

SELECTING VARIABLES FOR
SMALL AREA CLASSIFICATIONS
OF 1991 UK CENSUS DATA

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INTRODUCTION

Multivariate classifications of small area census data is a well established means of providing a simple to use and understand and therefore *useful* descriptive summary of the characteristics of residential areas (Openshaw, 1983; Openshaw & Wymer, 1994). In the commercial world this has become the basis for a geodemographic targeting industry with a variety of commercial systems being based on the last three censuses. Products, such as ACORN, MOSAIC, and PiNs have become industry standards (Brown, 1991). In the academic world the 1981 Super Profiles system has also attracted a considerable amount of interest and use (when it was made available in a ready to use form).

A new 1991 census based research classification has been developed under the aegis of an ESRC research project. The new system is called GB-Profiles '91 and has been developed solely for academic purposes. There is no relationship whatsoever with the Super Profiles system of CDMS. Profiles 91 uses the best available computer methods run on the best available computer hardware. It classifies the 150,000 (130,000) smallest areas in Britain for which 1991 census data are available (EDs in England & Wales, OAs in Scotland) into a relatively small number of distinctive residential area types based on an assessment of their multivariate census data profile. It is expected to be of considerable research value; particularly, when linked to unit postcodes. In building such a system there are a number of key design issues, particularly the choice of,

1. variables,
2. classification method,
3. result resolution,
4. and incorporation of prior knowledge.

The choice of variables to use is important because the results are to a large extent determined by it. Sadly in many previous studies there is no clear explanation or audit trail as to how the variables were chosen. An exception is the 1981 Super Profiles system; see Charlton *et al* (1985). The choice of variables has to reflect the purpose of the exercise and is both laboriously boring and tedious as well as hard because of the careful need to construct sensible indicator variables from a set of almost 10,000 available census counts for each small area.

Here the small areas used are the Census Enumeration Districts (EDs), and the source of data is the Small Area Statistics or SAS. The SAS is "a predefined set of cross tabulations of two or more census variables which are made available by the Census Offices in a machine readable format for a

wide range of different areal units throughout the whole of Great Britain"
(Cole, 1993, p. 201)

This statement makes two important points. First, that the census covers the whole of Great Britain. Every person must, by law, complete the census questionnaire, therefore the coverage is high. The Census Validation Survey (CVS) checks have indicated that approximately 299,000 (0.6% of the enumerated population) people were missed by the 1991 census, but this itself is estimated to be only a third of the actually under-enumeration (Wriggins, 1993). But even with an estimated 1 million people missing the census still represents a broad and accurate data set.

The second point is that it is available for a wide variety of different spatial units, including the enumeration districts (EDs and OAs) at which the census was taken. The SAS is the only Census data set that allows data to be output at this low level of resolution as confidentiality is maintained by two processes. First, by restricting output to those EDs which have more than 50 persons or 25 households, and second by "blurring" the results (adding +1, 0 or -1 to the census counts in a quasi-random manner). Although these confidentiality enhancing measures do allow data to be released for small areas, they cause severe methodological problems that have to be addressed when classifying census data.

Objectives & Purpose

It is most important to be clear about the purpose of the exercise. The choice of variables and their specification has to reflect the explicit purpose. It would seem that many previous classifications have, at best, been *"purpose vague"*. It is obvious, but important nonetheless to be quite frank. Different variables will almost certainly produce different results, and whatever purpose is reflected, this will probably map onto the available set of 10,000 census variables in many, many, different ways.

The research objective of the census classification project sponsored by the ESRC is to provide a **census data representative small area classification of Britain's residential areas**. The key phrase here is "census data representative". The aim is not solely to define areas of urban or rural deprivation or area of affluence; or areas dominated by this or that socio-economic mix that happens to be of narrow or specialist attention and importance. There are, of course, valid objectives for special purpose classifications of Britain, but the objective here is to seek a more general (broad based) census data descriptive representation. It is thought that this will appeal to the majority of the potential prospective social science users and is in the best traditions of the original geodemographic systems. It is also likely that this goal will provide maximum added-value to the 1991 database.

In practice, this means that the broadly representative set of census variable based indicators needs to be created. It follows, therefore, that in principle the importance of each general type of variable should broadly reflect the nature and content of the original census questionnaire rather than the 100 or so tables of cross-tabulated counts; the latter are a reflection of the perceived user needs for the census outputs. This desire for coverage and representativeness of the census questionnaire is, in practice, modified by an assessment of the sorts of variables previously and typically used, and by the thought that data redundancy may be induced or removed later via statistical

means. A consideration of indicators used by previous classifications is useful also, because it represents a, not insignificant, transfer of intellectual and conceptual thinking that may well be worth re-cycling. Indeed the lineage of some census indicator variables can be traced back to the 1966 census!

The strategy here then, is to review the variables used by others and then supplement and modify this list by reference to the principles of coverage and representativeness that are considered so important.

A REVIEW OF THE VARIABLES USED IN PREVIOUS AND CURRENT CLASSIFICATIONS

The Current Commercial Classifications

With the recent acquisition of PinPoint by CACI there are now only five major companies in Britain that provide geodemographic systems and the services that are associated with them (see Table 1). The release of the statistics for the 1991 Census has stimulated the redevelopment of the 1981 based systems. All five have produced new systems. PinPoint had been the first to launch a geodemographic system based on 1991 Census data, but it is understood that CACI will not be marketing this, only providing it to existing users (Sleight, 1993). This commercial situation is presently in a state of flux and therefore information on the variables that compose these systems is commercially sensitive.

Table 1: Major players in the British Geodemographic Industry

Company	Associated Products
CACI (+ PinPoint)	ACORN
CDMS	Super profiles
CCN	MOSAIC
Infolink	DEFINE
Equifax Europe	IMAGES
Euro Direct	Neighbours & PROSPECTS

Table 2 provides a list of the salient features of both the 1981 and 1991 systems. They can be differentiated by the number and type of data sources they use, the spatial unit they are based on, whether Principle Components Analysis is used to reduce redundancy within the variables, and the number of groups used to classify the data. It is interesting that a number of the systems claim to be based on unit postcodes, whereas the 1991 census only reported population and household counts at the ED level. This mixture of census ED and unit postcode data (units which are typically one tenth the size of EDs) causes all manner of problems and it is by no means clear whether the resulting classifications are actually any improvement over a purely ED based one, although they may often be perceived to be better by the end users.

Table 2: Description of the Major Geodemographic Systems

	Classification	Supplier	Sources of Variables	# of variables	Area Unit	PCA Used	# of grps
1981 SYSTEMS	ACORN	CACI	Census81 (only)	41	ED	no	11, 38
	DEFINE	Infolink	Census81 credit data electoral roll PAF data	67	Postcode	yes	10; 47; 423
	MOSAIC	CCN	Census81 credit activity data electoral roll PAF data CCJ data	38 4 11 link only 1	Postcode	no	12; 38; 57
	PIN	CACI	Census81 (only)	104	ED	yes	12; 25; 60
	Superprofiles	GDMS	Census81 TGI data	55 + 10 (affluence) 257 (small scale)	ED	yes	11 Lifestyle grps; 37 Groups; 180 Clusters
1991 SYSTEMS	ACORN91	CACI	Census91 (only)	79	ED	yes	6 Categories; 17 groups; 54 Types
	DEFINE91	Infolink	Census91 credit activity data electoral roll unemployment stats			yes	
	IMAGES	Equifax Europe (UK) Ltd	Census91 NDL data		Postcode		
	MOSAIC91	CCN	Census91 credit activity data electoral roll PAF data CCJ data retail access data	67	Postcode	No	11; 62
	Neighbours & PROSPECTS	Euro Direct Database Marketing Ltd	Census81 +91		ED?	?	
	PIN91	CACI	Census91 (only)	49	ED	No	5, 17, 42

Source: P. Sleight, 1993, Target Market Consultancy

As more and more data is collected in computer readable form so the number of different data sets available to marketing companies increases, Table 2 lists the varied sources used by each of the systems, they range from systems that restrict themselves to solely using census variables, ACORN, to

systems were the census forms only a minority of the total data used, MOSAIC. The most commonly used non census data sets used are the electoral roll, credit activity data, county court judgments and data associated with retail activity obtained either from surveys or lifestyle databases.

None of these extra-census data sets are currently available to academics so the use of similar variables is not an option considered here. However, it might be noted that mixing different data sources with different levels of spatial resolution and sampling characteristics is not necessarily or automatically an advantage, whilst it is a further source of methodological problems.

Also, it is recognized by most observers (Sleight, 1993; Openshaw, 1993) that there is now a general trend within the industry for systems to become more specific. Companies now produce a range of products to cover the wide range of situations where these systems can be applied. Such focusing is not relevant here because we seek to develop a general purpose census classification as a descriptive summary (or surrogate) of the multivariate complexity of the 1991 census.

Census Variables Used in the Current Commercial Classifications

In an attempt to incorporate previously hard earned knowledge a detailed review of the census variables incorporated in present geodemographics systems was used to provide an initial idea of which variables to select.

Each of the Census agencies listed in Table 1 was contacted and asked for information on the system concerned, specifically each was asked for a list of the census variables used in their system. Because the present competitive situation has increased the commercial value of this information only one company (Infolink) was prepared to provide this information. Unfortunately, the Infolink variables appear to be based on the total counts from each of the 88-tables in the SAS which restricts their utility. A list of the census variables used in the CCN system MOSAIC was acquired (see Appendix A) and this formed the initial basis of the selected variables.

Useful comparisons were made with the census variables used by the 1981 Super Profiles and ACORN systems and InfoLink's DEFINE (see Appendix B). The other agencies would only provide general information and the relevant brochures. A list of the variables

Further, some of these brochures provide enough detail to derive the general census topics involved in each of the geodemographic systems. For example, the CACI ACORN brochure provides short descriptions of each of the 54 ACORN types. Type 10.32 is described as *"Home Owning areas with Skilled Workers"*. To produce such a grouping CACI would have had to have used Census data on Tenure (more specifically Table S20, households owned outright) and data on social class. Indeed, this illustrates another useful principle. The variables defined here as of interest should be sufficient to identify any of the labeled area types described in the various other commercial systems.

There are also situations where the choice of variable is hard to discern. For example, it is unclear how CACI derive how home owning areas are *established* (Type 9.28) or what data they use to measure affluence (several

adjectives are used in the descriptions - *Wealthy, Affluent, Well-off* and *Prosperous*). In this situation no attempt was made to guess, the variables derived from these descriptions were only selected when it was obvious from the pen picture that they were included in the classification.

From these three sources, 1991 & 1981 lists and the analysis of pen descriptions of some of the better documented systems, a in-depth knowledge of the various selections of variable selected from the census was acquired. This knowledge was used in selecting the specific variables from the large number available.

DEFINING CENSUS VARIABLE INDICATORS

As stated above, the guiding principles for selecting these variables is that they should be broadly representative of the nature and content of the original census questionnaire so that the classification would be "*census data representative*". This foundation would then be modified by the assessment of the variables commonly used by commercial systems (described in section 3 above).

The statistics provided by the SAS are those that the OPCS perceived to be needed after an extensive consultation process. For example There is a strong emphasis on dependency within the 1991 census (lone parents, number of dependent children etc.) because of the recent moves by the government to review the structure of the Welfare State.

The content of the 1991 census forms remains fairly similar to that of 1981 Table 3 provides a list of the questions asked by the 1991 census questionnaire. There were five major changes from the 1981 census. These were additional questions on ethnic origin, long-term illness, the existence of central heating, the term-time address of students, and on the number of hours worked in the previous week.

Table 3: 1991 Census Questions

Questions on Households	type of accommodation extent of sharing tenure number of rooms availability of bath & WC central heating number of cars & vans lowest floor level of accommodation (Scotland only)
Questions on the individual	sex date of birth marital status relationship in household ethnic group whereabouts on Census night usual address term-time address (for students) usual address one year ago country of birth long-term illness whether working in week before Census hours worked weekly occupation industry address of place of work means of travel to work higher qualifications Scottish Gaelic (Scotland only) Welsh language (Wales only)

These topics have been regrouped under the eight headings listed below.

Table 4: Variable Selection Headings

Selection Groups	Census Topics
Demographic	age sex marital status
Ethnic	birth place nationality ethnic group
Housing	usual residence housing (number) rooms (number) tenure household amenities availability of cars & vans
Household Composition	<i>a combination of most of the other individual and household census topic aggregated to the level of the household e.g. couple households with dependent child(ren) and no car.</i>
Socio-economic	economic position occupation place of work industry qualifications
Migration	migration
Health	limiting long term illness
Travel-to-work	journey to work

These eight headings form the framework that structures the selection of potential variables, ensuring that all the important areas of the census are included in the final classification.

In considering suitable variables for a new general residential classification it is important not only to know which variables others have used, but also what the SAS counts represent. The OPCS provide a detailed explanation of the definitions and classifications used to aggregate the census returns into counts and tables (OPCS, 1992).

Equally important with all Census statistics is to remember what population the counts are being counted from. This is especially true of the SAS because the population being counted both between and *within* each table can vary (*Residents in Households, Students and schoolchildren aged 5 and over, or Persons aged 60 and over with limiting long-term illness*). The majority of the tables are either based on *the usual resident population* or the *number of households*. the full list of denominators used to create the rates are listed in Appendix D

This section describes and explains the selected variables. They are grouped under each of the eight topic heading listed above. A list of the associated SAS reference codes is provided in Appendix D.

Demographic Variables

Identifying variations in the age and sex structure and marital status is the initial step in distinguishing between different types of populations. All the commercial systems include variables in this category, although they vary according to the size of the age groups.

The SAS (Table S02) breaks down the usual resident population into 5 year age groups and provides counts for the total, single/widowed/divorced, and married men and women. So which variables would best represent this mass of data? In general commercial systems aggregate the age groups into five or six unequal groups. Here, seven different generations are identified ranging from infants to the aged.

The population base for these variables is the *usually resident population: 1991 base* (which is referred to as *Residents*). This is the most common base used within the SAS and is a count of...

"...all the persons recorded as resident in households in an area, even if they were present elsewhere on census night, plus residents in communal establishments who were present in the establishment on Census night." (OPCS, 1992, p. 7)

Age Structure

Age is an important factor in the life-cycle related behavior of individuals and here different age groups are identified. Here eight age groups were chosen which help to differentiate between several age types e.g. *infants, recently retired, & the aged*.

1	0 - 4	infants
2	5 - 14	children
3	15 - 24	young adults
4	25 - 44	adults
5	45 - 64	middle aged
6	65 - 74	recently retired
7	75 - 84	elderly
8	85+	the aged

Sex & Marital Status

The population as a whole can be split into two groups depending on whether individuals are married or not. Marriage changes the financial and general social situations of individuals and so it is important to differentiate between these two groups. Of course, an increasing number of people also live together as cohabiting couples, these are discussed below.

The increase in the numbers of students, working women and lone parents makes these groups particular important to differentiate within a 1990's classification.

9	Married population
10	Single population S02

From the analysis of the commercial systems four other social groups are generally identified as being important, pensioners, working women, lone parents and students. These groups have grown significantly in the last decade and it will become increasingly necessary to differentiate them from the general population.

Pensioners

Along with marriage, another major change in lifestyle is brought about at retirement. The tendency for pensioners to concentrate in certain regions and the fact that most are economically inactive makes this an important group to distinguish.

Pensioners also form an increasingly significant proportion of the population. The OPCS define pensionable age as the minimum age at which a person may receive a national insurance retirement pension *i.e.* 60 for women and 65 for men.

11	Resident persons who are of pensionable age
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Working Women

The role of women within society has change rapidly over the last two decades, particularly the place in the labour market. This change has been represented in the results of the census in that the addition of the number of hours worked question allows the number of part-time working women to be measured. The inclusion of the more specific variables on working women in couples and their occupations helps to differentiate between households with professionally qualified career orientated women and those who work in more part-time service industries (*i.e.* cleaners)

12	Working women
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Lone Parents

The problems associated with lone parents have been highlighted recently and it has been argued that as a group they have a disproportionate negative influence on society. Whatever the arguments, because of their social needs, they are an important group to differentiate. The variables included in this section aim to differentiate those lone parents that are particularly disadvantaged; those with poorly paid manual or no jobs and those who lack amenities (represented here by a lack of central heating).

13	Total 'Lone' Parents
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Students

Students are forming an increasingly large proportion of British society and because of financial constraints they tend to group together in either large university owned accommodation blocks or in low cost rented flats and bedsits. This high concentration allows these areas to be distinguished by including the total number of resident students enumerated at their term-time addresses.

14	Students 16+
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Error

An imputation procedure is used for the first time in this census to estimate the number and characteristics of residents in enumerated wholly absent households. These additional residents are added to this total. This population is therefore an estimate of the numbers of people actually living within an area. A count of how many individuals were imputed in each ED was included to enable clusters with large number of ED's with high proportions of the population estimated by imputation to be identified

15	Total Imputed Residents (S19)
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Ethnicity

The 1991 Census is the first to include a question on ethnicity - geodemographic system based on the 1981 Census were restricted to using Country of Birth. The Ethnicity question allows different ethnic groups to be compared in terms of unemployment, amenities (see below). The full classification has 35 classes. For the SAS the OPCS use a six group classification which seems sensible to use here.

16	White
17	Black
18	Indian
19	Pakistani
20	Bangladeshi
21	Chinese + Other

Ethnicity forms an important variable in all the commercial systems; there are many clusters characterized by having a large multi-ethnic component. It is important to be able to distinguish between these clusters by also including associated variables.

The SAS provides a large number of different variables associated with Ethnic Groups. One of the main topics is the tenure associated with these different groups. Although many multi-ethnic areas do tend to be associated with a poorer areas there is a danger of labeling all these areas as less well-off when a significant proportion are not. These 18 variables provide the detail required to differentiate between these areas. Tenure is used to distinguish between financially stable and financially stressed multi-ethnic regions.

	Owner	Council
Black (grps)	22	23
Indian, Pakistani, Bangladeshi	24	25
Chinese & others	26	27

Migration

An established Census question is whether the address of each person in the household was the same as one year ago. This data allows the OPCS to provide information on the movement of residents. A *migrant* is therefore defined by the OPCS as 'a person with a different usual address one year ago to that at the time of the Census' (OPCS & GRO(S), 1992b). This is a simple approach and does not distinguish between those that have moved to different countries to those that have moved next door.

A *migrant household* is defined as a household whose head is a migrant (the head of household is the first usually resident adult mentioned on the census form). A wholly moving household is a household whose resident members aged one year and over were migrants with the same postcode of usual residence one year before the census.

Only the net result of any moves is recorded so if a person returned to an address after moving within the year he or she would not be recorded as a migrant. Similarly any moves within the year are not recorded.

Different types of move can be distinguished depending on which boundaries are crossed (ward, district, county, standard regions and country). It should be borne in mind that the census includes internal migrants and immigrants to Great Britain, but not of course emigrants from Great Britain who are not enumerated.

Here two migration variables were used; the total number of resident migrants and the number of resident migrants that were also pensioners. The former allowed areas with a large number of new residents to be distinguished, for example new housing estates. While the later identified areas which attracted older residents who have usually recently retired, for example coastal retirement areas and retirement homes.

28	Total migrants
29	Pensioner migrants

Housing

In any classification of the general residential characteristics of Britain, discrimination between different forms of accommodation is important. There are several variables in the Census that provide information on the type, tenure and amenities of the British housing stock.

Tenure

Tenure describe how the household occupies its accommodation, for example by buying or by renting. The data on tenure is derived from Question H3. In this question there is a basic subdivision between buying and renting a property, with more detailed queries also being asked of these two groups.

Tenure is used by all the commercial classifications in one form or another. Superprofiles includes five variables and ACORN four. Both of these 1981 based systems distinguish between furnished and unfurnished flats. Here more emphasis is placed on home owners because of the increase in their numbers during the 1980's and these two tenures are aggregated under the privately rented category.

Generally the rented category and especially accommodation rented from Local Authorities *etc.* has been used by researchers as a measure of lack of resources and residential insecurity. In contrast. because of the financial commitment required to purchase a house, house ownership is seen as a surrogate for long term financial stability.

The OPCS classify tenure into 8 categories, here these are aggregated into six percentage variables.

30	Owned Outright
31	Mortgaged
32	Private Rented
33	Rented from HA, LA, NT

Household Space Type

A Household Space is defined as the "accommodation available for the household" (OPCS, 1992, p. 17). The census defines 22 different types of accommodation, but none of this information is included in either the 1981 versions of Superprofiles or ACORN. The following seems important as at

least providing a mental image the mix of building types within an area and therefore provides an idea of the general feel of an area.

34	detached
35	semi-detached
36	terraced
37	flats
38	bedsits

Amenities

The census records the presence or absence of several household amenities, including bath or shower, and WC. In 1991 the presence or absence of central heating was also added. Two variables were included in this list; all permanent households with no central heating and all permanent households which were either lacking or sharing a bath or shower. Both variables attempt to isolate the household which suffer from a lack of the most basic household amenities. Fortunately, in this country this is a tiny percentage of the housing stock and consequently these variables have become less important over time. The lack of central heating is a more general measure of household deprivation.

Superprofiles and ACORN include variables on households without WCs. Today this is generally agreed to be a universal amenity and is therefore dropped in favour of the central heating variable. But, as a measure of deprivation one problem with this variable is that while a large proportion of household have central heating, many households cannot afford to run it (even more so now there is VAT on fuel).

39	No central heating
40	Lacking bath and shower

Car Availability

The car has become a universal feature in British society despite its expense to both buy and run. Because of the high running costs car availability has been used by many researchers as a measure of short-term financial deprivation. For example, Townsend *et al* (1986) use the percentage of households lacking a car as a measure of lack of resources. This forms an ingredient in their measure of material deprivation - the Townsend Index. It should be remembered that cars are more important to those living in rural areas than to those in urban areas. Both variables are included in all geodemographic systems.

41	No car
42	2+ cars

Density

The number of persons per room (ppr) has also been a common variable in deprivation indices. This provides an indication of overcrowding. Here as in most systems a value of 1.5 persons per room is taken as the standard value over which a household is classified as 'overcrowded'. This variable has been heavily used by deprivation indices and commercial classifications as a surrogate measure of poverty. However, it is important to note that the definition and meaning of the term 'room' varies both geographically, culturally, and in terms of size.

The number of households which suffer from overcrowding is only 109,000, 0.5% of the total housing stock; therefore the problems caused by the ecological fallacy are likewise increased.

43	More than 1.5 ppr
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House Size

This supports the density variables and provides useful information on the amount of space for living available to each household. Large households are associated both with more prosperous and rural areas. Large houses require a high level of income to run (larger heating costs, community charge *etc.*) and high earning individuals tend not to be restricted by these costs. A partial exception to this trend is in rural areas where historically there is a higher percentage of large houses, but where the levels of economic activity has stagnated leading to isolated areas of rural deprivation.

44	Households with 7+ rooms
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Household Composition

The demographic composition of households affects their ability to generate sufficient income to meet their needs. For example a household containing two adults and two dependent children is less likely to be dependent on benefits than one containing only one adult with three dependent children. It is therefore important to include information of the numbers of adults and children within households.

Family Unit Type

The OPCS has used a predefined set of rules to allocate residents to one of 60 *family unit types* (see OPCS *Definitions*, 1992, Annex C). Within households with two generations the children are only placed in the family unit if they are single (never married) and have "*no obvious partner or offspring*". Married or divorced offspring are not included, but children who have had an informal relationship (*i.e.* a cohabiting partner) are included as this can not be deduced.

45	couple hhld, aged 16-24 without child(ren)
46	couple hhld, aged 16-24 with child(ren)
47	couple hhld, aged 25-34 without child(ren)
48	couple hhld, aged 25-34 with child(ren)
49	couple hhld, aged 35-54 without child(ren)
50	couple hhld, aged 35-54 with child(ren)
51	couple hhld, aged 55-75 plus

From this mass of data in Table S87 the following variables have been picked; again tenure is used as a surrogate for financial stability.

	Owner	Council
No Family Household	52	53
1 Couple Households (no children)	54	55
1 Couple Households (with children)	56	57
2+ Family Households	58	59

Dependent Households

Dependency is one of the major census topics primarily because of its influence on the State benefit System. Dependency variables therefore form

a significant proportion of this list. The census contains data on several different groups of dependents

60	Households with dependents
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Socio-economic Characteristics

Economic Position

These provide a guide both to affluence and to age. The lack of an income question in the 1991 census makes the use of proxies for income very important.

61	Economically active
62	Self-employed
63	Unemployment

The limitations with these figures are that for certain areas of Great Britain the figures may be substantially out of date because of the extent to which unemployment has increased since April 1991

Also, a change in the level of unemployment in an area may be more related to the local economy than to the quality of the residential neighbourhood. The late 1980's recession has affected many low unemployment areas, thereby reducing the value of unemployment as a indicator of residential characteristics.

Industry

The industry in which an individual is engaged is determined by the activity of his or her employer *i.e.* the nature of the service or product. The classification used is the Standard Industrial Classification and individual are assigned according to the name and description of their employers business collected in question 16.

64	Agric./Forestry/Fishing
65	Energy & Water
66	Manufacturing
67	Construction
68	Distribution & Catering
69	Transport
70	Banking & Finance

Socio-economic Group

This groups together jobs of similar social and economic status. Allocation is determined by considering the employment status, *i.e.* economically active or on a government scheme, and the occupation of the head of the household. It provides most of the information provided by the occupation variables, but in a more relevant framework.

71	Professional 1, 2, 3, 4
72	Intermediate & Junior non-manual 5, 6
73	Manual workers 8, 7, 9, 10, 11,12
74	Farmers & agricultural workers 13, 14, 15
75	Armed Forces & Other 16, 17

Qualifications

The question the qualifications that individuals hold provide information, unavailable from any other source, which is used in the planning of investment in education. It is limited to degrees, professional and vocational qualifications.

It is used here as a measure of education, which is also associated with a higher earnings, better levels of health and in general a higher standard of living.

76	Workers with higher degrees
77	Workers with other qualifications

Health

For the first time the 1991 Census provided useful morbidity data. The aim of this question was to provide information on the general incidence of morbidity within the population. The question specifically requests that problems do to old age are included. It has been found in pre census tests that this information correlates well with the use of both GP consultations and in and out patient hospital visits. This question therefore provides a simple, but nationally comparable,

This may well be effectual in picking up broad regional differences in the general level of well-being across Britain. Its usefulness as a *local* residential area discriminator is as yet unexplored

Limiting Long-term Illness

Here the total number of people that acknowledged that he or she was limited in their daily activities by a long-term illness, health problem, or handicap was taken as a general measure of the level of morbidity within the population.

Those residents that were economically inactive because of long-term illness were also included. This population is dependent on social and health care services and/or families for their way of life.

78	Total persons with LLI (S12)
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Transport-to-Work

The type of transport generally used to get to work (used on the longest part of the journey) provides an indication of the lifestyle of the individual. Cars are expensive to run and require a certain level of income. This generalization is complicated by other circumstances. The need for a car in rural areas is more acute because of the lack of public transport. The proportion of income that any individual in these circumstances may be willing to spend on a car may well be much higher than average. Rural areas therefore may well have a higher level of car ownership than would be expected give the income levels normally associated with the rural economy. Equally, where the bus or train networks are more dense *i.e.* in the south-east of England

79	Train Bus
80	Car
81	Work at home

Contextual Variables

To provide an indication of some of the more specialized contexts in which people live the following variables were included

V82	Medical & Care Ests.
V83	Detention centres & Defense Est.
V84	Education Ests.
V85	Hotels & Other Ests.

CONCLUSIONS

This paper has provided a description or 'audit trail' of the process of variable selection for the general residential classifications that have been developed. The objective of the project sponsored by the ESRC is to provide a census data representative small area classification of Britain's residential areas.

It is most important to be clear about the purpose of the exercise. The choice of variables and their specification has to reflect the explicit purpose. It would seem that many previous classifications have, at best, been "purpose vague". It is obvious, but important nonetheless to be quite frank. Different variables will almost certainly produce different results, and whatever purpose is reflected, this will probably map onto the available set of 10,000 census variables in many, many, different ways producing many possible different classifications.

The aim of this classification project has been to be "census data representative". The aim is not solely to define areas of urban or rural deprivation or area of affluence; or areas dominated by this or that socio-economic mix that happens to be of narrow or specialist attention and importance. There are, of course, valid special purpose objectives for a classification of Britain's residential areas, but the objective here is to seek a more general (broad based) census data descriptive representation. It is thought that this will appeal to the majority of the potential prospective social science users and is in the best traditions of the original geodemographic systems. It is also likely that this goal will provide maximum added-value to the 1991 database.

The variables defined here essentially reflect the past experience of the researchers, those used by other commercial organizations, and the desire for coverage of the census topics. Table 6 summarizes what has been achieved. It is inevitable that coverage is uneven and contains possibly high levels of data redundancy. What is done to either reduce or remove or retain redundancy is a subject for a separate study. The object here was to reduce almost 10,000 potential variables to a much more manageable number for subsequent analysis and classification.

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APPENDIX A

List of 1981 Census Variables used in CDMS Superprofiles

Ref#	Variable
1.	Persons aged 0-4
2.	Persons aged 5-14
3.	Persons aged 15-24
4.	Persons aged 25-44
5.	Persons aged 45-64
6.	Persons aged 65-74
7.	Persons aged 75+
8.	Total Residents
9.	Single Worker Hhlds
10.	Marr'd Couple Hhlds
11.	E.A./No Ch Hhlds
12.	Fem Aged 16-45
13.	Adults + Ch 0-15
14.	Person Hhlds
15.	Single Parent Hhlds
16.	Lone female O.A.P.s
17.	One Year Migrants
18.	Pensioner Migrants
19.	Rooms per Hhld 1-3
20.	Rooms per Hhld 4-6
21.	Rooms per Hhld 7+
22.	Overcrowded Hhlds(>1.5)
23.	Share/Lack Bath
24.	Share/Lack Insd WC
25.	Owner Occupied
26.	Council/New Town
27.	Tied Employ/Busin
28.	Unfurnished Rented
29.	Furnished Rented
30.	Second/Hol Homes
31.	African Born
32.	Caribbean Born
33.	Indo/Pakistan Born
34.	Non Commonw'lth/EEC
35.	Hhlds without Car

Ref#	Variable
36.	Hhlds with 1 Car
37.	Hhlds with 2 Cars
38.	Hhlds with 3+ Cars
39.	Working at Home
40.	T-to-Work by Foot
41.	T-to-Work by Bus
42.	T-to-Work by Car
43.	T-to-Work by Train
44.	Employ + Managers
45.	Professional Wrks
46.	Non-Manual Workers
47.	Self Emp Non-Prof
48.	Skilled Manual
49.	Semi-Skil'd Manual
50.	Unskilled Manual
51.	Armed Forces
52.	Agricultural Wkrs
53.	Energy+Water Wkrs
54.	Manufacturing Wkrs
55.	Service/Dist Wkrs
56.	Students 16+
57.	Qualified Workers
58.	Self Empl Workers
59.	Part Time Workers
60.	Prop Male Workers
61.	Working Wives
62.	Male Unemployed
63.	Total persons
64.	Total Hhlds
65.	Total Econ Acti
66.	Total Workers
67.	Total Marr'd Women
68.	Total Male E.A.
69.	Total Hholds with Dep Ch.
70.	Total Migrants

Ref#	Variable
71.	Persons of pens age
72.	Total persons aged 16+
73.	Total Hhlds with res.

Ref#	Variable
74.	Total wrkrs (T82)
75.	Total E.A (T92)
76.	Total wrkrs (T73)

APPENDIX B

List of 1981 Census Variables used in CACI ACORN

Ref#	Variable
1.	Unemployment
2.	Women in full time work
3.	Students
4.	One car hhlds
5.	2+ car hhlds
6.	4+ child hhlds
7.	Afro-Caribbean born
8.	Indo-Pakistan born
9.	Aged 0 - 4
10.	Aged 5 - 14
11.	Aged 15 - 24
12.	Aged 25 - 44
13.	Aged 45 - 64
14.	Aged 65+
15.	Population married
16.	Single non-pensioners
17.	Household size
18.	Rooms per hhld
19.	Owner occupied
20.	Council or HA
21.	Unfurnished rented
22.	Furnished rented
23.	Acute overcrowding
24.	Overcrowding
25.	No inside WC
26.	No bath
27.	Rooms per person
28.	Shared amenities
29.	7+ room dwelling
30.	1 or 2 room dwelling
31.	Walk to work
32.	Public transport to work
33.	Manufacturing workers
34.	Agricultural workers
35.	Service workers
36.	Professional workers
37.	Non-manual workers
38.	Skilled manual workers
39.	Semi-skilled manual workers
40.	Unskilled

APPENDIX C

List of 1981 Census Variables used in InfoLink's DEFINE system

Key Statistics

Resident population (1991 Base)
Total Households
Total Household Spaces
Total Dwellings
Household size

Pakistani
Bangladeshi
Chinese
Other Asian
Other

Population & Residents

Absent Residents (imputed)
Males in Household
Females in Household
Males not in Household
Females not in Household

Age Structure

Residents aged 0 - 4
Residents aged 5 - 15
Residents aged 15
Residents aged 16 - 19
Residents aged 20 - 24
Residents aged 25 - 29
Residents aged 30 - 34
Residents aged 35 - 39
Residents aged 40 - 49
Residents aged 50 - 59
Residents aged 60 - 64
Residents aged 65 - 74
Residents aged 75 and over

Communal Establishments

Persons present in communal establishments
Persons present medical\care sector
Persons present prison service establishments
Persons present defence establishments
Persons present educational establishments
Persons present other groups

Residents - Ethnic Group

White
Black Caribbean
Black African
Black other
Indian

Economic Position - Residents aged 16 & over

Males aged 16 & over
Males aged 16 & over - Econ Active
Males aged 16 & over - Unemployed
Males aged 16 & over - Econ Inactive
Females aged 16 & over
Females aged 16 & over - Econ Active
Females aged 16 & over - Unemployed
Females aged 16 & over - Econ Inactive

Students age 16 & over

Total Students
Total Students not in households

Long Term Illness in Households

Residents in Households with LLI

Long Term Illness in Communal Establishments

Residents not in households with LLI

Migrants

Residents with different address 1 year before Census

Housing Tenure - Households with Residents

Total Permanent buildings
Owner Occupied - Owned Outright
Owner Occupied - Buying
Rented Privately - Furnished
Rented Privately - Unfurnished
Rented with Job
Rented from Housing Assoc.
Rented from Local Authority, New Town, Scottish Homes
Non Permanent buildings
Total Households with No Car

Car Availability

Total Households with residents
Households with No Car
Households with 1 car
Households with 2 cars
Households with 3 or more cars

Rooms and Persons per Household

Households with residents - spacious
Households with residents - very spacious
Households with residents - overcrowded
Households with residents - severely overcrowded

Household Structure - Households with Adult Residents

Households comprising 1 male
Households comprising 1 female
Households comprising 2 (1m/1f)
Households comprising 2 (same sex)
Households comprising 3+ (mixed)
Households comprising 3+ (same sex)

Pensioners

Households with 1 or more pensioners

Lifestages Categories - Residents Aged 16 & over in Households - Household Heads in a Couple Households

Aged 16 - 24, 0 children aged 0 - 15
Aged 16 - 24, child(ren) aged 0 - 15
Aged 25 -34, 0 children aged 0 - 15
Aged 25 -34, child(ren) aged 0 - 4
Aged 25 -34, child(ren) aged 0 - 15
Aged 25 -34, child(ren) aged 11 - 15
Aged 35 - 54, 0 children aged 0 - 15
Aged 35 - 54, child(ren) aged 0 - 4
Aged 35 - 54, child(ren) aged 0 - 15
Aged 35 - 54, child(ren) aged 11 - 15
Aged 55 to pension, working or retired
Aged 55 to pension, Unempl. or econ. inact.

Pensionable age to 74
75 & over

Lifestages Categories - Residents Aged 16 & over in Households - Household Heads NOT in a Couple Households

Aged 16 - 24, 0 children aged 0 - 15

Aged 16 - 24, child(ren) aged 0 - 15
Aged 25 -34, 0 children aged 0 - 15
Aged 25 -34, child(ren) aged 0 - 4
Aged 25 -34, child(ren) aged 0 - 15
Aged 25 -34, child(ren) aged 11 - 15
Aged 35 - 54, 0 children aged 0 - 15
Aged 35 - 54, child(ren) aged 0 - 4
Aged 35 - 54, child(ren) aged 0 - 15
Aged 35 - 54, child(ren) aged 11 - 15
Aged 55 to pension, working or retired
Aged 55 to pension, Unempl. or econ. inact.
Pensionable age to 74
75 & over

Occupancy - Household Spaces

Household Spaces - Households with residents
Household Spaces - Vacant Accom.
Household Spaces - New, Never Occupied
Household Spaces - Under Improvement
Household Spaces - Other
Household Spaces - Second Residences
Household Spaces - Holiday Accom.
Household Spaces - Student Accom.

Household Space Types

Total Household Spaces
Detached
Semi-detached
Terraced
PB Flat - residential Building
PB Flat - Commercial Building
Converted Flat
Converted Flatlet
Not Self Cont. Flat
Not Self Cont. Rooms
Not Self Cont. Bedsit
Shared Dwelling - NSC Flat
Shared Dwelling - NSC Rooms
Shared Dwelling - Bedsit
Non Permanent Accom.

Amenities - Households with Residents

Exclusive Bath/shower & WC
Exclusive Bath/shower & WC with Central Heating (CH)
Exclusive Bath/shower & WC with no CH
Lack/share bath/shower and/or WC

Lack/share bath/shower and/or WC with
CH

Lack/share bath/shower and/or WC with no
CH

Comparison of 100% and 10% Counts

Total 100% residents

Total 100% Enumerated Residents in
households

Total 100% Imputed Residents in
Households

Total 10% Enumerated Residents in
Households

Total 10% residents

100% Enumerated Households

Total 100% Imputed Households

Total 10% Enumerated Households

Industry - residents Aged 16 & over

Total Persons, age 16 & over

Agric., Forestry, Fishing

Energy, Water

Minig

Manuf. metal

Other Manuf.

Construction

Distrib. & Catering

Transport

Banking & Finance

Other Services

Not Stated

Occupation - residents Aged 16 & over

Total aged 16 & over

Managers, Admin

Professional

Assoc. Prof. & Tech.

Clerical & Secr.

Craft & Related

Personal & Protective

Sales

Plant & Machine Ops.

Other Occupations

Not Stated

Working Outside District of Residence

**Travel to Work - residents Aged 16 &
over**

BR Train

Other Rail

Bus

Car - Driver

Car - Passenger

Motor Cycle

Pedal Cycle

On foot

Other

Work at Home

Not Stated

Qualifications - Residents age 18 & over

Total Persons aged 18 & over

Higher degree

Degree

Diploma

Qualified, Unemployed

**Socio-Economic Groups - Households
with Residents (HoH)**

SEG 1

2

3

4

5.1

5.2

6

7

8

9

10

11

12

13

14

15

16

17

Econ. Inactive

Family Type - Residents in Households

Total Persons in all Households

in households with no family

in households with 1 person

in households with 2 or more

persons

in households with 1 family

married couple, no children

married couple, dependent
child(ren)
married couple, non-dep child(ren)
cohabiting couple, no children
cohabiting couple, dependent
child(ren)
cohabiting couple, non-dep
child(ren)
lone parent, dependent child(ren)
lone parent, non-dep child(ren)
in households with 2 or more
families

**Social Class - Households with
residents (HoH)**

Total Households

Social Class I
II
IIIN
IIIM
IV
V

Armed Forces

On a Govt. Scheme

Not Stated

retired

Other inactive

APPENDIX D: Definition & SASPAC cell references for the selected set of descriptive and interaction variables

Demographic Variables

Code	Variable Description	SASPAC Cell References	Sample
V086	0 - 4	S020008	100%
V087	5 - 14	S020015 + S020022	100%
V088	15 - 24	S020029 + S020026 + S020043 + S020050	100%
V089	25 - 44	S020057 + S020064 + S020071 + S020078	100%
V090	45 - 64	S020085 + S020092 + S020099 + S020106	100%
V091	65 - 74	S020113 + S020120	100%
V092	75 - 84	S020127 + S020134	100%
V093	85+	S020141 + S020148	100%
V094	Total marr'd population	S020004 + S020007	100%
V95	Single population	S020003 + S020006	100%
V96	Total retired (pensioners)	S080133 + S080287	100%
V97	Working Women (excluding Govt Sch.) (S08)	S340011 - S340041	100%
V98	Total 'Lone' Parents	S400001	100%
V99	Students (16+) in term-time addresses	S100001	100%

Ethnic Variables

V100	White	S060002	100%
V101	Black	S060003 + S060004 + S060005	100%
V102	Indian	S060006	100%
V103	Pakistani	S060007	100%
V104	Bangladeshi	S060008	100%
V105	Chinese + Other	S060009 + S060011 + S060012	100%
V106	Black (grps) and Owner & privately rented	S490024 + S490031	100%
V107	Indian, Pakistani, Ban'deshi and Owner & privately rented	S490025 + S490032	100%
V108	Chinese & others and Owner & privately rented	S490026 + S490033	100%
V109	Black (grps) and council rented	S490038 + S490045	100%
V110	Indian, Pakistani, Ban'deshi and council rented	S490039 + S490046	100%
V111	Chinese & others and council rented	S490040 + S490047	100%
V21	Black (grps) and Owner & privately rented	SS490024 + SS490031	100%
V22	Indian, Pakistani, Ban'deshi and Owner & privately rented	SS490025 + SS490032	100%
V23	Chinese & others and Owner & privately rented	SS490026 + SS490033	100%
V24	Black (grps) and Council rented	SS490038 + SS490045 + SS490052	100%
V25	Indian, Pakistani, Ban'deshi and Council rented	SS490039 + SS490046 + SS490053	100%
V26	Chinese & others and Council rented	SS490040 + SS490047 + SS490054	100%

Migration Variables

V112	Movers last year	S150001	100%
V113	Pensioner migrants	S150046	100%
V28	Pensioner migrants	SS150046	100%

Housing Variables

V114	Owned Outright	S200002	100%
V115	Mortgaged	S200003	100%
V116	Private Rented	S200004 + S200005 + S200006	100%
V117	Rented from HA, LA, NT	S200007 + S200008	100%
V29	Owned Outright	SS200002	100%
V30	Mortgaged	SS200003	100%
V31	Private Rented	SS200004 + SS200005 + SS200006	100%
V32	Rented from HA, LA, NT or SH	SS200007 + SS200008 + SS200009	100%
V118	Detached	S560002	100%
V119	Semi-detached	S560003	100%
V120	Terraced	S560004	100%
V121	Flats	S560005 + S560006 + S560007 + S560008 + S560010 + S560012 + S560013	100%
V122	Bedsits	S560011 + S560014	100%
V123	No central heating	S200031 + S200061	100%
V124	Lacking bath and shower	S200041	100%
V38	No central heating	SS200034 + SS200067	100%
V39	Lacking bath and shower	SS200045	100%
V125	No car	S210003	100%
V126	2+ cars	S210005 + S210006	100%
V127	Hhlds with more than 1.5 ppr	S230004	100%
V128	Number of Hhlds with 7+ rooms	S570001 + S570009	100%

Household Composition Variables

V129	Couple hhld, aged 16-24 without child(ren)	S530001	100%
V130	Couple hhld, aged 16-24 with child(ren)	S530005	100%
V131	Couple hhld, aged 25-34 without child(ren)	S530009	100%
V132	Couple hhld, aged 25-34 with child(ren)	S530013 + S530017 + S530021	100%
V133	Couple hhld, aged 35-54 without child(ren)	S530025	100%
V134	Couple hhld, aged 35-54 with child(ren)	S530029 + S530033 + S530037	100%
V135	Couple hhld, aged 55-75 plus	S530041 + S530045 + S530049 + S530053	100%
V136	No Family Hhlds / Owner	S870012 + S870013	10%
V137	No Family Hhlds / Council	S870014 + S870015	10%
V138	Marr'd + cohabiting Couple no children / Owner	S870062 + S870063 + S870102 + S870103	10%
V139	Marr'd + cohabiting Couple no children / Council	S870064 + S870065 + S870104 + S870105	10%
V140	Marr'd + cohabiting Couple + dependent children / Owner	S870072 + S870073 + S870112 + S870113	10%
V141	Marr'd + cohabiting Couple + dependent children / Council	S870074 + S870075 + S870114 + S870115	10%
V142	2+ Family Hhlds / Owner	S870162 + S870163	10%
V143	2+ Family Hhlds / Council	S870164 + S870165	10%
V51	No Family Hhlds / Owner	SS870013 + SS870014	10%
V52	No Family Hhlds / Council	SS870015 + SS870016 + SS870017	10%
V53	Marr'd + cohabiting Couple no children / Owner	SS870068 + SS870069 + SS870112 + SS870113	10%
V54	Marr'd + cohabiting Couple no children / Council	SS870070 + S870071 + SS870072 + SS870114 + SS870115 + SS870116	10%

V55	Marr'd + cohabiting Couple + dependent children / Owner	SS870079 + SS870080 + SS870123 + SS870124	10%
V56	Marr'd + cohabiting Couple + dependent children / Council	SS870081 + SS870082 + SS870083 + SS870125 + SS870126 + SS870127	10%
V57	2+ Family Hhlds / Owner	SS870178 + SS870179	10%
V58	2+ Family Hhlds / Council	SS870180 + SS870181 + SS870182	10%
V144	Hhlds with dependants	S280001 - S280016	100%

Socio-economic Variables

V145	Economically active residents 16+	S080012 + S080166	100%
V146	self-employed	S080045 + S080056 + S080199 + S080210	100%
V147	Total e.a. unemployed	S080078 + S080232	100%
V148	Agric./Forestry/Fishing	S730002	10%
V149	Energy, Water & Mining	S730003 + S730004	10%
V150	Manufacturing	S730005 + S730006	10%
V151	Construction	S730007	10%
V152	Distribution & Catering	S730008	10%
V153	Transport	S730009	10%
V154	Banking & Finance	S730010	10%
V155	Professional (1,2,3,4)	S860021 + S860034 + S860047 + S860060	10%
V156	Intermediate & Junior Non-manual (5,6)	S860073 + S860086 + S860099	10%
V157	Manual (8,9,12; 7,10; 11)	S860112 + S860125 + S860138 + S860151 + S860164 + S860177	10%
V158	Agricultural (13, 14, 15)	S860190 + S860203 + S860216	10%
V159	Armed Forces (16)	S860229	10%
V70	Professional (1,2,3,4)	SS860023 + SS860037 + SS860051 + SS860065	10%
V71	Intermediate & Junior Non-manual (5,6)	SS860079 + SS860093 + SS860107	10%
V72	Manual (8,9,12; 7,10; 11)	SS860121 + SS860135 + SS860149 + SS860163 + SS860177 + SS860191	10%
V73	Agricultural (13, 14, 15)	SS860205 + SS860219 + SS860233	10%
V74	Armed Forces (16)	SS860247	10%
V160	Workers with higher degrees	S840007	10%
V161	Workers with other qualifications	S840010 + S840013	10%

Health Variables

V162	Total persons with LLI (S12)	S120001	100%
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Travel-to-work Variables

V163	Train & Bus	S820002 + S820003 + S820004	10%
V164	Car	S820005 + S820006	10%
V165	Work at home	S820011	10%

Error Variables

V166	Total Imputed Residents	S010022	100%
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Contextual Variables

V167	Medical & Care Ests.	S040001	100%
V168	Detention centres & Defence Est.	S050013 + S050019	100%
V169	Education Ests.	S050025	100%
V170	Hotels & Other Ests.	S050031 + S050037	100%

Denominators

Ref#	Variable Description	SASPAC Cell References	
V86	Total Persons S02	S020001	
V87	Economically active residents aged 16 and over	S080012 + S080166	
V88	Residents age 16 and over S08	S080001 + S080155	
V89	Total persons present S06	S060001	
V90	Total hhlds with residents	S490001	
V90	Total hhlds with residents	SS490001	
V91	Total Migrant Resident aged 1+	S150001	
V91	Total Migrant Resident aged 1+ (Scotland)	SS150001	
V92	Total permanent accommodation	S200001	
V92	Total permanent accommodation (Scotland)	SS200001	
V93	Total Hhld spaces (All types of occupancy)	S560001	
V94	Total hhlds S57	S570001	
V95	Total Households with residents (car availability) S21	S210002	
V96	Total hhlds with residents	S870001	
V96	Total hhlds with residents (Scotland)	SS870001	
V97	Total Hhlds S28	S280001	
V98	Total residents aged 16 and over S73	S730001	
V99	Total hhlds with residents S86	S860008	
V99	Total hhlds with residents S86	SS860008	
V100	Total persons 18+ S84	S840001	
V101	Residents aged 16+ and over (employed & self-employed) S82	S820001	
V102	Total residents not in hhlds (non-staff)	S040001	
V103	Total residents not in hhlds (non-staff)	S050001	

 Scottish SAS Table Codes

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