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Survey of Admissions to Residential Care: SSA analysis report

**Andrew Bebbington,
Pamela Brown,
Robin Darton
and Ann Netten**

PSSRU discussion paper 1217/3
July 1996

The **PERSONAL SOCIAL SERVICES RESEARCH UNIT** undertakes social and health care research, supported mainly by the United Kingdom Department of Health, and focusing particularly on policy research and analysis of equity and efficiency in community care, long-term care and related areas — including services for elderly people, people with mental health problems and children in care. The PSSRU was established at the University of Kent at Canterbury in 1974, and from 1996 it has operated from three sites:

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**SURVEY OF ADMISSIONS TO RESIDENTIAL CARE
SSA ANALYSIS REPORT**

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1. Introduction

This is the report of work commissioned by the Department of Health to inform the development of Standard Spending Assessment formulae for allocating resources to local authorities, as specified in Bebbington & Netten (1995). The analysis is based on the 1995 PSSRU Survey of Admissions to Residential and Nursing Homes, comparing people admitted with those aged 65+ in the 1994 General Household Survey, in order to identify factors correlated with the risk of admission to local authority supported residential care, and the cost consequences to local authorities. Indicators of local authority need are developed. There are eight variants: (i) using two different approaches to weighting data from the authorities that took part in the survey; (ii) including and excluding attendance allowance as a factor in formulae; (iii) with two different approaches to adjusting for net cost.

2. Background

The principles of SSA formulae are well established. They concern the estimation of the number of people in a local authority who, under a standard level of service would be judged to require services of a given standard, and the cost to the local authority of purchasing those services. These costs will depend in part on the needs and circumstances of people requiring care (demand) and on the availability and prices of input factors such as capital and labour (supply). This report is concerned with demand factors only and supply is not examined here.

SSA formulae should:

- depend on factors that are straightforward to measure on a routine basis, which have a demonstrable and quantifiable link with needs and costs, and are outside the influence of local authorities (particularly through past decisions about services);
- measure *variations* between local authorities in needs and in costs of support under a standard level of service. The formulae are not concerned with the absolute level of expenditure need, nor with the short-run implications of actual funding arrangements;
- be as simple as possible.

Simplicity is sought by:

- restricting the factors to be included to a minimum, by including only those for which a clear and significant influence on need can be demonstrated, which can be measured accurately at local authority level, and which differ between local authorities so that they have a redistributive effect;
- minimising the number of groups, and hence the number of formulae, to be included. Combining groups is justified where variations between authorities in the predicted expenditure need from the combined group is similar to that when the groups are treated separately¹.

2.1 Demand

¹ This usually occurs where there is a high correlation across authorities in the predicted size of groups: where the ratio of those in the high need group to those in the low need group is fairly constant.

The present report is concerned only with predicting demand: the estimate of the number of people living in a local authority who might be expected to need services under a standard level of service, modified by client-related factors affecting the net cost to the authority. The preferred approach is to compare people nationally who do and do not receive residential care services, so as to identify socio-demographic factors that are predictive of membership of the target group of people who will be considered for service receipt, at a nationally average standard². The factors of interest are associated with need, but exclude those which might relate to access to such services.

For residential care there is a problem with this general approach in that the socio-demographic circumstances of those currently in care are of limited comparability with those of people who continue to live in other forms of accommodation (chiefly private households). There is a reasonable evidence that people enter residential care for reasons that are correlated with, and influenced by, readily measurable socio-demographic factors, as well as the utilization of health services and benefits. However, once in residential care establishments, many things which influenced admission, such as the availability of informal care, are no longer relevant.

As a practical approach it is proposed that the level of demand for residential care (and its substitutes) in a local authority under a standard level of service should be estimated *not* in terms of the circumstances of people currently in residential care. Rather it should be estimated on the basis of the number of people living in private households who have those combinations of factors which it can be demonstrated would be associated with an increased probability of admission to residential care. The approach is essentially to examine these factors among a nationally representative sample of people currently being admitted into supported residential care, compared with others who are not. It is generally not possible to determine what these factors were for people who have been admitted some time ago, and even if it were, these people were admitted at a time when admissions policies may have been very different³.

² The approach implies that the circumstances of people in residential care will be used to stand proxy for all people who use residential care *and its substitutes*. The latter nowadays includes people receiving highly supportive domiciliary care over an extended period at a cost to the social services department which matches or exceeds residential care. People supported in some very sheltered housing schemes are in a similar position. The boundary chosen for the present study is partly in the interests of having a clear-cut and fairly easily implemented definition, and on the assumption that the people receiving these substitute services are similar in their circumstances to those in long-stay residential care, and that their numbers are small relative to the total of elderly people living outside residential care. See also section 6.

³ Omitting the needs of those currently in communal establishments could potentially discriminate against two types of local authority.

- Authorities that provide high levels of supported residential care, to the extent that this lowers the number of people living in private households with circumstances that would be predictive of the future need for residential care.
- Authorities that have people with a need for local authority supported care who come from communal establishments, and who are not represented in private households. This applies particularly to areas that attract in-migrants to private residential and nursing establishments, who subsequently seek local authority support because of spend-down.

The first has been examined in past work by the PSSRU, and has found little evidence in support. Bebbington & Tong (1983) used an earlier survey to investigate the possibility of an ecological correlation between the level of functional disability in residential homes in an authority, and a need indicator based on people living in private households. There was very limited evidence of such a correlation (based on 12 areas), after controlling for the supply of residential care in authorities. However, this issue is being examined again in a cross-sectional survey of homes undertaken at the end of 1996.

Spend-down was investigated during the field-work for the survey. This did not yet appear to be a major issue for

2.2 The Cost Consequences of Demand

The cost of residential care for a new admission, under a standard level of service, may be regarded as determined by:

- The length of stay (we mean here length of stay as a supported resident);
- the type of care that he/she will require, which will depend on the health and dependency of the resident, and may vary through time;
- the person's ability to pay for part or all of their keep (for net unit cost)⁴.

These are discussed further in the subsections below.

Length of stay. Although some people stay many years and have high cost consequences, many others leave very quickly (for example short-term admissions or those in terminal decline) and have low cost consequences over time. Whereas 83% of admissions to LA homes over a year are (planned) short-term, only 9% of people in LA homes at any point in time are short-term admissions⁵. With an admissions survey, it is therefore appropriate to give more weight to individuals proportional to their length of stay. But information on length of stay requires a longitudinal study. It should be noted that a cross-sectional survey would be self-weighting in relation to length of stay: assuming that the residential population is stable⁶.

Because it is still desirable to weight the admissions sample on the basis of expectations about length of stay, two proposals are made.

- What is really likely to matter is whether the admission is long-term or short-term. What evidence there is would appear to suggest that once established long-term admissions quite soon converge to a stable pattern that would not be atypical of a cross-sectional sample in its average cost implications. The proposal is therefore to exclude from analysis short-stay cases, those who have left in under a month.
- The admissions survey can be compared with the cross-section, the current population of local authority residents. This can be done using age, placement and local authority only, from DH return SR1⁷. Reweighting can be used to adjust for discrepancies. However, the rapid changes in the supported population cast doubt on the usefulness of this source (see section 6.1).

Type of care. The key factor is whether the person is admitted to a residential or nursing home,

authorities, at least not in the way described above.

⁴ Under a standard level of service, fee levels depend only on the client's circumstances, and not on the actual cost of care.

⁵ RA/93/2 tables 7 and 10.

⁶ Both longitudinal and cross-sectional surveys, matching the admissions survey, are underway, and will both contribute to answering this point.

⁷ More detailed comparisons are also possible with residents of local authority homes in the 1991 Census.

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though other demand-related factors may affect costs. For this reason the admissions study has determined the negotiated net weekly cost of the new resident, which can be related to socio-demographic circumstances at the time of admission.

It is possible that the people admitted to each type of facility are quite different in their circumstances, and numbers in need of the two types of service are not correlated across authorities. In this case it may be desirable to form separate target groups for residential homes and nursing homes, and by implication separate SSA formulae. The initial evidence does not however suggest this is necessary, and full examination is not carried out in this report.

Ability to pay. The net cost of care to a local authority depends in part on the client's contribution and hence on their financial resources. Wealth also influences whether someone seeks support. If so, wealth must also be included as part of the process of estimating need for supported care. However, sources such as the Census provide limited information about wealth. A more useful indicator may be the affluence of the locality from which the elderly person comes.

"Spend-down" may be a factor for people being admitted from other long-stay communal establishments, and this group may have separate cost implications.

3. The Admissions Survey

Research Services Limited undertook a survey of all people admitted to local authority supported residential and nursing care, excluding planned short-term care, during three months at the end of 1995⁸. Data for 2572 cases were obtained from case records and financial assessment data. Of these, 14 were ineligible as they were aged under 65 and 108 had total capital assets, including property, valued at over £8000. A further 461 people, who had previously been living in some form of institution, had no data on household composition variables, and are ineligible for this analysis. Among the remaining 1989 people, 106 had missing information for some of the variables used in the analysis, including 8 people have been excluded from the analysis because of inadequate information on the tenure variable. 163 people for whom complete information was available were regarded as ineligible for the analysis because they remained in local authority supported care for less than 30 days (note that there are 109 further people whose status at 30 days is unknown, but these have been retained). This leaves a revised total of 1720 eligible people for analysis (compared with 1796 used in preliminary report 2 and 1788 used in preliminary report 3). Of these, 267 had no information recorded on their income, capital assets, or cost of care (table 1B).

Tables 2A and 2B show the number of eligible cases and the number available for analysis by local authority. In the case of Leeds, the agreed survey procedure meant that there was incomplete household information on virtually all people admitted from hospital or other institution. Overall, 78 per cent of people from Leeds had been admitted from institutions, compared with 67 per cent for the survey as a whole.

4. Predictor Variables I: Personal Circumstances

The analysis involved the comparison of members of the admissions survey sample with elderly people included in the 1994 General Household Survey, and the estimation of equations to predict

⁸ A technical report of the survey is available from PSSRU.

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membership of the two groups (the dependent variable). The 1994 General Household Survey included 3058 elderly people (aged 65 and over) in England, out of a total of 3501 in England, Wales and Scotland. Of these 2910 have sufficiently complete information on the main factors of interest, to be included in this analysis.

Table 3 presents the independent variables used in the analysis, some of which are alternatives. The variables cover demographic characteristics (age, sex, marital status, and ethnic origin); household characteristics (number of persons in household, household composition, tenure, status in the household, and length of residence); dependency characteristics (limiting longstanding illness); and financial factors (receipt of income support, receipt of attendance allowance, and claim for housing benefit).

The household composition variable was constructed from both datasets to match the variable tabulated for the Population Census (SAS table 47). The tenure/relationship to head of household variable was constructed as a composite variable. All other variables were drawn direct from the surveys, and definitions are intentionally similar. For the admissions survey dataset a limited amount of imputation for item non-response was undertaken, based on inspection of the data: persons for whom marital status was not recorded were assumed to be living as married if they were living with other elderly people, and not living as married if they were not living with other elderly people; and persons for whom the length of residence was not recorded were coded as length of residence not known.

Tables 4 to 17 present descriptive statistics for each of the 14 variables, showing for each variable the distribution of cases in each of four subgroups: GHS respondents not known to receive community care services; GHS respondents known to receive community care services (local authority home help or home care worker used in last month, meals on wheels used in last month, or attendance at a day centre in the last month); survey cases admitted to a residential bed (including a small number of cases for whom the type of bed was not recorded); and survey cases admitted to a nursing bed. The definition of community care services received by GHS respondents was provided by the Department of Health. Tables 4 to 17 include the 1720 elderly people in the survey dataset who were eligible for analysis and 2912 elderly respondents in the General Household Survey for whom there was no missing data for any of these variables⁹.

With the exception of ethnic origin, each of the socio-demographic variables are significantly associated with subgroup membership, as measured by a chi-squared test. Recipients of care, either in the community or in residential or nursing homes were older, more likely to be male, less likely to be married, more likely to be living alone, more likely to be living in rented accommodation, more likely to be suffering from a limiting longstanding illness, and more likely to be in receipt of income support, attendance allowance or claiming housing benefit. For age, tenure, limiting longstanding illness and receipt of income support and attendance allowance, GHS respondents receiving community care were intermediate to GHS respondents not receiving community care and survey cases. For length of residence, survey cases were slightly more likely to have been living at their last address for less than one year. The comparisons in tables 4 to 17 indicate that these variables are likely to be good predictors of membership of the admissions survey group or the General Household Survey group. The trends across the subgroups suggest that the variables will be intercorrelated, and the purpose of the multivariate analysis is to examine the joint effect of all variables.

During the course of the analysis, several variables have been simplified by the combination of categories, including age, ethnic origin, number of persons in the household, household composition, tenure, and length of residence. In the case of ethnic origin, the small number of individuals in the non-

⁹ Two more were subsequently excluded when the indicator described in section 5 was prepared.

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white ethnic origin categories necessitated the combination of these categories into a single non-white category. A preliminary analysis showed that each of the non-white ethnic origin categories showed that each was associated with a higher probability of membership of the admissions survey group. Length of residence was recorded as not known for a number of cases in the admissions survey group, and these cases were assumed to have been living at their previous address for over a year.

A special problem occurs for the items relating to receipt of benefit. For the General Household Survey, this information is based on the head of household or spouse of head of household, and may be unavailable in the case of a proxy interview. For income support and housing benefits, which may be thought of as a benefit to the household, this is probably not a major problem, though the number of people aged 65+ reported as being in income support households is slightly lower in the GHS than the national average. However this is a serious problem for attendance allowance, which is a personal benefit particularly as it seems likely that people receiving this benefit will be over-represented among proxy interviews for which no financial information is available. In consequence, the proportion of people aged 65+ reported as receiving attendance allowance in the GHS, which from table 16 is 6.8 per cent; little more than half the actual proportion nationally. This further discussed in section 6.

5. Predictor Variables II: Locality

In section 2 it was argued that both the decision to seek local authority care, and the ability to contribute to the cost of that care, would be affected by the wealth of elderly people and that one potential need indicator for this would be a measure of affluence in the locality from which the elderly person came. For this purpose an indicator has been derived which is described as "A simple ward-based index of wealth, reflecting plausible factors likely to be associated with occupational pensions and more expensive private housing".

5.1 Construction

The indicator consists of two items constructed from the 1991 Census Small Area Statistics:

- Persons in owner occupied households with 6+ rooms, as a proportion of all persons in private households. This is from table 22. The construction is: $(\text{Cell 161} + \text{Cell 162}) / \text{Cell 73}$
- Households where the head is in a professional or managerial SEG, as a proportion of all households where the SEG of the head is known. This is from table 86. The construction is: $(\text{Cell 14} + \text{Cell 27} + \text{Cell 40} + \text{Cell 53} + \text{Cell 196}) / (\text{Cell 1} - \text{Cell 235} - \text{Cell 248})$

These items have been prepared for all wards with a minimum of 250 households. These two items are correlated 0.74 and a scale of affluence is formed by adding together their z-scores (i.e. after subtracting the ward mean and dividing by the standard deviation).

This scale has also been prepared for local authorities. The lowest (least affluent) and highest (most affluent) authorities on this scale are:

Tower Hamlets	-2.77
Barking & Dagenham	-2.41
Newham	-2.09
Hackney	-1.98
Southwark	-1.97

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.....	
Buckinghamshire	1.52
Solihull	1.56
Bromley	1.64
Richmond upon Thames	1.82
Surrey	2.05

Across wards, the affluence scale is correlated (negatively) with a number of well-known deprivation scales which have been prepared from the 1991 Census. This is shown in table 18.

5.2 Affluence and Admission to Homes

Table 19 shows the ward of origin of people in both the admissions survey and the General Household Survey, grouped by affluence. It is evident from this table that a disproportionate number of elderly people admitted to local authority supported care come from the less affluent wards. The affluence index is just slightly more correlated with admission rates than was the Jarman index examined in preliminary report no.2.

6. Weighting

Data from the admissions and GHS samples are reweighted prior to the construction of predictive equations, to reflect the (hypothetical) populations which they are intended to represent. Note that this reweighting is in effect a rebalancing act, weights are constructed so that the combined sample size remains unchanged.

6.1 Weighting the Admissions Sample

Reweighting of the admissions sample is undertaken to more nearly match the population of people currently receiving state-supported permanent residential or nursing home care. Two bases of weighting are proposed, both of which relate to class of local authority:

- Weighting on the basis of LA Association membership. As the main discrepancy between the admissions sample and the population in care is the large number of admissions from metropolitan authorities, preliminary report 2 weighted the sample on the basis of the association to which the authority belonged. This is subsequently referred to as the "Association" weighting¹⁰.
- Weighting on the basis of DOE Economic Index score for the LA. It was proposed that it would be appropriate to classify non-London authorities according to their economic position, and reweight on this basis. Accordingly, non-London authorities have been divided into two groups, comprising those which score above (high) or below (low) zero, on the DoE Economic Index. This criterion very roughly divides non-London authorities into halves¹¹.

¹⁰ This nomenclature does not imply endorsement by the local authority associations.

¹¹ Our thanks to Andrew Presland for supplying this index. It is computed by the DoE for county districts. County values have been prepared from the population-weighted average of county districts.

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In either case local authorities are divided into three classes, and the sample is reweighted such that the sample size from each class is made proportional to the total number of LA supported residents in authorities in that class as at March 1995¹². Table 20A shows the weights. In fact the sample is reasonably well balanced in its representation of high and low economic status authorities, and it can be seen from this table that the resulting "Economic Index" weights are much less different from unity (all 1's implies no weighting) than the "Association" weights.

6.2 Weighting the GHS

We noted in section 4 that the GHS underestimates, almost certainly due to under-reporting, receipt of attendance allowance. There ought to be about 356 reports of receipt, rather than 199, among the 2912 people on whom our analysis is based¹³. Unless allowance is made for this, to bring GHS and the admissions survey more into line, the significance of attendance allowance will be overestimated, as will its coefficient in prediction equations. In order to prevent this, a pro-rata adjustment has been made to increase the weight given to those people known to be receiving attendance allowance in the GHS. *This adjustment is made only to regression analyses where attendance allowance is included as one of the factors.* The weights are shown in table 20B. Other analyses do not make this adjustment. The adjustment is predicated on an assumption that people for whom attendance allowance is reported are similar to those who receive, but do not report, attendance allowance.

6.3 Weighting the Surveys Together

Construction of prediction equations requires that we weight the admissions survey and the GHS in relation to their respective populations, which have been taken for this purpose as 7,435,000 for the GHS and 265,000 for the survey of admissions (see table 20C)¹⁴. It will be appreciated that unless this is done, probabilities predicted by the model for the risk of admission would be much too high.

Weighting the surveys together prior to analysis is not strictly necessary for logistic regression, as the adjustment just involves a simple modification to the predicted constant. It is required for linear approximations: weighting prior to analysis gives a better fit than would an unweighted analysis with a subsequent multiplicative adjustment. As with other weighting adjustments, results are not sensitive to the exact weights used. However because the sampling fraction for the GHS is so much smaller than that

¹² It would be better to include all state-supported residents, including those with preserved rights; since this is likely to be more representative of the long-run population for whom local authorities will be providing support, when those with preserved rights are replaced by local authority supported residents. At March 1995, nearly one half of all state-supported residents had preserved rights. However, the available data is insufficient. Unlike SR1 it relates to the destination rather than local authority of origin. From the previous year's figures we know for example that there are very few preserved rights residents reported for Inner London authorities: the assumption is that most are placed in nearby authorities. So these figures will not reflect the likely long-run financial responsibility of authorities, and we think that at present SR1 distribution is a better indication of the eventual distribution, even if not of absolute numbers.

¹³ At 29.2.96 there were an estimated 938,000 recipients of attendance allowance aged 65+ of whom possibly 30,000 were in communal establishments (only people self-funding are eligible). This represents an estimated 12.21 percent of people aged 65+ living in private households. Our thanks to Peter Steele, Department of Health, for supplying these figures.

¹⁴ 265,000 is the total number of state-supported residents, including DSS preserved rights, as at February/March 1995. Note that this differs from previous versions of this report, in which the weighting was to 143,000 local authority residents only. Because the population is assumed to be larger, estimated probabilities are higher with this version and this considerably affects regression coefficients particularly in tables 22 and 26.

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of the admissions survey, GHS observations are in effect weighted 17:1 with admissions survey observations. This extreme weighting does have consequences. In particular it leads to the depression of correlations, so in some cases we report R^2 and other indicators of fit in the unweighted analysis as well as in the weighted analysis. These remarks are particularly relevant to the analysis reported in section 8.3.

7. Prediction Equation for Need

7.1 Need Formulae

The basic method of constructing need formula using the combined GHS and admissions survey is described in the appended methodology paper (Bebbington, 1996). Logistic regression is used in the first instance as a means of deriving a prediction formula for the probability that a person with a given set of circumstances would be in the target group of people who might be admitted to supported residential care. The dependent variable is whether each individual was in the admissions survey or the GHS. Table 21 shows these analyses using the "Association" and "Economic Index" based weightings. The other weights described in section 6 are also applied.

Table 21 includes all the main indicators discussed in section 3, excluding NPERSONS which is very closely related to HHW1PPNR, and TEN_RHOH which is very closely related to tenure. Both equations have very similar coefficients for the variables, and McFadden's R^2 for these equations are 0.39 and 0.38¹⁵. Main order effects only are included in this equation. A number of first order interactions between the more significant factors were tested in an earlier version of these equations. As none proved significant they are not included in this table¹⁶.

7.2 Simplification

The next step is to simplify these equations by reducing the number of indicators as far as practicable. The following describe the rules for simplification:

- Removal of factors of low significance in the logistic equations. This includes:
 - SEX
 - MARSTAT7 (Marital Status)
 - ORGN491R (Ethnic group)
 - RESLENRR (Length of residence locally)
 - AFFIND (Ward affluence)
- Simplification of factors where significance is fairly low. HHW1PPNR is significant mainly because it distinguishes those living alone from those with others, and has been simplified accordingly, to a new dummy variable HHPP1 (whether or not living alone). Note that as all

¹⁵ The last column of tables 21A and 21B can be interpreted as the odds ratios involved. For example, all else being equal, people aged 85+ are 10 to 11 times as likely to be in admissions survey as the GHS, compared with people aged 65-69. Odds ratios below 1 signify categories less likely than the first in each group, to be in the admissions survey.

¹⁶ They were tested by adding each in turn to the main effects model and rejecting when the improvement in model likelihood ratio failed to reach the 5 per cent level of the nominal significance test. The interactions tested were AGE GP x TENURE4R; HHW1PPNR x TENURE4R; AGE GP x LLSILL; SEX x LLSILL; TENURE4R x LLSILL; RELHOH2R x LLSILL; RESLENRR x LLSILL.

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people living alone are heads of household, this simplified factor is related to RELHOH2R, whether or not person is the head of household (or partner of the head).

- Formation of composite factors to replace two or more simple factors (eg people over 75 living alone). The composite must of course be available tabulated at local authority level. This has not proved useful.

There are two other reasons for simplification which are not directly related the explanatory power of the factor in the logistic regression equation. The first concerns factors that are significant, but which will be difficult to estimate reliably at a local authority level.

- HBCLAIM is of marginal significance, but in any case DSS advise that estimates of receipt among households with elderly people are insufficiently reliable at local authority level for use in SSA formulae.
- ATTALL92, receipt of attendance allowance is also problematic, not only because it appears to be under-recorded in the General Household Survey (see section 4), but because local authority estimates from DSS records are sampled. The standard deviation of the sample estimates of numbers in local authorities can be as much as 5 per cent of the means. Yet despite these problems, receipt of attendance allowance is undoubtedly a very strong predictor of risk of admission. Variants of the prediction formula with and without this factor are therefore included.

The second concerns the removal of factors for which there is little per capita variation between local authorities. The reasoning behind this was discussed in section 2, and concerns the redistributive effect of the factor. With a linear equation, the redistributive effect of each factor relative to one another, is very roughly indicated by the product of regression coefficient and the standard deviation of the factor measured across the local authorities¹⁷. For this reason this criterion is most easily applied after the linear approximation has been derived (see next sub-section), and is shown in table 23. Some of the factors are very much more variable between local authorities than others. Age structure, particularly the number of people aged 75-84 relative to those aged 65-74 varies comparatively little, and for this reason AGE6P has been reduced to just a single indicator, the number of people aged 85+.

7.3 Linear approximation

The third stage is to produce a linear approximation to the logistic regression, for the reason discussed in the methodology paper. This is the linear combination of the remaining factors after simplification, that predicts probabilities which are as close as possible to those predicted by the logistic

Install Equation Editor and double-click here to view equation. **Error! Main Document Only.,** where p denotes the estimated proportion of people at risk in each authority, β_i is the regression coefficient, and Install Equation Editor and double-click here to view equation. **Error! Main Document Only.** denotes the average of factor x_i in each authority, variances being across authorities. It is only in this simple case that the separate contribution of each factor to the variance of the estimator can be determined, and normally the factors will not be uncorrelated across authorities. Nevertheless applied with caution this criterion gives an indication of factors that are unlikely to be redistributive in the formula.

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regression equation. The method is to determine the linear combination which gives the closest least squares fit to the probabilities that would be predicted by the logistic regression equation in table 21, for every individual in the training sample, after reducing the factors to the selected list¹⁸.

Table 22 shows the best fitting linear approximations, in four variants both including and excluding ATTALL92, and with the "Association" and "Economic Index" weights. The correlations between the probabilities predicted by the logistic and the linear approximation are shown.

8. Predicting Net Costs

The analysis so far has been concerned with the probability (risk) of admission to care. It is desirable to take into account the differential cost of care, where this is the consequence of the elderly person's needs, or of their ability to contribute to costs. In section 2 three types of adjustment were proposed, to allow for length of stay, type of care, and client contribution.

Reweighting the admissions sample to match the distribution of the cross-section of people currently receiving state-supported care would, we argued, help to adjust for differential lengths of stay in care. This is the purpose behind the re-weighting on the basis of local authority type.

8.1 Client Contribution and Net Cost

To take into account the other demand factors, the method is to develop a prediction model for the net cost to the local authority paying for care.

As noted in section 3, cost and financial assessment information is available for 1453 of the 1720 cases in the admissions survey used in the analysis. The remaining 267 had no information recorded on their assessed financial resources or cost of care. Cost analysis uses only this smaller sample. Comparisons between the cases with and without the financial information on the variables used in the analysis indicated that the cases with missing information were more likely to be homeowners (41.6 per cent, compared with 26.2 per cent), less likely to have been in receipt of income support (45.7 per cent, compared with 54.4 per cent), and less likely to have claimed housing benefit (37.5 per cent, compared with 55.0 per cent). For the other predictor variables there was no statistically significant difference between cases with and without the financial information.

The average gross costs per week vary principally according to the type of bed: residential care averages £248 per week and nursing beds £321. London authorities pay rather more than those outside. Even allowing for this, there remains a certain amount of variation in average weekly costs between the 18 authorities in the study. The standard deviation is about £36.

Average net costs are additionally affected by client contribution. Typically, client contribution is closely linked to weekly income support rates for elderly people, and table 24 shows only 7.5 per cent of new clients have been assessed as having significant financial resources which puts their contribution above this level¹⁹. Note that a few people in the original sample had assets equivalent to capital of

¹⁸ The "simplified" logistic regressions have not been included in the tables. In fact this analysis is equivalent to undertaking a linear regression using the same dependent variable.

¹⁹ Table 24 shows the frequency distribution of assessed weekly client contribution. Many of the 27 cases of nil assessment are provisional assessments: it seems common practice for local authorities to meet full costs if there is a delay in settling

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£8,000 or more: these are usually people who will only need to be supported by the local authority until these assets can be released, and have excluded from the analysis.

8.2 Adjusting Need by Average Net Cost

The analysis of average net cost is undertaken after deflating net costs by the DOE Area Cost Adjustment Factor, in order to eliminate supply related factors from the analysis. After deflating, the average net cost (across both nursing and residential homes) is £185 per week. The only factor we have found which appears to have a significant influence on average weekly net cost, among those which might be used as SSA indicators, is whether or not the elderly person was living alone. Table 25 shows the regression relationship. Generally, the net cost is lower for such people. This appears to be for two reasons:

- People living alone are rather more likely to go into residential care while those living with others are rather more likely to go into nursing homes (see table 8). Possibly those living with other tend to be admitted at more advanced states of ill-health.
- The mean assessed client contribution is slightly higher (about £5 per week) among those formerly living alone. Possibly this is because it is more likely that capital resources are released.

The regression formulae in table 25 could be used to convert estimates of numbers in need to a predicted cost. This adjustment for average cost does not apply uniformly to all people in a local authority (as is the case with supply-type cost adjustments), but is a personal one and must be applied, like the needs formula, to each individual. The estimate of the overall net cost for each authority in effect requires that we separate the numbers of people predicted as being in need in table 22 into two groups, those who are (or were) living alone and the remainder, and apply the lower average unit cost to the former group. Although this is straightforward in principle, we do not propose this approach for two reasons.

First, combining need and cost is not simply a matter of multiplying two equations together. The calculation results in a formula that must contain all factors from the need equation cross-classified against whether or not living alone (see the methodology paper). This virtually doubles the number of factors in the prediction equation, which is unacceptable for SSA formulae.

Second, the variation between local authorities in the proportions of elderly people living alone is quite small (table 23), and the difference in unit cost due to this factor is also small, so its net effect is most unlikely to be very much.

financial affairs. The survey established the financial position one month after admission, but this was not sufficient time in some cases. People with no income and under £3,000 capital will receive income support. If placed in a local authority home they would have received IS of £58.85 p.w. including £13.35 personal allowance, and three-quarters of the people who contributed £45-£46 were in an LA home. These represent about one third of those admitted to an LA home in the survey (for whom assessment information is available). If placed in an independent home they would have received IS between £63.10 and £71.65 according to need, plus residential allowance of £51.00 (£57.00 in London), and after deducting £13.35 personal allowance, and their assessments will all lie in the range £101-£116 per week. For those with some resources, the situation is more complex, and local authorities have discretion. Clients with higher levels of income will typically contribute all this income less the £13.35 personal allowance. Clients with no extra income but capital between £3,000 and £8,000 capital will receive less income support, and may contribute less.

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Therefore, for practical purposes it is sufficient to use the mean. The "Need-based Predictor" is derived simply by multiplying each person from the prediction formulae in table 22 by £185, the deflated average net cost of a supported place.

8.3 Predicting Net Costs Directly

An alternative approach is to predict net cost directly, rather than predicting numbers of people likely to need residential care and making a separate adjustment for net cost. This can be done using multiple regression with the combined samples, where the dependent variable is the net cost, and the net cost for all individuals in the GHS is taken as nil. This approach can be used to produce a simple linear estimator for cost (see the methodology paper): we call this the "Cost-based Predictor".

As with the previous approach, net costs are first deflated using the Area Cost Adjustment Factor. The factors included are the same as those in simplified linear formula for need. However, it turns out that "living alone" (HHPP1) is not significant in this equation and has been omitted. This is not too surprising since, as we have already seen, the higher risk of admission of people living alone is partly balanced by the lower cost once in care. Therefore table 26 does not include this factor.

Separate analyses are undertaken with the "Association" and "Economic Index" weights, and including/excluding attendance allowance as a predictor. The extremely high weight given to all observations in the GHS compared with those in the admissions survey (after reweighting in proportion to respective populations) combined with the fact that the dependent variable is zero for all of them combines to produce very low R^2 for the analysis reported in table 26. This was discussed in section 6.3 and should not be a cause for undue concern²⁰.

9. Exemplification

The exemplifications presented here are illustrative only, and use population estimates that are mostly a little out of date. Eight variants of the basic model have been exemplified, each possible combination of the following three:

- Using the "Association" and "Economic Index" weightings for the survey of admissions;
- using (i) a need predictor multiplied by average net unit cost (the "Need-based Predictor", section 8.2) or (ii) a direct net unit cost predictor (the "Cost-based Predictor", section 8.3);
- including or excluding attendance allowance (ATTALL92) as a predictor.

These exemplifications are based on the formulae presented in tables 22 (Need-based Predictor) and tables 26 (Cost-based Predictor) respectively, applied to counts of people in each local authority who possess the characteristic corresponding to each factor in the formulae. The total amount predicted has been scaled to an arbitrary control total of £1,000m across all local authorities. Table 27 presents the results in the form of estimated expenditure need per person aged 65+ across the 108 local authorities used for the analysis. These estimates do not allow for price differences through the Area Cost

²⁰ This is a consequence of mis-specification of the residual distribution in the model: see Bebbington, 1996. Without the population reweighting, R^2 for the analysis would be 0.42 for the analysis including attendance allowance and 0.38 without. Another consequence is that the resulting equations can predict small negative costs in a few cases.

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Adjustment.

It is clear from tables that neither the weightings used with the admissions survey nor the choice between the "need-based predictor" method and the "cost-based predictor" method, makes a great deal of difference. However, whether or not allowance is made for numbers of elderly people receiving Attendance Allowance does appear to make a real difference to some authorities. Some additional sensitivity analysis indicates that these results are not unduly sensitive to the problem of under-reporting Attendance Allowance in the GHS (since this affects only correlations among the predictors).

Finally, table 28 shows the construction of the predictor variables for local authorities, as used in these exemplifications.

10. Acknowledgements

The project was funded by the Department of Health. We acknowledge with grateful thanks the contribution of the Steering Committee, the assistance provided by staff in the 18 local authorities that provided information about people admitted to residential and nursing homes, and Research Services Limited who undertook the survey. The 1991 Census Small Area Statistics, and the 1994 General Household Survey were made available by the Office of National Statistics, who bear no responsibility for this further analysis and interpretation.

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Table 1: Survey of Admissions to Residential Care: Eligibility for Analysis

A. Overall

Eligibility for analysis	No. %	
Eligible - complete data	1883	73.2
Eligible - missing data	106	4.1
Discharged from hospital etc., and no household data	461	17.9
Ineligible - aged under 65	14	0.5
Ineligible - value of capital & property >£8000	108	4.2
Total	2572	100.0

B. Location 30 Days after Admission, and Response to Finance Questionnaire

Eligibility for analysis, local authority support at 30 days, and response to finance questionnaire	No. %	
Eligible - complete data, supported, and finance data	1398	54.4
Eligible - complete data, support not known, and finance data	55	2.1
Eligible - complete data, supported, and no finance data	213	8.3
Eligible - complete data, support not known, and no finance data	54	2.1
Eligible - missing data, discharged from hospital etc., or not supported	730	28.4
Eligible - missing data, discharged from hospital etc., or not supported	14	0.5
Ineligible - aged under 65	108	4.2
Ineligible - value of capital & property >£8000	2572	100.0
Total		

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Table 2A: Survey of Admissions to Residential Care: Local Authority by Eligibility for Analysis

Local authority	Eligible - complete data		Eligible - missing data		Discharged from hospital etc., & no household data	
	No.	%	No.	%	No.	%
Cheshire	194	73.5	4	1.5	66	25.0
Doncaster	111	90.2	0	0.0	12	9.8
Haringey	27	90.0	1	3.3	2	6.7
Harrow	26	83.9	2	6.5	3	9.7
Hertfordshire	146	62.7	53	22.7	34	14.6
Kent	227	80.8	6	2.1	48	17.1
Leeds	34	22.8	9	6.0	106	71.1
Manchester	216	94.7	0	0.0	12	5.3
Newham	51	63.0	3	3.7	27	33.3
Norfolk	234	87.0	1	0.4	34	12.6
Sandwell	87	85.3	0	0.0	15	14.7
Sefton	63	58.3	13	12.0	32	29.6
South Tyneside	68	80.0	1	1.2	16	18.8
Southwark	57	80.0	4	6.2	9	13.8
Stockport	108	92.3	5	4.3	4	3.4
Sutton	33	67.3	0	0.0	16	32.7
Tameside	104	94.5	2	1.8	4	3.6
Warwickshire	102	81.6	2	1.6	21	16.8
Total	1833	76.9	106	4.3	461	18.8

Note:

1 Percentages are percentages of row totals.

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Table 2B: Survey of Admissions to Residential Care: Local Authority by Eligibility for Analysis, Location 30 Days after Admission, and Response to Finance Questionnaire

Local authority	Eligible - complete data, supported, & finance data No. %	Eligible - complete data, support not known, & finance data No. %	Eligible - complete data, supported, & no finance data No. %	Eligible - complete data, support not known, & no finance data No. %	Eligible - complete data, all cases No. %	Eligible - missing data, discharged from hosp. etc., or not supported No. %
Cheshire	97 36.7	3 1.1	93 35.2	1 0.4	194 73.5	70 26.5
Doncaster	81 65.9	3 2.4	14 11.4	3 2.4	101 82.1	22 17.9
Haringey	22 73.3	1 3.3	0 0.0	0 0.0	23 76.7	7 23.3
Harrow	23 74.2	0 0.0	0 0.0	0 0.0	23 74.2	8 25.8
Hertfordshire	125 53.6	2 0.9	0 0.0	0 0.0	127 54.5	106 45.5
Kent	179 63.7	20 7.1	8 2.8	5 1.8	212 75.4	69 24.6
Leeds	32 21.5	0 0.0	0 0.0	0 0.0	32 21.5	117 78.5
Manchester	184 80.0	0 0.0	0 0.0	0 0.0	184 80.7	44 19.3
Newham	47 58.0	0 0.0	0 0.0	0 0.0	47 58.0	34 42.0
Norfolk	160 59.5	1 0.4	34 12.6	14 5.2	209 77.7	60 22.3
Sandwell	71 69.6	1 1.0	0 0.0	0 0.0	72 70.6	30 29.4
Sefton	59 54.6	0 0.0	1 0.9	0 0.0	60 55.6	48 44.4
South Tyneside	55 64.7	3 3.5	4 4.7	0 0.0	62 72.9	23 27.1
Southwark	44 67.7	2 3.1	0 0.0	0 0.0	46 70.8	19 29.2
Stockport	47 40.2	3 2.6	43 36.8	6 5.1	99 84.6	18 15.4
Sutton	31 63.3	0 0.0	0 0.0	0 0.0	31 63.3	18 36.7
Tameside	48 43.6	15 13.6	16 14.5	25 22.7	104 94.5	6 5.5
Warwickshire	93 74.4	1 0.8	0 0.0	0 0.0	94 75.2	31 24.8
Total	1398 57.1	55 2.2	213 8.7	54 2.2	1720 70.2	730 29.8

Note:

1 Percentages are percentages of row totals, and do not sum to 100 per cent because of the inclusion of the subtotals for complete data for all

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Table 3: Predictor Variables Examined in Analysis of Risk of Admission to Local Authority Supported Residential or Nursing Home Care

Name	Description	Variable categories
AGEGP	Age group	165 to 69 270 to 74 375 to 79 480 to 84 585 to 89 690 to 94 795 and over
AGEGPR	Age group, recoded	165 to 74 275 to 84 385 and over
AGEGP3	Aged 85 or over	0No 1Yes
SEX	Sex	1Male 2Female
MARSTAT7	Marital status	1Married, cohabiting 2Non-married
ORIGN491	Ethnic origin	1White 2Black 3Indian 4Pakistani, Bangladeshi 5Other
ORGN491R	Ethnic origin, recoded	1White 2Other
NPERSONS	Number of persons in household	1-12
HHW1LPN	Household composition	1Lone male 65-74 2Lone male 75-84 3Lone male 85 and over 4Lone female 65-74 5Lone female 75-84 6Lone female 85 and over 72+, all pensioners, under 75 82+, all pensioners, any 75+ 91+ pensioners & 1 non-pensioner 101+ pensioners & 2+ non-pensioners
HHW1PPNR	Household composition, recoded	1Living alone 22+, all pensioners 31+ pensioners & 1 non-pensioner 41+ pensioners & 2+ non-pensioners
HHPP1	Living alone	0No 1Yes

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Table 3: (continued)

Name	Description	Variable categories
TENURE4R	Household tenure	1Owns/buying on mortgage 2Rents from LA/HA 3Rents privately -9Other
TENUR4R2	Household tenure, recoded	1Owns/buying on mortgage 2Rents or other
TENUR1	Rents or other tenure	0No 1Yes
RELHOH2R	Relationship to head of household	1Head of h'hold, spouse or cohabitee 2Other
RELHOH1	Other relationship to head of household	0No 1Yes
TEN_RHOH	Tenure and relationship to head of household	1Owned, elderly person householder 2Owned, other householder 3Rent pub, elderly person householder 4Rent pub, other householder 5Rent priv, elderly person householder 6Rent priv, other householder 7Other ten, elderly person householder 8Other tenure, other householder
RESLENR	Length of residence	1Less than 1 year 21 year or more 3Not known
RESLENRR	Length of residence, recoded	1Less than 1 year 21 year or more or not known
LLSILL	Limiting longstanding illness	0Limiting longstanding illness 1No limiting longstanding illness
LLSILL1	Limiting longstanding illness	0No 1Yes
INSUP92	Receipt of income support	1Not receiving income support 2Receiving income support
ATTALL92	Receipt of attendance allowance	0Not receiving attendance allowance 1Receiving attendance allowance
HBCLAIM	Whether claimed housing benefit	1Yes 2No
AFFIND	Affluence score of ward of residence (in deciles)	1Least affluent 10% of wards 10Most affluent 10% of wards

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Table 4: Age Group by Source of Data and Type of Care

Age group	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
65 to 69	838	26	26	37
70 to 74	838	51	82	73
75 to 79	450	56	153	126
80 to 84	317	78	284	178
85 to 89	136	55	307	168
90 to 94	41	20	156	72
95 and over	1	5	36	22
Total	2621	291	1044	676
			100.0	100.0

Overall $\chi^2 = 1521.5$, $p(18df) = 0.0000$
 Residential vs nursing $\chi^2 = 26.9$, $p(6df) = 0.0002$

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Table 5: Sex by Source of Data and Type of Care

Sex	GHS 1994				Survey of Admissions to Residential Care	
	No community care		Received community care		Residential care bed	
	No. %	No. %	No. %	No. %	No. %	No. %
Male	1131	43.2	86	29.6	286	27.4
Female	1490	56.8	205	70.4	758	72.6
Total	2621	100.0	291	100.0	1044	100.0
					676	32.8
					454	67.2
					676	100.0

Overall $\chi^2 = 95.4$, p(3df) = 0.0000
 Residential vs nursing $\chi^2 = 5.8$, p(1df) = 0.0156

Table 6: Marital Status by Source of Data and Type of Care

Marital Status	GHS 1994				Survey of Admissions to Residential Care	
	No community care		Received community care		Residential care bed	
	No. %	No. %	No. %	No. %	No. %	No. %
Married, cohabiting	1475	56.3	56	19.2	188	18.0
Non-married	1146	43.7	235	80.8	856	82.0
Total	2621	100.0	291	100.0	1044	100.0
					676	29.4
					477	70.6
					676	100.0

Overall $\chi^2 = 573.3$, p(3df) = 0.0000
 Residential vs nursing $\chi^2 = 30.7$, p(1df) = 0.0000

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Table 7: Ethnic Origin by Source of Data and Type of Care

Marital Status	GHS 1994		Survey of Admissions to Residential Care	
	No community care No. %	Received community care No. %	Residential care bed No. %	Nursing care bed No. %
White	2584	287	1028	661
Black	13	1	4	3
Indian	6	1	1	2
Pakistani, Bangladeshi	6	0	0	1
Other	12	2	11	9
Total	2621	291	1044	676
	100.0	100.0	100.0	100.0

Overall $\chi^2 = 12.0$, $p(12df) = 0.4448$
 Residential vs nursing $\chi^2 = 2.8$, $p(4df) = 0.5893$

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Table 8: Number of Persons in Household by Source of Data and Type of Care

	No. of persons in household	GHS 1994		Survey of Admissions to Residential Care	
		No community care No. %	Received community care No. %	Residential care bed No. %	Nursing care bed No. %
1	923	35.2	213	732	344
2	1463	55.8	74	219	254
3	168	6.4	3	74	54
4	35	1.3	0	9	9
5	22		0	6	12
6	8	0.3	1	1	2
7	0	0.0	0	2	1
8	1	0.0	0	0	0
9	1	0.0	0	0	0
10	0	0.0	0	0	0
11	0	0.0	0	0	0
12	0	0.0	0	1	0
Total	2621	100.0	291	1044	676
				100.0	100.0

Overall $\chi^2 = 520.6$, $p(27df) = 0.0000$
 Residential vs nursing $\chi^2 = 73.9$, $p(7df) = 0.0000$

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Table 9: Household Composition by Source of Data and Type of Care

Household composition	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
Lone male 65-74	137	5.2	41	18
Lone male 75-84	88	3.4	67	34
Lone male 85 and over	24	15	59	31
Lone female 65-74	326	12.4	29	30
Lone female 75-84	262	10.0	224	114
Lone female 85 and over	86	3.3	312	117
2 or more, all pensioners, under 75	897	34.2	22	29
2 or more, all pensioners, any 75 and over	506	19.3	172	200
1 or more pensioners with 1 non-pensioner	175	6.7	57	55
1 or more pensioners with 2+ non-pensioners	120	4.6	61	48
Total	2621	100.0	1044	676

Overall $\chi^2 = 1358.9$, $p(27df) = 0.0000$
 Residential vs nursing $\chi^2 = 82.6$, $p(9df) = 0.0000$

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Table 10: Household Tenure by Source of Data and Type of Care

Household tenure	GHS 1994		Survey of Admissions to Residential Care	
	No community care	Received community care	Residential care bed	Nursing care bed
	No.%	No.%	No.%	No.%
Owns/buying on mortgage	1799	126	281	210
Rents from LA/HA	667	140	623	402
Rents privately	146	23	105	48
Other	9	2	35	16
Total	2621	291	1044	676
			100.0	100.0
			26.9	31.1
			59.7	59.5
			10.1	7.1
			3.4	2.4

Overall $\chi^2 = 717.3$, p(9df) = 0.0000
 Residential vs nursing $\chi^2 = 7.9$, p(3df) = 0.0491

Table 11: Relationship to Head of Household by Source of Data and Type of Care

Relationship to head of household	GHS 1994		Survey of Admissions to Residential Care	
	No community care	Received community care	Residential care bed	Nursing care bed
	No.%	No.%	No.%	No.%
Head of household, spouse or cohabitee	2507	281	912	567
Other	114	10	132	109
Total	2621	291	1044	676
			100.0	100.0
			87.4	83.9
			12.6	16.1

Overall $\chi^2 = 148.9$, p(3df) = 0.0000
 Residential vs nursing $\chi^2 = 4.1$, p(1df) = 0.0422

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Table 12: Tenure and Relationship to Head of Household by Source of Data and Type of Care

Tenure and relationship to head of household	GHS 1994		Survey of Admissions to Residential Care	
	No community care No. %	Received community care No. %	Residential care bed No. %	Nursing care bed No. %
Owned, elderly person is householder	1707	119	202	140
Owned, other person is householder	92	7	79	70
Rents from LA/HA, elderly person is householder	651	139	600	384
Rents from LA/HA, other person is householder	16	1	23	18
Rents privately, elderly person is householder	140	22	94	37
Rents privately, other person is householder	6	1	11	11
Other tenure, elderly person is householder	9	1	16	6
Other tenure, other person is householder	0	1	19	10
Total	2621	291	1044	676
			100.0	100.0

Overall $\chi^2 = 940.6$, $p(21\text{df}) = 0.0000$
 Residential vs nursing $\chi^2 = 13.8$, $p(7\text{df}) = 0.0540$

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Table 13: Length of Residence by Source of Data and Type of Care

Length of residence	GHS 1994			Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%	
Less than 1 year	60	4	47	39	5.8
1 year or more	2561	287	909	544	80.5
Not known	0	0	88	93	13.8
Total	2621	291	1044	676	100.0

Overall $\chi^2 = 387.8$, $p(6df) = 0.0000$
 Residential vs nursing $\chi^2 = 14.5$, $p(2df) = 0.0007$

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Table 14: Limiting Longstanding Illness by Source of Data and Type of Care

Limiting longstanding illness	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
Does not have limiting longstanding illness	1624	97	66	28
Has longstanding illness	997	194	978	648
Total	2621	291	1044	676

Overall $\chi^2 = 1396.2$, $p(3df) = 0.0000$
 Residential vs nursing $\chi^2 = 3.8$, $p(1df) = 0.0521$

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Table 15: Receipt of Income Support by Source of Data and Type of Care

Receipt of income support	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
Does not receive income support	2330	197	459	348
Receives income support	291	94	585	328
Total	2621	291	1044	676
			44.0	51.5
			56.0	48.5
			100.0	100.0

Overall $\chi^2 = 921.6$ p(3df) = 0.0000
 Residential vs nursing $\chi^2 = 9.3$, p(1df) = 0.0023

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Table 16: Receipt of Attendance Allowance by Source of Data and Type of Care

Receipt of attendance allowance	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
Does not receive attendance allowance	2495	218	435	241
Receives attendance allowance	126	73	609	435
Total	2621	291	1044	676
			100.0	100.0

Overall $\chi^2 = 1660.3$, $p(3df) = 0.0000$
 Residential vs nursing $\chi^2 = 6.2$, $p(1df) = 0.0126$

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Table 17: Whether Claimed Housing Benefit by Source of Data and Type of Care

Whether claimed housing benefit	GHS 1994		Survey of Admissions to Residential Care	
	No community care No.%	Received community care No.%	Residential care bed No.%	Nursing care bed No.%
Has not claimed housing benefit	2137	149	470	351
Claimed housing benefit	484	142	574	325
Total	2621	291	1044	676

Overall $\chi^2 = 581.56$, $p(3df) = 0.0000$
 Residential vs nursing $\chi^2 = 7.8$, $p(1df) = 0.0051$

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Table 18: Correlation Matrix between Ward Indicators of Deprivation and Wealth, from the 1991 Census

	DOE	CARSTAIRS	JARMAN	TOWNSEND	
AFFLUENCE					
DOE	1.00	0.87	0.95	0.92	-0.70
CARSTAIRS	0.87	1.00	0.91	0.95	-0.80
JARMAN	0.95	0.91	1.00	0.93	-0.76
TOWNSEND	0.92	0.95	0.93	1.00	-0.81
AFFLUENCE	-0.70	-0.80	-0.76	-0.81	1.00

Based on 8222 wards, weighted by resident population. The first four indices shown are

- (i) The DoE Index (DoE 1983)
- (ii) The Carstairs Index (Carstairs & Morris 1989)
- (iii) The Jarman Underprivileged Area (UPA) Index (Jarman 1984)
- (iv) The Townsend Material Deprivation Index (Townsend et al 1988)

These are based on the description by Morris & Carstairs (1991), recomputed using 1991 Census SAS by Jane Eimermann and Andrew Lovett of the University of East Anglia, and made available through Manchester Computer Centre Census Database. The fifth index is described in the text.

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Table 19: Ward of Origin for People in the Admissions Survey and All Over 65 in the 1991 Census, Categorised by Ward Affluence

Score (Positive = affluent)	Proportion of wards	Proportion of people in wards with score		
		People 65+ England	People 65+ 18 LA's	In admissions survey
	%	%	%	%
Up to -1.34	18.0	24.7	28.2	38.7
-1.34 to -0.26	18.0	21.3	20.2	20.4
-0.26 to 0.76	18.3	19.2	17.1	15.5
0.76 to 1.99	19.7	18.4	16.8	12.5
Above 1.99	19.0	15.8	17.5	12.8
Not classified	7.0	0.6	0.2	0.0
Total	9,930	8,044,238	1,311,493	2,068

The third column includes all people over 65 in the 18 local authorities that were included in the survey. The fourth column shows people who were in the admissions survey.

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Table 20: Weights Applied in the Analysis

A. Survey of Admissions

Local authority grouping	Number supported, all authorities, 31/3/95 (SR1)	Number of supported cases in analysis	Weights
By Association			
Counties	87,641	836	1.2583
Metropolitan districts	38,340	714	0.6445
London boroughs	17,321	170	1.2229
By DoE Economic Index			
Low EI (ex-London)	75,269	935	0.9662
High EI (ex-London)	50,712	615	0.9897
London boroughs	17,321	170	1.2229
Total	143,302	1720	

B. General Household Survey

Receiving Attendance Allowance	Actual, in 1994 GHS %	England average 1996 %	Weights
Yes	6.83	12.18	1.695
No	93.17	87.82	0.949

GHS weights are used only in analyses with Attendance Allowance.

C. Combined samples

	Effective sample size	Population	Weights
Admissions Survey	1720	265,000	0.093
GHS	2912	7,435,000	1.536

The population for the admissions survey includes 143,000 LA supported residents and 122,000 DSS preserved rights cases, as at March 1995.

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Table 21: Logistic Regression for Need

A. Weighted to "Association" Groupings

Variable	B	S.E.	Sig	Exp(B)
AGEGPR				
65-74	.0000	-	-	1.0000
75-84	1.5672	.3689	.0000	4.7934
85+	2.4002	.3792	.0000	11.0254
SEX				
Male	.0000	-	-	1.0000
Female	-.1477	.2846	.6037	.8627
HHW1PPNR				
Living Alone	.0000	-	-	1.0000
2+ All Pens	-1.3671	.5321	.0102	.2548
1+ Pens, 1 Non	-.6596	.6125	.2815	.5171
1+ Pens, 2+ Non	-1.0899	.6827	.1104	.3363
MARSTAT7				
Married	.0000	-	-	1.0000
Not married	-.5631	.5081	.2677	.5694
TENUR4R2				
Owns/Mort	.0000	-	-	1.0000
Rents	1.4639	.3605	.0000	4.3228
RELHOH2R				
Head or Spouse	.0000	-	-	1.0000
Other	2.4937	.5636	.0000	12.1057
ORGN491R				
White	.0000	-	-	1.0000
Other	.7415	1.0113	.4634	2.0992
RESLENRR				
Less than 1yr	.0000	-	-	1.0000
More than 1yr	-.9181	.5879	.1184	.3993
LLSILL				
Not LLI	.0000	-	-	1.0000
LLI	2.7143	.5301	.0000	15.0934
INSUP92				
Not receiving IS	.0000	-	-	1.0000
Receiving IS	.7273	.2710	.0073	2.0694
ATTALL92				
Not receiving	.0000	-	-	1.0000
Receiving	1.3770	.2592	.0000	3.9630
HBCLAIM				
Not claiming	.0000	-	-	1.0000
Claiming	.6983	.3533	.0481	2.0103
AFFIND1				
Other	.0000	-	-	1.0000
Lowest quintile	.0776	.1984	.6958	1.0807
Constant	-7.5905	1.0591	.0000	-

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Table 21: (continued)

B. Weighted to "DoE Economic Index" Groupings

Variable	B	S.E.	Sig	Exp(B)
AGEGPR				
65-74	.0000	-	-	1.0000
75-84	1.4968	.3612	.0000	4.4676
85+	2.3141	.3717	.0000	10.1157
SEX				
Male	.0000	-	-	1.0000
Female	-.1534	.2842	.5894	.8578
HHW1PPNR				
Living Alone	.0000	-	-	1.0000
2+ All Pens	-1.3528	.5315	.0109	.2585
1+ Pens, 1 Non	-.5805	.5969	.3308	.5596
1+ Pens, 2+ Non	-1.1063	.6872	.1074	.3308
MARSTAT7				
Married	.0000	-	-	1.0000
Not married	-.4983	.5082	.3268	.6075
TENUR4R2				
Owns/Mort	.0000	-	-	1.0000
Rents	1.5190	.3566	.0000	4.5675
RELHOH2R				
Head or Spouse	.0000	-	-	1.0000
Other	2.4197	.5646	.0000	11.2427
ORGN491R				
White	.0000	-	-	1.0000
Other	.7604	.9971	.4457	2.1392
RESLENRR				
Less than 1yr	.0000	-	-	1.0000
More than 1yr	-.8778	.5942	.1396	.4157
LLSILL				
Not LLI	.0000	-	-	1.0000
LLI	2.5316	.4888	.0000	12.5730
INSUP92				
Not receiving IS	.0000	-	-	1.0000
Receiving IS	.7838	.2710	.0038	2.1898
ATTALL92				
Not receiving	.0000	-	-	1.0000
Receiving	1.3703	.2589	.0000	3.9366
HBCLAIM				
Not claiming	.0000	-	-	1.0000
Claiming	.7709	.3488	.0271	2.1617
AFFIND1				
Other	.0000	-	-	1.0000
Lowest quintile	.3102	.1947	.1111	1.3636
Constant	7.5294	1.0383	.0000	-

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Table 22: Best Linear Approximation to Logistic Regression (after simplifying factors)

A. Including Attendance Allowance, "Association" weights. Correlation = 0.87.

Variable	B	SE B	Significance
AGEGP3	.078399	.002577	.0000
HHPP1	.016326	.001679	.0000
RELHOH1	.074086	.003746	.0000
LLSILL1	.038163	.001610	.0000
TENUR1	.020624	.001709	.0000
INSUP92	.036933	.002311	.0000
ATTALL92	.097586	.002443	.0000
(Constant)	-.027051	.001259	.0000

B. Including Attendance Allowance, "Economic Index" weights. Correlation = 0.87.

Variable	B	SE B	Significance
AGEGP3	.076576	.002552	.0000
HHPP1	.016725	.001661	.0000
RELHOH1	.070832	.003714	.0000
LLSILL1	.036998	.001593	.0000
TENUR1	.021186	.001691	.0000
INSUP92	.039861	.002286	.0000
ATTALL92	.096724	.002418	.0000
(Constant)	-.026874	.001246	.0000

C. Excluding Attendance Allowance, "Associations" weighting "Economic Index" weighting. Correlation = 0.87.

Variable	B	SE B	Significance
AGEGP3	.102136	.002394	.0000
HHPP1	.005105	.001531	.0000
RELHOH1	.064321	.003413	.0000
LLSILL1	.054807	.001441	.0000
TENUR1	.027776	.001564	.0000
INSUP92	.064165	.002130	.0000
(Constant)	-.023486	.001137	.0000

D. Excluding Attendance Allowance, using "Economic Index" weights. Correlation = 0.87.

Variable	B	SE B	Significance
AGEGP3	.100015	.002377	.0000
HHPP1	.005568	.001519	.0000
RELHOH1	.060979	.003392	.0000
LLSILL1	.053473	.001430	.0000
TENUR1	.028337	.001552	.0000
INSUP92	.067093	.002112	.0000
(Constant)	-.023344	.001128	.0000

The correlations are between the probabilities of risk as predicted by the logistic formula and the linear approximation, across all cases in the combined GHS and Admissions survey (unweighted).

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Table 23: Variation between Local Authorities for Prediction Factors

Factor	SD	Regression Coefficient	Product
AGEGP3	12.05	.078399	0.94
HHPP1	39.02	.016326	0.64
RELHOH1	14.71	.074086	1.09
LLSILL1	44.03	.038163	1.68
TENUR1	143.67	.020624	2.95
INSUP92	52.26	.036933	1.93
ATTALL92	31.38	.097586	3.06

The standard deviations are in the rates per 1000 people aged 65 for these variables measured across 108 local authorities (see table 29). The criterion is illustrated using the "Associations" weighted and "Attendance Allowance included" regression analysis.

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Table 24: Distribution of Assessed Client Contribution to Cost of Placement in Nursing Care and Residential Care Beds

£ per week	No.%	
0	27	1.9
1-44	13	0.9
45-46	61	4.2
47-100	232	16.0
101-116	1011	69.9
117+	109	7.5
Total	1453	100.0

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Table 25: Analysis of Net Unit Cost of Care

A. Using "Associations" weights.

Mean =£170.44
SD = £53.37

Regression Analysis:
R² = 0.03

Variable	B	SE B	Significance
HHPP1	-18.16	2.85	.0000
Constant	181.70	2.25	.0000

B. Using "Economic Index" weights.

Mean =£169.50
SD = £53.68

Regression Analysis:
R² = 0.03

Variable	B	SE B	Significance
HHPP1	-17.22	2.88	.0000
Constant	180.32	2.28	.0000

Net cost to local authority per week, deflated by 1995/6 DOE Area Cost Adjustment. Analysis based on 1453 cases from admissions survey.

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Table 26: Linear Regression Analysis of Net Weekly Cost (after deflation)

A. Including Attendance Allowance, "Association" weights. $R^2 = 0.10$.

Variable	B	SE B	Significance
AGEGP3	12.117	1.405	.0000
RELHOH1	10.668	2.038	.0000
LLSILL1	5.717	.885	.0000
TENUR1	3.806	.928	.0000
INSUP92	5.692	1.262	.0000
ATTALL92	14.214	1.345	.0000
(Constant)	-3.439	.636	.0000

B. Including Attendance Allowance, "Economic Index" weights. $R^2 = 0.10$.

AGEGP3	11.793	1.404	.0000
RELHOH1	9.939	2.040	.0000
LLSILL1	5.573	.884	.0000
TENUR1	3.915	.927	.0000
INSUP92	6.119	1.261	.0000
ATTALL92	14.078	1.343	.0000
(Constant)	-3.395	.636	.0000

C. Excluding Attendance Allowance, "Association" weights. $R^2 = 0.09$.

Variable	B	SE B	Significance
AGEGP3	15.167	1.442	.0000
RELHOH1	9.823	2.044	.0000
LLSILL1	8.085	.874	.0000
TENUR1	4.595	.936	.0000
INSUP92	9.372	1.286	.0000
(Constant)	-3.395	.632	.0000

D. Excluding Attendance Allowance, "Economic Index" weights. $R^2 = 0.09$.

Variable	B	SE B	Significance
AGEGP3	14.801	1.441	.0000
RELHOH1	9.086	2.045	.0000
LLSILL1	7.919	.873	.0000
TENUR1	4.704	.934	.0000
INSUP92	9.803	1.283	.0000
(Constant)	-3.354	.631	.0000

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Table 27: Eight Exemplifications of Expenditure Need Indicator for Residential Care, English SSD's, Expressed per Capita Population Aged 65+

	Including Attendance Allowance				Excluding Attendance Allowance			
	Need Predictor		Cost Predictor		Need Predictor		Cost Predictor	
	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £
Cleveland	148	148	148	148	154	154	154	154
Cumbria	131	131	130	130	118	117	117	117
Durham	153	153	154	154	159	160	160	161
Northumberland	127	128	129	129	133	133	134	134
Gateshead	168	169	169	171	183	183	184	185
Newcastle upon Tyne	164	165	164	165	179	180	180	181
North Tyneside	140	141	140	141	155	155	155	156
South Tyneside	163	164	165	166	179	180	181	182
Sunderland	178	178	179	180	185	185	186	187
Humberside	141	141	141	142	143	144	143	144
North Yorkshire	100	100	99	99	99	98	98	97
Barnsley	172	172	174	174	167	167	169	169
Doncaster	166	166	167	167	150	150	151	151
Rotherham	180	181	183	184	174	174	176	176
Sheffield	175	176	176	177	180	181	181	183
Bradford	154	155	152	152	149	149	147	148
Calderdale	127	127	124	124	134	134	133	133
Kirklees	143	143	141	141	141	141	140	141
Leeds	143	143	143	144	154	155	154	155
Wakefield	172	172	174	174	163	163	164	165
Cheshire	128	128	128	128	122	122	122	122
Lancashire	141	140	138	137	125	125	124	124
Bolton	171	171	169	169	159	159	158	158
Bury	146	146	144	144	135	135	134	134
Manchester	200	202	201	202	204	205	205	207
Oldham	158	158	155	156	155	155	154	155
Rochdale	164	164	163	163	159	160	159	160
Salford	187	188	187	188	183	183	183	185
Stockport	125	125	123	123	123	123	122	122
Tameside	168	169	167	167	161	161	160	161
Trafford	148	148	146	146	127	127	127	126
Wigan	173	173	172	172	162	162	162	162
Knowsley	222	222	224	225	196	196	198	199
Liverpool	212	212	212	213	194	195	195	196
Sefton	131	130	129	128	107	107	107	106
St Helens	223	225	223	225	210	212	210	212
Wirral	146	146	144	144	132	132	131	131
Hereford & Worcester	116	115	117	116	112	112	112	111
Shropshire	138	138	139	139	128	128	129	129
Staffordshire	142	142	143	142	133	133	133	133
Warwickshire	118	118	119	118	119	119	119	119
Birmingham	174	175	174	174	169	170	169	170
Coventry	139	139	137	137	131	131	130	130
Dudley	157	157	159	159	150	150	151	151
Sandwell	179	180	182	183	184	185	185	187
Solihull	109	108	109	108	107	107	107	106
Walsall	177	178	179	180	173	174	174	175
Wolverhampton	161	162	163	164	171	172	173	173

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Table 27: (continued)

	Including Attendance Allowance				Excluding Attendance Allowance			
	Need Predictor		Cost Predictor		Need Predictor		Cost Predictor	
	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £
Derbyshire	137	136	137	137	130	130	130	130
Leicestershire	125	125	126	126	126	126	126	126
Lincolnshire	106	106	108	108	113	113	113	113
Northamptonshire	117	117	118	118	121	121	122	122
Nottinghamshire	134	134	134	135	134	134	134	134
Bedfordshire	128	128	129	128	125	125	125	125
Berkshire	107	107	109	108	116	116	117	116
Buckinghamshire	117	116	118	117	118	117	118	118
Cambridgeshire	124	124	125	125	122	122	122	122
Essex	117	117	117	117	118	118	118	118
Hertfordshire	120	120	122	122	118	118	119	119
Norfolk	105	105	107	107	113	113	113	113
Oxfordshire	109	109	111	110	113	113	114	113
Suffolk	117	116	117	117	114	114	114	114
Camden	180	181	178	180	198	200	200	202
Greenwich	164	165	166	167	170	171	172	173
Hackney	217	220	221	224	246	248	250	253
Hammersmith & Fulham	177	178	176	178	199	200	201	202
Islington	208	210	211	213	221	223	225	227
Kensington & Chelsea	130	131	125	126	153	154	152	154
Lambeth	175	176	176	178	199	200	202	203
Lewisham	169	169	170	171	183	184	185	186
Southwark	179	181	183	185	204	205	207	209
Tower Hamlets	217	220	222	226	249	252	253	256
Wandsworth	162	163	163	163	178	178	179	180
Westminster	164	165	161	163	180	181	181	183
City of London	125	126	124	126	169	169	170	171
Barking & Dagenham	185	185	187	188	175	176	177	178
Barnet	127	126	125	125	127	126	126	125
Bexley	115	114	114	112	116	115	115	114
Brent	168	168	168	168	172	172	173	172
Bromley	102	101	100	99	103	102	102	101
Croydon	114	113	113	112	126	126	126	125
Ealing	147	146	146	145	157	157	157	157
Enfield	128	127	126	125	134	133	133	132
Haringey	190	191	190	190	198	199	199	200
Harrow	131	130	129	127	132	131	131	130
Havering	107	107	107	107	104	103	103	103
Hillingdon	119	118	119	118	121	121	121	120
Hounslow	144	144	144	144	155	155	156	156
Kingston upon Thames	107	106	104	103	107	106	106	105
Merton	122	121	120	119	136	135	135	134
Newham	205	206	206	207	213	214	215	216
Redbridge	134	133	132	131	127	126	125	124
Richmond upon Thames	114	113	111	110	120	119	119	118
Sutton	110	110	108	108	118	117	117	116
Waltham Forest	187	187	186	186	179	179	179	179

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Table 27: (continued)

	Including Attendance Allowance				Excluding Attendance Allowance			
	Need Predictor		Cost Predictor		Need Predictor		Cost Predictor	
	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £	Assn £	EcIn £
Dorset	95	95	95	94	96	96	95	94
Hampshire	104	104	104	104	107	106	107	106
Isle of Wight	100	100	99	98	101	101	100	99
Kent	115	114	114	114	116	116	115	115
Surrey	92	91	91	91	96	95	95	94
East Sussex	107	107	105	104	111	111	109	109
West Sussex	91	91	90	89	96	96	95	94
Wiltshire	110	109	111	110	109	109	110	109
Avon	117	117	117	117	117	117	117	116
Cornwall	119	119	119	119	114	114	114	113
Devon	112	111	111	111	108	108	107	107
Gloucestershire	108	108	108	108	104	104	104	103
Somerset	102	102	103	102	104	104	104	103

These exemplifications are calculated from the following formulae:

- Column 1: Table 22A: Need based, Including Attendance Allowance, "Association" weights.
- Column 2: Table 22B: Need based, Including Attendance Allowance, "Economic Index" weights.
- Column 3: Table 26A: Cost based, Including Attendance Allowance, "Association" weights.
- Column 4: Table 26B: Cost based, Including Attendance Allowance, "Economic Index" weights.
- Column 5: Table 22C: Need based, Excluding Attendance Allowance, "Association" weights.
- Column 6: Table 22D: Need based, Excluding Attendance Allowance, "Economic Index" weights.
- Column 7: Table 26C: Cost based, Excluding Attendance Allowance, "Association" weights.
- Column 8: Table 26D: Cost based, Excluding Attendance Allowance, "Economic Index" weights.

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Table 28: Local Authority Counts used for Exemplification

The construction of counts used with tables 22 and 26 to produce tables 27 and 28 is shown below. Figures from the 1991 Census are denoted by their SAS Cell Identifier, e.g. S350113 is table 35, cell 113. (See OPCS 1991 Census User Guide no. 25, *Cell Numbering Layouts: Small Area Statistics*).

A. Census counts.

The following two ratios are used to convert numbers based on pensionable age to age 65+:

$$\begin{aligned} P &= (S350117 + S350124)/(S350110 + S350117 + S350124) \\ Q &= (S350113 + S350120)/(S350110 + S350113 + S350120) \end{aligned}$$

1. People aged 65+ living in private households

$$\text{CONST} = S350113 + S350120 + S350127 + S350134 + S350141 + S350148$$

2. People aged 85+ living in private households

$$\text{AGEGP3} = S350141 + S350148$$

3. People aged 65+ living alone

$$\text{HHPP1} = S470015 + S470029 + S470043 + S470057xP + S470071 + S470085$$

4. People aged 65+ who are not head of household (or spouse)

$$\text{RELHOH1} = (S530050 - S530052)xQ + (S530054 - S530056)$$

5. People aged 65+ not in owner occupation

$$\text{TENURE1} = \text{CONST} - S470189xQ - S470203 - S470217$$

6. People aged 65+ with limiting longstanding illness

$$\text{LSILL1} = S120019 + S120022$$

B. Social Security counts.

(These may include some people in communal establishments)

7. People aged 65+ receiving income support

$$\text{INSUP92} = (\text{CONST}/(\text{CONST}+S350106)) \times \text{Number of income support recipients aged 60+ at August 1994 from SWG:SSASG(96)11 table C (100\%).}$$

8. People aged 65+ receiving attendance allowance

$$\text{ATTALL92} = \text{Number of attendance allowance recipients aged 65+ at 29.2.96, central estimate from 5 percent return; from private communication, P.W.James (DSS) to P.Steel (DH), 30.4.96.}$$

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