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Analysis to Support the Development of the Relative Needs Formula for Older People: Final Report

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Summary

1. This report presents options for an improved and updated formula for the Relative Needs Formula (RNF) for PSS for older people.

2. Two approaches were adopted. First, individual-level analyses used information about older people in receipt and not in receipt of services. This approach required the collection of data from samples of care home admissions and home care service users. Second, small area analyses used information about service receipt on an area (ward-level) basis.

Individual Level Analysis

3. The individual-level analysis drew on data provided by 16 local authorities. Delays at the start of the project and problems in data collection meant that an initial analysis had to be based on a dataset of admissions to care homes in the mid-1990s, adjusted to reflect the characteristics of current admissions. This was combined with data about current home care recipients from a survey in 13 of the 16 local authorities and 2001-02 General Household Survey data about service users and non-service users.

4. This report presents a similar analysis to that in the interim report, but based on admissions to care homes from the 2005 survey. However, the final sample sizes were smaller than had been anticipated, and the number of usable records was reduced by problems of incomplete data.

5. In total, data on 826 care home admissions and 384 people in receipt of domiciliary care were received, compared with planned sample sizes of 1,200 and 600, respectively. The care home admissions represent 32 per cent of all admissions in the fieldwork period in the authorities concerned and the home care recipients represent about 28 per cent of the sample selected.

6. Changes to rules on benefit entitlement presented problems in both the initial and the final individual-level analyses. The principal technical problem in producing interim results using re-weighted 1995 data on admissions involved estimating who would have received Pension Credit in 1995. However, the problem also applied to the 2001-02 GHS. Details of the approach used are given in Section 4.3.

7. Logistic and OLS analyses identified the characteristics associated firstly with receipt of services and secondly with the costs of those services. The best fitting linear equations, which provided very similar results to the theoretical two-part model, were used to generate proposed formulae.

8. The final equations, based on the 2005 surveys, exhibited some differences from the results of the interim analysis, although the overall pattern of the results remained fairly similar. The interim analysis indicated that living alone, which had been included in previous analyses, should be replaced with a variable identifying people who were living with others. However, the revised analysis did not support this. The revised analysis also indicated that the proportion of

older individuals had a greater influence than previously, suggesting that a separate category of persons aged 90 or over should be investigated if the supporting data become available.

9. Four formulae were estimated based on alternative methods of estimating Pension Credit receipt and weighting the data for the GHS sample. These indicated that the coefficients for the benefit variables were sensitive to the assumptions about benefit receipt and to the weighting procedures adopted. Furthermore, the use of Income Support to impute Pension Credit receipt had additional consequences as a result of the correlations between the receipt of Income Support and household circumstances. For the main analysis, using an income-based estimate of Pension Credit, the formula included:
   - Age (80–84 and 85+)
   - Household characteristics (Single person households)
   - Tenure (Renting)
   - Limiting longstanding illness
   - Benefits (receipt of Pension Credit and Attendance Allowance/DLA)

10. In the light of the small achieved sample sizes and the problem in estimating Pension Credit receipt for the GHS sample, the Department of Health and the ODPM decided that the results of the individual-level analysis could not be used for the RNF calculations. Instead, the calculations were based on the results of the small area analysis.

Small Area Analysis

11. The small area analysis drew on service use data provided by 17 local authorities. It was based on 76,325 older social service users in 775 wards. This was combined with ward-level census data, area information about benefit receipt and other nationally available information about CSSRs, including earnings and the area cost adjustment.

12. Demand functions were estimated using multi-level random effects models with a service 'price' indicator as an explanatory variable. This price was derived as the service weighted local unit cost (deflated by the ACA to account for input cost differences) over the service weighted national cost.

13. Two models were estimated, one based on rates per head of population 65 plus and the second on total spend and numbers of individuals. The formula based on the former included:
   - Age (90+)
   - Household characteristics (Single person households)
   - Tenure (Renting)
   - Benefits (receipt of Pension Credit and Attendance Allowance)

Lessons from this Project

14. The problems experienced in completing the two surveys commissioned for this study have several implications for future studies. Appendix B discusses the methodological issues raised and presents recommendations for future studies.

15. In addition to the specific purpose of providing data for the RNF analyses, the surveys of admissions and home care recipients provide up-to date information about the characteristics of samples of each group of service users. Reference tabulations containing descriptive information from the surveys are included in Appendix C.

1. Introduction

This report presents the findings of a study of social services for older people in England. The study was one of three studies commissioned in 2004 by the Department of Health to produce options for improved and updated formulae for allocating central government funding to councils with social service responsibilities (CSSRs) under the Formula Spending Shares (FSS) system.

The FSS system for the allocation of resources for local authority services was replaced in 2006-07 by the system of Relative Needs Formulae (RNFs), and this report refers to the RNF system. There are three personal social services RNFs, covering children, younger adults and older people, and separate studies were commissioned for each of these client groups. A guide to the formula grant distribution system has been published by the Office of the Deputy Prime Minister (2006a), and full details of the distribution of grant are given in the Local Government Finance Report (Office of the Deputy Prime Minister, 2006b).

The RNF formula for older people covers provision for people aged 65 and over in care homes, day care, home care and home help services, and meals, together with the associated social work and administration costs. The formula contains four components: a need component, a low income adjustment, a sparsity adjustment, and an area cost adjustment. The study described in this report was commissioned to examine the needs component.

The principles underlying the current formulae used to allocate central government funding to local authorities were established by the Layfield enquiry in 1976 (Cmnd 6453, 1976), which was followed by the introduction of the system of Grant Related Expenditure formulae in 1980. The central principle of that approach, particularly as it applied to personal social services, was to devise a system for measuring expenditure need, taking into account both demand and supply factors, but which was independent of what local authorities actually chose to provide. Since its introduction the approach has been reviewed and refined on a number of occasions, culminating in the RNF system introduced in 2006-07.

The objective of the system of Relative Needs Formulae is to provide a way of assessing the relative need for a particular set of services by different local authorities. The formulae need to be based on factors that are measured and updated routinely, 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). The formulae have to be designed to measure variations in needs between local authorities and costs, other than area costs. They are not concerned with the absolute level of expenditure needed, or with the short-run implications of actual funding arrangements. Area costs are the higher costs experienced in some council areas, mainly due to pay differences, such as London weighting. A separate adjustment for area costs is made by applying an appropriate scaling factor in each service formula.

The PSSRU has been involved both with the inception of this system through the work of Professor Bleddyn Davies for the Layfield Enquiry (Bebbington and Davies, 1980a,b), and with the development of empirical formulae. Specific research contributions were made in 1980 for all client groups (Bebbington et al., 1980), in 1983 for older people

(Bebbington et al., 1983), in 1988 for children (Bebbington and Miles, 1988), in 1996 for older people (Bebbington et al., 1996), and in 2002 for older people (Bebbington, 2002).

The approach adopted in these PSSRU studies has involved the combination of primary data from local authority surveys of service recipients with secondary data about a sample of the general population from sources such as the General Household Survey (GHS). An alternative approach is small area analysis. This involves the analysis of data collected at the local level, for example ward-level data, for routine, administrative purposes.

Small area analysis has been used in the health field to look at differential health care utilisation rates, health status, and expenditure per capita, for example, standardised for local circumstances, particularly local 'need' factors. Oliveira (2002) notes that the empirical evidence in the health field has consistently shown that differences across areas (for example, in utilisation) may result from variations in demand (for example, morbidity or expectations), variations in supply (for example, availability of facilities and physician judgement), and also statistical artefacts (for example, data errors or random variation). Small area analysis was developed in an attempt to distinguish between 'legitimate' needs, such as health status and deprivation, and 'illegitimate' influences, such as the availability of hospital beds, general practitioners, and nursing homes (Judge and Mays, 2002). In other words, it allows demand factors to be isolated from supply factors, where the latter are functions of previous resource allocation levels. The use of small area approaches allows the linking, by geographical area, of various routinely-collected administrative datasets, in order to build up a more comprehensive statistical picture of confounding factors. It is well established as a method for allocating resources across the NHS in England (Carr-Hill et al., 1994; Sheldon et al., 1994; Smith et al., 1994), and has been used for examining the determinants of expenditure on children's social services (Carr-Hill et al., 1999).

Small area data can offer greater precision than large area data, such as local authority level data, by reflecting variations within the larger area, and multiple regression analysis can be used with small area data to tackle the complexity of needs factors. Nonetheless, the literature on its application in social care remains generally sparse (but see Carr-Hill et al., 1999, and Glasby, 2003). The use of small area data is also methodologically superior since it can avoid the 'ecological fallacy' that may arise at the local authority level (Carr-Hill et al., 1999). The ecological fallacy arises when relationships between variables differ according to the level of analysis, due to the influence of other unknown or unmeasured variables (Blalock, 1964). Thus, as shown by Carr-Hill et al. (1999), differences in local authority expenditure policy, for example, can obscure the relationship between expenditure and need identified at the small area level. Small area analysis relies in part on routine data collections at ward or similar small areas within a local authority, augmented by the collection of specific additional data. Thus the analysis is limited by the data available, instead of the data being collected specifically to address the research question. Individual-level analysis is superior to small area analysis because needs and other adjustments for resource allocation stem from individuals not areas. However, the collection of individual-level data is more costly, and small area analysis can be a sound approach for determining equitable and fair resource allocations.

The timescale for the completion of the work was dictated by the need for consultations on changes to the funding formula to take place between central and local government representatives in the summer of 2005. This required a report in June 2005, and concerns were raised by the researchers at the time that the study was commissioned about whether the collection of individual data could be completed on time. The companion study on younger adults, which had been commissioned from Secta Consulting, was a small area study, and it was agreed that this would be extended to include information about older people. Thus, both individual-level and small area level analyses were undertaken for services for older people.

The approach to determining the needs component for the RNF formula for older people involves the prediction of demand for social services on the basis of an estimate of the number of people living in a CSSR area who might be expected to need services under a standard level of service. The development of services in recent years, such as intensive home care, new forms of housing options and intermediate care indicated that up-to-date information was needed. However, there had been no suitable large-scale national study of older people in residential care since the survey of admissions conducted by the PSSRU in 1995 for input into the calculations of the Standard Spending Assessment formulae (Bebbington et al., 1996). Information on older people using domiciliary services is available from general purpose household surveys, such as the General Household Survey and the British Household Panel Survey. However, these do not provide all the necessary information. In addition, the most recent sweep of the General Household Survey that contained a special section for older people was in 2001-02, and included relatively few recipients of local authority funded services.

The individual-level analyses required information about older people who were in receipt and not in receipt of services. The approach adopted for estimating the level of demand for care home places involved determining the number of people living in private households with characteristics associated with an increased probability of admission to a care home. It is not usually possible to determine what these factors were for people who had already been admitted to a care home, and thus the information needs to be obtained for a nationally representative sample of people who are currently being admitted into supported residential care. However, it is necessary to re-weight the sample to ensure that it represents the cross-section of residents in care homes in order to reflect the cost consequences of long-term care provision. This was the approach taken by the previous PSSRU survey in 1995. Equivalent information is required for individuals who were receiving services in their own homes, but a cross-sectional survey is appropriate for these clients since new admissions are likely to be atypical, particularly in their volume of service use. The data collection for the individual-level analyses comprised a sample of admissions to care homes, following the design of the survey conducted in 1995, and a sample of people currently receiving home care. These datasets were combined with data about older people who living in their own homes from the 2001-02 General Household Survey.

The small area analyses required information about service receipt by individuals in specific areas (usually wards) with known characteristics. For these analyses, service receipt data were drawn from local authority information systems. This involved the collection of information on the numbers of clients, service volumes and expenditure, aggregated to the postcode, ward or local authority level. As noted above, the collection of data on older people was undertaken by Secta Consulting as part of their study on the

RNF for younger adults, and the data were transferred to the PSSRU for analysis. Section 5 of this report describes the small area analysis and the data used.

In collecting data for the individual level analysis, it was necessary to take account of a number of developments in service provision in recent years, as noted above. Some of these developments are not yet very widespread, for example extra care housing (Department of Health, 2003b) and Direct Payments (Department of Health, 2000), and so it would not be appropriate to incorporate them into the development of the formulae at present. However, they may develop quite rapidly over the next few years, and so it would be important to investigate the current position and consider the implications for the future. For example, the separation of accommodation and care in extra care housing has the potential for the care component to be treated equivalently to care services in other types of housing. Information about the development of extra care housing was requested during the negotiations with the authorities selected for the study. Extra care housing was not very widely developed in these authorities and was separate from the care home system. In consequence, information about occupants of specialised housing was obtained in the home care survey, by including all home care recipients in the sampling frames. Recipients of intensive home care services were over-sampled in the survey, but no additional sampling of individuals in extra care housing was undertaken.

In addition, changes in the population are likely to affect the demand for services, for example people from ethnic minorities are geographically concentrated, and there are questions about whether they are obtaining access to the services appropriate to their levels of need. To investigate the need for services among people from ethnic minorities, the surveys for the individual level analysis were designed to over-sample local authorities with high ethnic minority populations. Although the final sample of local authorities contained fewer such authorities than planned, non-white individuals remained over-represented.

In relation to care home provision, two issues that are of importance to local authorities are the impact of spend-down among those who entered care homes as self-payers, and the increased use of care homes for temporary and intermediate care. The survey of admissions to care homes included individuals who were already in the care home. However, as noted above, it may not be possible to obtain all the necessary information about the circumstances of admission for existing residents of a care home, and this was the case in the survey, as discussed later in the report. Thus, if it were decided to incorporate the issue of spend-down into the formulae, it would be necessary to identify an alternative means of doing so. However, the survey of admissions was designed to collect information about such individuals where possible. The survey was restricted to permanent admissions to care homes, but individuals who were being transferred to permanent care were included. One local authority that participated in the survey was concerned that its policy of using temporary admissions initially could have reduced the number of individuals included in the survey, and so it was agreed to include all admissions and then screen out those who did not become permanent residents.

As noted above, the results of the analysis were required in June 2005. However, fewer completed questionnaires than expected were obtained in both the survey of admissions to care homes and the survey of home care. The fieldwork for both surveys was extended to maximise the number of usable returns, but the results were required before the fieldwork had been completed. Following discussions with the Steering Group for

the study, it was agreed to adopt two approaches to the shortfall in the number of cases available for the report in June 2005 (Darton et al., 2005a). For admissions to care homes, the data from the 1995 survey of admissions to care homes were used in place of the 2005 survey, reweighted to reflect the distribution of types of authority and the dependency profile of individuals admitted to care homes in 2005. For home care clients, the data available from the survey were augmented with the data about home care recipients from the General Household Survey.

It was agreed that the results of further analysis would be provided to the Department of Health in early September 2005, based on the additional information obtained by continuing the fieldwork. It was anticipated that more complete datasets for both the 2005 survey of admissions to care homes and the home care survey would be available in early August 2005, in time for the September deadline. However, despite the extension of the fieldwork, the number of usable returns was still smaller than expected. The further analysis using the data from the 2005 survey of admissions was undertaken and delivered to the Department of Health in early September, and the results were presented in the draft version of this report (Darton et al., 2005b). As in the earlier analysis, the data available from the survey of home care clients was augmented with the data available in the 2001-02 General Household Survey. However, the Department of Health, in consultation with the Office of the Deputy Prime Minister (ODPM), decided that the sample sizes were too small for the results of the individual-level analysis to be used for the RNF calculations. In addition, the 2001-02 General Household Survey was conducted before the introduction of Pension Credit, and it was not possible to produce a satisfactory estimate of the receipt of Pension Credit for the GHS. Instead, the calculations were based on the results of the small area analysis. This report presents both the individual-level and the small area level analyses and compares the individual-level analyses based on the 1995 and 2005 surveys of admissions to care homes.

The PSSRU received final datasets for the survey of admissions to care homes and the home care survey in the middle of September 2005. In addition, some missing data were collected from the local authorities by PSSRU staff. Thus, in addition to the requirements of the RNF analysis, the surveys provide up-to-date, comparable information on individuals admitted to care homes or receiving home care. This report also describes the surveys and includes descriptive information collected in the surveys, based on the final datasets, in an appendix (see Appendix C).

Following the delivery of the draft version of this report, individual feedback reports were prepared for the participating local authorities. During the preparation of the feedback reports, one of the authorities reported that the information provided in the survey of admissions about the receipt of benefits related to the position following admission to a care home, rather than prior to admission as had been intended. The authority concerned had contributed a relatively large number of cases to the survey, and offered to provide corrected data. Since the receipt of benefits prior to admission was an important factor in the analysis, the impact of using the amended data has been examined for this version of the report. The descriptive information presented in Appendix C incorporates the amendments to the data on the receipt of benefits.

The following two sections describe the data collections for the individual-level analyses and discuss the representativeness of these data. Sections 4 and 5 discuss the

results of the individual-level analyses and the small area analyses, and Section 6 discusses the results of the study.

2. Method and Data

The data collection for the individual-level analyses comprised a sample of admissions to care homes and a sample of people currently receiving home care. In both cases, the individuals included were in receipt of services arranged and funded by local authorities and provided by either local authority or independent sector providers. The study of admissions to care homes followed the design of the survey of admissions conducted in 1995 (Bebbington et al., 1996), using similar questionnaires to collect information on the needs-related and financial circumstances of those admitted over a planned period of three months. The questionnaires were completed by local authority staff from the information collected in the care and financial assessments, subject to the older person's consent. The home care survey employed a personal interview with the older person or a proxy. In some authorities, individual information about the respondent's financial circumstances was obtained from the financial assessment, subject to the older person's consent. The home care survey questionnaires were designed to be compatible with the questionnaires for the survey of admissions and the relevant questions in the GHS. NOP World conducted the fieldwork for the two surveys. The research proposal was approved by the relevant ethics committee at the University of Kent and, where required, by local authority ethics committees.

The surveys of admissions to care homes and of home care recipients were planned to yield usable samples of 1,200 admissions and 600 individuals receiving home care. The data from these surveys would then be combined with the data in the 2001-02 General Household Survey on people aged 65 and over who were not receiving home care. However, although 16 local authorities were eventually recruited for the study, which should have been sufficient to yield the required number of questionnaires, fewer completed questionnaires were obtained than expected in both surveys. In the survey of admissions, the number of questionnaires returned by the participating authorities was much lower than the expected number, and delays in the fieldwork reduced the number of usable returns available. The collection of financial information followed the collection of information from care assessments and thus delays in the fieldwork affected the scheduling of this process. In the home care survey, three of the selected local authorities withdrew, including two counties, and there was a substantially larger refusal rate than predicted. The sampling fraction used in the home care survey was increased to allow for the higher refusal rate, where possible, and additional samples of home care clients were selected in four of the participating authorities. In addition, the fieldwork for the surveys was continued in order to increase the number of usable cases. However, only two-thirds of the planned number of completed interviews could be obtained. In one of the four authorities in which additional samples had been selected, all the selected individuals declined to participate. Although the local authorities were asked to contact a proxy where this was more appropriate than contacting the service user, it appears that this was only done in two authorities, and a number of potential interviews may have been lost as a result. In addition, in six of the participating authorities financial information was collected from local authority records following the interview, and delays in collecting this information reduced the number of usable returns available for the June 2005 report. Appendix A describes the sample design and adjustments made to the sample in more detail.

The data available for analysis for the June 2005 report (Darton et al., 2005a) related to 662 admissions to care homes and 388 home care clients, but information from the

financial assessment was only available for 338 individuals admitted to care homes. Furthermore, missing data for individual questions (item nonresponse) reduced the number of cases that could be included in the analysis. Among the home care clients, complete information required for the analysis was only available for 211 individuals.

As noted above, it was agreed to adopt two approaches to the shortfall in the number of cases available for the interim report due in June 2005. For admissions to care homes, the data from the 1995 survey of admissions to care homes were used in place of the 2005 survey, reweighted to reflect the distribution of types of authority and the dependency profile of individuals admitted to care homes in 2005. Since the 1995 data did not include unitary authorities, unitary authorities had to be combined with counties in the weighting procedure for care homes. For home care clients, the data available from the survey were augmented with the data available in the 2001-02 General Household Survey.

The timetable for the final analysis required data to be available by August 2005. By that time, data were available for 826 admissions to care homes, although one case was subsequently found to be a duplicate, and information from the financial assessment was available for 675 of the 825 separate individuals. This represents an overall response of just under 32 per cent. However, complete information was only available for 360 individuals, corresponding to just under 14 per cent of the estimated number of admissions. In part, this shortfall was due to the inclusion of individuals who were already resident in care homes and who were being reassessed, and had been expected. Information about the former housing circumstances of these individuals was often unavailable, and so they could not be included in the analysis. However, crucial information about social security benefits was also omitted for a substantial number of individuals, despite being an important element in the financial assessment. In the survey of home care clients, the recruitment of sample members ended in April 2005 and subsequent fieldwork activity was limited to the collection of additional financial information from local authority records. This increased the number of individuals with complete information to 241 cases. However, four of the 388 home care clients were found to have been duplicates, where the original interview had been replaced by a proxy interview, but had not been deleted. Thus, completed interviews were obtained for 384 home care clients, an overall response of just under 28 per cent.

NOP World provided final datasets for the survey of admissions to care homes and the home care survey in the middle of September 2005. In addition, some data were collected from the local authorities by PSSRU staff. In particular, information on the type of care home (personal care or nursing care) was obtained for the majority of those for whom this information was missing, thus providing a much more complete picture of people admitted to the two types of care. The final datasets included information relating to 826 admissions to care homes and 384 home care clients. Information from the financial assessment was available for 694 of the individuals admitted to care homes, and information on the type of care home was obtained for a further 105 individuals. Details of the number of responses by local authority are given in Appendix A.

A small number of cases in both surveys were found to be aged under 65 or to have missing information on age. In addition, the home care survey included some individuals who were reported to be receiving no local authority arranged home care. As

noted below, there may have been some confusion between the receipt of home care arranged by the local authority and privately-arranged home care and, apart from two individuals with incomplete information, all of the individuals in the survey were reported to be receiving local authority or privately-arranged home care. However, since the receipt of privately-arranged home care was not relevant for the purposes of the analyses for the Relative Needs Formula, the receipt of home care was restricted to that recorded as arranged by the local authority, and the individuals who were reported to be receiving no local authority arranged home care were excluded from the analyses.

3. Sample Representativeness for Individual-Level Analysis

Problems in the data collection for the individual-level analysis raise the question of whether the data are nationally representative. Table 1 compares the returns in the survey of admissions to care homes with the latest national figures (Department of Health, 2004b) for the distribution of admissions by type of authority and type of care. London authorities and metropolitan districts were over-represented in the survey compared with shire counties and unitary authorities, as reflected in the distribution of all 825 cases available in August 2005. Among the cases with complete data (360 cases), those in London were less over-represented, but unitary authorities were even more poorly represented. For these cases the proportion of those admitted for nursing care was smaller than the national figure, although for all cases for which the type of care was known (649 cases), 35 per cent were admitted for nursing care.

Table 1: Permanent admissions to care homes

	England, 2003-04 %	Survey, 2005 (825 cases) %	Survey, 2005 (360 cases) %
London	10.7	22.2	15.6
Metropolitan districts	24.0	30.2	40.0
Shire counties	48.4	38.2	36.7
Unitary authorities	16.9	9.5	7.8
Residential care	60.3	–	72.8
Nursing care	39.7	–	27.2

Table 2 compares the returns in the survey of home care with the latest national figures (Department of Health, 2005b; NHS Health and Social Care Information Centre, 2005a) for receipt of home care services for the distribution by type of authority, intensity of home care services and ethnicity. The survey of home care provided information on 384 individuals, and complete information, including financial information, was obtained for 241 of these individuals. As for the survey of admissions to care homes, London authorities were over-represented in the survey, compared with shire counties and unitary authorities. However, the proportion of individuals in metropolitan districts was close to the national figure.

The survey over-sampled individuals receiving intensive home care services, defined as more than 10 hours per week, by selecting equal numbers of those receiving intensive and non-intensive services. Forty-four per cent of the individuals in the achieved sample were recorded as receiving intensive home care services by the local authorities, indicating a higher level of non-response for this group. However, this proportion was not significantly different from the corresponding proportion among those who refused to participate (48 per cent), as reported in Appendix A. Although 44 per cent of the individuals in the survey were recorded as receiving intensive home care, only 35 per cent were reported to be receiving more than 10 hours of local authority home care per week, excluding cases who were recorded as not receiving any local authority home care. Thirty-five per cent of those recorded as receiving intensive home care services were reported to be receiving 10 hours or fewer of local authority home care per week

and, conversely, 7 per cent of those recorded as receiving non-intensive home care services were reported to be receiving more than 10 hours of local authority home care per week. In some cases there may have been some confusion between the receipt of local authority home care and privately-arranged home care since about one-third of those reported to be receiving 10 hours or fewer of local authority home care were reported to be receiving more than 10 hours of local authority or privately-arranged home care in total. However, as noted above, the receipt of privately-arranged home care was not relevant in the analyses for the Relative Needs Formula, and for the purposes of this report the receipt of home care was restricted to that recorded as arranged by the local authority. Thus the figures shown in table 2 for the proportion of individuals in the survey who were receiving intensive home care services relate to the reported receipt of local authority home care.

Nine per cent of the individuals in the home care survey were classified as non-white, compared with 3 per cent of clients aged 65 and over who received an assessment in England (Department of Health, 2005b). The survey over-sampled local authorities with high ethnic minority populations and, although the final sample of local authorities contained fewer such authorities than planned, non-white individuals remained over-represented in the sample. No weighting has been applied for the ethnic composition of the sample.

Table 2: Home care clients

	England, 2003-04 %	Survey, 2005 (384 cases) %	Survey, 2005 (241 cases) %
London	14.1	38.5	38.2
Metropolitan districts	26.4	30.2	27.8
Shire counties	43.6	21.4	24.9
Unitary authorities	15.9	9.9	9.1
Intensive	25.9	34.6	35.3
White	88.1	91.1	90.0
Non-white	2.7	8.9	10.0
Ethnicity not known	9.2	0.0	0.0

Further details of the response to the surveys and the characteristics of the nonrespondents to the home care survey are presented in Appendix A.

4. Individual-Level Analysis

4.1 Data

Interim Analysis

As explained above, the data from the 1995 PSSRU survey of admissions to care homes were used in place of the 2005 survey data for the interim report, reweighted to reflect the distribution of types of authority and the dependency profile of individuals admitted to care homes in 2005. In addition, the data available from the survey of home care clients were augmented with the data available in the 2001-02 General Household Survey. The 2001-02 General Household Survey was also used to augment the home care data for the analysis in this report. This report presents the individual-level analyses based on the 2005 survey of admissions, and compares the results of these analyses with those based on the 1995 survey data.

A complex weighting procedure was employed for both sets of analyses, in order to create a sample that was plausibly representative of older people in England, including those living in their own home and receiving or not receiving local authority arranged home care and those admitted to permanent care in a care home. However, the weighting procedure for the interim report included additional components to adjust the data from the 1995 survey, as noted above.

The datasets and the weighting procedure adopted for the interim analyses were discussed in the interim report, and are only summarised here. The 1995 survey of admissions to care homes provided complete data on approximately 1,750 people. The data from the 1995 survey were reweighted to correspond to the dependency profile of individuals admitted to care homes in 2005 by classifying individuals into four groups according to their scores on the Barthel Index of Activities of Daily Living (Mahoney and Barthel, 1965; Collin et al., 1988) and the MDS Cognitive Performance Scale (CPS) (Morris et al., 1994). A brief description of these scales is given in Appendix C of this report. For each scale, individuals were classified into 'low' or 'high' dependency groups, and the resulting fourfold classification was then reweighted to reflect the corresponding classification for the data available from the 2005 survey. The importance of reweighting the 1995 data may be seen from the figures reported in table C6 in Appendix C: in terms of physical dependency, the proportion of more dependent individuals admitted to care homes has increased from 42 per cent to 51 per cent; while the proportion of severely cognitively impaired individuals has increased from 35 per cent to 45 per cent. The data from the 1995 survey were also reweighted to reflect the national profile of numbers of permanent admissions supported by local authorities of different types.

Final Analysis

The individual-level analyses presented in this report were based on the following datasets:

- The 2005 PSSRU/NOP survey of admissions to care homes (360 people with complete needs and financial data).

- The 2005 PSSRU/NOP survey of home care recipients (approximately 240 people with complete data).

- The 2001-02 General Household Survey (people over 65), which is divided between (i) community care recipients (118 individuals) and (ii) non-recipients (3,200 individuals).

Table 3 shows the number of cases with usable data for the analysis from each dataset for the variables that appear in the equations discussed below. The table shows that information on benefits was not available for a substantial proportion of individuals in the surveys conducted in 2005. In addition, information on household composition and tenure was not available for about one-quarter of the individuals in the survey of admissions, largely because this information could not be obtained for a majority of those who were already resident in care homes and who were being reassessed. Nearly one-quarter of those included in the survey of admissions were already in care homes. It may also be noted that the information on the type of care home place was not available for 14 of the 360 individuals in the survey of admissions who otherwise had complete data for analysis. The alternative versions of the Pension Credit variable are discussed in Section 4.3, below.

Table 3: Response statistics

	2001-02 GHS	Home care survey	Care home survey
Sample size (no.)			
Achieved sample	3356	384	825
In scope (65 or over)	3356	376	821
In scope (care services information)	3216	367	649
In scope	3216	360	646
Complete independent var. data for analysis	3140	241	360
Complete independent var. & services data	3140	241	346
Age (no.)			
Known/in scope	3356	374	819
Missing/out of scope	0	10	6
Household composition (no.)			
Known	3351	384	612
Missing	5	0	213
Tenure (no.)			
Known	3356	380	633
Missing	0	4	192
Limiting longstanding illness (no.)			
Known	3339	384	765
Missing	17	0	60
Pension Credit (GHS: income-based) (no.)			
Known	3356	262	562
Missing	0	122	263
Pension Credit (GHS: IS-based) (no.)			
Known	3295	262	562
Missing	61	122	263
Attendance Allowance/DLA (no.)			
Known	3146	367	572
Missing	210	17	253
Achieved sample: Authority type (no.)			
London boroughs	–	148	183
Metropolitan districts	–	116	249
County councils	–	82	315
Unitary authorities	–	38	78
Achieved sample: Authority type (%)			
London boroughs	–	38.5	22.2
Metropolitan districts	–	30.2	30.2
County councils	–	21.4	38.2
Unitary authorities	–	9.9	9.5
Complete IV data: Authority type (no.)			
London boroughs	–	92	56
Metropolitan districts	–	67	144
County councils	–	60	132
Unitary authorities	–	22	28
Complete IV data: Authority type (%)			
London boroughs	–	38.2	15.6
Metropolitan districts	–	27.8	40.0
County councils	–	24.9	36.7
Unitary authorities	–	9.1	7.8

4.2 Weighting Procedure

The weighting procedure used for the individual-level analyses in this report was based on five separate components, which were then multiplied together and rescaled to sum to unity to produce a composite weight. Components that were not applicable for a particular category were set to unity, for example for supported residents in care homes in the case of the weights for home care clients. The individual components were as follows:

- Weights to reflect the relative proportions of older people in England who were (i) not receiving local authority arranged home care or supported care in a care home, (ii) receiving local authority arranged home care, and (iii) receiving local authority supported care in a care home. The relevant figures were based on the mid-2003 population (Office for National Statistics, 2005), the number of home care clients in September 2004 (NHS Health and Social Care Information Centre, 2005a), and the number of supported residents in care homes at 31st March 2004 (Department of Health, 2004b).

- Weights to reflect the relative proportions of home care clients in the four types of local authorities: London boroughs, metropolitan districts, counties and unitary authorities (NHS Health and Social Care Information Centre, 2005a). These weights could only be applied to the data obtained in the survey of home care clients. The geographical location of the subsample of community care recipients from the General Household Survey was not known, and so these individuals received a weight of unity for this component.

- Weights to reflect the relative proportions of supported residents in care homes in the four types of local authorities: London boroughs, metropolitan districts, counties and unitary authorities (Department of Health, 2004b).

- Weights to reflect the proportions of individuals receiving non-intensive or intensive home care services, based on the proportions of households receiving intensive home care services in September 2004 (NHS Health and Social Care Information Centre, 2005a). These weights were applied to the combined sample from the survey of home care clients and the subsample of community care recipients from the General Household Survey. For the survey data, intensive home care services were defined as being over ten hours of home care per week, without the additional requirement of at least six visits used in the national statistics.

- Weights to adjust the 2001-02 General Household Survey to reflect the replacement of Income Support by Pension Credit in 2003. The weights were designed to reflect the relative proportions of elderly recipients of Attendance Allowance/Disability Living Allowance and/or Pension Credit, based on the statistics available for May 2004 (Department for Work and Pensions, 2004), and are referred to as 'benefit' weights below. The treatment of the transfer from Income Support to Pension Credit is discussed in more detail below.

The analysis was therefore based on a combined sample of the 2005 survey of admissions to care homes, the 2005 survey of home care recipients and the 2001-02 GHS (recipients and non-recipients), weighted together.

4.3 Variables used in the Analysis

The predicted (dependent) variable for the individual-level analyses was the gross weekly cost of the local authority-provided services. For service recipients this was determined as the average national unit cost for the service (nursing care for older people, residential care for older people, home care for adults and older people, day care for older people, and meals for adults and older people) for 2003-04 (Department of Health, 2005c), multiplied by the weekly volume of services received. More accurately, this should be described as a price-weighted volume rather than cost. Adjustment for local price variations and for the ability of clients to contribute is made elsewhere in the formula calculations.

With the exception of day care, the unit cost figure used was the cost for all provision, as follows: £383 per person per week for nursing care; £375 per person per week for residential care; £12.90 per hour for home care; and £3.80 per meal for meals. For day care, the unit cost figure for own provision was used, that is £22 per day care session. The cost for non-recipients of each service was zero. In some cases the gross weekly cost of community services exceeded the cost of nursing care provision, due to the receipt of large numbers of hours of home care. For these individuals the cost was set at the nursing care cost.

The predictor variables were based on characteristics for which census counts and benefit data would be available for local authorities. Table 4 presents descriptive statistics for the variables included in the equations, both for unweighted and weighted versions of the variables. The characteristics of individuals linked to census indicators have been re-examined in some detail, resulting in some changes from the list recommended in the 2002 analysis conducted by the PSSRU on the basis of their significance in the present analysis: the principal changes are described below.

A particular problem arose in relation to Pension Credit. As noted above, Pension Credit replaced Income Support in 2003, and so information about Pension Credit is only available from the surveys conducted in 2005. Furthermore, entitlement to Pension Credit is wider, and so the number of recipients of Pension Credit is now about half as much again as the former number of elderly recipients of Income Support (Department for Work and Pensions, 2003, 2004). Formerly, Income Support receipt was significantly associated with receipt of social services, and it would be expected that the same would be true of Pension Credit. As counts of recipients are available at the local level, this is a useful indicator. The information collected in the survey of home care clients did not distinguish between the receipt of the guarantee credit and savings credit elements of Pension Credit, and so it was agreed that a binary indicator of Pension Credit receipt would be used for the analysis.

As discussed above, information on benefits was not available for a substantial proportion of individuals in the surveys conducted in 2005. An enquiry into the charging policies adopted by the participating authorities indicated that individuals receiving Pension Credit would not be required to pay for home care services, following Department of Health guidance (Department of Health, 2003c). However, an analysis conducted for the interim report indicated there was very little difference in the proportion of clients who were not paying for services among recipients of Pension Credit (46 per cent) and non-recipients of Pension Credit (43 per cent). Thus it was not

possible to assume that the clients with missing financial data that were not paying for services were recipients of Pension Credit, and so it was not possible to impute the receipt of Pension Credit from the information available on payments for services.

The lack of availability of information about Pension Credit for the 2001-02 General Household Survey sample was dealt with by imputing the receipt of Pension Credit by applying the income rules for Pension Credit to 2001-02 benefit levels, and then using the weighting procedure described above to reflect the relative proportions of elderly recipients of different benefits recorded in the most recent statistics available, for May 2004. The maximum income levels for the receipt of Pension Credit at 2001-02 benefit levels were supplied to the Department of Health by the Department of Work and Pensions, as follows: £121.63 per week for single persons, and £177.53 per week for married couples. These income levels were applied to the income recorded in the GHS for single persons and married couples, and were applied to gross income since the use of net income would have made little difference at these income levels.

A similar procedure was used in the interim report, but the weights used for the interim report were designed to adjust the relative proportions of elderly recipients of Attendance Allowance/Disability Living Allowance and/or Income Support to the corresponding national proportions of recipients of Attendance Allowance/Disability Living Allowance and/or Pension Credit in May 2004. The use of Income Support recipients, reweighted to the proportion of benefit recipients, was based on the assumption that this group will effectively represent current recipients of Pension Credit. However, since the entitlement to Pension Credit is wider than that for Income Support, the reweighted group represents a lower income group than those eligible for Pension Credit.

As a result of the procedure used for the interim report, the weighted proportion of individuals in the GHS sample imputed to be in receipt of Pension Credit was overestimated. For the main analysis, a number of alternative methods of estimating receipt of Pension Credit amongst those in the 2001-02 GHS were examined. Firstly, the procedure devised for the interim analysis was amended to correct for the over-estimation of the receipt of Pension Credit, by computing the weights from the variables representing the estimates of the receipt of Pension Credit. Secondly, three further variants were examined at the request of the Department of Health and the ODPM, based on an alternative estimate of the receipt of Pension Credit, and on excluding the 'benefit' weight from the calculation of the composite weight. The alternative estimate of the receipt of Pension Credit was based on the receipt of Income Support, and the appropriate 'benefit' weight was computed for use with this estimate.

Since the interim report was based on the data from the 1995 survey of admissions to care homes, the analysis for the report also had to incorporate an estimate of the receipt of Pension Credit prior to admission for the individuals in the 1995 survey. This was done by estimating the proportion of those in receipt of Pension Credit from the data available from the survey in 2005, approximately 75 per cent, and then combining those who were in receipt of Income Support and those from the lower part of the income distribution in the 1995 survey to match this proportion. In order to deal with the uncertainty arising from the different rules of entitlement and the take-up of benefits, three variant assumptions about the proportion in receipt of Pension Credit were employed in a sensitivity analysis, corresponding to 70, 75 and 80 per cent respectively.

Thus, three variants of the formula were presented in the interim report. For comparison purposes, the central variant is reproduced in this report.

4.4 Statistical Analysis

The analysis was undertaken using SPSS 13.0.

The analysis for both the interim report and the current report consisted of two steps. The first involved fitting a theoretically appropriate two-stage econometric model to the data. The two stages consisted of: (i) what is the probability that a person with given characteristics will be a service recipient, either of home care or care in a home; (ii) given that someone is a recipient, what is the cost (or more accurately, the price-weighted volume) of those services. Various functional forms for this two-stage model have been considered, such as the Heckman Selection Model (Heckman, 1976), which vary according to their theoretical assumptions about the processes driving the resource allocation. In the event, the selected model, as in previous analyses of this type, consisted of a logistic model for the probability that someone is assessed for services, and an Ordinary Least Squares (OLS) model for the cost. It is usual in such cases to consider a transformation of the cost variable prior to analysis in order to satisfy certain distributional requirements, in particular skewness in the variable but, unusually, this was found to be unnecessary.

It was agreed that the analysis for the current report would reproduce the equations reported in the interim report, using the updated datasets available in August 2005, to determine whether the factors identified in the interim analysis remained statistically significant. The results of the interim analysis are reproduced in tables 5 and 6, for the central variant of the estimate of the receipt of Pension Credit for the individuals in the 1995 survey. The results of the analyses using the updated datasets are shown in tables 7–14, for the four variants derived for the 2001-02 GHS data, as described above. That is: (i) using the income-based estimate, reweighted for benefit receipt, described above as the main analysis (tables 7 and 8); (ii) using the income-based estimate, not reweighted for benefit receipt (tables 9 and 10); (iii) using the Income Support-based estimate, reweighted for benefit receipt (tables 11 and 12); and (iv) using the Income Support-based estimate, not reweighted for benefit receipt (tables 13 and 14). It should be noted that the other weighting factors were combined into an alternative version of the composite weight and used in the analyses for variants (ii) and (iv).

The results of the two-step model are shown in the first of each pair of tables. The predicted demand by each individual from the two-step model is the product of the two parts; that is, the expected probability of being a recipient, multiplied by the expected cost if that person was a recipient. In theory, these estimates could be summed across all residents over 65 of a local authority to give a total resource estimate. However, in practice this is not possible. The product formula is too complex to be applied to the available counts from census and benefits data. Moreover, there is a preference to avoid non-linear formulae in the RNF calculations.

The second step in the analysis is therefore to find the best fitting linear equation, and to ensure that it provides similar results to the theoretical model. This was based on an OLS regression of the cost across all individuals in the combined sample, taking the

cost for non-recipients of services as zero. The results of this calculation in the interim analysis are shown in table 6, and for the current analysis in tables 8, 10, 12 and 14. The correlation of the predicted cost from this equation, over all individuals in the combined sample, with the predictions from the corresponding two-step model is 0.85 or better in all cases. This is reassuring that the best fitting equation is giving a reasonably close approximation to the theoretical model.

It should be noted that coefficients for the linear equations can be interpreted directly in cost terms. The negative constant term implies that the calculation for each authority starts from a negative amount, and will then add amounts according to the numbers of individuals with particular characteristics. It is unlikely, but not impossible, that this would result in a negative overall estimate for an authority.

As noted in Section 1, following the completion of the individual-level analyses discussed in the draft version of this report, one of the participating authorities reported that the information provided in the survey of admissions about the receipt of benefits related to the position following admission to a care home, rather than prior to admission, and thus underestimated the receipt of benefits among people being assessed for admission. The authority concerned had contributed a relatively large number of cases to the survey, and thus the under-estimation of the receipt of benefits was likely to have a significant impact on the results of the analysis.

Inspection of the distribution of responses to the relevant questions for the individual participating authorities suggested that the same problem might have occurred in a second authority, although this authority had only provided a relatively small number of cases. The authority that had identified the problem offered to provide replacement data on benefits, and the impact of using the corrected data has been investigated using the final datasets that were received in September 2005.

4.5 Results

The predictor variables that were examined in the analyses for the interim report represented the following characteristics of the recipients and non-recipients of care services: age, sex, marital status, ethnic group, household size, household composition, housing tenure, relationship to the head of household/household reference person, limiting longstanding illness, receipt of Pension Credit, and receipt of Attendance Allowance or Disability Living Allowance. A number of composite variables relating to household composition were also computed and tested. Tables 5 and 6 show the final form of the estimated model after removing variables that did not reach statistical significance. As noted above, the weighting procedure used for the interim report resulted in an overestimate of the proportion of individuals in the GHS sample imputed to be in receipt of Pension Credit in the weighted dataset. The likely effect of this was to underestimate the coefficient for Pension Credit. With this caveat, the following points highlight the results of the interim analysis, particularly in relation to changes from formulae recommended in the past (see Bebbington, 2002). The table in Appendix D shows how the variables should be constructed from local authority 2001 census counts.

- *Age groups.* The probability of service use now increases rapidly after 80. It is worthwhile to break the 75-84 age group into two subgroups, 75-79 and 80-84,

on the basis of a much greater likelihood of service receipt in the latter group. However, age has much less impact on the amount of service provided. In the linear form of the equations (table 6) age 75-79 proved not significant and has been dropped. Thus two slightly different age groups are proposed, compared with previous formulae.

- *Household composition.* This has been re-examined carefully with the result that it is rather different from before. Three categories of household status for people over 65 are now used: (i) people living alone; (ii) married/living as married people in households of 2+ people; (iii) single living with others. The indicator 'people over 65 living in households where neither they nor their spouse is head of household' has been dropped. The number of such people has fallen considerably in the last 15 years, and as a result this factor is no longer significant in any equation. However, it has been replaced by 'people who are single (not married or living as married) who are living with other people'. This is a high-cost group as such people are at comparatively high risk of needing a care home place. People who live alone are at higher than average risk of needing services, but these tend to be low-cost. Overall, living alone is not a significant cost raiser, and is not included in the linear form of the equations (table 6).

- *Tenure.* A few people in miscellaneous accommodation are categorised along with renting. Renting raises the probability of service receipt, but does not influence the cost of that service.

- *Limiting longstanding illness.* Limiting longstanding illness both raises the probability of service receipt and the subsequent cost of services.

- *Benefits.* Both Pension Credit and Attendance Allowance/DLA are associated with a much raised probability of service receipt. However, they have different effects on costs. A very high proportion of admissions to care homes appear to have received Pension Credit, and so this is a marker for high costs. On the other hand, Attendance Allowance (which residents are not entitled to after four weeks' stay) is more associated with domiciliary services receipt, and so is a marker for below average costs. Three variant assumptions about the number of people entering care homes who were in receipt of Pension Credit were examined, corresponding to 70, 75 and 80 per cent of individuals. Table 6 shows the results for the central variant. The equations were somewhat sensitive to the assumption: the more people receiving Pension Credit among this group, the more it is a cost-raiser. Ideally it would be best to have improved information here.

- *Ethnicity.* This was retested but, due to the low numbers overall in the highest age groups, there is still no significant quantitative evidence of its effect on the probability of receiving services.

In the light of the interim analysis, it was recommended that for the Relative Needs Formula for older people, consideration should be given to the use of the linear equation for the central variant.

The analysis for the current report reproduced the equations reported in the interim report, using the updated datasets available in August 2005, to determine whether the

factors identified in the interim analysis remained statistically significant. Consideration was given to creating a further subdivision of the age variable, in order to identify those aged 90 or above, as in the small area analysis discussed in Section 5. The age distribution shown in table C1 in Appendix C illustrates the importance of this age group among admissions to care homes. However, it was not possible to derive a corresponding variable for the GHS data, and so the original age groups had to be retained.

Tables 7 and 8 show the model designed to correspond to the model presented in the interim report (tables 5 and 6). A difference in the weighting procedure means that the proportion of Pension Credit recipients was over-weighted in the interim analysis, but the forms of the logistic models for service receipt are quite similar in terms of the size of the coefficients and the pattern of significant coefficients. The equations for costs of services for service recipients display more dissimilarities, in particular for the household composition variables, where single people living with others cannot be distinguished from people living alone. The single living with others variable was not significant in the linear approximation and has therefore been dropped from the final equation (table 8). However, living alone was a significant cost raiser and has been retained in the equation, paralleling previous analyses.

The change in the age distribution of entrants to care homes illustrated in table C6 in Appendix C is reflected in the coefficients for the age variables. The coefficients for the 80–84 age group were similar in both sets of analyses, but the coefficients for the 85 plus age group have increased considerably.

The coefficients for the variables representing the receipt of Pension Credit and Attendance Allowance/DLA in the revised model are substantially different from those in the interim analysis, as expected from the correction to the weighting procedure. The coefficient for the receipt of Pension Credit almost doubled and the coefficient for the receipt of Attendance Allowance/DLA was reduced substantially.

The equations presented in tables 7–10 are based on the equivalent variable definitions to those used in the interim analysis, with the receipt of Pension Credit by members of the GHS sample being estimated from income, whereas in the equations presented in tables 11–14 the receipt of Pension Credit is based on the receipt of Income Support. Table 4 shows that 44 per cent of the unweighted sample were estimated to be in receipt of Pension Credit using the income-based method for the GHS sample, compared with 19 per cent using the Income Support-based method. Application of the weighting procedure incorporating the benefit weights reweights the proportion of recipients of Pension Credit to the correct level, whereas omitting the benefit weight sets the proportion of recipients of Pension Credit according to the level given by the underlying variable (income or Income Support). The weights have similar effects on the variable representing receipt of Attendance Allowance/Disability Living Allowance.

The relative sizes of the coefficients for the receipt of Pension Credit in the four sets of equations correspond directly to the weighted proportions of sample members estimated to be in receipt of Pension Credit, with the smallest coefficients appearing in the equation with the largest weighted proportion (tables 9 and 10) and the largest coefficients appearing in the equation with the smallest weighted proportion (tables 13 and 14). Similar effects may be noted for the receipt of Attendance

Allowance/Disability Living Allowance. The exclusion of the benefit weight from the equations using the income-based estimate (tables 9 and 10) resulted in a similar estimated proportion for those in receipt of Pension Credit as in the interim analysis. Similar-sized coefficients for the receipt of Pension Credit and Attendance Allowance/Disability Living Allowance were obtained in the two analyses (see tables 6 and 10).

Removal of the component of the weight relating to benefit receipt (tables 9 and 10) reduced the importance of the living alone variable, although the coefficient in the linear approximation remained significant at the 5 per cent level. However, both the living alone and the housing tenure variable were removed from the equations that used the Income Support-based estimate for receipt of Pension Credit (tables 11–14). This may be expected from the correlation between the receipt of Income Support and household circumstances, particularly tenure. The (weighted) correlations between the Income Support-based estimate of Pension Credit and living alone and tenure were 0.26 and 0.39, respectively, compared with the corresponding correlations for the income-based estimate of 0.22 and 0.25. Since these comparisons are based on the entire sample used for the analysis, the estimates include observations from the care home and home care samples, and thus may underestimate the correlations with the receipt of Income Support. However, given the replacement of Income Support by Pension Credit, future analyses would be likely to include the household variables.

Tables 15 and 16 show the results of re-analysing the model shown in tables 7 and 8 using the corrected data on benefits. Using the corrected data increased the coefficient for the receipt of Attendance Allowance/Disability Living Allowance in the linear approximation from 5.81 (table 8, equation 2) to 10.55 (table 16, equation 2), with a corresponding increase in the level of significance to 1 per cent. With the exception of the coefficient for the living alone variable, the coefficients for the remaining variables were slightly reduced in absolute value, but all coefficients remained significant at the 1 per cent level.

Similar results were obtained when the authority that supplied corrected data and the second authority that might have provided incorrect benefits data were excluded from the analysis. After excluding the data on admissions to care homes for these two authorities, the coefficient for the receipt of Attendance Allowance/Disability Living Allowance in the linear approximation was 9.44, which was significant at the 1 per cent level. Including the corrected data but excluding the data for the second authority resulted in a coefficient of 11.24, which was again significant at the 1 per cent level. Given the variability resulting from the small sample sizes for the surveys, these results suggest that a reasonable estimate for the coefficient for the receipt of Attendance Allowance/Disability Living Allowance is in the 10–11 range for this model.

4.6 Conclusions

The results of the revised analysis based on the 2005 surveys exhibited some differences from the results of the interim analysis, although the overall pattern of the results remained fairly similar. The interim analysis indicated that living alone, which had been included in previous analyses, should be replaced with a variable identifying people who were living with others. However, the revised analysis did not support this change.

The revised analysis also indicated that the proportion of older individuals had a greater influence than previously, suggesting that a separate category of persons aged 90 or over should be investigated if the supporting data become available. Correction of the data on the receipt of benefits in the survey of admissions, after the completion of the main analyses, resulted in a doubling of the size of the coefficient for the receipt of Attendance Allowance/Disability Living Allowance, but the effects on the coefficients for the other variables were minor.

The estimation of the receipt of Pension Credit for members of the GHS sample raised particular problems, since the income-based estimate did not correspond to national statistics. However, the weighting procedure was able to represent the national proportion of recipients. The coefficients for the benefit variables were sensitive to the assumptions about benefit receipt and to the weighting procedures adopted. Furthermore, the use of Income Support to impute Pension Credit receipt had additional consequences as a result of the correlations between the receipt of Income Support and household circumstances. The impact of the use of estimates of Pension Credit could be examined further if future data from the GHS or its equivalent, containing information on Pension Credit, become available.

The response to the 2005 surveys was much lower than had been anticipated, resulting in lower levels of precision. The weighting procedures for the analysis ensured that the weighted totals for the service recipients and non-recipients remained in the same relative proportions. If the achieved samples reflected the distributions of the characteristics of service users, similar results could be expected as would have been obtained for larger samples. However, the low level of response raises inevitable questions about the representativeness of the achieved samples. As shown in table C6, the average age and level of dependency of residents admitted to care homes was greater than in 1995, suggesting that the achieved sample was fairly representative of the individuals admitted to care homes in 2005. However, the home care survey may have been more likely to have under-represented individuals with greater care needs.

Table 4: Descriptive statistics for independent variables (3741 cases with complete data)

	Unweighted (%)	Partial weighting (excl. benefit weights) (%)	Full weighting (inc. benefit weights) (%)
Age 65–74	49.7	54.8	55.8
Age 75–79	20.2	21.1	20.1
Age 80–84	15.9	14.5	14.3
Age 85+	14.2	9.6	9.8
Living alone	42.8	38.9	36.3
Married/living as married	49.7	54.3	56.8
Single living with others	7.5	6.7	6.9
Renting (LA or private)	34.2	29.7	27.7
Limiting longstanding illness	47.9	41.8	45.3
Pension Credit (GHS: income-based)	43.7	40.7	23.4
Pension Credit (GHS: IS-based)	20.3	14.3	23.4
Attendance Allowance/DLA	19.4	14.2	22.5

Table 5: Two-part model for predicting cost of CSSR-funded services (interim analysis, central variant)

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	52	0.000	ref	1.00	0.00	ref
75–79	22	0.596	**	1.81	9.57	ns
80–84	16	1.226	**	3.41	25.67	ns
85+	10	1.982	**	7.26	42.67	*
Household composition						
Living alone	41	0.511	**	1.67	-43.43	*
Married/living as	51	0.000	ref	1.00	0.00	ref
Single living with others	8	0.407	ns	1.50	18.15	ns
Renting (LA or private)	35	0.368	**	1.45	15.03	ns
Limit. longstanding illness	48	1.237	**	3.45	112.27	**
Benefits recipient						
Pension Credit	43	0.644	**	1.90	57.14	**
AA/DLA	23	1.740	**	5.70	-61.04	**
Constant		-5.710	**	na	110.28	**
n (unweighted)		*5097*			*2072*	
R^2		0.37			0.15	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 6: Linear approximation for predicting cost of services (interim analysis, central variant)

	Coeff. (£)	t-stat.
Age 80–84	14.13	5.67
Age 85+	46.79	15.55
Single living with others	10.80	3.21
Renting (LA or private)	5.68	2.91
Limiting longstanding illness	13.12	6.53
Pension Credit	11.93	6.46
AA/DLA	28.16	11.55
Constant	-10.45	-6.95
R^2	0.15	

All coefficients shown are statistically significant at nominal 1% level.

Table 7: Two-part model for predicting cost of CSSR-funded services (income-based estimate for Pension Credit for GHS, with benefit weight)

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	56	0.000	ref	1.00	0.00	ref
75–79	20	0.637	**	1.89	-1.96	ns
80–84	14	1.394	**	4.03	22.77	ns
85+	10	2.180	**	8.85	52.77	*
Household composition						
Living alone	36	0.716	**	2.05	-10.24	ns
Married/living as	57	0.000	ref	1.00	0.00	ref
Single living with others	7	0.318	ns	1.38	-13.45	ns
Renting (LA or private)	28	0.378	*	1.46	10.13	ns
Limit. longstanding illness	45	1.524	**	4.59	95.76	**
Benefits recipient						
Pension Credit	23	0.802	**	2.23	56.49	**
AA/DLA	23	1.067	**	2.91	-101.90	**
Constant		-5.744	**	na	123.47	**
n (unweighted)		*3741*			*699*	
R^2		0.40			0.20	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 8: Linear approximation for predicting cost of services (income-based estimate for Pension Credit for GHS, with benefit weight)

	Equation 1		Equation 2		Equation 3	
	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.
Age 75–79	0.69	0.27	–	–	–	–
Age 80–84	14.93	4.93	14.94	5.14	15.37	5.30
Age 85+	57.65	15.77	57.65	16.30	58.50	16.65
Living alone	6.69	2.94	6.36	2.90	6.51	2.97
Single living with others	2.68	0.65	–	–	–	–
Renting (LA or private)	7.13	2.99	7.15	3.00	7.78	3.29
Limit. longstanding illness	16.95	7.48	16.99	7.50	18.94	9.19
Pension Credit	22.07	8.72	22.24	8.83	23.13	9.32
AA/DLA	5.66	2.00	5.81	2.06	–	–
Constant	-10.18	-6.07	-9.84	-6.32	-10.00	-6.43
R^2	0.18		0.18		0.17	

Equation 2: coefficients are statistically significant at nominal 1% level, except AA/DLA (5%).
Equation 3: coefficients are statistically significant at nominal 1% level.

Table 9: Two-part model for predicting cost of CSSR-funded services (income-based estimate for Pension Credit for GHS, no benefit weight)

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	55	0.000	ref	1.00	0.00	ref
75–79	21	0.583	*	1.79	5.90	ns
80–84	14	1.404	**	4.07	30.60	ns
85+	10	2.274	**	9.72	62.61	*
Household composition						
Living alone	39	0.694	**	2.00	-10.54	ns
Married/living as	54	0.000	ref	1.00	0.00	ref
Single living with others	7	0.329	ns	1.39	-8.25	ns
Renting (LA or private)	30	0.341	*	1.41	13.99	ns
Limit. longstanding illness	42	1.445	**	4.24	110.74	**
Benefits recipient						
Pension Credit	41	0.642	**	1.90	45.61	*
AA/DLA	14	2.006	**	7.43	-78.54	**
Constant		-5.967	**	na	96.57	**
n (unweighted)		*3741*			*699*	
R²		0.44			0.18	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 10: Linear approximation for predicting cost of services (income-based estimate for Pension Credit for GHS, no benefit weight)

	Equation 1		Equation 2		Equation 3	
	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.
Age 75–79	0.58	0.23	–	–	–	–
Age 80–84	14.26	4.80	14.27	5.01	15.12	5.34
Age 85+	56.76	15.66	56.80	16.18	58.36	16.89
Living alone	5.72	2.56	5.29	2.47	–	–
Single living with others	3.42	0.84	–	–	–	–
Renting (LA or private)	6.22	2.72	6.29	2.75	7.32	3.26
Limit. longstanding illness	15.19	7.01	15.24	7.04	15.34	7.08
Pension Credit	9.55	4.57	9.74	4.69	10.46	5.08
AA/DLA	33.02	10.59	33.19	10.66	33.36	10.71
Constant	-10.99	-6.32	-10.61	-6.52	-9.49	-6.07
R^2	0.18		0.18		0.18	

Equation 2: coefficients are statistically significant at nominal 1% level, except living alone (5%).
Equation 3: coefficients are statistically significant at nominal 1% level.

Table 11: Two-part model for predicting cost of CSSR-funded services (Income Support-based estimate for Pension Credit for GHS, with benefit weight)

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	56	0.000	ref	1.00	0.00	ref
75–79	20	0.540	*	1.72	-3.59	ns
80–84	14	1.272	**	3.57	24.73	ns
85+	10	2.223	**	9.24	59.41	*
Household composition						
Living alone	36	0.630	**	1.88	-15.88	ns
Married/living as	57	0.000	ref	1.00	0.00	ref
Single living with others	7	0.328	ns	1.39	-3.49	ns
Renting (LA or private)	28	0.139	ns	1.15	-5.55	ns
Limit. longstanding illness	45	1.297	**	3.66	110.47	**
Benefits recipient						
Pension Credit	23	0.766	**	2.15	59.83	**
AA/DLA	23	1.316	**	3.73	-95.66	**
Constant		-5.543	**	na	120.42	**
n (unweighted)		*3740*			*699*	
R^2		0.37			0.18	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 12: Linear approximation for predicting cost of services (Income Support-based estimate for Pension Credit for GHS, with benefit weight)

	Equation 1		Equation 2		Equation 3	
	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.
						–
Age 75–79	0.44	0.17	–	–	–	–
Age 80–84	14.20	4.76	14.31	5.03	14.82	5.24
Age 85+	56.96	16.02	57.07	16.66	58.17	17.32
Living alone	3.95	1.72	3.49	1.63	–	–
Single living with others	3.51	0.87	–	–	–	–
Renting (LA or private)	0.32	0.14	–	–	–	–
Limit. longstanding illness	13.80	6.04	13.85	6.07	13.89	6.09
Pension Credit	22.89	8.43	23.24	9.03	24.16	9.61
AA/DLA	10.92	3.94	11.04	4.00	11.01	3.98
Constant	-7.93	-4.42	-7.44	-4.62	-6.40	-4.33
R^2	0.16		0.16		0.16	

Equation 3: coefficients are statistically significant at nominal 1% level.

Table 13: Two-part model for predicting cost of CSSR-funded services (Income Support-based estimate for Pension Credit for GHS, no benefit weight)

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	55	0.000	ref	1.00	0.00	ref
75–79	21	0.540	*	1.72	-0.43	ns
80–84	14	1.356	**	3.88	21.81	ns
85+	10	2.309	**	10.07	57.80	*
Household composition						
Living alone	39	0.644	**	1.90	-14.98	ns
Married/living as	54	0.000	ref	1.00	0.00	ref
Single living with others	7	0.313	ns	1.37	-11.54	ns
Renting (LA or private)	30	0.076	ns	1.08	4.90	ns
Limit. longstanding illness	42	1.291	**	3.64	103.34	**
Benefits recipient						
Pension Credit	14	1.352	**	3.87	68.73	**
AA/DLA	14	1.782	**	5.94	-84.17	**
Constant		-5.733	**	na	109.28	**
n (unweighted)		*3740*			*699*	
R^2		0.47			0.21	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 14: Linear approximation for predicting cost of services (Income Support-based estimate for Pension Credit for GHS, no benefit weight)

	Equation 1		Equation 2	
	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.
Age 75–79	-0.25	-0.10	–	–
Age 80–84	12.61	4.35	13.21	4.79
Age 85+	54.84	15.49	55.86	16.60
Living alone	3.00	1.38	–	–
Single living with others	0.87	0.22	–	–
Renting (LA or private)	-0.30	-0.13	–	–
Limiting longstanding illness	12.19	5.73	12.23	5.76
Pension Credit	43.71	14.22	44.39	15.29
AA/DLA	24.94	8.10	24.94	8.12
Constant	-7.12	-4.37	-6.34	-4.77
R^2	0.22		0.22	

Equation 2: coefficients are statistically significant at nominal 1% level.

Table 15: Two-part model for predicting cost of CSSR-funded services (income-based estimate for Pension Credit for GHS, with benefit weight), using amended benefits data

	Proportion of weighted combined sample in listed category (%)	(i) Logistic model for service receipt			(ii) OLS model for cost (recipients only)	
		Coeff.	Signif.	Odds Ratio	Coeff. (£)	Signif.
Age						
65–74	56	0.000	ref	1.00	0.00	ref
75–79	20	0.656	**	1.93	1.67	ns
80–84	14	1.372	**	3.94	21.95	ns
85+	10	2.127	**	8.39	52.90	*
Household composition						
Living alone	36	0.732	**	2.08	-5.61	ns
Married/living as	57	0.000	ref	1.00	0.00	ref
Single living with others	7	0.303	ns	1.35	-10.31	ns
Renting (LA or private)	28	0.352	*	1.42	11.89	ns
Limit. longstanding illness	45	1.488	**	4.43	96.75	**
Benefits recipient						
Pension Credit	23	0.774	**	2.17	56.78	**
AA/DLA	23	1.180	**	3.26	-90.71	**
Constant		-5.753	**	na	112.29	**
n (unweighted)		*3748*			*706*	
R^2		0.40			0.17	

** denotes significant at 1% level, * significant at 5% level, 'ns' not significant
'ref' denotes the reference category

Table 16: Linear approximation for predicting cost of services (income-based estimate for Pension Credit for GHS, with benefit weight), using amended benefits data

	Equation 1		Equation 2	
	Coeff. (£)	t-stat.	Coeff. (£)	t-stat.
Age 75–79	1.01	0.39	–	–
Age 80–84	14.26	4.71	14.15	4.87
Age 85+	55.21	15.07	55.07	15.53
Living alone	6.99	3.07	6.75	3.08
Single living with others	2.25	0.55	–	–
Renting (LA or private)	6.57	2.75	6.58	2.76
Limiting longstanding illness	15.59	6.87	15.63	6.89
Pension Credit	21.13	8.34	21.30	8.45
AA/DLA	10.42	3.67	10.55	3.73
Constant	-10.08	-6.01	-9.70	-6.23
R^2	0.17		0.17	

Equation 2: coefficients are statistically significant at nominal 1% level.

5. Small Area Analysis

5.1 Method and Data

As explained in Section 1, an analysis using small area data was conducted in parallel to the analysis of individual-level data. The companion study of younger adults was extended to include information on older people, and this provided the data for the small area analysis, in conjunction with data from national datasets.

Data Sources

The small area analysis used data from five main sources:

The first involved downloads of activity data from councils. Specifically, councils provided a download of service use for each client on their books at a pre-determined date. The data indicated whether each client was using one or a combination of: domiciliary (home) care, day care, direct payments, care home (personal care) and care home (nursing care). The pre-care address of clients was also requested. Use of these services by individuals could then be grossed up to the respective (pre-care) ward level to give total supported service activity in the above categories. Pre-care wards are important because it is the council in which a person was resident at the time of assessment for service that is responsible should that person prove eligible for council-funded services. Because the (pre-care) ward characteristics act as a summary proxy in the analysis for the characteristics of the individual when service decisions are made, it should be the ward in which the individual was resident prior to care that is used. However, in the case of care homes, service users might move to different wards.

The second source of data was census data at 2003 ward level, including details of population, age structure, tenure and household composition. Third, benefits data were obtained from the DWP, including Pension Credit and Attendance Allowance. Fourth, data collected about councils with social services responsibilities (CSSRs) by the Department of Health were obtained, including in particular the average unit costs of services and also the area cost adjustment (ACA). Fifth, data at council level, such as New Earnings Survey wage data were obtained.

All these data sources were provided by or could be mapped onto (geographical) administrative areas. Small area analysis uses this common geographical area reference to combine the data into a fuller descriptive picture of each small area. Where the areas are small enough they can be used to approximate the characteristics of individual service users who live in those areas. In other words, in lieu of information about the individual, we suppose that individuals have the average characteristics of all people in that ward. For example, where we know that, on average, some percentage of people in a ward are receiving Pension Credit, we assume that any individual in that area have the same percentage chance of being a Pension Credit recipient.

There were 7,987 census wards in England in 2003. Activity data from councils were available from 17 councils, totalling 775 wards, giving just under a 10 per cent sample. In total, records for 76,325 users were downloaded. In practice, this dataset had three limitations:

First, only an indication of service use, rather than intensity of use, was available for the majority of cases.

Second, for only seven councils were *pre-care* addresses provided for those that had moved into care homes, although this did account for 565 of the 775 wards (73 per cent). As noted above, since we are interested in associating activity and cost to pre-care resident ward, the pre-care address is required. Community-based services are provided with respect to the individual's current address and, therefore, information about the current resident ward is all that is required in this case. In order not to lose many wards from the sample – especially since the community-based care services data were available for these wards – a synthetic process was used to allocate care home activity to these non pre-care address wards, alongside the community care activity. This is described below.

Third, some data downloads did not cover all services, and in a number of cases there were some issues about whether all clients were included. We can assume nonetheless that downloads were made on the same basis for all wards within the CSSR. This allows multi-level estimation techniques to be used to address potential inconsistencies between CSSRs.

Table 17 describes the councils in the sample along with the number of wards and their population. The coverage of council types was reasonable: three shire counties, three metropolitan districts, five unitary authorities, three inner London and three outer London boroughs.

Table 17: Councils in the small area sample

CSSR	Wards	Total population 65 plus in those wards
Bournemouth	18	34280
Croydon	24	42601
Derby	17	35910
Durham	128	80694
Hammersmith & Fulham	16	17342
Hampshire	249	201135
Hounslow	20	24368
Lambeth	21	24616
Manchester	33	52006
Milton Keynes	23	21276
Newcastle upon Tyne	26	41370
Poole	16	28054
Redbridge	21	33503
Shropshire	104	50884
Southend	17	30742
Southwark	21	25355
Stockport	21	47011

5.2 Services and Costs

The downloads from councils indicated for each individual whether or not they were in receipt of domiciliary (home) care, day care, direct payments, care home (personal care) and care home (nursing care) at that time. Service activity for each ward was then found by adding up the numbers of people in that ward that were receiving the service. We assume that service receipt in the downloads indicates receipt of services in that week. Therefore all activity is measured in terms of recipient-weeks. This assumption is just a convenience for costing. What matters is the relative cost of services, and therefore that service costs are compared in the same units (that is, weekly or daily etc. costs).

In particular, *gross* weekly unit costs per service recipient were used to calculate total service expenditure for each ward. To some degree local unit costs are influenced by the council (for example, differences in efficiency in commissioning practices), and so national average unit costs were applied using the latest DH unit cost figures (see table 18). This means that the expenditure is 'normalised' across the sample. Indeed, the purpose of applying costs is to have a common currency with which to add up total activity. For example, a care home placement (personal care) costs nearly four times as much as a week of home care.

Table 18: Unit costs

Service	Weekly unit cost per user (£s)
Day care	57
Home care	95
Direct payments	130
Care homes – personal care	376
Care homes – nursing care	381

Hence the total cost-weighted activity is:

$$totcost = 57 \times daycare + 130 \times dirpay + 95 \times domcare + 376 \times CHPC + 381 \times CHNC$$

CHPC = care home personal care
CHNC = care home nursing care

There are a number of issues to consider:

First, the costs used here reflect the current average mix between service types, intensity of service inputs and quality of services. This means that the formulae that are developed below are those that (fairly) compensate councils in producing services in the current configuration. There is no presumption that this is the 'best' configuration. If it were not the best configuration it implicitly means that the formula is not compensating for that better configuration. This consideration is not in any way a criticism of the methodology used here, but rather underlines the point that the formula is based on (which it has to be) data about current practices.

Second, and closely related to the previous point, the data do not distinguish between different intensities of home care use. As a result, it would tend to under-reward councils that provide more hours than average of home care and over-reward those which provide fewer hours. Given recent trends towards increased use of intensive home care, even over the course of a financial year, the average cost of home care per recipient-week could well be an underestimate.

Third, the relatively high care home (with personal care) cost is due to the relatively high cost of in-house providers. The dataset did not identify provider type. There is an

argument that in-house provision might have inefficiently high costs. However, the counter argument is that in-house homes do tend to offer a somewhat different service to different people.

5.3 Explanatory Factors

The main objective of a formula-based approach to funding is that it can account for legitimate differences in the need for services at local level that are beyond the (direct) control of councils. Councils that have population characteristics that generate a higher than average per capita need for services should accordingly receive greater funding to cope with this higher need.

The concept of 'need' differs somewhat from 'demand', in that individuals of similar 'need' may not receive the same level of publicly-funded service because they exercise choices in light of the charges made for services, dependent on their own resources (and so on means-testing rules). The data on services used here strictly reflect *demand* not need, being the actual level of council-supported services that were used. Overall, therefore, demand for supported services is a composite of need and the income and wealth of potential service users. In practice these effects are interwoven, because levels of need tend to be correlated with income and wealth. For example, people with high needs tend to have lower incomes and wealth, other things equal.

In addition, realised demand (actual service use) will depend on levels of supply of services in an area. Again, holding other things constant, areas with relatively high levels of supply will accommodate more provision. Another way of accounting for this effect is to look at supply prices. If supply prices are high relative to the average, supply will be lower than average. It follows that demand will be lower than average, given needs. It is important to account for this effect because it allows closer identification of needs with demand, not with actual activity. In other words, the coefficients for the needs variables estimated in the models will be different if supply price is not included.

There are two issues in taking supply prices into account. First, how are such prices defined? Second, how can we ensure that it is the supply price and not the actual price that we are using? With regard to the first, price was derived as the service-weighted local unit cost (deflated by the ACA to account for input cost differences) over the service-weighted national cost:

$$price = \frac{\left(UC_{DC} \times daycare + UC_{DP} \times dirpay + UC_{HC} \times domcare + UC_{CP} \times CHPC + UC_{CN} \times CHNC\right)/ACA}{57 \times daycare + 130 \times dirpay + 95 \times domcare + 376 \times CHPC + 381 \times CHNC}$$

CHPC = care home personal care
CHNC = care home nursing care

With regard to the second, an instrumental variables approach was used. This involves using not the actual price, but the predicted value of the price variable as derived from a first stage estimation that uses factors likely to be correlated with supply conditions (for example, local wage rates, provider density etc.), not factors correlated with demand.

Previous analysis and the relevant academic literature point to several categories of relevant indicators of need and demand. In each case these variables have to be available from administrative and, preferably, routinely-collected datasets. The first are *benefits* data. Receipt of Attendance Allowance is a good indicator because it reflects local levels of care need but is not means-tested. Eligibility for Attendance Allowance requires an application based on information that has significant parallels with assessment for social services. Receipt of Pension Credit is a powerful indicator of low income and therefore is likely to be a good predictor of use of means-tested local authority funded social care (Department of Health, 2003c, 2005a). Areas with high levels of Pension Credit receipt are likely to be more deprived, generating more demand. Furthermore, this demand for services is more likely to be from people eligible for state-supported services.

A second set of data concern demographic factors and, more particularly, age distributions. Age is a well-known determinant of service use (age may drive service use directly, but it is also a proxy indicator because it is highly correlated with disability-related long-term conditions). The older the population, the more demand we would expect.

A third set of factors concern the service user's family, housing and income circumstances. Tenure (broadly whether people are renters or owner-occupiers) is indicative of income and accommodation-related needs (although tenure is a poor indicator of the suitability of accommodation). People who rent are more likely to use council-funded social care. Household composition – whether a person lives alone – is a pointer to the availability of informal/unpaid caring, especially by spouses or cohabitants (Pickard, 2001). The social care system leans heavily on informal carers, and where this is absent, public service demand is higher. Reflecting the comments made above, using household composition in the model means accounting for current social care practice i.e. heavy reliance on informal care. It may not be an ideal solution, and effectively giving fewer funds to areas with high potential informal care supply reinforces the reliance on informal caring in that area.

In summary, the expected effects on service expenditure are:

- Supply price: reduce demand for services
- Receipt of Attendance Allowance: increase demand for services
- Receipt of Pension Credit: increase demand for services
- Proportion of very old people in the population: increase demand for services
- One person households: increase demand for services
- Renting: increase demand for services

5.4 Care Home Services

As noted above, a number of records did not have a pre-care address (212 wards). In effect, care home activity for these wards was missing – the downloads for these wards provided a count of care home placements within the ward, but not necessarily placements made for people who lived in that ward before going into the home. As a result, care home service activity was imputed for this quarter or so of observations by synthetic regression. In particular, a regression on needs and cost characteristics was

undertaken using the 565 observations with pre-care addresses. This gives an equation for the costs of care home placements for people admitted from a ward according to the characteristics of that (pre-care) ward. Hence this equation can be applied to wards in the data where the count of care home activity was the number placed *in* the ward, not the number placed *from* the ward. These predicted values were added to community-based care costs to determine a total cost for these 212 wards. For the majority of wards with care home activity identified as from pre-care addresses, observed not predicted values were used.

A fixed effects OLS regression with total care homes expenditure per capita (weighted at the national unit costs, listed above) was used for the synthetic regression. The aim of this estimation was to maximise explanatory power using variables that were available for downloads without pre-care addresses. A per capita (65 plus) dependent variable was chosen for consistency with the main estimation (see below). The estimation 'explained' over 36 per cent of the variation in the dependent variable (although 'R-squares' should be treated with some caution; exactly the same estimation was undertaken with the dependent variable in absolute values, not per capita, and this estimation produced an 'R-square' of nearly 70 per cent). More importantly, the estimation satisfied tests for omitted variable bias. The estimation is described in Appendix E. Also in Appendix E is a list of predicted per capita care home costs for each ward without a pre-care address.

5.5 Estimation

There were three potentially important characteristics of the data that influenced how the cost equations were to be estimated:

First, as noted above, the data have a multi-level structure with 775 wards grouped into 17 CSSRs. To account for potential inter council effects (including potential differences in data download processes), a random effects model was employed. In particular, it is reasonable to assume that the data download by each council was on a consistent basis. However, data downloads between councils might well vary as a result of different processes. In addition, there may be council-specific factors that are not accounted for by the available data. A random effects approach will help address these data issues, and also account for missing factors if they vary between councils. It specifically distinguishes, between each of the 17 councils, the variation in costs (observations) within each council (with an average of 45.6 wards in each council). This exploits the assumption that the variation in costs between wards within a particular council might have a different pattern to that variation for other councils. Recognising this difference in patterns is to extract more 'information' from the data.

Second, the inclusion of a 'price' variable requires an 'instrumental variables' approach. As described above, additional factors to reflect supply conditions are included in a two-stage estimation process. Finally, cost data often have a rightward skew i.e. a relatively small number of very high cost cases. This was evident in the current data in total cost per ward terms, but was not unreasonably high. Also, when costs were expressed as a rate of population 65 plus, no skew was observed.

Taking these three issues together, estimation using an instrumental variables random effects model was suitable. This estimation procedure is available in Stata 8. After some experimentation, the implementation due to Baltagi (the ec2sls process) was adopted (see Baltagi, 2001).

5.6 Results

Two models were estimated. The first was with variables expressed as rates per head of population 65 plus. The second was with variables as total numbers (of people, claimants etc.). Table 19 and table 20 report respectively the estimation results. The variable names are as follows, with variables in rates having "p65" appended to the name.

Totncost	Total service cost derived at national average unit costs
Price	As above
AAclaim	Attendance Allowance claimants
Renting	Rented households (all rent sectors) – people over 65
One_pers	One person households – people over 65
PCclaim	Pension Credit claimants
Pop90	Population over 90
Pop85	Population over 85
AAhclaim	Attendance Allowance (higher rate) claimants
Llsi	Limiting longstanding illness
One_pers	One person household – pensioners
White%	Percentage of population that is white

Descriptive statistics for the sample are provided in table 21. The tables describe the variables used to capture the theoretical demand effects discussed above. A number of points of specification are relevant. First, with regard to the rates model, total numbers of Attendance Allowance claimants was used rather than higher rate claimants. Second, tenure was measured by the proportion of people renting rather than owning, although the two are almost flip sides of the same coin (a very small number of people do not either rent or own). Third, the age effect indicator chosen was the proportion of the population over 90. Although the population over 85 was also highly significant, there was greater collinearity with other variables. In particular, because these variables are measuring to some extent the effect of need, they potentially interact in a way that is difficult to interpret. Using 90 plus population rates minimised this difficulty. The variable remains highly significant, and in only just over half of one per cent of wards were there no people over 90 (that is, negligible censoring). Appendix H reports the estimation of the main rates model with these age variables swapped. It also reports the main model estimated with the inclusion of an ethnicity variable. This proved to be insignificant in the estimation and was dropped.

Table 19: Estimation of expenditure per ward as a rate per head of population 65 plus

Totncost_p65	Coeff.	Std. Err.	t-stat.	Prob.	[95% Conf.	Interval]
Price	-12.11476	5.020976	-2.41	0.016	-21.95569	-2.273825
AAclaim_p65	21.0775	4.835913	4.36	0.000	11.59928	30.55571
Renting_p65	4.076295	1.475627	2.76	0.006	1.184118	6.968471
One_pers_p65	5.459387	2.411193	2.26	0.024	.7335346	10.18524
PCclaim_p65	16.39326	1.883825	8.70	0.000	12.70103	20.08549
Pop90_p65	72.97528	7.636193	9.56	0.000	58.00861	87.94194
_cons	10.51869	4.949439	2.13	0.034	.8179669	20.21941
sigma_u	2.4096097					
sigma_e	3.8606088					
rho	.2803512	(fraction of variance due to u_i)				

Number of obs = 775
Number of groups = 17

Obs per group: min = 16
               avg = 45.6
               max = 249

R-sq: within = 0.4443
      between = 0.4130
      overall = 0.4246

corr(u_i, X) = 0 (assumed)

Wald chi-sq (6) = 589.12
Prob > chi-sq = 0.0000

Instrumented: Price
Instruments: AAclaim_p65, Renting_p65, One_pers_p65, PCclaim_p65, Pop90_p65, Aca, Wage_avsq,
              Wage_md, Area, Areasq, Density

In the 'totals' model, the population 85 plus did not cause any particular problems. Again, after experimentation in the totals model, household composition was measured as the total number of pensioners living alone, not just pensioners over 65. In theory, since we are concerned with services for people over 65, we might expect the 'all pensioners' variable to be more 'noisy'. However, that it offered a better fit may perhaps be due to synergies between adults and older people's services in councils. In this model the rate of limiting long-standing illness was also significant, again for people who could also be less than 65, providing additional information about the needs characteristics of the area (high rates of chronic conditions in the young old suggest specific types of need that will carry through to older age, for example an historical local reliance on mining industries). Finally, the proportion of white people in the area was included, but was not significantly different from zero. Limiting longstanding illness was significant in the totals model but not in the rates model ($p = 0.34$). It is likely that because age and chronic illness are highly correlated, the expected effect was distorted when expressed as an older population rate. What appears to matter is the total

number of people with limiting conditions in an area, not the proportion of older people with such conditions. In any case, there is a high degree of correlation between the various needs variables, and this would have a different impact when expressed as a rate rather than as a total.

Table 20: Estimation of total expenditure per ward

Totncost	Coeff.	Std. Err.	t-stat.	Prob.	[95% Conf.	Interval]
Price	-16190.37	7656.591	-2.11	0.034	-31197.02	-1183.73
AAhclaim	32.91718	6.300124	5.22	0.000	20.56917	45.2652
Llsi	3.248872	.6506002	4.99	0.000	1.973719	4.524024
Onepers	1.939398	.4268801	4.54	0.000	1.102729	2.776068
PCclaim	17.5123	1.648961	10.62	0.000	14.2804	20.74421
Pop85	1361.736	134.8745	10.10	0.000	1097.387	1626.085
White%	2588.079	1533.844	1.69	0.092	-418.1995	5594.357
_cons	10804.43	7709.536	1.40	0.161	-4305.979	25914.85
sigma_u	3128.9976					
sigma_e	2851.186					
rho	.54635532	(fraction of variance due to u_i)				

Number of obs = 775
Number of groups = 17

Obs per group: min = 16
                avg = 45.6
                max = 249

R-sq: within = 0.7348
      between = 0.6226
      overall = 0.7477

corr(u_i, X) = 0 (assumed)

Wald chi-sq (7) = 2074.52
Prob > chi-sq = 0.0000

Instrumented: Price
Instruments: AAhclaim, Llsi, Onepers, PCclaim, Pop85, White%, Aca, Wage_avsq, Wage_md, Area, Areasq

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Table 21: Descriptive statistics

Variable	Cases	Mean	Std. Dev.	Min.	Max.
Rates					
Price	775	0.972498	0.091609	0.690767	1.294773
AAclaim_p65	775	0.136473	0.042089	0.028736	0.26178
Rentingp65	775	0.300505	0.177516	0.016246	0.879819
One_persp65	775	0.344378	0.076846	0.146342	0.694215
PCclaim_p65	775	0.281585	0.138189	0.03876	0.829493
Pop90p65	775	0.039662	0.017604	0	0.137667
Totals					
AAhclaim	775	66.08	49.71036	5	270
Llsi	775	1196.99	731.9044	100	3210
One_pers	775	360.9239	235.3265	6	1125
PCclaim	775	293.7974	225.2099	5	1170
Pop85	775	1.943071	1.094909	.08	8.52
White%	775	.9196034	.1372366	.2852206	1
Population					
Pop65	775	1020.835	618.8209	41	3386
Costs					
Totncost_p65	775	12.3814	5.592521	(0)	33.04225
Totncost_p65 (pre-care only)	565	11.28311	4.918021	1.273196	28.56871

5.7 Formulae

The above estimations are used to construct formulae for predicting service costs on the basis of identified needs factors. The first equation (in rates) is:

Total level spend per head 65 plus =		**£s**	
Attendance Allowance claimants – rate per head pop 65+	×	33.260	+
Pensioner rented households (all rent sectors) – rate per head pop 65+	×	6.432	+
One pensioner households – rate per head pop 65+	×	8.615	+
Pension Credit claimants – rate per head pop 65+	×	25.868	+
Population over 90 – rate per head pop 65+	×	115.153	+
(Constant)		-1.993	

One of the strengths of this approach is that because the variables are in rates, there are no issues in scaling up to the CSSR level. In this case, the price variable was held at its sample constant value and added to the constant term. Furthermore, the coefficients were scaled up by a factor of 1.58 so that the predicted expenditure matched the actual expenditure across the sample. The resulting formula can be applied at CSSR level using the rates as described for the CSSR to derive a total spend per head 65 plus. Total spend is then derived by multiplying by the CSSR population aged 65 plus (see Appendix F for a derivation).

The second equation is:

Total level spend =   £s
Attendance Allowance (higher) claimants – num   ×   50.983   +
Number with limiting long-standing illness – num   ×   5.032   +
Number of one person households – num   ×   3.004   +
Pension Credit claimants – num   ×   27.123   +
Population over 85 – rate per head pop 65+   ×   2109.077 x num of wards   +
(Constant)   -3985.989 x num of wards

Total spend is derived directly using the total number in the CSSR for the first four variables. Population over 85 enters as a rate, and so is scaled from ward to CSSR level by multiplying through by the number of wards in the CSSR (at the time of the analysis). Similarly, the constant was derived by ward, and so needs to be multiplied through by the number of wards (see Appendix F for a derivation).

Applying each formula to CSSRs gives a predicted required total spend. *Relative need* is found by dividing through each CSSR's total by the England average required spend (the total expenditure as found in the above equations summed over each CSSR for the England total divided by 150). This gives the England average 'relative' need a value of unity. Any CSSR with a relative need of greater than unity has higher than average need, those with less than unity have relatively low need. Re-scaling in this way makes it easier to compare CSSRs. The table in Appendix G gives the relative need for each CSSR from the two models. There is a very high correlation between the relative need predictions of the models, of 86 per cent. The following figure plots the relative need for each CSSR. It also shows a high degree of correspondence between the predictions of the two models, as measured by their relative need results. This improves our confidence in the results since although the variables used are similar, their specification in the models is quite different. Overall, the totals model had a slightly lower standard deviation and a lower range of relative need. The rates model showed a lower inter-quartile range.

Figure 1. Relative need predictions of the two models (England = 1)
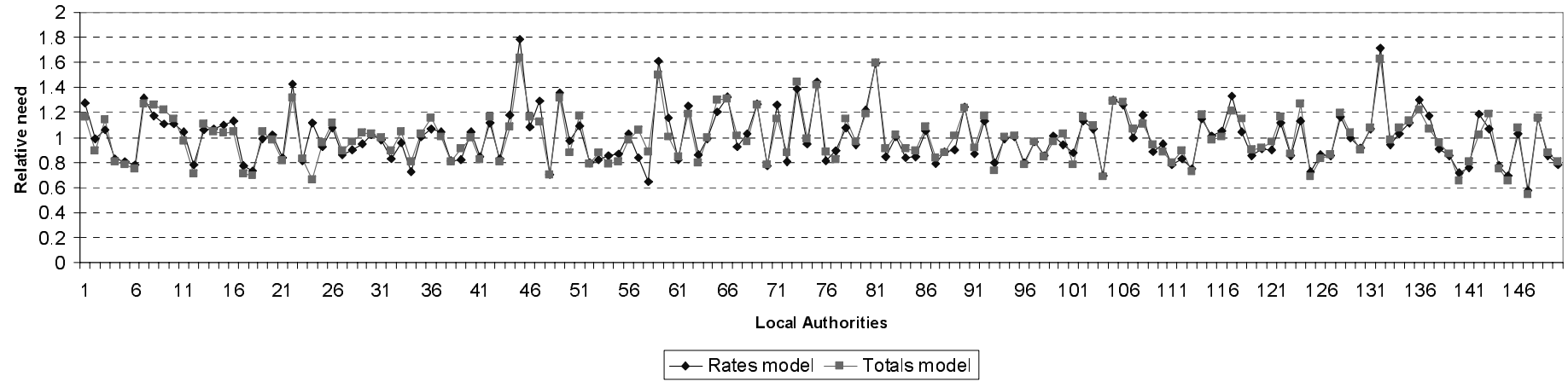
5.8 Summary Points

The small area analysis was conducted on 775 census wards in England representing about 10 per cent of the total. It was used to predict the resource requirements of CSSRs accounting for demand/need and, to a limited degree, supply conditions.

Small area analysis is a well-established technique for this purpose. There were a number of data issues, including data quality and availability of care homes activity data as relating to the ward from which the person was placed. A range of statistical methods was used to address these problems, including multi-level (random effects) modelling and synthetic regression. Overall, the resulting models showed good fit to the data and produced results that entirely accord to theoretical expectations.

Two models were estimated, the first in rates per capita (65 plus) and the second in totals at ward level. The models indicate that relative need across the country varies from 0.58 to 1.79 of the England average of unity (0.55 to 1.63 for the totals model). The inter-quartile range is 0.84 (25 per cent percentile) to 1.11 (75 per cent percentile).

6. Discussion

The objective in the estimation of the formulae for allocating central government funding to local authorities is to identify the number of people in a local authority judged to require services of a given standard, and the cost to the local authority of purchasing those services. The formulae need to be based on factors that are measured and updated routinely, which are linked to needs and costs, and which are outside the influence of local authorities.

Two approaches to estimating the needs component of the formula for older people were investigated. First, following the methodology used in previous studies for estimating the allocation formulae for older people, individual-level analyses were undertaken using survey information about older people in receipt and not in receipt of services. Second, following the methodology used in previous studies for children's services and particularly in the health field, small area analyses were undertaken using information about service receipt on an area (ward-level) basis.

Despite the differences in approach, both methods produced equations based on similar variables, namely age, household characteristics, tenure and the receipt of benefits. The individual-level equations and the totals model in the small area analysis also included limiting longstanding illness. However, both approaches were affected by problems of data availability.

In the case of the individual-level analysis, the response to the survey of individuals admitted to care homes and to the survey of home care recipients was in the region of 30 per cent in each case, a much lower figure than had been achieved in previous studies. In the light of the small sample sizes, together with problems in estimating the receipt of Pension Credit for the GHS, the Department of Health and the ODPM decided that the results of the individual-level analysis could not be used for the RNF calculations and, instead, the calculations were based on the results of the small area analysis.

The individual-level analysis employed the 2001-02 General Household Survey to provide data on older people living in their own homes, as this was the most recent sweep of the GHS with the relevant data on older people. However, the 2001-02 GHS was conducted prior to the replacement of Income Support by Pension Credit, entitlement to which is wider than it was for Income Support. A number of alternative approaches to the estimation of the receipt of Pension Credit for the GHS were examined, and these resulted in predictable variations in the values of the corresponding coefficients in the equations. In addition, corrections to the data on benefit receipt after the main analyses had been completed also affected the value of the coefficient for the receipt of Attendance Allowance/Disability Living Allowance. In the case of the small area analysis, information on care home expenditure was incomplete and a synthetic procedure was used to impute the missing data.

In the small area analysis, the population aged over 90 was preferred to the population aged over 85 for computing the age variable for the rates model. The results of the survey of admissions also indicated the increasing importance of this age group among admissions to care homes, but it was not possible to derive a corresponding variable for the GHS data, and so the effect of redefining the age groups to identify those aged over

90 could not be examined. The routine availability of data at the national level is a crucial factor in the selection of variables for estimating the Relative Needs Formulae. The surveys of admissions to care homes and of home care recipients and, to a lesser extent the GHS, included a much wider range of information about the characteristics of older people. The ability to include such variables in the analyses could provide the opportunity to increase the explanatory power of the equations. However, this would require a corresponding increase in the range of national data with which to exemplify the models computed from survey data, as well as a return to the response rates obtained in previous surveys.

Appendix A

Design of the Survey of Admissions to Care Homes and the Home Care Survey

Introduction

The relative numbers of admissions and of individuals receiving home care planned for the study, 1,200 and 600 respectively, were based on the relative gross expenditure on care homes and home care (Department of Health, 2004c), and the overall size of the study was based on budgetary considerations. National statistics on local authority supported residents in care homes (Department of Health, 2003a) indicated that a sample of 15 local authorities would yield the required number of admissions, after allowing for refusals and incomplete data. The survey of home care clients would then be undertaken in the same local authorities.

Selection of CSSRs

An initial sample of 25 authorities was selected from the 148 local authorities in England with responsibilities for social services, excluding the City of London and the Isles of Scilly. The 148 local authorities were stratified according to the proportion of non-white individuals among the population aged 75 and over. Authorities with over 5 per cent of non-white individuals were allocated to the high ethnic minority population stratum. Within each of the two strata, local authorities were ordered by type of authority (county councils, London boroughs, metropolitan districts and unitary authorities) and geographically, and a systematic sample was selected from each stratum: 10 of the 28 authorities with high ethnic minority populations and 15 of the 120 authorities with low ethnic minority populations were selected. Of these 25 local authorities, 14 agreed to participate, including five authorities in the high ethnic minority stratum and nine in the low ethnic minority stratum. In order to increase the number of admissions to care homes and improve the representation of counties, the ODPM approached the counties that were not selected for the original sample to recruit additional volunteers, and two further counties were recruited. However, the recruitment of additional authorities had little effect on increasing admissions of older people in ethnic minorities.

Admissions to Care Homes

The number of expected admissions to care homes was based on three months of admissions (two months for planned late starters), from the 2003-04 statistics on supported residents admitted to permanent care (Department of Health, 2004b). However, the number of admissions reported by the participating authorities was much lower than the expected number and the fieldwork had to be extended to compensate for this. Statistics for 2004-05 were published in October 2005 (NHS Health and Social Care Information Centre, 2005b), and showed a fall of 7.3 per cent in the number of supported residents admitted to permanent care, compared with 2003-04. It was intended that the fieldwork for the survey would begin in November 2004, but six local authorities were not able to start the fieldwork until December, and five were not able to

start the fieldwork until early 2005. In four cases the delay until 2005 was planned, but in the fifth case the delay was due to problems in setting-up the fieldwork arrangements. The period during which new admissions were included, termed the fieldwork period, ranged from nine weeks in one authority to 21 weeks in five authorities.

In addition, the collection of financial information for individuals was based on the financial assessment by the local authority, which would follow the care assessment. In consequence, the survey did not yield sufficient cases for analysis in time for the interim report in June 2005 (Darton et al., 2005a). The fieldwork was also continued to increase the proportion of individuals with complete information, and PSSRU staff took over the role of liaising with the participating authorities for the survey of admissions to care homes from NOP World in mid-May, but it was not possible to collect financial information for all of the individuals in the survey.

Table A1 lists the 16 local authorities recruited for the survey, and shows the ethnic minority proportion, the number of admissions of permanent residents for 2003-04, and the predicted number of admissions during the fieldwork period. Eleven of the 16 local authorities provided information on the number of eligible cases admitted to care homes during the fieldwork period, and these figures are included in table A1. For the remaining five local authorities, an estimate of the number of admissions during the recorded fieldwork period has been derived using the 2004-05 statistics on supported residents admitted to permanent care. For these estimates, the number of weeks used to predict the number of admissions was reduced by three weeks to allow for the initial start-up time and the Christmas holiday period, and by two weeks for one authority in which the fieldwork began in 2005.

In thirteen authorities, the number of admissions or estimated admissions during the fieldwork period exceeded the original predicted number based on the statistics for 2003-04, and the greatest differences tended to occur for the authorities with the longest fieldwork periods. However, in authority H the fieldwork period ran for 15 weeks and the authority reported 174 eligible cases, compared with 235 individuals admitted during 2003-04 as a whole, and 215 admitted during 2004-05. The number reported for 2003-04 was substantially smaller than the corresponding figure of 415 admissions reported for 2002-03 (Department of Health, 2003a). However, even with an annual figure of 415 admissions, only about 120 admissions would be expected during a period of 15 weeks. In addition to 235 permanent admissions, 670 temporary admissions were reported for this authority in 2003-04 (Department of Health, 2004b), and thus about 260 permanent and temporary admissions would be expected during a period of 15 weeks. Thus the figure reported by authority H cannot easily be reconciled with the national statistics, and calculations of response rates for the survey have been based on the reported figure of 174 eligible cases.

For three authorities, the number of admissions or estimated admissions was smaller than the original predicted number. In two of these authorities the number of admissions had to be estimated, and in the third case the fieldwork period only lasted for two months, compared with at least three months in all the other authorities.

Table A1: Admissions to care homes sample

Local authority	% 75+ not white	2003-04 admissions	2/3 months admissions[1]	Fieldwork period adm.[2]
A	5.30	275	69	96
B	4.36	265	66	101
C	12.76	230	58	35
D	7.92	580	145	165
E	6.11	200	50	72
F	6.02	240	60	125
G	1.00	570	143	160
H	1.81	235	39	174
I	0.46	550	138	144
J	0.45	835	209	280
K	0.74	945	236	221
L	0.62	1935	323	178
M	0.76	1910	318	373
N	0.77	1735	289	311
O	1.32	295	74	113
P	0.36	205	51	65
London boroughs (A–F)	6.70	1790	448	594
Metropolitan districts (G–J)	0.82	2190	529	758
County councils (K–N)	0.71	6525	1166	1083
Unitary authorities (O, P)	0.83	500	125	178
Total	1.60	11005	2268	2613

Sources:
2001 Census.
Department of Health (2004b), table S7.
NHS Health and Social Care Information Centre (2005b), table S7.
Notes:
1. Number of admissions estimated for 2 months for 4 authorities (H, L, M and N).
2. Number of admissions in fieldwork period, estimated for 5 authorities (C, G, K, N and P).

It was originally intended that pilot studies would be undertaken in two local authorities. However, this was not possible, partly because of the time needed to finalise the questionnaires and partly because of delays in the local authorities concerned. Instead, the survey was set up by NOP World in individual authorities as the fieldwork process was agreed. Since the questionnaires had been developed from a previous survey, it was anticipated that few problems would be identified. In addition, the assessment documents used by the participating authorities were used to guide the development of the questionnaires. However, the lack of a pilot study prevented the testing of consent arrangements. The authorities were given options for obtaining verbal or written consent, and some required written consent. The implementation of consent procedures within the data collection process proved difficult, and staff in one authority claimed that the older people being assessed were too old and frail to give their consent, despite their providing other information.

Two alternative procedures were adopted for the data collection process, depending on the preferences of the individual local authorities. In seven local authorities batches of questionnaires were sent in advance, and in the remaining nine local authorities the questionnaires were distributed following notification of admissions to NOP World by

the local authority, usually following an admissions panel meeting. The second procedure, described as 'triggered distribution', was preferred by NOP World since it provided greater control over the process. However, as discussed below, a shortfall in the number of completed returns under the triggered distribution procedure suggests that greater emphasis should have been given to ensuring the return of the questionnaires under this procedure.

Home Care Recipients

The home care study was conducted in 13 of the 16 local authorities between February and May 2005. One of the two additional counties declined to participate, and two authorities withdrew after the sample sizes had been calculated. One of the two authorities required that selected service recipients opt-in to the survey, rather than be given the choice to opt out, and one of the other counties withdrew from survey due to pressure on resources. The organisation of the fieldwork required the participating local authorities to make the initial approach to the selected individuals, and offer them the option of opting out of the study. An opt-in policy was judged to be likely to produce a biased sample, and was therefore rejected. A 50 per cent response rate was assumed for the survey, but several authorities experienced much higher levels of opting out. In some authorities the sample size was increased, and four authorities agreed to provide supplementary samples. As in the survey of admissions, the collection of financial information from local authorities was delayed and the fieldwork was continued to generate a more complete dataset.

Within each local authority, home care clients were stratified by the intensity of the service they received: non-intensive (up to 10 hours per week) and intensive (over 10 hours per week). Calculations based on sampling theory (Cochran, 1977) and the available statistics on home care (Department of Health, 2004a) suggested that equal-sized samples of non-intensive and intensive home care recipients were appropriate for the survey. The calculation of the relative proportions of non-intensive and intensive home care recipients was based on the relationship between the relative numbers in the two groups or strata, the variability (standard deviation) of home care hours within each stratum, and the costs of obtaining an interview in each stratum. Recipients of intensive home care account for just under one quarter of all home care recipients, and the standard deviation for this stratum was estimated as about three times as large, based on the 1998 GHS sample of people aged 65 and over. Similar costs were assumed to apply for obtaining an interview in each stratum.

The sample of clients was selected systematically from each stratum by the local authority, following instructions provided by NOP World. The selection of home care clients was based on the number of individuals receiving home care. However, in some authorities sampling in proportion to the number of clients resulted in rather small or rather large numbers of individuals, and the selected number was adjusted to produce at least 30 respondents in each authority, with the maximum number adjusted downwards to yield an overall sample of 600 cases. The calculated numbers were then doubled, on the assumption of a 50 per cent overall response rate. Although the initial sample was selected on the assumption of a 50 per cent response rate, several authorities experienced much higher levels of opting out. This was slightly higher for individuals in the intensive stratum, but not substantially so, as discussed below. In some authorities

the sample size was increased, and four authorities agreed to provide supplementary samples. For the analysis, the home care respondents have been weighted appropriately to represent those receiving intensive and non-intensive home care services. However, as discussed above, the information on service intensity recorded by the local authority did not always correspond to the information reported in the interview, and the interview information was used for the computation of weights.

Table A2 lists the 16 local authorities recruited for the survey, and shows the results of the initial calculations on 18th January 2005, following the removal of the county that declined to participate, of the number of completed interviews required under proportionate sampling, and then adjusted to yield a minimum of 30 interviews in each authority. Table A3 shows the adjustments made to the sample to compensate for withdrawals. The issued sample is the sample provided to the interviewers, following the removal of individuals who indicated their refusal to participate when contacted by the local authority.

Table A2: Home care survey sample (initial calculations)

Local authority	Clients 15-21/09/2003	Proportionate sample	Adjusted sample
A	2730	41	41
B	1280	19	30
C	1200	18	30
D	2360	35	35
E	1330	20	30
F	1550	23	30
G	4710	71	71
H[2]	2220	33	33
I	2310	35	35
J	3450	52	52
K	2680	40	40
L[1]	12560	–	–
M	9030	136	71
N[2]	2830	43	43
O	1560	23	30
P	700	11	30
London boroughs (A–F)	10450	156	196
Metropolitan districts (G–J)	12690	191	191
County councils (K–N)	14540	219	154
Unitary authorities (O, P)	2260	34	60
Total	39940	600	601

Source:
Department of Health (2004a), table 1.2.
Notes:
1. Not included in sampling procedure, and excluded from county council subtotal and total.
2. Withdrew from fieldwork following sampling procedure.

Table A3: Home care survey sample (final version)

Local authority	Initial sample	Sample selected	Adj. sample selected[3]	Issued sample[4]
A	41	106	106	84
B	30	60	60	37
C	30	60	60	42
D	35	92	92	52
E	30	60	60	35
E supplement[3]	–	–	30	18
F	30	60	60	41
G	71	92	92	65
H[2]	33	–	–	–
I	35	98	98	39
J	52	130	130	75
J supplement (for H)	–	99	99	59
K	40	112	112	53
L[1]	–	–	–	–
M	71	144	144	73
M supplement[3]	–	–	68	41
N[2]	43	120	–	–
O	30	60	60	21
O supplement[3]	–	–	30	0
P	30	90	90	36
London boroughs (A–F)	196	438	468	309
Metropolitan districts (G–J)	191	419	419	238
County councils (K–N)	154	376	324	167
Unitary authorities (O, P)	60	150	180	57
Total	601	1383	1391	771

Notes:
1. Withdrew from fieldwork prior to sampling procedure.
2. Withdrew from fieldwork following sampling procedure. H replaced by J.
3. Adjusted sample included additional samples from E, M and O.
4. Issued sample excludes refusals and some out of scope cases.

Given the delays and the difficulties in reaching agreements with local authorities, it was only possible to conduct the pilot study in one local authority, although the initial interviews in a second authority were also treated as pilot interviews. The pilot exercise indicated that the questionnaire was generally satisfactory and provided suggestions for a few amendments to improve the questionnaire. One problem that did arise was that respondents did not understand the system of Pension Credit. Accordingly, the local authorities were approached to determine whether they would be willing to provide individual information from their financial assessments, subject to the older person's consent, and six of the 13 authorities agreed to this. In the case of the authorities that agreed, the older person was asked to provide their written consent for the local authority to provide the information. Otherwise, the older person was asked to provide the information. However, some information on charges and the receipt of Attendance Allowance was requested from the respondent in a separate part of the interview.

Following the selection of the sample of home care clients, the local authority sent letters to the selected individuals, explaining the purpose of the study and offering the opportunity to opt out. The letters included an opt-out form and a reply-paid envelope,

and gave a deadline of two weeks for the return of the form. After this time the local authority forwarded the contact details of those individuals who had not opted out to NOP World, for NOP to issue to their fieldwork staff. As part of this process, the local authorities were asked to screen the selected sample to identify clients for whom a proxy interview would be required, and to address the letter accordingly. However, only two authorities appear to have done this, although a larger number of proxy interviews were completed for the survey altogether. The survey questionnaire was administered using computer-assisted personal interviewing (CAPI).

Response to the Surveys

Table A4 shows the response to the two surveys. The numbers of responses for the survey of admissions to care homes include partial responses where no financial information was obtained, and a more detailed analysis of the response to this survey is given below. In one of the counties, one of the social services areas withdrew from the survey of admissions during the fieldwork period.

Table A4: Response to admissions to care homes and home care surveys

Local authority	Care homes		Home care	
	Fwk adm.	Response	Issued sample	Response
A	96	58	84	31
B	101	21	37	11
C	35	4	42	22
D	165	19	52	23
E	72	36	53	35
F	125	45	41	26
G	160	111	65	28
H	174	32	–	–
I	144	79	39	27
J	280	27	134	61
K	221	106	53	22
L	178	106	–	–
M	373	66	114	60
N	311	37	–	–
O	113	20	21	12
P	65	59	36	26
London boroughs (A–F)	594	183	309	148
Metropolitan districts (G–J)	758	249	238	116
County councils (K–N)	1083	315	167	82
Unitary authorities (O, P)	178	79	57	38
Total	2613	826	771	384

As noted above, 11 of the 16 local authorities provided information on the number of eligible cases admitted to care homes during the fieldwork period, totalling 1,821 individuals. The estimated total number of admissions during the fieldwork period was 2,613. However, the 16 local authorities only provided 1,335 records to NOP World. Among these cases, 1,029 had the individual's confirmed consent for their data to be used in the study. Among the cases with consent, NOP World received data for 826 admissions, although one case was subsequently found to be a duplicate. However,

information relating to a further case was subsequently delivered directly to the PSSRU, resulting in a total of 826 admissions.

The local authorities were asked whether they could explain why only half the eligible cases were reported to NOP World, but it has not been possible to obtain this information. In cases where consent had not been obtained at the time of the assessment, local authority staff did try to obtain consent retrospectively, but this was not very successful. Similarly, it has not been possible to obtain information on the reasons behind the difference between the number of cases with confirmed consent and the number of cases for whom information was supplied. However, for nine authorities the number of cases for whom information was supplied was very similar to the number with confirmed consent, while for the remaining seven authorities there was a substantial discrepancy between the two numbers. Although the 'triggered distribution' procedure was used to supply the questionnaires in nine authorities altogether, it was used in six of the seven authorities in which there was a substantial discrepancy between the number of cases for whom information was supplied and the number with confirmed consent. This suggests that greater emphasis should have been given to ensuring the completion and return of the questionnaires under the triggered distribution procedure.

The overall response to the survey of admissions was just under 32 per cent, based on the number of admissions reported by the local authorities during the fieldwork period or the estimated number from 2004-05. However, the responses from individual authorities varied widely, from around 10 per cent in four authorities to just over 90 per cent in one authority in which the number of admissions had to be estimated. For six of the authorities, the estimated response rate was at least 50 per cent. These six authorities included five of the seven that had received the questionnaires in advance.

In the home care survey, the data available for analysis in June 2005 related to 388 home care clients, and it was expected that the final dataset would include 397 individuals. However, the additional nine cases were found to be ineligible, and four of the 388 records were found to have been duplicates, where the original interview had been replaced by a proxy interview, but had not been deleted. Thus, completed interviews were obtained for 384 home care clients. A proxy interview was conducted in 81 cases.

The issued sample for the home care survey represented 55 per cent of the selected sample, and the response to the issued sample was 50 per cent, giving an overall response of just under 28 per cent, in contrast to the 50 per cent response assumed in planning the survey. The variation in response rates between individual authorities was smaller than for the survey of admissions to care homes, but the response rates ranged from 13 per cent to 43 per cent.

The local authorities were asked to select equal-sized samples of non-intensive and intensive home care recipients. However, among the 384 respondents, 44 per cent were classified as receiving an intensive home care service, although the information on service intensity recorded by the local authority did not always correspond to the information reported in the interview, as discussed above.

The participating local authorities were asked to provide information about the characteristics of the home care clients who refused to be included in the survey, and 11 of the 13 authorities provided this information. However, comparable information was not collected about those in the issued sample who refused to be interviewed. The local authority reports indicated that, compared with the respondents to the survey, those who refused were older ($X^2 = 18.59$, 5 df, $p < 0.01$), but there was no difference between the sex distributions ($X^2 = 0.54$, 1 df, $p > 0.05$).

Among those clients contacted directly, there were more refusals among clients who received a non-intensive home care service, whereas similar numbers of proxies refused for each group. Overall, 52 per cent of refusals were from the low intensity group and 48 per cent were from the high intensity group. However, although a smaller proportion of respondents received an intensive home care service (44 per cent), suggesting that those receiving an intensive service may have been more likely to have refused when contacted by the NOP World interviewer, the proportions were not significantly different ($X^2 = 0.83$, 1 df, $p > 0.05$).

Table A5 shows the composition of the final dataset prepared for the survey of admissions, and table A6 shows the corresponding information after the removal of six individuals who were found to be aged under 65 or to have missing information on age. Table A7 shows the response to the home care survey before and after the removal of nine individuals who were found to be aged under 65 or to have missing information on age.

Information from the financial assessment was available for 694 of the 826 individuals admitted to care homes, and information on the type of care home was available for a further 105 individuals. For 27 individuals the information obtained was restricted to that collected in the care assessment, and 19 of these cases were in a single authority. No financial information was obtained for any individuals in this authority, and so it was not represented in the analyses reported above.

Table A5: Response to admissions to care homes survey

Local authority	Total returns	Complete response	Adm. ques. & destination	Adm. ques. only
A	58	34	24	0
B	21	15	6	0
C	4	2	0	2
D	19	0	0	19
E	36	34	2	0
F	45	22	21	2
G	111	84	27	0
H	32	32	0	0
I	79	79	0	0
J	27	17	10	0
K	106	105	1	0
L	106	106	0	0
M	66	64	2	0
N	37	31	5	1
O	20	18	2	0
P	59	51	5	3
London boroughs (A–F)	183	107	53	23
Metropolitan districts (G–J)	249	212	37	0
County councils (K–M)	315	306	8	1
Unitary authorities (O, P)	79	69	7	3
Total	826	694	105	27

Table A6: Response to admissions to care homes survey (aged 65 and over)

Local authority	Total returns	Complete response	Adm. ques. & destination	Adm. ques. only
A	58	34	24	0
B	21	15	6	0
C	4	2	0	2
D	19	0	0	19
E	36	34	2	0
F	44	22	21	1
G	110	83	27	0
H	32	32	0	0
I	79	79	0	0
J	27	17	10	0
K	105	104	1	0
L	104	104	0	0
M	66	64	2	0
N	36	30	5	1
O	20	18	2	0
P	59	51	5	3
London boroughs (A–F)	182	107	53	22
Metropolitan districts (G–J)	248	211	37	0
County councils (K–M)	311	302	8	1
Unitary authorities (O, P)	79	69	7	3
Total	820	689	105	26

Table A7: Response to home care survey

Local authority	Total returns	Clients aged 65 and over
A	31	31
B	11	11
C	22	22
D	23	23
E	35	27
F	26	26
G	28	28
H	–	–
I	27	27
J	61	61
K	22	22
L	–	–
M	60	60
N	–	–
O	12	11
P	26	26
London boroughs (A–F)	148	140
Metropolitan districts (G–J)	116	116
County councils (K–M)	82	82
Unitary authorities (O, P)	38	37
Total	384	375

Appendix B

Methodological Issues and Recommendations for Future Studies

Introduction

As has been discussed in this report, individual-level data provide the most theoretically sound basis for the Relative Needs Formula. The results of the individual-level data collection were very disappointing, and it is important to draw lessons from this for the purposes of future work. While all fieldwork can run into problems at some stage, there appear to be a number of more fundamental problems that would be important to consider in the commissioning and conduct of future research, both to feed into the older persons RNF and more generally.

Resources

The overall budget for the study was set at a similar level to the cost of the 1995 survey of admissions to care homes. For the 2004-05 study, two samples were needed: a sample of home care service users and a sample of care home admissions. Thus it was clear that the sample size for the survey of admissions would need to be smaller than in 1995. During the design stage, the researchers approached a number of fieldwork organisations and described the approach to collecting admissions data that had been used in the 1995 study. This involved having an individual local liaison worker being responsible for chasing data in each area. None of the fieldwork organisations felt that it was possible to conduct the study on that basis within the budget (and, indeed, it appears that the organisation contracted to undertake the 1995 study may have devoted more resources to the survey than it had planned).

For the 2004-05 survey of admissions, NOP World proposed an approach that involved social workers having the option of completing the forms on-line, with progress chasing being conducted via electronic means. The researcher team did have reservations about this, and when NOP identified problems in communication at a relatively early stage the team recommended that NOP adopt local liaison workers. However, NOP did not feel this was necessary. In the event, although the electronic procedure was available to all authorities, it was only used by only one social worker in the whole study. From the outset, the researchers emphasised the need to adapt the data collection approach to the system in each individual local authority, but the NOP team's priority was to ensure a consistent approach that would enable them to keep track of each stage of the process. In practice, it was noticeable that those authorities that conformed most closely to this system tended to have lower response rates, as reported in Appendix A.

In addition, it was clear that local authorities had much less capacity to deal with this type of work than in the past. During the recruitment of local authorities, one authority requested financial support for its participation, but this was not possible, and the authority did not participate in the study. When resources are limited, participating in a research study tends to fall to the bottom of the priorities of those directly responsible for collecting the data, whatever the enthusiasm for the study at the top of an organisation.

We would recommend that, prior to commissioning any work to feed into subsequent formulae or for other specific purposes, a scoping exercise should be undertaken to identify the likely resource requirements, including the demands on local authorities and their staff.

Timing

The timetable set out in the proposal was very tight, and was made more so by delays at the commissioning stage. Because there was a need to comply with an externally set timetable for the evaluation and implementation of the results, there was little flexibility in terms of end dates. At the first meeting of the advisory group for the RNF research, it was made clear that the research team did not think that the work could be completed in time, but was persuaded to try to identify possible short-cuts. In practice, the only scope for shortening the timescale was by virtually eliminating the pilot stage for the admissions survey. This meant that process problems were not identified until too far into the main stage of the data collection for any changes to be made. Furthermore, these problems were compounded by the lack of local liaison arrangements noted above.

There are intrinsic delays in collecting data as part of the process of admission. Information about needs is identified at an initial assessment, but financial data are collected later, sometimes after the decision to admit the person to a care home has been made, and the details of the placement cannot be confirmed until the person has entered a home. The fieldwork for the survey was due to begin in November 2004, in order to be underway before the Christmas holiday. However, there was a relatively short period between the negotiations with the selected authorities and the beginning of the fieldwork, and several authorities were unable to begin the fieldwork on time. The approach adopted by NOP World to liaising with the local authorities involved making contact by e-mail, but this was not successful in identifying where local authorities had been delayed in starting the fieldwork. In some cases the delays meant that it was not possible to set up the procedures before the Christmas holiday season, and in these cases it was necessary to delay the beginning of the fieldwork until January 2005. Furthermore, one of the additional counties did not start until February 2005. As a result, the fieldwork period had to be extended to attempt to maintain the planned sample size, consequently delaying the overall timetable.

The timetable also affected the timing of the home care survey, which also had to be conducted with insufficient piloting. The pilot interviews that were undertaken did identify considerable confusion about Pension Credit, and arrangements were made to obtain financial information from the local authority in six areas, where the older person agreed. However, these arrangements had to be made quickly, and it is likely that more complete data could have been obtained if the timetable had been longer. In addition, the collection of sensitive personal information from the interviewees raised a number of problems, and solutions to these had to be found without having sufficient time to test the proposed procedures.

We would recommend that the data collections to be used for the purposes of developing Relative Needs Formulae are separated from the wider RNF review timetable, or at least are planned to be complete at least six months prior to the time

when the data are needed for the relevant analyses. The Invitation to Tender recognised that the data collected would have wider policy-related uses, and initial reports focusing on these would be of value in their own right.

Dropping Out

At all levels, both component surveys suffered from an unexpectedly high level of, and often late, drop-outs: by local authorities that had agreed to participate; by areas within local authorities; by the failure of staff to participate as agreed; and by service users.

At the initial stage of recruiting local authorities, which had to be undertaken during the summer holiday period, local authorities that had initially expressed an interest were not able to arrange meetings, and then dropped out late in the process. The ODPM was very helpful in facilitating the participation of additional authorities, and these authorities made a valuable contribution to the study, but this did add to the problems of delaying the start of the fieldwork. In addition, one area in one of the larger local authorities withdrew from the survey of admissions, and all areas in the authority decided not to participate in the home care survey, both decisions occurring quite late in the fieldwork period.

In relation to the survey of admissions to care homes, it appears that most of the problems that arose in identifying and reporting admissions within authorities were linked to failures in staff participation that were probably associated with the resource pressures noted above.

In the case of the survey of home care service users, major problems were created by the withdrawal of three of the 16 selected authorities, particularly since one large authority dropped out very late in the process. Some of the other areas had to be asked to provide an additional sample of service users, and this was most helpful. However, it was not possible to select sufficient replacements to cover the shortfall in numbers.

The overall refusal rate for the home care survey was much higher than anticipated, both to the first approach letter from the local authorities and to the approach by the interviewer. As reported in Appendix A, the sample issued to the interviewers represented 55 per cent of the selected sample, and the response to the issued sample was 50 per cent, giving an overall response of just under 28 per cent, in contrast to the 50 per cent response assumed in planning the survey. As service users become increasingly frail, it is likely that response rates will decline. However, part of the problem may have been related to the use of proxy interviews. Although the local authorities were asked to contact a proxy where this was more appropriate than contacting the service user, it appears that this was only done in two authorities. A total of 81 proxy interviews was obtained but, where the local authorities provided information about those who refused to be included in the survey, about half of the refusals were given by a proxy. This suggests that greater emphasis should have been given to the recruitment of potential proxy interviewees, to ensure that they were aware that they could provide the information instead of the service user.

We would recommend that a very low response rate is assumed for similar future surveys, and that communications with potential interviewees ensure that it is clear that a proxy can be interviewed rather than the service user.

Research Governance

Research governance arrangements introduced in recent years have added layers of complexity to the research process that were not an issue for the survey conducted in 1995. In particular, obtaining informed consent proved problematic and was time consuming in many areas. For the survey of admissions, some local authorities required consent to be obtained explicitly, in order to enable the authority to supply information that, in other authorities, was covered by standard procedures, such as a statement on the assessment form. For the home care study, two authorities interpreted informed consent as requiring home care service users to actively opt-in to the study, rather than simply to indicate that they did not wish to be approached by an NOP interviewer by returning a form to opt out. As this would have been likely to result in a biased sample, it was not possible to conduct the home care survey in one authority that was unwilling to change its interpretation of the requirements for obtaining informed consent.

We would recommend that local authorities:
- *are provided with guidance from the Department of Health on good practice, in terms of informed consent and data sharing;*
- *ideally, routinely ask service users if they are happy to have their data, suitably anonymised, used for research purposes, preferably at the time of their needs assessment; and*
- *are required to have governance policies that are made publicly available, so that researchers can identify if there are likely to be any problems prior to approaching them to participate in research studies.*

Local Authority Data

Both the individual and small area data collections were affected by gaps in the data provided from local authority systems. Some of the local authorities were unable to provide information on the number of admissions to care homes during the fieldwork period. For those authorities that did provide this information, the numbers were consistent with the most recent Department of Health figures, for 2003-04, with one exception that could not be reconciled with the national figures.

For the individual-level data collection it was surprising how often authorities did not have full information in the financial assessment about the receipt of social security benefits, such as Pension Credit and Attendance Allowance. This may in part be due to a lack of knowledge among the individuals themselves. As noted above, the pilot interviews for the home care survey identified considerable confusion about Pension Credit, in particular.

We would recommend that, as part of the general review of routine data collection, the Department considers whether data needed for small area analyses for RNF purposes could be collected on a routine basis.

Appendix C

Reference Tabulations

This appendix contains tabulations of selected variables for the survey of admissions to care homes and the home care survey for reference purposes. Tables C1 to C4 present comparable information for the two surveys; table C5 presents some key information from the survey of admissions, separately for those admitted to care homes for personal care and for nursing care; and table C6 presents the corresponding information for comparison with the 1995 survey of admissions to care homes (Bebbington et al., 2001; Netten et al., 2001).

The tables are based on individuals aged 65 or over, that is 820 people admitted to care homes and 375 home care clients, and are unweighted. As explained above, one participating local authority provided corrected data on benefit receipt for those admitted to a care home after the draft version of this report had been completed. The corrected data on benefit receipt were provided for all those included in the survey in the authority concerned. Thus, some of the information presented in table C3 is based on a larger number of individuals than the 689 complete responses, representing cases with information from both the care and financial assessments, recorded in table A6 in Appendix A. In table C5 the overall figures correspond to the combined figures for personal and nursing care, and exclude those for whom information for the particular attribute was recorded but whose type of care was missing. Thus the figures in table C5 differ slightly from those reported for the corresponding information in the other tables.

Tables C5 and C6 include two aggregate measures of physical and mental functioning: the Barthel Index of Activities of Daily Living (Mahoney and Barthel, 1965) and the MDS Cognitive Performance Scale (CPS) (Morris et al., 1994). The scores on the original Barthel Index ranged from 0 to 100, in five-point increments, with a higher score corresponding to a lower level of dependency. However, the scale can be rescored in one-point increments (Collin et al., 1988), and the rescored version is used here. The scores on the Barthel Index have been grouped into five categories (0–4, 5–8, 9–12, 13–16, 17–20), following Granger et al. (1979), but with an additional subdivision of the group of higher scores. However, for table C6 the information for 1995 was available for the four groups identified by Granger et al., and so the comparative information is shown for the low and very low dependence categories combined. The MDS CPS is a seven-category scale, ranging from 0 ('intact') to 6 ('very severe impairment').

Table C1: Demographic characteristics of surveyed individuals

	Care homes		Home care	
	No.	%	No.	%
Age group				
65 to 69	23	2.8	28	7.5
70 to 74	56	6.8	40	10.7
75 to 79	107	13.0	65	17.3
80 to 84	190	23.2	115	30.7
85 to 89	214	26.1	68	18.1
90 and over	230	28.0	59	15.7
Sex				
Male	228	28.2	100	26.7
Female	581	71.8	275	73.3
Missing	11	–	0	–
Marital status				
Single	78	10.0	41	10.9
Married/living as married	154	19.7	76	20.3
Divorced/separated	30	3.8	33	8.8
Widowed	519	66.5	225	60.0
Missing	39	–	0	–
Ethnic origin				
White	776	97.7	342	91.2
Non-white	18	2.3	33	8.8
Missing	26	–	0	–
Household tenure				
Owner occupied/mortgaged	212	33.4	175	47.0
Rented from LA/HA	328	51.7	167	44.9
Privately rented	94	14.8	25	6.7
Other	0	0.0	5	1.3
Missing	186	–	3	–
Household size				
Living alone	462	73.7	247	65.9
Living with others	165	26.3	128	34.1
Missing	193	–	0	–
Specialised housing				
No	330	49.8	283	75.7
Sheltered housing	150	22.6	91	24.3
Care home	183	27.6	–	–
Missing	157	–	1	–
Number of cases	820	100.0	375	100.0

Table C2: Receipt of informal and formal care by surveyed individuals

	Care homes		Home care	
	No.	%	No.	%
Receipt of informal care				
Live with informal carer	174	23.1	90	24.0
Contact every day/nearly	248	32.9	13	3.5
Contact 2–3 times a week	85	11.3	8	2.1
Contact once a week	54	7.2	5	1.3
Contact less often	21	2.8	0	0.0
Contact frequency not known	28	3.7	213	56.8
No informal care	144	19.1	46	12.3
Missing	66	–	0	–
Receipt of LA home care in last month				
No	207	35.1	14	3.8
1–5 hours per week	58	9.8	130	34.9
6–10 hours per week	114	19.4	102	27.3
11–15 hours per week	71	12.1	67	18.0
16–20 hours per week	31	5.3	26	7.0
21 hours per week or more	39	6.6	34	9.1
Frequency not known	36	6.1	0	0.0
Receipt not known	33	5.6	0	0.0
In care home	183	–	–	–
Missing	48	–	2	–
Receipt of priv. home care in last month				
No	360	72.1	268	72.0
1–5 hours per week	32	6.4	61	16.4
6–10 hours per week	11	2.2	17	4.6
11–15 hours per week	4	0.8	7	1.9
16–20 hours per week	4	0.8	8	2.2
21 hours per week or more	8	1.6	11	3.0
Frequency not known	13	2.6	0	0.0
Receipt not known	67	13.4	0	0.0
In care home	183	–	–	–
Missing	138	–	3	–
Visits to day centre in last month				
None	349	63.9	298	79.5
Every day/nearly	32	5.9	0	0.0
2–3 times a week	62	11.4	26	6.9
Once a week	38	7.0	24	6.4
Less often	0	0.0	27	7.2
Frequency not known	7	1.3	0	0.0
Receipt not known	58	10.6	0	0.0
In care home	183	–	–	–
Missing	91	–	0	–
Receipt of meals on wheels in last month				
None	325	63.7	312	83.2
Every day/nearly	90	17.6	49	13.1
2–3 times a week	24	4.7	12	3.2
Once a week	0	0.0	2	0.5
Less often	0	0.0	0	0.0
Frequency not known	15	2.9	0	0.0
Receipt not known	56	11.0	0	0.0
In care home	183	–	–	–
Missing	127	–	0	–

Table C3: Financial circumstances of surveyed individuals

	Care homes		Home care	
	No.	%	No.	%
Receipt of Pension Credit				
Yes	433	65.7	138	45.1
No	145	22.0	121	39.5
Don't know	81	12.3	47	15.4
Missing	161	–	69	–
Receipt of Housing Benefit				
Yes	179	25.0	106	37.7
No	378	52.8	158	56.2
Don't know	159	22.2	17	6.0
Missing	104	–	94	–
Receipt of Council Tax Benefit				
Yes	191	26.7	145	52.2
No	360	50.3	85	30.6
Don't know	165	23.0	48	17.3
Missing	104	–	97	–
Receipt of Attendance Allowance				
Yes	199	29.1	261	69.6
No	344	50.4	80	21.3
Don't know	140	20.5	34	9.1
Missing	137	–	0	–
Receipt of Disability Living Allowance				
Care and mobility components	8	1.2	9	7.9
Care component	8	1.2	3	2.6
Mobility component	9	1.4	9	7.9
Component not known	123	18.6	16	14.0
No	384	58.1	58	50.9
Don't know	129	19.5	19	16.7
Missing	159	–	261	–
Income per week				
£0	4	0.6	18	7.3
£1–£105	124	19.5	32	12.9
£106–£160	361	56.8	83	33.5
£161–£250	128	20.1	80	32.3
£251 and over	19	3.0	35	14.1
Missing	184	–	127	–
Savings				
£12,250 or below	507	77.4	192	58.9
£12,251–£20,000	95	14.5	19	5.8
Over £20,000	21	3.2	29	8.9
Not known	32	4.9	50	15.3
Refused to answer	–	–	36	11.0
Missing	165	–	49	–
Number of cases	820	100.0	375	100.0

Table C4: Disability and limiting longstanding illness of surveyed individuals

	Care homes	Home care
	%	%
Unable to do without help		
Get up/down stairs or steps	80.4	63.7
Go out of doors	87.3	73.1
Get around indoors (except steps)	53.3	17.9
Get in/out of bed (or chair)	50.8	22.4
Use WC	58.6	21.1
Wash face and hands	57.7	18.9
Bath/shower/wash all over	92.8	67.5
Dress/undress	82.6	42.1
Feed self	30.3	9.3
Number of 9 self-care tasks assisted with		
None	3.6	16.0
1	2.9	12.3
2	5.7	15.5
3	7.3	17.1
4	11.7	12.0
5	8.3	5.6
6	10.3	4.0
7	11.1	5.9
8	15.3	5.1
9	24.0	6.7
Limiting longstanding illness		
No	6.2	18.9
Yes	93.8	81.1
Number of cases		
Total	820	375
Minimum valid number	701	375

Table C5: Characteristics of admissions, by type of care home placement

	Personal care		Nursing care		All types of care	
	No.	%	No.	%	No.	%
Age group						
65 to 69	9	1.8	12	4.4	21	2.7
70 to 74	29	5.9	23	8.5	52	6.8
75 to 79	62	12.6	38	14.0	100	13.1
80 to 84	121	24.5	51	18.8	172	22.5
85 to 89	126	25.5	72	26.6	198	25.9
90 and over	147	29.8	75	27.7	222	29.0
Total	494	100.0	271	100.0	765	100.0
Missing	–	–	–	–	55	–
Sex						
Male	131	26.8	82	30.8	213	28.2
Female	357	73.2	184	69.2	541	71.8
Total	488	100.0	266	100.0	754	100.0
Missing	–	–	–	–	66	–
Source of admission						
Domestic household	131	27.2	45	17.2	176	23.7
Sheltered housing	48	10.0	8	3.1	56	7.5
Care home	56	11.6	46	17.6	102	13.7
Hospital	184	38.3	141	53.8	325	43.7
Intermediate care	35	7.3	11	4.2	46	6.2
Other temporary accommodation	27	5.6	11	4.2	38	5.1
Total	481	100.0	262	100.0	743	100.0
Missing	–	–	–	–	77	–
Barthel Index of ADL (grouped)						
Very low dependence (Score 17–20)	42	10.3	7	3.1	49	7.7
Low dependence (Score 13–16)	95	23.3	21	9.2	116	18.2
Moderate dependence (Score 9–12)	130	31.9	21	9.2	151	23.7
Severe dependence (Score 5–8)	86	21.1	57	25.0	143	22.5
Total dependence (Score 0–4)	55	13.5	122	53.5	177	27.8
Total	408	100.0	228	100.0	636	100.0
Missing	–	–	–	–	184	–
MDS Cognitive Performance Scale						
Intact (0)	67	14.9	36	15.1	103	15.0
Borderline intact (1)	39	8.7	16	6.7	55	8.0
Mild impairment (2)	52	11.6	24	10.1	76	11.1
Moderate impairment (3)	114	25.4	33	13.9	147	21.4
Moderately severe impairment (4)	61	13.6	33	13.9	94	13.7
Severe impairment (5)	108	24.1	73	30.7	181	26.3
Very severe impairment (6)	8	1.8	23	9.7	31	4.5
Total	449	100.0	238	100.0	687	100.0
Missing	–	–	–	–	133	–
Number of cases						
Total	494	64.6	271	35.4	765	100.0
Missing	–	–	–	–	55	–

Table C6: Characteristics of admissions to care homes, 1995 and 2005

	1995 survey %	2005 survey %
Age group		
65 to 69	3.3	2.8
70 to 74	9.0	6.8
75 to 79	16.8	13.0
80 to 84	26.1	23.2
85 and over	44.8	54.1
Sex		
Male	29.2	28.2
Female	70.8	71.8
Source of admission		
Domestic household	28.2	23.6
Sheltered housing	5.3	7.8
Care home	12.9	13.2
Hospital	52.1	44.6
Intermediate care	–	5.8
Other temporary accommodation	–	5.1
Other	1.5	–
Barthel Index of ADL (grouped)		
Low dependence (Score 13–20)	33.7	25.7
Moderate dependence (Score 9–12)	24.2	23.8
Severe dependence (Score 5–8)	23.0	23.2
Total dependence (Score 0–4)	19.2	27.4
MDS Cognitive Performance Scale		
Intact (0)	20.2	14.8
Borderline intact (1)	12.7	8.3
Mild impairment (2)	11.2	10.9
Moderate impairment (3)	21.1	21.1
Moderately severe impairment (4)	8.4	13.2
Severe impairment (5)	24.4	27.2
Very severe impairment (6)	2.1	4.6
Number of cases		
Total	2438	820
Minimum valid number	2287	682

Appendix D

Construction of Local Authority Census Counts for RNF Indicators

Table D1: Construction of local authority census counts for RNF indicators

Indicator	2001 Census
People aged 65+ living in private households	S0040256 + S0040273 + S0040290 + S0040307 + S0040324 + S0040341
People aged 75-79 living in private households	S0040290
People aged 80-84 living in private households	S0040307
People aged 85+ living in private households	S0040324 + S004034
People aged 65+ who are living alone	T050577 + T050578 + T050579 + T050583 + T050584 + T050585
People aged 65+ who are married (or living as married)	T050538 + T050539 + T050540 + T050544 + T050545 + T050546 + T050551 + T050552 + T050553 + T050557 + T050558 + T050559
People aged 65+ who are single and living with others	T050525 + T050526 + T050527 + T050531 + T050532 + T050533 + T050564 + T050565 + T050566 + T050570 + T050571 + T050572
People aged 65+ not in owner occupation (renting)	T050460 + T050461 + T050462 + T050466 + T050467 + T050468 + T050473 + T050474 + T050475 + T050479 + T050480 + T050481 + T050486 + T050487 + T050488 + T050492 + T050493 + T050494 + T050499 + T050500 + T050501 + T050505 + T050506 + T050507
People aged 65+ living in private households with limiting longstanding illness	S0160218 + S0160230 + S0160242 + S0160254 + S0160266 + S0160278
People aged 65+ whose ethnic group is non- White	T13137 – T13138 – T13139 – T13140 + T13154 – T13155 – T13156 – T13157

Cell numbering conventions follow the 2001 Census Standard and Theme tables.

Appendix E

Prediction of Care Home Costs for Missing Pre-Care Addresses

Table E1: OLS regression for cross-prediction of care home expenditure for data without pre-care addresses

Variables	Coeff.	Std. Err.	t-stat.	Prob.
Population 65+	0.003442	0.001104	3.12	0.002
Population 65+ (squared)	-1.21E-06	3.86E-07	-3.13	0.002
AA claimants	28.64645	22.53909	1.27	0.204
AA claimants (squared)	-71.7942	88.01404	-0.82	0.415
LLSI per capita	0.416729	0.759687	0.55	0.584
Pensioners who own home per capita	-10.803	2.365563	-4.57	0
One pensioner households per capita	-4.10395	3.157322	-1.3	0.194
Pension Credit claimants per capita	9.537968	3.11471	3.06	0.002
Ratio of females to males	-3.09234	7.91237	-0.39	0.696
Pop 75 to 84 per capita (65+)	-0.70288	0.152935	-4.6	0
Pop 85 to 94 per capita (65+)	2.300388	0.542324	4.24	0
Pop 90+ per capita (65+)	1.629931	0.699212	2.33	0.02
Gross weekly female wages (median)	0.047993	0.035732	1.34	0.18
Gross weekly female wages (mean)	-0.09331	0.029938	-3.12	0.002
Area of ward	-0.00048	0.000171	-2.8	0.005
Area of ward (squared)	3.34E-08	1.32E-08	2.53	0.012
Population density	-0.00249	0.012897	-0.19	0.847
Fixed effects				
Unitary authority	1.934536	0.899335	2.15	0.032
Durham	-3.5779	0.854358	-4.19	0
Poole	-3.32414	1.332963	-2.49	0.013
Hampshire	3.332538	0.430961	7.73	0
(Other authorities - dropped in the regression due to extreme collinearity)				
Constant	30.85909	5.011556	6.16	0

Dependent variable	Care home expenditure per capita (65+)
n	565
F(21, 543)	17.45
Prob > F	0.0000
R-squared	0.3638
Root MSE	3.388
RESET test	1.90

Table E2: Predicted values of care home costs per capita for wards without pre-care addresses

Census Wardcode	Care home cost per capita 65
00ANGA	1.74644
00ANGB	4.90255
00ANGC	2.62441
00ANGD	3.71357
00ANGE	5.11178
00ANGF	2.89145
00ANGG	4.74588
00ANGH	1.20497
00ANGJ	3.57821
00ANGK	2.59814
00ANGL	1.97061
00ANGM	2.34727
00ANGN	3.41683
00ANGP	5.25845
00ANGQ	1.75948
00ANGR	4.7439
00AYFZ	6.0995
00AYGA	7.17904
00AYGB	5.73875
00AYGC	7.21488
00AYGD	10.8717
00AYGE	8.91863
00AYGF	6.6769
00AYGG	5.35928
00AYGH	6.08109
00AYGJ	7.98576
00AYGK	8.62461
00AYGL	7.41421
00AYGM	5.81729
00AYGN	6.75989
00AYGP	5.4192
00AYGQ	2.71138
00AYGR	5.7458
00AYGS	4.91979
00AYGT	4.57097
00AYGU	6.13509
00AYGW	9.22561
00BCFY	7.54974
00BCFZ	7.01754
00BCGA	7.42039
00BCGB	7.13433
00BCGC	7.23105
00BCGD	6.6021
00BCGE	10.2911
00BCGF	10.3067
00BCGG	7.27124
00BCGH	6.79393
00BCGJ	8.53671
00BCGK	6.55858
00BCGL	12.1483
00BCGM	6.91575
00BCGN	6.76759
00BCGP	6.99383
00BCGQ	5.63167
00BCGR	8.23743

00BCGS	8.95522
00BCGT	10.1963
00BCGU	7.04072
00BEGC	5.26699
00BEGD	7.45794
00BEGE	4.92582
00BEGF	4.7259
00BEGG	-1.6706
00BEGH	1.05881
00BEGJ	5.8072
00BEGK	4.4856
00BEGL	4.81081
00BEGM	5.08706
00BEGN	4.2836
00BEGP	5.09887
00BEGQ	7.88968
00BEGR	1.52892
00BEGS	4.40886
00BEGT	4.75318
00BEGU	4.61001
00BEGW	1.3529
00BEGX	4.75672
00BEGY	4.08261
00BEGZ	-0.368
00BNFA	16.3569
00BNFB	10.3303
00BNFC	12.8605
00BNFD	15.4132
00BNFE	15.2754
00BNFF	11.467
00BNFG	13.0967
00BNFH	8.89001
00BNFJ	10.6471
00BNFK	16.0771
00BNFL	11.6085
00BNFM	14.3829
00BNFN	10.7035
00BNFP	10.5655
00BNFQ	6.59206
00BNFR	13.7346
00BNFS	11.5724
00BNFT	11.9754
00BNFU	15.0268
00BNFW	16.9949
00BNFX	10.4195
00BNFY	8.93777
00BNFZ	14.8721
00BNGA	14.1303
00BNGB	9.04197
00BNGC	12.5843
00BNGD	9.69111
00BNGE	11.9249
00BNGF	13.1522
00BNGG	12.3186
00BNGH	10.644
00BNGJ	9.48505
00BNGK	9.655
00BSFA	9.40972
00BSFB	15.2446
00BSFC	13.073
00BSFD	6.23126

00BSFE	7.47392
00BSFF	6.4654
00BSFG	11.3519
00BSFH	4.8641
00BSFJ	10.5208
00BSFK	9.86317
00BSFL	6.52535
00BSFM	5.57873
00BSFN	8.18112
00BSFP	9.71722
00BSFQ	10.5494
00BSFR	9.10592
00BSFS	10.3041
00BSFT	7.16474
00BSFU	7.00882
00BSFW	11.6755
00BSFX	5.89675
00CJFA	15.9793
00CJFB	14.8482
00CJFC	19.4721
00CJFD	9.34627
00CJFE	9.59342
00CJFF	12.5942
00CJFG	16.8537
00CJFH	12.7993
00CJFJ	11.3387
00CJFK	10.8373
00CJFL	13.2415
00CJFM	13.9833
00CJFN	12.3712
00CJFP	13.7476
00CJFQ	18.1156
00CJFR	18.5199
00CJFS	15.0829
00CJFT	16.5463
00CJFU	15.029
00CJFW	12.2392
00CJFX	19.6507
00CJFY	14.1248
00CJFZ	21.1925
00CJGA	7.69278
00CJGB	12.1943
00CJGC	13.7486
00FKMX	11.4652
00FKMY	-2.2123
00FKMZ	8.212
00FKNA	14.2096
00FKNB	5.18088
00FKNC	6.06615
00FKND	5.39759
00FKNE	7.86982
00FKNF	10.4008
00FKNG	8.42412
00FKNH	7.10476
00FKNJ	5.02382
00FKNK	2.74033
00FKNL	10.5987
00FKNM	6.16143
00FKNN	11.3024
00FKNP	5.25976
00HNMW	12.9342

00HNMX	19.1424
00HNMY	15.2903
00HNMZ	15.5961
00HNNA	10.1403
00HNNB	10.2749
00HNNC	12.8248
00HNND	12.9084
00HNNE	11.9966
00HNNF	19.0607
00HNNG	10.8694
00HNNH	12.3806
00HNNJ	16.1543
00HNNK	11.1163
00HNNL	14.0012
00HNNM	16.4945
00HNNN	12.8899
00HNNP	12.4425
00KFMP	12.2543
00KFMQ	14.3721
00KFMR	22.7242
00KFMS	11.3332
00KFMT	18.4952
00KFMU	13.4791
00KFMW	18.6688
00KFMX	14.9224
00KFMY	13.1691
00KFMZ	13.5233
00KFNA	15.1022
00KFNB	11.2323
00KFNC	8.55315
00KFND	17.4863
00KFNE	13.1332
00KFNF	12.807
00KFNG	12.6146
24UBJN	10.697

Appendix F

Calculation of the Total Spend for Individual CSSRs

For the rates model, total spend T can be found by summing across N wards in the LA as follows, where P is population 65+, the x^s are the S variables in the model, the α is the constant and the β's the coefficients from the model. The subscript numbers denote wards and the subscript 'LA' denotes the total for the local authority.

$$\frac{T_1}{P_1}+...+\frac{T_N}{P_N}=\alpha N+\beta_1\left(\frac{x_1^1}{P_1}+...+\frac{x_N^1}{P_N}\right)+...+\beta_S\left(\frac{x_1^S}{P_1}+...+\frac{x_N^S}{P_N}\right)$$

or

$$\frac{T_{LA}}{P_{LA}}N=\alpha N+\beta_1\frac{x_{LA}^1}{P_{LA}}N+...+\beta_S\frac{x_{LA}^S}{P_{LA}}N$$

or

$$T_{LA}=\left(\alpha+\beta_1\frac{x_{LA}^1}{P_{LA}}+...+\beta_S\frac{x_{LA}^S}{P_{LA}}\right)P_{LA}$$

For the totals model:

$$T_{LA}=T_1+...+T_N=\alpha N+\beta_1\left(x_1^1+...+x_N^1\right)+...+\beta_{S-1}\left(x_1^{S-1}+...+x_N^{S-1}\right)+\beta_S\left(\frac{x_1^S}{P_1}+...+\frac{x_N^S}{P_N}\right)$$

and so,

$$T_{LA}=\alpha N+\beta_1 x_{LA}^1+...+\beta_{S-1}x_{LA}^{S-1}+\beta_S N\frac{x_{LA}^S}{P_{LA}}$$

Appendix G

Relative Need as Predicted by the Small Area Models

Table G1: Relative need as predicted by the models (where England's relative need = 1 for both models)

CSSR	Rates model	Totals model
Barking and Dagenham	1.276236	1.164197
Barnet	0.991391	0.891085
Barnsley	1.058421	1.141117
Bath & North East Somerset	0.832492	0.801066
Bedfordshire	0.805419	0.782932
Bexley	0.783483	0.745768
Birmingham	1.313466	1.268954
Blackburn with Darwen	1.169483	1.259366
Blackpool	1.108804	1.22056
Bolton	1.104444	1.148282
Bournemouth	1.041941	0.969461
Bracknell Forest	0.781703	0.707361
Bradford	1.059185	1.105048
Brent	1.065702	1.042634
Brighton & Hove	1.097675	1.035286
Bristol	1.134524	1.046095
Bromley	0.770523	0.7103
Buckinghamshire	0.736777	0.690831
Bury	0.987248	1.045661
Calderdale	1.017666	0.976512
Cambridgeshire	0.835875	0.809179
Camden	1.423531	1.315424
Cheshire	0.813173	0.82805
City of London	1.112273	0.664263
Cornwall	0.924063	0.952341
Coventry	1.076949	1.111582
Croydon	0.86222	0.893513
Cumbria	0.896626	0.966279
Darlington	0.94944	1.032413
Derby	1.022473	1.027288
Derbyshire	0.976915	0.993181
Devon	0.832215	0.891957
Doncaster	0.95827	1.046263
Dorset	0.721167	0.808015
Dudley	1.003567	1.031286
Durham	1.064394	1.153799
Ealing	1.043964	1.006702
East Riding of Yorkshire	0.816551	0.804748
East Sussex	0.8205	0.909114
Enfield	1.042001	0.998281
Essex	0.84222	0.822944
Gateshead	1.113088	1.165034

Gloucestershire	0.830144	0.808534
Greenwich	1.181843	1.087419
Hackney	1.787071	1.632763
Halton	1.086426	1.161588
Hammersmith and Fulham	1.293533	1.126341
Hampshire	0.69822	0.699083
Haringey	1.356819	1.318423
Harrow	0.970364	0.875304
Hartlepool	1.090121	1.169946
Havering	0.793551	0.790095
Herefordshire	0.822898	0.873594
Hertfordshire	0.851435	0.788536
Hillingdon	0.86875	0.804211
Hounslow	1.028903	0.978535
Isle of Wight Council	0.835679	1.058323
Isles of Scilly	0.647471	0.888034
Islington	1.611917	1.501967
Kensington and Chelsea	1.155323	1.002943
Kent	0.817823	0.843543
Kingston upon Hull	1.253812	1.189313
Kingston upon Thames	0.862243	0.793948
Kirklees	0.987372	0.996825
Knowsley	1.203261	1.301726
Lambeth	1.325384	1.303627
Lancashire	0.924631	1.011784
Leeds	1.030394	0.963289
Leicester	1.263793	1.256308
Leicestershire	0.769542	0.783543
Lewisham	1.257282	1.149774
Lincolnshire	0.802086	0.873592
Liverpool	1.386769	1.438484
Luton	0.951357	0.985471
Manchester	1.441625	1.419763
Medway	0.813416	0.883952
Merton	0.894558	0.824281
Middlesbrough	1.075983	1.14955
Milton Keynes	0.942569	0.964477
Newcastle upon Tyne	1.218775	1.184568
Newham	1.591848	1.591831
Norfolk	0.842587	0.911026
North East Lincolnshire	1.000778	1.019421
North Lincolnshire	0.836861	0.91234
North Somerset	0.847409	0.889193
North Tyneside	1.054421	1.082411
North Yorkshire	0.787695	0.84029
Northamptonshire	0.884052	0.875061
Northumberland	0.903062	1.010553
Nottingham	1.241632	1.238125
Nottinghamshire	0.865527	0.918613
Oldham	1.134614	1.172179
Oxfordshire	0.797334	0.733005
Peterborough	0.984504	1.000677

Plymouth	1.004022	1.015207
Poole	0.796976	0.78266
Portsmouth	0.961968	0.960679
Reading	0.854624	0.844064
Redbridge	1.013058	0.962355
Redcar and Cleveland	0.937571	1.02695
Richmond upon Thames	0.879286	0.779809
Rochdale	1.134686	1.162297
Rotherham	1.064017	1.094185
Rutland	0.692154	0.685717
Salford	1.295446	1.293284
Sandwell	1.2552	1.281886
Sefton	0.993923	1.064234
Sheffield	1.182225	1.109303
Shropshire	0.884038	0.939452
Slough	0.949552	0.88588
Solihull	0.777807	0.796075
Somerset	0.832343	0.889281
South Gloucestershire	0.746225	0.723386
South Tyneside	1.147149	1.177765
Southampton	1.010838	0.977592
Southend-on-Sea	1.049118	1.00158
Southwark	1.334429	1.209622
St Helens	1.043586	1.14858
Staffordshire	0.85565	0.903955
Stockport	0.908332	0.917548
Stockton-on-Tees	0.903183	0.966689
Stoke-on-Trent	1.112741	1.166579
Suffolk	0.854171	0.866098
Sunderland	1.133923	1.264146
Surrey	0.721625	0.687843
Sutton	0.859506	0.825131
Swindon	0.851431	0.857317
Tameside	1.159654	1.193
Telford and the Wrekin	0.998767	1.037207
Thurrock	0.91799	0.898762
Torbay	1.071016	1.073612
Tower Hamlets	1.717093	1.629096
Trafford	0.937505	0.976168
Wakefield	1.027883	1.07574
Walsall	1.113651	1.133942
Waltham Forest	1.296644	1.221144
Wandsworth	1.173463	1.070455
Warrington	0.907896	0.959272
Warwickshire	0.855299	0.868477
West Berkshire	0.718863	0.657207
West Sussex	0.756667	0.802584
Westminster	1.188711	1.018219
Wigan	1.069314	1.188297
Wiltshire	0.773647	0.748456
Windsor and Maidenhead	0.692469	0.655334
Wirral	1.027646	1.077456

Wokingham	0.577533	0.544529
Wolverhampton	1.152754	1.154824
Worcestershire	0.848842	0.879808
York	0.782368	0.80691
England	**1**	**1**

Appendix H

Alternative Specifications of the Small Area Models – Testing Age and Ethnicity Variables

Table H1 is a re-run of the main rates model (see table 19) swapping the proportion of the population over 90 with the proportion over 85. Since age is correlated with both need and household composition, the result produces multicollinearity with effect to these other variables. This does not introduce bias in the coefficients, but does render the one person household variable insignificant.

Table H1: Estimation of expenditure per ward as a rate per head of population 65 plus – including over 85s variable

Totncost_p65	Coeff.	Std. Err.	t-stat.	Prob.	[95% Conf.	Interval]
Price	-12.8903	4.854477	-2.66	0.008	-22.4049	-3.3757
AAclaim_p65	14.74243	4.814364	3.06	0.002	5.306449	24.17841
Renting_p65	4.929176	1.440768	3.42	0.001	2.105322	7.75303
One_pers_p65	0.416108	2.426138	0.17	0.864	-4.33904	5.171251
PCclaim_p65	17.94104	1.854382	9.67	0.000	14.30652	21.57556
Pop85_p65	46.2251	3.986267	11.6	0.000	38.41216	54.03804
_cons	10.54202	4.810928	2.19	0.028	1.112779	19.97127
sigma_u	2.4197753					
sigma_e	3.8814115					
rho	.27988172	(fraction of variance due to u_i)				

Number of obs = 775
Number of groups = 17

Obs per group: min = 16
              avg = 45.6
              max = 249

R-sq: within = 0.4750
    between = 0.4364
    overall = 0.4573

corr(u_i, X) = 0 (assumed)

Wald chi-sq (6) = 675.73
Prob > chi-sq = 0.0000

Instrumented: Price
Instruments: AAclaim_p65, Renting_p65, One_pers_p65, PCclaim_p65, Pop90_p65, Aca, Wage_avsq, Wage_md, Area, Areasq, Density

Table H2 shows the results of adding an ethnicity indicator to the main model (in table 19). Specifically the proportion of white people in the older population was used. Further breakdowns of ethnicity were inadvisable because of the small numbers

involved (approximately 5 per cent or less of the sample ward populations on average for the other main ethnicity categories). The table shows that the ethnicity variable was insignificant. If this ethnicity variable were cast as the proportion of non-white people, the relevant coefficient in that estimation would remain insignificant.

Table H2: Estimation of expenditure per ward as a rate per head of population 65 plus – including ethnicity variable

Totncost_p65	Coeff.	Std. Err.	t-stat.	Prob.	[95% Conf.	Interval]
Price	-14.63701	3.832243	-3.82	0.000	-22.14807	-7.125949
AAclaim_p65	19.99822	4.819504	4.15	0.000	10.55217	29.44428
Renting_p65	3.371566	1.508112	2.24	0.025	.415721	6.32741
One_pers_p65	5.186303	2.521557	2.06	0.040	.2441415	10.12846
PCclaim_p65	17.5423	2.072526	8.46	0.000	13.48022	21.60437
Pop90_p65	74.18179	7.716248	9.61	0.000	59.05822	89.30536
White_p65	1.323995	1.015763	1.30	0.192	-.6668635	3.314853
_cons	10.49001	3.937966	2.66	0.008	2.771737	18.20828

sigma_u	2.1893645					
sigma_e	4.6954708					
rho	.17858348	(fraction of variance due to u_i)				

Number of obs = 775
Number of groups = 17

Obs per group: min = 16
          avg = 45.6
          max = 249

R-sq: within = 0.4447
    between = 0.4315
    overall = 0.4274

corr(u_i, X) = 0 (assumed)

Wald chi-sq (6) = 589.39
Prob > chi-sq = 0.0000

Instrumented: Price
Instruments: AAclaim_p65, Renting_p65, One_pers_p65, PCclaim_p65, Pop90_p65, Aca, Wage_avsq, Wage_md, Area, Areasq, Density

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