effect, admissions rates are relatively low bearing in mind the level of deprivation in these neighbourhoods. Though the relationship between age and standardised admission rates is relatively flat it is evident that relative to other neighbourhoods, admission rates tend to increase with age. It is the younger population who appear to have better health (after taking age into account) than the older population. It would not be surprising if the overall health of these neighbourhoods improved as the young population ages

'Town Centre Refuge' has a high level of hospital admissions. In part this is because it contains quite a large number of old people as well as of young singles. However, after controlling for age, we continue to find above average admissions rates for all age groups. However it is evident that the very high risks are encountered by two age groups in particular, the 15-19 age group, many of which are at risk of being involved in teenage pregnancies, drugs and alcohol abuse in these neighbourhoods, and middle aged people, many of whom in this type of neighbourhood will be single. By contrast children are not much more likely than average to be admitted to hospital and among the very elderly the gap between the neighbourhood and the national average admissions rate is hardly distinguishable.

This conclusions that can be drawn from this comparison of just two of the 61 neighbourhood types are that there are quite considerable differences in the health profiles of types of neighbourhood; that there are many instances where these differences do not correspond with differences in the overall level of deprivation as measured by government indexes; and that the particular health difficulties of certain types of neighbourhood can be traced to specific periods in the life cycle. Not all age groups in a type of neighbourhood are likely to experience health inequalities to exactly the same degree.

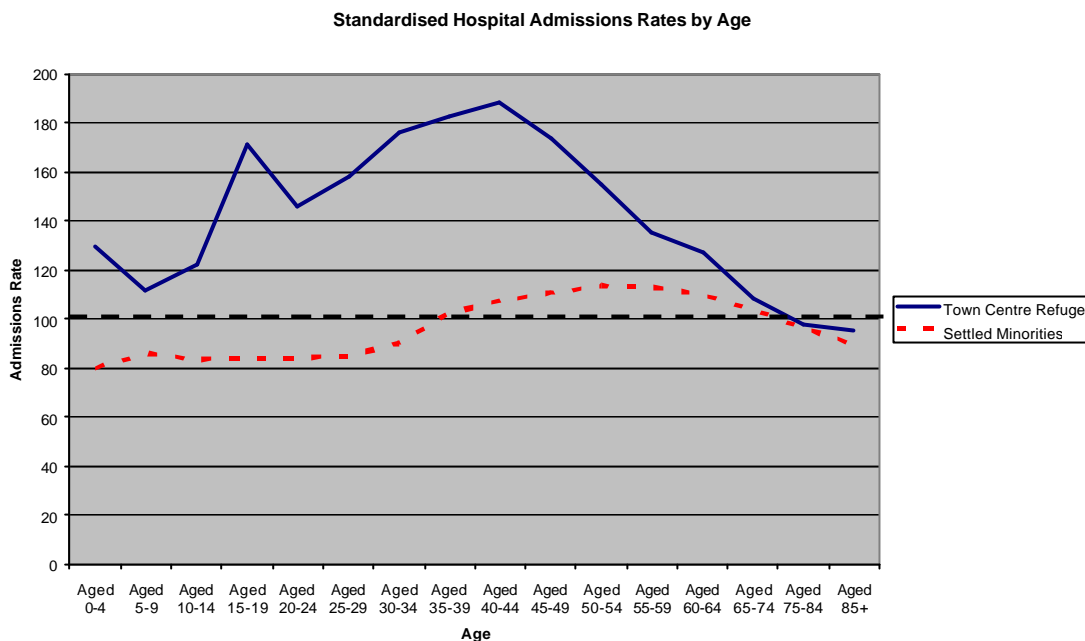


Figure one : Standardised Admissions rates by age : selected types of neighbourhood

An alternative way of looking at the data is to compare the admissions rate of different age groups across the different types of neighbourhood. This alternative approach is illustrated in figure two. Here we have taken two age groups, 15-19 and 54 – 59 and plotted admissions rates indexed against the national average for each of the 61 Mosaic types of neighbourhood (although only alternate ones are named). Notwithstanding the pattern that was evident when we examined the health profile of ‘Town Centre Refuge’, the profile of the relative rate of admissions rates of the two age cohorts is relatively similar. The biggest exception, ‘Sharing a Staircase’, is predominantly a Scottish type and the large index of admissions for the 15-19 age grouping this type may be a result of the very small size of the English sample.

Although the two series track each other closely it is evident that the amplitude of the fluctuation of the admissions rate for young people (aged 15-19) is greater than that of older people (aged 54-59). In other words neighbourhood inequalities are greater among the young than among the old. Another pattern that is evident, and which is in a sense a consequence of the previous observation, is that young people tend to have significantly lower admissions rate in better off neighbourhoods than do older people, after standardising for age. This is not surprising since at a younger age admission to hospital is more likely to be result of factors relating to deprivation whilst at an older age there a convergence in health risk is caused by the fact that the ageing process and eventual death are unavoidable. From this we can conclude that the application of targeting and segmentation to health promotion is even more appropriate to issues which affect young people than it is to campaigns which target the elderly. This is a useful corrective to the contrary opinion that, because young people are more evenly dispersed than old people

by type of neighbourhood, it make greater sense for targeting to be applied to campaigns directed at old people rather than young people.

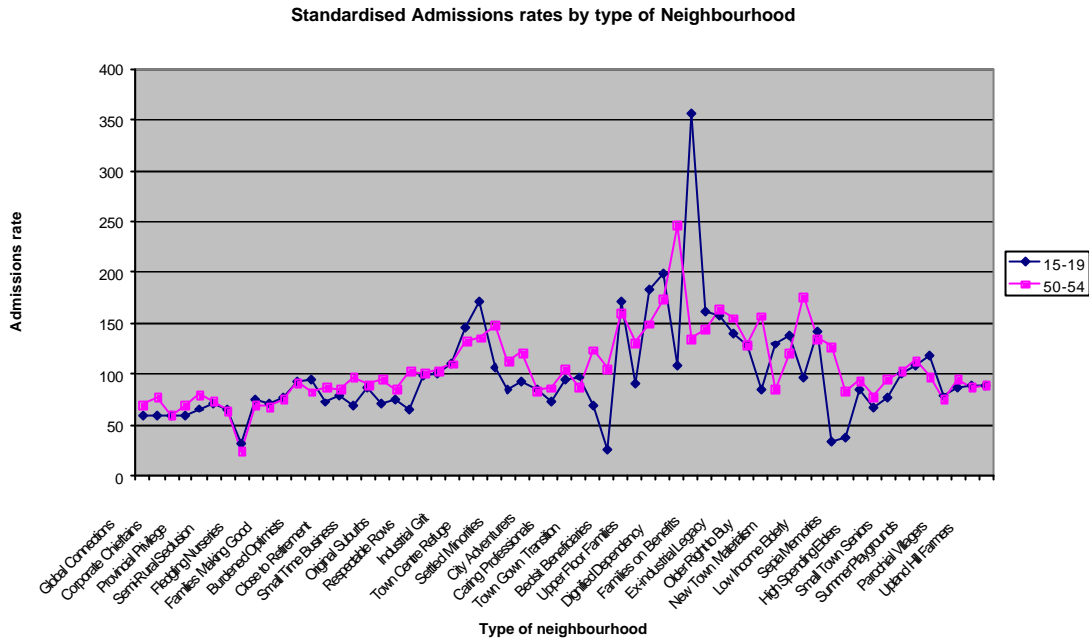


Figure two : Standardised Admissions rates by type of neighbourhood : selected ages

## 7 : Using profiles for the targeting of resources

Profiles of diagnoses by type of neighbourhood can be used to target either campaigns or resources. The pilot exercise on diagnoses undertaken by Dr Foster and Slough PCT on behalf of the Department of Health provides a good illustration of the use of profiles for the targeting of campaigns.

In this exercise all postcodes within the Slough PCT were coded by (Mosaic) type of neighbourhood. Using a table linking type of neighbourhood to risk of diabetes generated from an analysis of HES records for the whole country, postcodes were then colour coded on a scale of 1 (low) to 3 (high) according to whether the postcode was of a sort that, nationally, had a low or high risk of diabetes. An example of such a maps is shown in figure three. The benefit of basing the map on the national profile of diabetes is that the annual number of diabetic admissions in Slough is substantially less than the total number of postcodes. For this reason 'actual' data can be reliable only at much coarser levels of geography which, as a result, contain neighbourhoods with quite different levels and types of deprivation and hence of diabetes risk.

A second benefit of using national data to calibrate the risk estimation is that it avoids problems associated with local differences in the way data are collected and recorded. Clearly, in the instance of diabetes, the extent to which the PCT has previously been

active in health promotion activities in its area, whether or not these campaigns have been targeted and precisely how admissions policies are applied will influence local

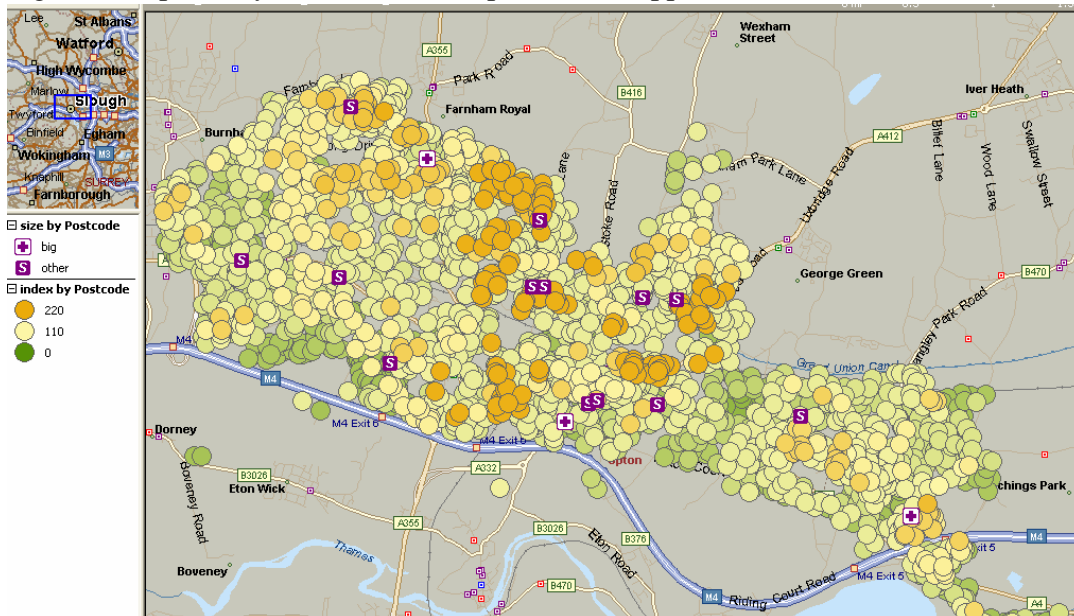


Figure three : Index of risk of diabetes by postcode, Slough PCT

measurement of diagnosis. As ever there is a danger that local data provides a picture of the local provision of services rather than a representation of local demand. Often these may co-incide but not always.

A third benefit it that risk measurement bases on a national profile can place the level of local risk in a national rather than local perspective and help the PCT to identify the extent to which, relative to other Trusts, it has a particular problem in this particular field.

The use of national data to map local risk at the level of the unit postcode does necessarily make a number of assumptions. The most important of these is that the profile of a risk of a particular diagnosis by type of neighbourhood is reasonably consistent across different regions of the country. A second important assumption is the level of risk within a given type of neighbourhood is also consistent between different types of city and region. From evaluations undertaken for Experian by the Centre for Advanced Spatial Analysis (CASA)<sup>10</sup> it would appear that both of these assumptions are largely borne out for distributions other than age itself.

Whereas it is desirable that tools for the targeting of promotional campaigns should use geographical information at the lowest possible level of spatial resolution, the evaluation of resource requirements typically requires calculations to be made for whatever levels of geography are used in the resource allocation process. To this end many commercial organisations rely on the use of a category multiplication methods whereby the proportion of the population of an area that belongs to each type of neighbourhood is multiplied by the risk propensity of that type of neighbourhood on a particular behaviour to generate a weighted average level of risk (or whatever) for the entire area.



The research undertaken by CASA quantifies the extent to which estimates based on this method differ from actual levels based on analysis of a set of twelve indicators from the 2001 census, half of which are measures of deprivation. On average the correlation between the estimates and the observed figures for these measures at the level of the postcode sector is in the region of  $r=+0.86$ .

A similar approach can be used to generate estimates of total admissions for each of the 309 PCTs in England, estimates which can then be compared with actual levels of admissions. The correlation between actual and estimated admissions is slightly lower than the correlations based on census statistics, though the level of geographic resolution is significantly coarse. Typically the residuals between the two show a high degree of spatial auto-correlation suggesting that sub-regional factors, whether related to NHS administration or to other factors, play an important role in influencing local rates. As even it is not clear whether the differences between actual and estimated admission rates at the local level reflect errors in the estimation process or vagaries in the health provision process.

The category multiplication process used in the CASA exercise was applied to geographically bounded territories. The method can equally well be applied to the evaluation of other entities. For example the advertising agencies that work on behalf of commercial organisations often ‘match’ the Mosaic profiles of different products and behaviours to the profiles of different national newspapers, magazines and users of other media. This matching results in a ranking of media according to the goodness of fit between the audience they reach and the target audience of the advertiser. This method is as appropriate to the targeting of government campaigns placed with these agencies as it is to the targeting of commercial advertising.

Another potentially useful application of the category multiplication process is to match the neighbourhood profiles of different diagnoses to the neighbourhood profiles of pupils at different schools. Using the DfES Pupil Level Annual School Census (PLASC) it has been possible to construct a table showing the percentage of pupils in each state school in England by (Mosaic) neighbourhood type. By matching these profiles to the neighbourhood profile of teenage pregnancy, it is possible to derive a useful ranking of schools according to the risk their current pupils have of becoming involved in teenage pregnancy. Such a ranking would obviously be very useful were it decided that a campaign on this subject be targeted through schools of high risk. A similar approach led the Slough PCT diabetes campaign team to target mosques rather than branches of Sainsburys as places through which to communicate their campaign messages.

## **8 : Summary and conclusions**

This exercise has demonstrated that it is possible to use the HES database as a tool for analysing health inequalities, both at the level of total admissions and at the level of individual diagnoses.

The profiles which emerge from these analyses do support established perceptions of the relative risk of different diagnoses between different population groups, in particularly reinforcing the strength of relationships between admissions, age and occupational status.

Notwithstanding the overall strength of the relationship between admissions, age and occupational status, it is evident that there are consistent misalignments between the otherwise expected levels of admissions in certain types of neighbourhood. Certain types of neighbourhood do have consistently different patterns of admission than would be expected on the basis of age and occupational status alone.

One of the reasons for this is that the condition of people's health may itself be a partial factor in explaining why they live where they do. This reverse loop applies both in the private and the state housing markets.

It appears that overall levels of health inequality, though significant, are slightly weaker than inequalities that pertain to other domains of deprivation, such as unemployment, overcrowding, debt and financial problems. However this conceals the fact that variations between in neighbourhoods in terms of some individual diagnoses are very much greater than variations in other deprivations. This tends to be the case particularly in diagnoses which are more common among younger people than old people and among diagnoses other than cancer. This would suggest that whilst neighbourhood targeting may not be especially appropriate for generic health promotion, it is appropriate for the targeting of specific campaigns.

The exercise also demonstrates that it is possible to profile admissions both in raw and in standardised form. Whilst the raw profiles may be appropriate for the targeting of resources and campaigns, the profiles when standardised by age can provide useful insights into the factors other than age that contribute to neighbourhood inequalities in respect of specific diagnoses. Standardised overall admissions rates are much more closely associated with deprivation than unstandardised admissions. However the link tends to be much weaker, and other neighbourhood influences much stronger, when one looks at individual diagnoses.

Based on an example from just two types it would appear that standardised admissions rates, after controlling for age, may be significantly different within individual types of neighbourhood for different age groups. Evidence also suggests that for any age group levels of overall admissions do not necessarily track deprivation indicators, with London neighbourhoods tending to have lower than might be expected admissions rates at all ages. These findings are supported by others that suggest ethnicity has an important effect on the pattern of admissions, with Asians in particular having very different health profiles from whites and people of Afro-Caribbean descent.

Two distinct potential applications of neighbourhood profiling in the health service are identified, the targeting of promotional campaigns and the targeting of health resources.

It is suggested that for the targeting of promotional campaigns, best results are achieved by applying national profiles to the demographics of areas at the very finest level of geographical resolution. The practice of 'profile matching' can also productively be used to identify specific communications channels and individual media titles whose audience best matches that of the high risk segments. It is also suggested that profiles of school pupils can provide a useful basis for identifying schools that might reasonably be the subject of special health promotional campaigns.

The application of profiles to the quantification of health need is more problematical since the differences between actual and expected levels of admissions by PCT is somewhat weaker than the associations that are found when one applies a similar technique to the estimations of demographics and deprivations. Further research would be needed to show whether this gap results from the manner in which individual PCTs define and collect the statistics that they contribute to HES or whether there are significant sub regional influences that affect people's health.

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<sup>1</sup> For example the frequently used 'Jarman Index' is constructed using the following seven variables: Elderly living alone; single-parent households with children under five; households that are overcrowded; unskilled workers; house-movers; persons of working age who are unemployed; residents in ethnic minorities

<sup>2</sup> 'Action Diabetes', a programme run by Slough PCT working with Dr Foster, is highlighted in the Department of Health Public Health White Paper, HMSO, 16 November 2004, p24.

<sup>3</sup> 'Socio economic classifications of Local Authority Areas', Craig, J. and Webber R., OPCS Studies on Medical and Population Subjects, no 35, HMSO, 1978

<sup>4</sup> 'Parliamentary constituencies : a socio economic classification', Webber R., OPCS occasional paper 13, 1978

<sup>5</sup> 'The National Classification of Residential Neighbourhoods : An introduction to the Classification of Wards and Parishes', Webber R., PRAG Technical Paper No 23, Centre for Environmental Studies, 1977

<sup>6</sup> 'Census enumeration districts: a socio-economic classification', Webber R., PRAG Technical Paper, Centre for Environmental Studies, 1979

<sup>7</sup> 'Targetting Customers : How to Use Geodemographic and Lifestyle Data in Your Business'. Sleight P., World Advertising Research Centre, 2004

<sup>8</sup> A full description of the UK Mosaic types can be found on the website of Experian Business Strategies <http://www.business-strategies.co.uk/Content.asp?ArticleID=566>

<sup>9</sup> UK Mosaic was built using statistics for GB only. It is for the GB population that the information about each of 61 types is held. However Northern Irish postcodes have been allocated to Mosaic types subsequent to the completion of the original classification.

<sup>10</sup> Spatial Analysis, the CASA book of GIS, Ed Longley A., ESRI Press, pp 233-266