PSSRU
Personal Social Services Research Unit

Exploring the use of micro data for estimating a Relative Needs Formula for older people's additional assessments following the introduction of a universal cap on social care expenditure[1]

Interim working paper

Jose-Luis Fernandez

Tom Snell

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University of Kent

University of Kent
Cornwallis Building
Canterbury
Kent
CT2 7NF
Tel: 01227 823963
pssru@kent.ac.uk

London School of Economics

London School of Economics
LSE Health & Social Care
Houghton Street
London
WC2A 2AE
Tel: 020 7955 6238
pssru@lse.ac.uk

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1 Contents

2 Background

Relative needs formulae (RNFs) are used to calculate how central government grants should be distributed across local authorities in England. They reflect a range of local characteristics associated with the need for services. The RNF for Older people's Personal Social Services (PSS) helps determine the allocation of central government funding for adults aged 65 and over receiving care in institutions and in the community, and the associated costs of assessments, care management and administration.

The cap on social care costs due to be introduced in April 2016 will mean that all individuals with social care needs will become eligible for state-supported care should the costs associated with their lifetime needs exceed £72,000. Consequently, it is expected that the number of individuals approaching local authorities to have their care needs assessed will increase significantly.

Given that the ratio of publicly- to privately-funded social care recipients varies across authorities, the additional number of assessments and associated expenditure cannot be calculated accurately on the basis of the existing social care RNF formula or of existing LA social care activity. The methodology described in this paper develops a formula which identifies the relative need for additional assessments for over 65s that might follow the introduction of the funding reforms.

3 Methods

RNFs for older peoples' PSS are traditionally based on data aggregated at the geographical area about factors such as population size, age and gender profiles, proxies of informal care provision and indicators of deprivation and wealth. While data of this type provide a good basis for comparing authorities, their aggregate nature limits the capacity for the analysis to capture potentially important individual-level interactions between for instance need and wealth factors. Doing so is important because local authority activity concentrates on people with high levels of need and with low income and wealth.

The paper includes two alternative **methods** for estimating relative local social care need using individual-level data in an attempt to capture (as best as possible) interactions between population characteristics.

This aim would be most easily achieved using individual level data sources for each local authority containing indicators of income, wealth and need for social care support. Were these data to exist, a spending formula could be derived straightforwardly by "counting" or aggregating up for each LA the numbers of people with a target combination of characteristics. In the present case, the analysis aims to understand the additional number of individuals that might approach social care services in order to be assessed following the implementation of the funding reforms. This additional burden of assessments could be assumed to be proportional to the numbers of individual with social care needs and excluded from state support at present on the grounds of their income and wealth.

Unfortunately, no single data source has sufficient data (in terms of the number of observations and appropriateness of the indicators required) to quantify directly numbers of people with combinations of social care need, income and wealth at the local authority level. The approaches explored in this report therefore combine data from a number of sources in order to derive such estimates.

Both methods quantify the numbers of individuals with social care needs in the community and in residential care separately, and then aggregate the two sets of estimates in order to produce a total indicator of local social care need, differentiating between self-payers and local authority supported individuals. In the following sections, we describe the strategy adopted for estimating local levels of social care need in residential care and the approaches developed to estimate local social care need in the community.

3.1 Estimating local need for social care

The definition of what constitutes need is a particularly important but challenging element of the analysis. Whereas local authorities in England are free to set their minimum eligibility criteria, the development of an allocation formula requires that the same definition of "entitled need" is applied across all areas to prevent the indicators of relative need from reflecting differences in local policy preferences.

3.1.1 Local need in residential care

A two-step approach was taken to estimate the level of need across local areas. In the first instance, the analysis estimated the local level of social care need in residential care. The analysis assumed that all older people in residential care across England, either supported by a local authority or privately funded, would meet the "national" implicit minimum eligibility criteria for social care. The calculation of supported residents and self-funders in each area took account of out of area placements.

The number of residential care users associated with a given authority was therefore calculated as the sum of the care home residents supported by the authority (living in the authority or in an out of area placement) and the numbers of private residents living in the area.

The number of supported residents was taken from the S2 returns provided by the authorities. The number of privately-funded care home residents was estimated by subtracting the number of supported residents living in a given area from the number of older people in residential and nursing homes according to Census 2011. Since not all supported care home residents reside within the local authority responsible for funding their care, numbers of state-funded recipients were first redistributed to their area of residence on the basis of pooled Capturing Regulatory Information at a Local Level (CRILL) data collected between 2007 and 2009[1]. This data provides a matrix showing the distribution of out-of-area placements between local authorities. The effect of out-of-area

[1] CRILL data stopped being collected in 2009.

placements is particularly marked in a number of inner-London authorities that host a small number of care home residents relative to the number funded.

3.1.2 Local need in the community

Whereas it can be assumed that all older people living in institutions are sufficiently dependent to meet the "national" minimum needs eligibility threshold, it is much more difficult to establish what proportion of older people in the community would do so. We describe below two strategies for estimating the numbers of community residents in need of social care drawing on evidence from the Census 5% Sample and the English Longitudinal Study of Ageing (ELSA).

The **5% sample of the Census** provides a range of relevant individual-level indicators including age and gender distributions, household size (a strong proxy indicator for receipt of informal care), limiting long-standing illness, home ownership and self-rated health. The very large size of this sample allows the evidence to be aggregated at the local authority level. Census data do not, however, provide indicators of physical dependency which differentiate accurately between different disability levels to determine likely eligibility for care services. Equally, the indicators of socio-economic status contained in the Census 2011 are limited proxies of whether an individual would be entitled to means-tested financial support from the local authority.

Individual level surveys such as the English Longitudinal Study of Ageing (ELSA), on the other hand, provide detailed indicators of need including ability to carry out physical tasks - Activities of Daily Living (ADLs) - and household tasks – Instrumental Activities of Daily Living (IADLs). ELSA also contains detailed information on income and wealth which allows the current means-testing arrangements to be replicated in the model. These surveys, however, are too small to allow estimates to be derived for each local authority.

In what follows, we use two approaches for combining these types of data in order to produce local authority level estimates of relative need.

3.1.2.1 The ELSA-based estimates of need in the community

The first method uses individual-level data from pooled ELSA waves to construct a representative sample of community-based older people in England. Data from the final three waves of ELSA data (collected in 2006-07, 2008-09 and 2010-11) were pooled together and the 2006-07 and 2008-09 data reweighted and rescaled to match 2009-10 population distributions and income levels (Figure 1 provides details of the process undertaken). Adults aged below 65 and those that had moved into institutional settings were excluded from the ELSA analysis sample.

The pooled ELSA dataset provides a nationally-representative sample of older people in the community with information about many of their need and socio-economic characteristics, including:

- Age
- Gender
- Housing tenure
- Benefit receipt
- Income
- Asset wealth
- Receipt of informal care
- Receipt of formal care services
- Longstanding illness
- ADL dependency
- IADL dependency.

Local authority-level information from the 2011 Census was used to reweight the ELSA sample to reflect individual local authority profiles in terms of:

- Age and gender distributions (from 2011 Census)
- Limiting longstanding illness stratified by age and gender (from 2011 Census)
- Receipt of pension credit stratified by age and gender (from DWP)
- Attendance allowance take-up (from DWP)
- Living alone stratified by home ownership (from 2011 Census).

A raking process was applied, iteratively applying each weighting dimension until convergence across all weighting measures was achieved. The resulting 151[2] local authority weights allow us to 'reshape' the ELSA sample to reflect the combinations of characteristics of each local authority population, and of sub-groups of the population within each local authority in terms of combinations of the factors listed above. In particular, the reweighted sample provides estimates of the number of community-based residents in each local authority with particular combinations of characteristics in terms of needs, informal care, income and wealth and living arrangements.

In order to determine which proportion of the population of older people in each local authority would meet the social care eligibility criteria, we: (1) calculated the need characteristics of the current population of older people receiving local authority supported community care services in England (2) estimated "typical care packages" allocated to them (3) determined the assessable income of the population of community recipients in each local area and (4) identified the individuals within each area that would meet needs and/or means-testing eligibility criteria. The stages of the process are summarised in Figure 1.

Pooled data from the Adult Social Care Survey (ASCS) were analysed to determine the distribution of need characteristics of the population of older community-based state-funded care recipients in England. The total numbers of community-supported individuals in England with combinations of ADL count, 10-year age group, gender and informal care receipt were estimated by inflating the

[2] Results excluded the Isles of Scilly owing to data constraints due to small sample sizes.

ASCS distribution to national levels reported in Referrals Assessment and Packages of care returns (2012/13). The probability of care receipt for individuals with different characteristics was derived by comparing their numbers (on the basis of the ASCS data) against the total number of community residents in England with the same characteristics (on the basis of the reweighted ELSA sample). These probabilities were named "targeting ratios" and describe the likelihood that individuals with certain combinations of need-related circumstances will satisfy the needs eligibility threshold.

Care package data from ASCS and the Individual Budgets Service Evaluation Network (IBSEN) project were used to calculate the cost of care services corresponding to clients with combinations of the characteristics listed above.

Current means testing rules were applied to individuals in the ELSA sample in order to estimate their assessable income.

For each individual, their assessable income was compared against the size of their care package in order to determine their eligibility to local authority financial support (those individuals whose assessable income did not exceed the cost of care package were assumed to be entitled to local authority supported care). The value of disability-related disregards was adjusted to the needs of individuals, and set overall to ensure that (i) aggregated care packages costs were aligned with national-level expenditure on community-based services as reported in 2012/13 PSS EX1 data and (ii) the total numbers of recipients across authorities corresponded to levels reported in 2012/13 PSS RAP data at the national level.

The numbers of older people with care needs in the community in each local authority were estimated by applying the targeting ratios to corresponding cell counts from the ELSA-based model. In other words, the reweighted ELSA population of older people in each local authority was segmented by combinations of ADL count, 10-year age group, gender and informal care receipt. The number of older people in each of the segments was then multiplied by its corresponding targeting ratio as defined above in order to get numbers of individuals in each group that would satisfy the needs eligibility criteria. Furthermore, by replicating the existing means testing arrangements, the analysis was able to split the population of older people with social care needs between those that would receive financial support from the local authority and those that would need to fund independently their services.

3.1.2.2 The Census-based estimates of need in the community

An alternative method for estimating need levels in the community was developed using individual-level data with local authority identifiers from the 5% sample of the 2001 Census (the corresponding dataset for the 2011 Census was not available at the time of the study).

While the 5% sample of the Census provides a large and representative sample of residents in each local authority, it does not contain detailed indicators of dependency or income and wealth. We therefore conducted analyses of data from ELSA waves 1-5 to model the correlations between characteristics common to both datasets and more detailed indicators of need and wealth available

in ELSA and necessary to determine eligibility to local authority support. On the basis of these predictions, we synthetically imputed ADL and IADL counts, informal care receipt, pension credit receipt, income and wealth based on explanatory variables in the Census dataset, including:

- Age and gender
- LLSI
- Self-reported health status
- Availability of informal care
- Home ownership
- Household composition
- Marital status.

Where relevant, the analysis of the relationship between individual proxies of need and wealth available in Census and indicators of ADL, IADL, informal care and wealth were stratified. Due to limitations in the numbers of cases, we truncated the indicators of ADL to 3 problems, and defined the indicator in terms of difficulties, in line with ELSA. In order to improve the precision of predicted non-housing wealth, pension credit receipt was imputed as a first stage and rescaled at the local authority level within the Census sample to match expected figures. Additional imputations were conducted using data from the British Household Panel Survey (BHPS) waves 10, 11, 12, 13, 15, 16 and 17. Further details of the imputation process are provided in Fernandez & Snell (2013).

Unlike the ELSA-based model which categorises individuals in terms of likely eligibility in terms of physical dependency, eligibility in the Census-based model is defined in terms of combinations of ADL and IADL limitations. Assumptions are then required about the number ADL activities that correspond to the current need threshold across England.

Figure 1: Overview of the main stages of the weighted ELSA-based dataset

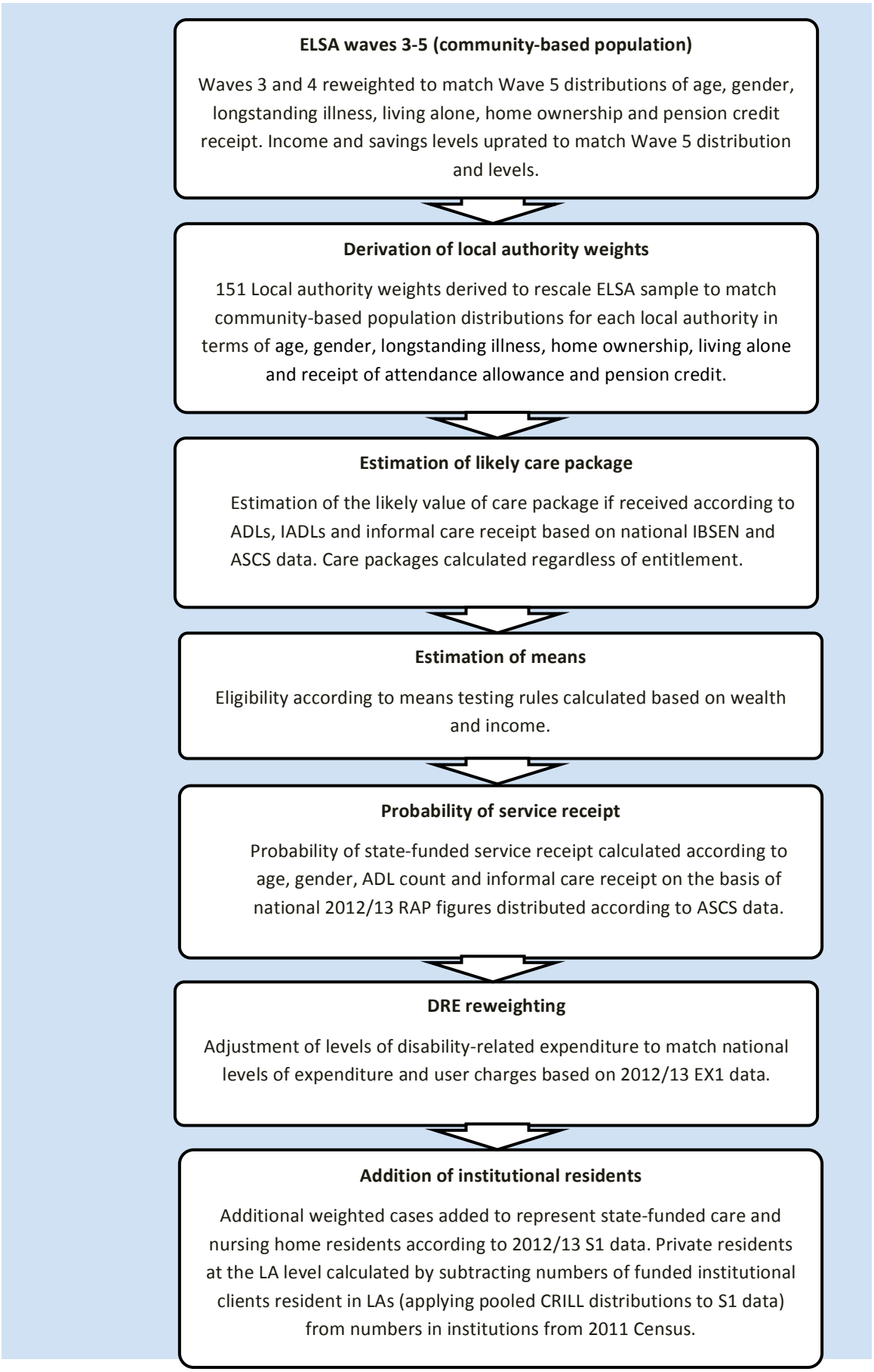


Figure 2 Overview of sources used in constructing the Census-based dataset

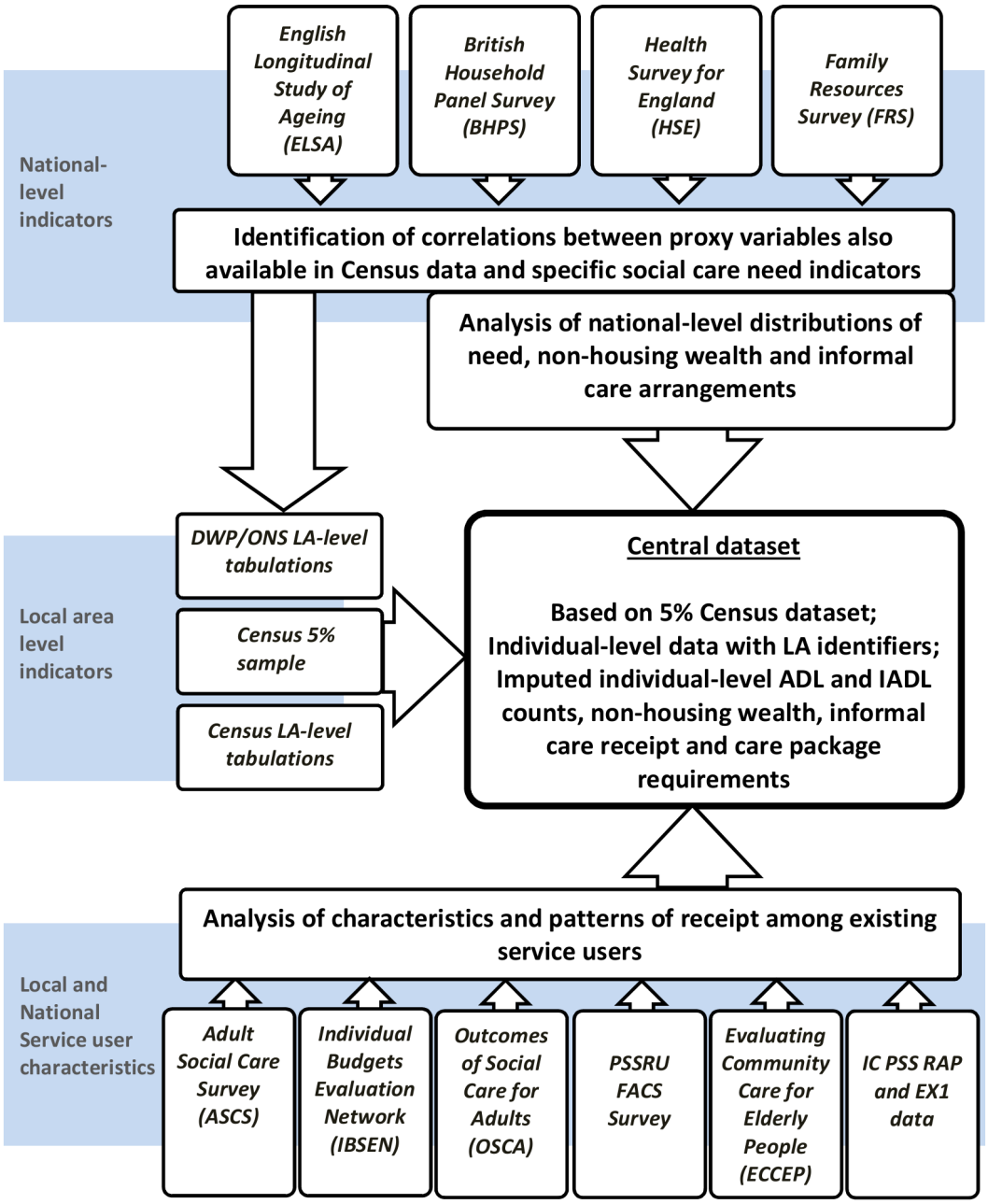
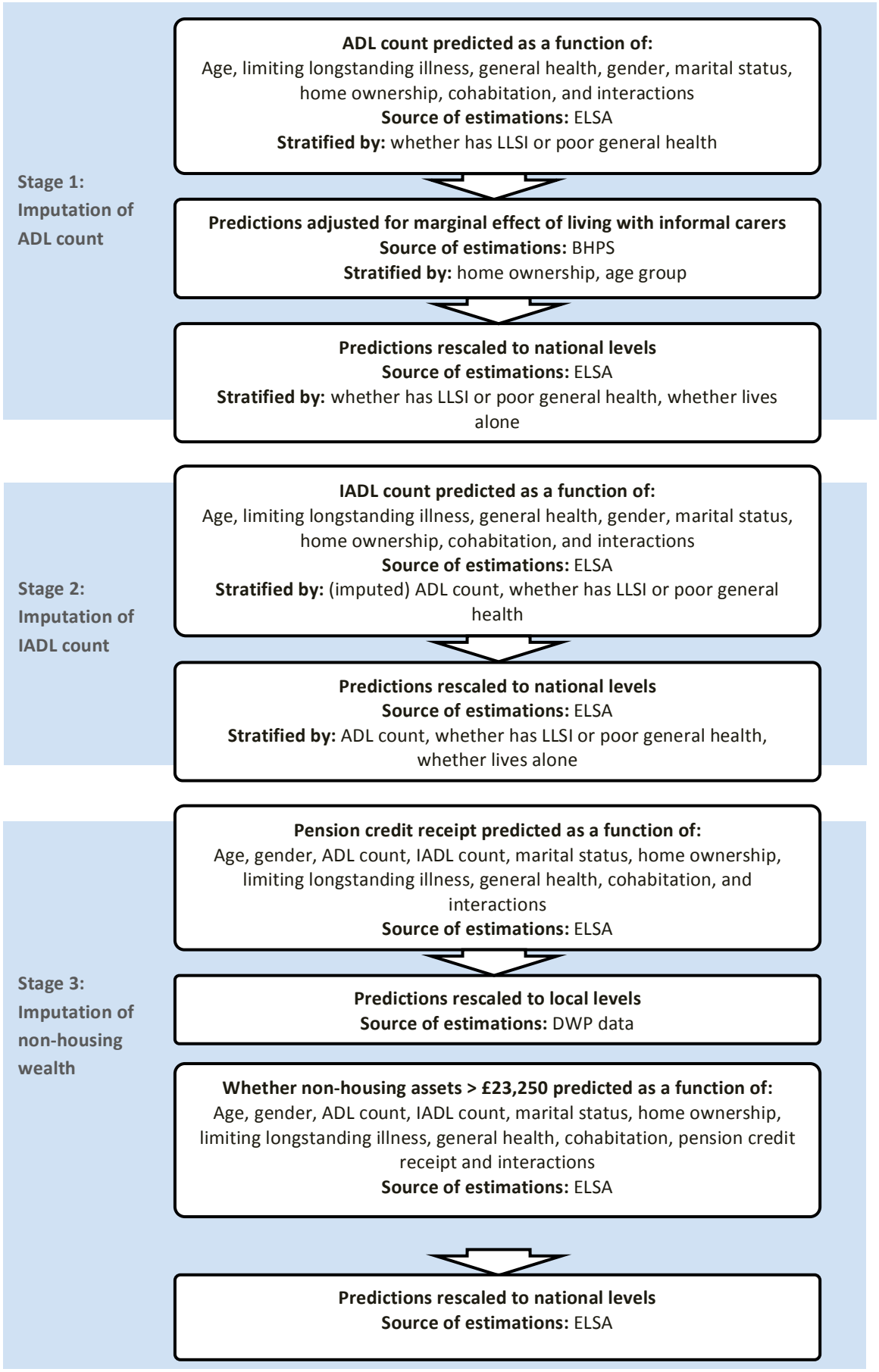


Figure 3: Overview of the main stages of imputation of variables in Census-based dataset



3.2 Estimating additional need for assessments

In the analysis we make the assumption that, post-reform, the total number of assessments in a given area will be proportional to the total number of individuals in the LA that would meet the national needs eligibility criteria. Following the discussion above, this figure can be estimated by summing the numbers of individuals in residential care and in the community with care needs, using one of the two methodologies developed.

Because the models allow the decomposition of the population of older people in each local authority between those that meet the needs and/or financial eligibility criteria, the additional burden of assessments can be approximated by the number of individuals in an authority that would meet the needs eligibility criteria but that are not entitled to local authority financial support. In the following sections, we refer to this quantity as the additional burden of assessments, which is expressed either overall or per capita (per number of older people).

Let:

- O^i represents the population over 65 in area i
- N^i represent the number of individuals in area i that meet the national needs eligibility criteria
- N_S^i represent the number of individuals in area i that meet the national needs eligibility criteria and that would receive financial support from the local authority
- N_P^i represent the number of individuals in area i that meet the national needs eligibility criteria and that would pay privately for their care

Based on the results of the models, we can define the following quantities

- Total relative need for assessment index, $I_T^i = \frac{N^i}{\sum_{j=1}^{151} N^j}$
- Per capita relative need for assessment index $I_R^i = \frac{N^i}{O^i}$
- Total relative need for additional assessment index $I_{TA}^i = \frac{N_P^i}{\sum_{j=1}^{151} N_p^j}$
- Per capita relative need for additional assessment index $I_{RA}^i = \frac{N_P^i}{O^i}$
- Total relative need for supported assessment index $I_{TS}^i = \frac{N_S^i}{\sum_{j=1}^{151} N_p^j}$
- Per capita relative need for supported assessment index $I_{RS}^i = \frac{N_S^i}{O^i}$

Whereas all indices are useful from the point of view of checking the validity of the modelling results, the central indicators for the analysis are I_{RA}^i and I_{TA}^i.

4 Key assumptions and caveats

The model makes a number of important simplifying assumptions that need to be borne in mind.

Behavioural homogeneity: The model assumes that the likelihood that somebody will present him/herself for an assessment is the same among private clients and supported care recipients, other things being equal. Whether this is true will depend, among other things, on whether and when self-payers will feel it is to their advantage to get assessed in order to start metering towards the care cap.

Equivalence of the intensity of assessments: the analysis makes the assumption that all assessments will require identical resources to be carried out, regardless of the level of need of the individual and whether the individual is currently a self-payer or supported by the local authority. This might not be the case if, for instance, local authorities develop different systems (e.g. telephone assessments or self-assessments) to deal with the additional number of assessments.

Patterns of out of area placement: With no recent data available for the distribution of out-of-area placements (care home clients funded by one local authority but resident in another), assumptions have been based upon pooled data collected in CRILL returns from 2007 to 2009.

Area level reweighting: The central dataset in the model comprises individual-level data, with the aim of capturing inter-dependencies and interactions between individual-level characteristics. However, these data are reweighted on the basis of aggregate local authority indicators (age distributions, proportion of older people with limiting longstanding illness, etc). The aggregate data used to create local authority weights have two limitations: firstly, they are limited in their capability to capture variation across the entire need distribution, and in particular to reflect differences between local authorities in terms of the number of people with the highest levels of dependency. Secondly, the stratification of local authority indicators is limited according to the cross-tabulations provided on the basis of 2011 Census data (limiting longstanding illness, for example, is available at the local authority level broken down by of age and gender; but not by home ownership and household size). Availability of the 2011 5% Census sample (not published at the time of writing) would improve the potential for further interactions to be explored, although cell-count issue may constrain the potential to expand significantly the reweighting process.

Continuing Health Care users: at present, approximately 50,000 individuals in England are receiving Continuing Health-Care. Around one half of them will be supported in residential and nursing care homes. Ideally, the analysis would exclude individuals who receive continuing healthcare in institutions, as they are unlikely to require a social care assessment. However, the analysis was unable to do so due to the lack of good quality data about the take-up of continuing care across English local authorities.

Homogeneity of relationship between individual characteristics and local resource need: the analysis uses individual level data about the needs, income and wealth of individuals to derive

estimates of need for social care services at the local level. In doing so, it assumes that the relationship between individual characteristics and local resource requirements is the same across all local authorities. It might be, however, that the service requirements associated with certain needs varies depending on local factors such as population density or deprivation.

5 Quality assessment of the models

A series of tests were conducted to assess the reliability and face validity of the two proposed modelling methods. In particular, we performed the following tests:

- Consistency between ELSA and CENSUS based estimates.
- Correlation between per capita relative need for supported assessment index (defined as I_{RS}^{i} in Section 3.2) and the 2014/15 RNF for older people's PSS.
- Correlation between estimates of supported and additional assessments and local indicators of need and wealth.

5.1 Consistency between ELSA and CENSUS-based estimates

Although using different methodologies, the ELSA and CENSUS-based approaches should generate indicators that are very highly correlated. This hypothesis is confirmed by Figure 4 and Figure 5, which show a very high correlation between the two sets of estimates at the population level (97.7%) and at the per capita level (86.6%), respectively.

Figure 4: Correlation between the total relative need for supported assessment index according to the ELSA-based and the Census-based model: local authorities in England

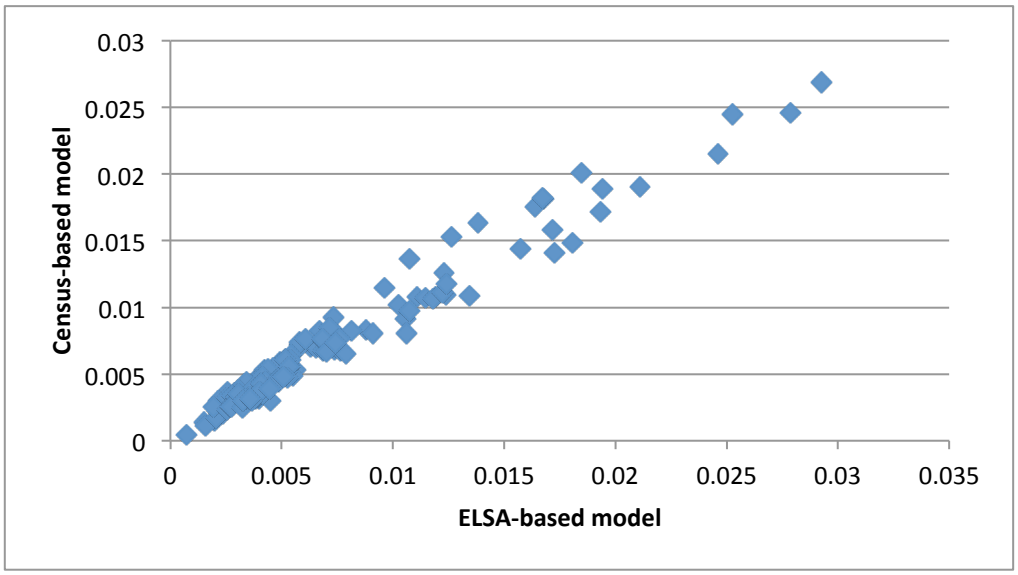
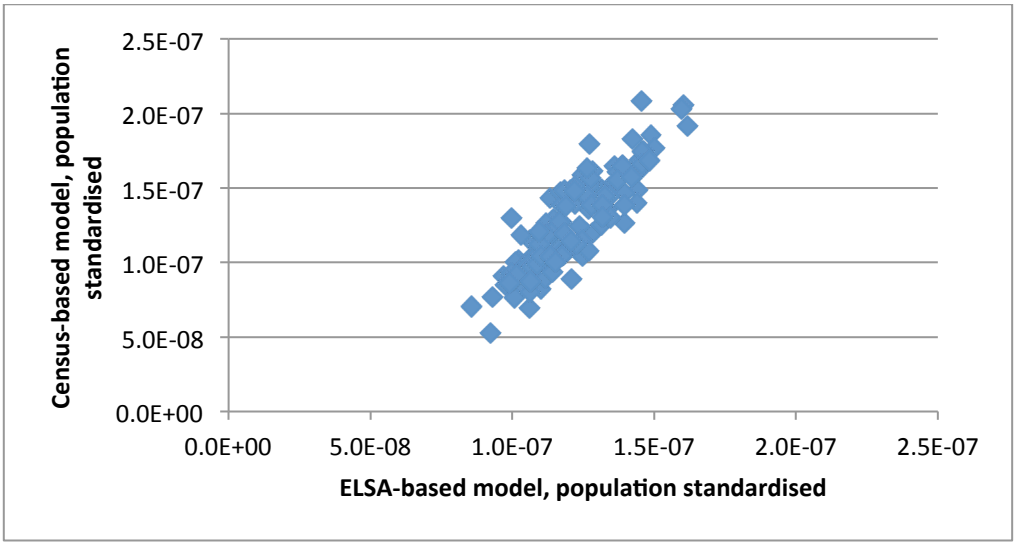


Figure 5: Correlation between the per capita relative need for supported assessment index according to the ELSA-based and the Census-based model: local authorities in England



5.2 Correlation between per capita relative need for supported assessment index and the 2014/15 RNF for older people's PSS

The models' estimates of the number of supported individuals with social care needs should have a strong (if not perfect) correlation with the overall social care RNF estimate for older people. We therefore test the correlation between the two indicators: overall, per capita, and after controlling for area inflation effects in the RNF estimates (using the Area Cost Adjustment - ACA).

It should be noted that a perfect correlation with 2014/15 RNF figures should not be expected for a number of reasons. Existing RNF formulae use a somewhat different set of proxy indicators for wealth, dependency and informal care with a different baseline year for estimates. Moreover, the 2014/15 RNF figures include adjustments to allow for varying costs of service provision between authorities and between types of support, rather than simply reflecting underlying levels of eligible individuals.

5.2.1 Population level correlation

Figure 6 illustrates the correlation between the local estimates of overall relative need for supported assessments based on the ELSA-based model and the 2014/15 RNF for older people's PSS. The correlation coefficient was extremely high (99.0%), driven largely by the correlation between the two indices and local levels of older population. The most visible outliers tended to be large authorities, where discrepancies between formula shares according to different methods are most amplified. Controlling the RNF estimates for local prices using ACA values increased the level of correlation with the ELSA-based estimates from 99.0% to 99.3%.

In terms of the Census-based estimates, setting in the model an eligibility level equivalent to at least two ADLs and one IADL provides the closest correlation to 2014/15 RNF figures. Under these assumptions, the correlation coefficient is 97.8% (Figure 7), rising to 98.2% after controlling for ACA.

Figure 6: Correlation between the 2014/15 RNF for older people's PSS and the total relative need for supported assessment index for older people according to the ELSA-based model: local authorities in England

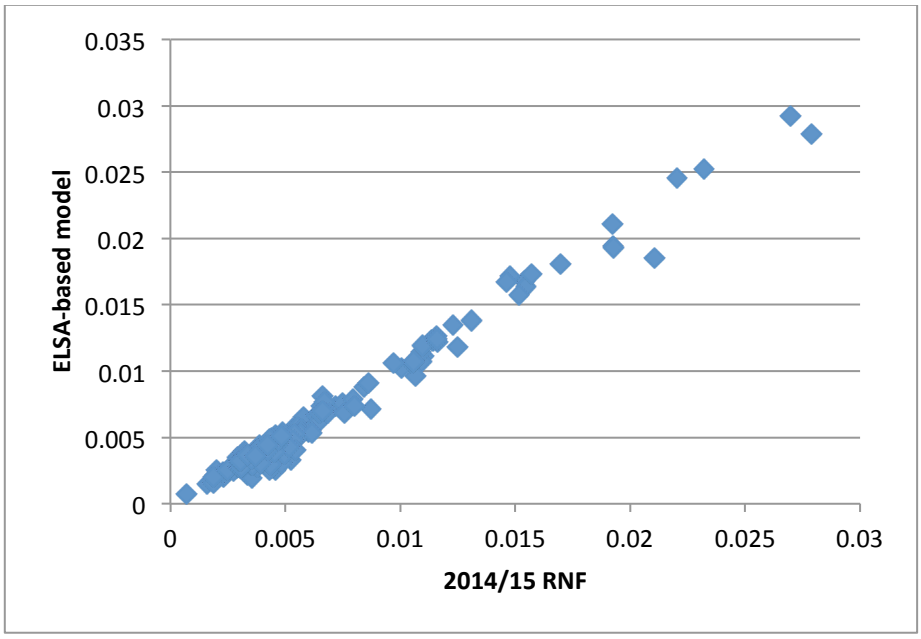
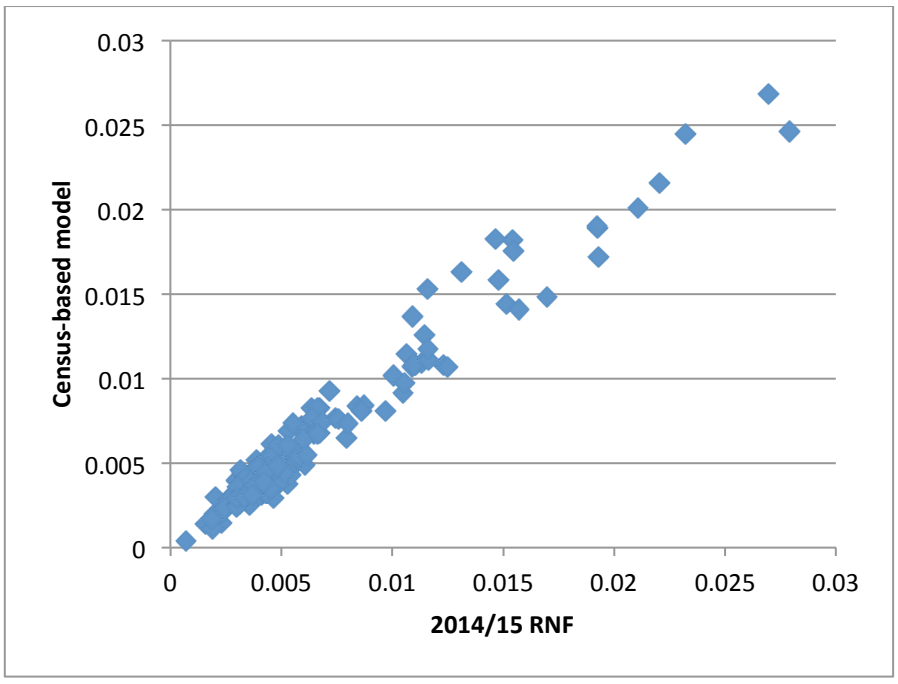


Figure 7: Correlation between the 2014/15 RNF for older people's PSS and total relative need for supported assessment index according to the Census-based model: local authorities in England



5.2.2 Per capita level correlation

Controlling for the size of local authorities, the correlation coefficient between the 2014/15 RNF and the per capita ELSA-based estimates was 67.7%, rising to 78.7% when controlling for ACA. The correlation coefficient with the per-capita CENSUS-based estimates based on an eligibility level equivalent to at least two ADLs and one IADL was 72.0%, rising to 79.3% after controlling for ACA (Figure 9).

Figure 8: Correlation between the 2014/15 RNF for older people's PSS and the per capita relative need for supported assessment according to the ELSA-based model: local authorities in England

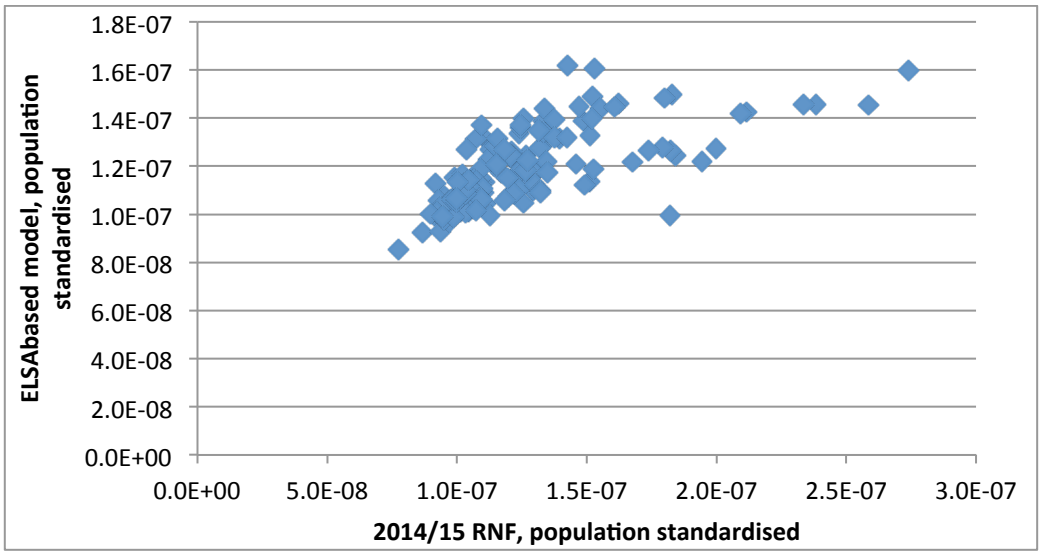
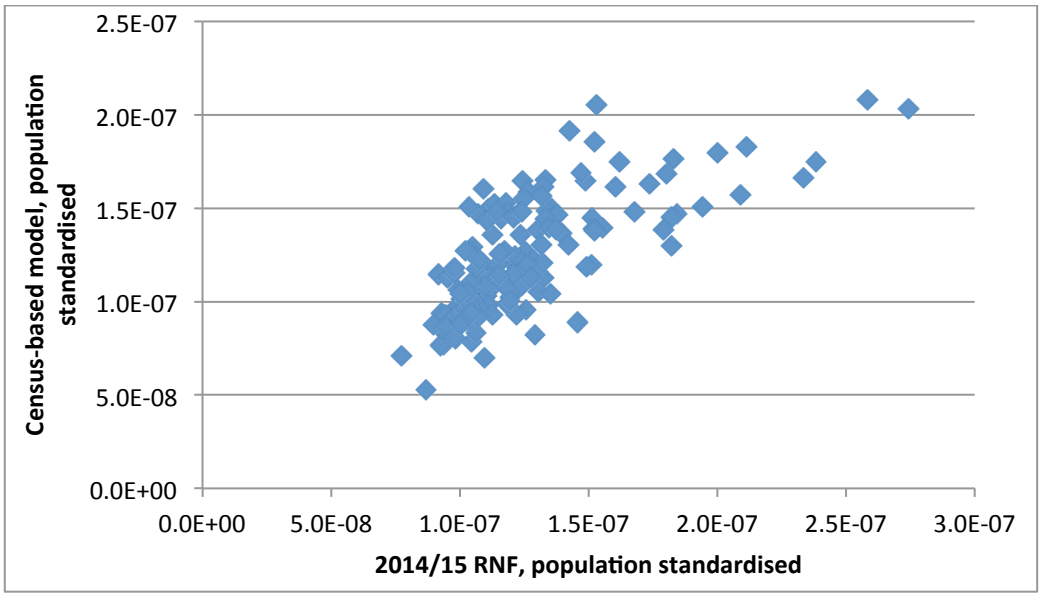


Figure 9: Correlation between the 2014/15 RNF for older people's PSS and the per capita relative need for supported assessment index according to the Census-based model: local authorities in England



Implications: Both the ELSA-base and CENSUS-based methods show a high level of correlation against existing formulae, particularly in terms of total numbers of supported individuals within each local authority. In addition to providing the closest alignment to existing RNF shares in terms of overall numbers of eligible adults, however, the ELSA-based model has the advantage of greater simplicity and transparency relative to the Census-based approach. In particular, it uses weighting in place of imputation to triangulate data from different sources – imputation being a method that, while statistically sound, is not as readily understood or as easily replicated.

For these reasons, *we recommend the ELSA-based model over the CENSUS-based method*, and concentrate exclusively in the remainder of this report on estimates derived from the ELSA model.

5.3 Correlation between model estimates and local characteristics

The ELSA-based estimates underwent a number of additional checks to ensure that they accurately reflected observed distributions in terms of demographics, dependency, income and wealth and levels of service utilisation at national and local levels. Regression models were run using the model's estimates of supported and additional assessments to check the face validity of their relationships with indicators of local need and wealth.

Table 1 shows the equation predicting per capita relative need for supported assessments standardised by older population. The correlations are in keeping with a priori expectations: after standardising for the size of the older population, higher rates of attendance allowance receipt and higher levels of receipt of pension credit are significantly correlated with an increased share of supported clients. Higher proportions of older people living alone, higher proportions of females in the older population and higher density levels (older people per square km) are also significantly correlated with an increased share of supported assessments. The regression shows a close fit to the data with an adjusted R-squared of 85%.

A corresponding model predicting the share of additional assessments per capita is reported in the results section (Table 4). These results also show the expected effects, and in particular a reversal of the effect of pension credit, which becomes negatively associated with the share of additional (and therefore unsupported) assessments.

Table 1: Linear model predicting per capita relative need for supported assessment index

				Number of obs	**151**
				F(8, 142)	108.1
Source	SS	df	MS	Prob > F	0
Model	0.010779	8	0.001347	R-squared	0.859
Residual		142		Adj R-squared	0.851
	0.00177		1.25E-05		
Total	0.012548	150	8.37E-05	Root MSE	0.00353

	Coef.	Std. Err.	T	P>t	[95%	CI]
Proportion receiving AA	0.0745	0.0181	4.110	0.000	0.0387	0.1104
Proportion with high LLSI (85+)	-0.0219	0.0140	-1.570	0.119	-0.0496	0.0057
Proportion own home	-0.0028	0.0061	-0.460	0.643	-0.0148	0.0092
Proportion receiving PC (80+)	0.0645	0.0089	7.210	0.000	0.0468	0.0821
Proportion live alone	0.0920	0.0127	7.230	0.000	0.0669	0.1171
Proportion female	0.1173	0.0312	3.760	0.000	0.0557	0.1790
Density (65+/km2)	0.0000	0.0000	-3.410	0.001	0.0000	0.0000
Population 65+	0.0000	0.0000	-0.630	0.530	0.0000	0.0000
Constant	-0.0450	0.0173	-2.610	0.010	-0.0791	-0.0109

5.4 English-level triangulation

A grossing weight for England was created by adding together the 151 local authority weights in the ELSA sample. Applying these weights, we compared implied levels of service use and corresponding charges and expenditure in the model to 2012/13 figures from PSS RAP and EX1 data. As Table 2 shows, the modelled levels (calculated at the individual level on the basis of ADL and IADL counts, informal care receipt and assessable income and wealth) were all broadly in keeping with HSCIC figures, the greatest disparity being in terms of the total value of charges, which was 12.9% higher than the EX1 total on the basis of the weighted model. These figures are sensitive in particular to assumptions around the distribution of disability-related disregards by level of dependency in the model (for which data are not available). Further sensitivity analysis would allow the opportunity to explore the impact of different assumptions on the levels reported in Table 2.

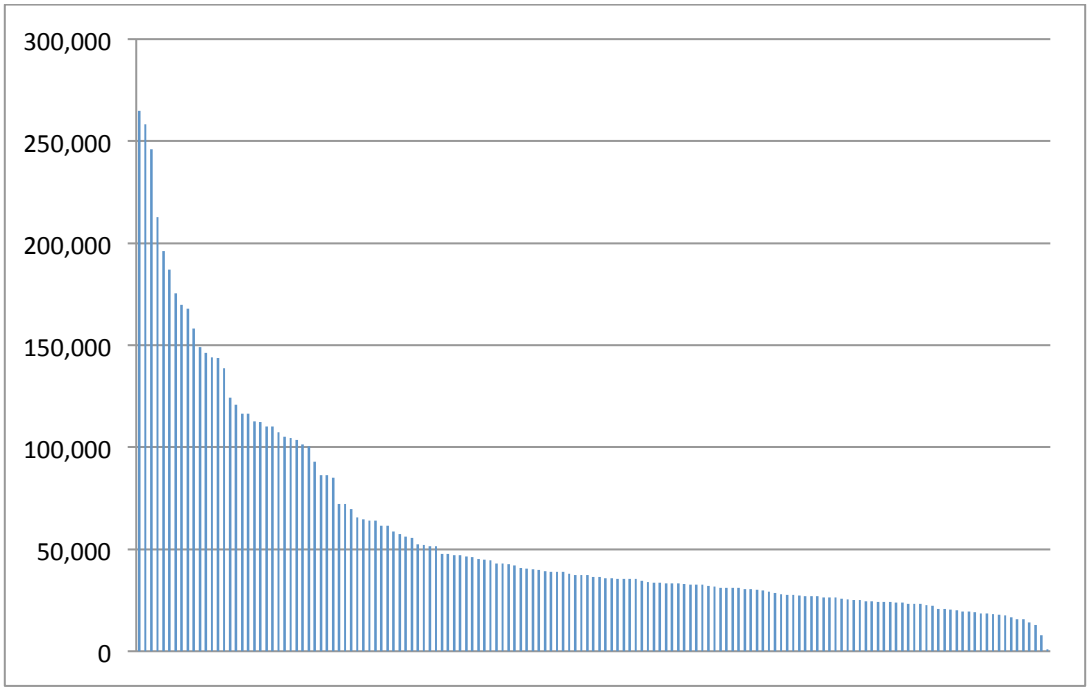
Table 2: Target and modelled numbers of supported community care recipients and corresponding expenditure, charges and care packages

	Target	Modelled results	Modelled results relative to target (%)
Number of community recipients of state-funded care	417,740	428,933	102.7%
Total gross expenditure on community care (£m)	£2,705m	£2,960	109.4%
Average value of community care package (£)	£6,476	£6,900	106.5%
Total value of charges (£m)	£434m	£490m	112.9%

A further check was carried out to ensure that the weighted ELSA sample was consistent with observed distributions of age and population, longstanding illness, pension credit and attendance allowance receipt, living alone and home ownership according to the target levels reported in ONS, Census, and DWP sources. Weights were applied using an iterative raking process with a total of five cycles in order to achieve convergence.

Population size is by far the single greatest determinant of formula share, and varies substantially across local authorities: The largest authority in terms of population aged 65+ contains over 250,000 older people, whereas the smallest contains little over 1,000 (Figure 10).

Figure 10: Population aged 65+ by local authority



Over and above population size, numbers of adults with eligible needs that fall within current means testing rules range from 5% to 10% of older people (Figure 11). The modelled distribution on the basis of the ELSA-based model does not account for local preferences in targeting policies, and therefore shows less variation than numbers of supported residents per capita as reported in RAP and S1 returns for 2012/13 (Figure 12).

Figure 11: Proportion of older population with supported needs according to the ELSA model

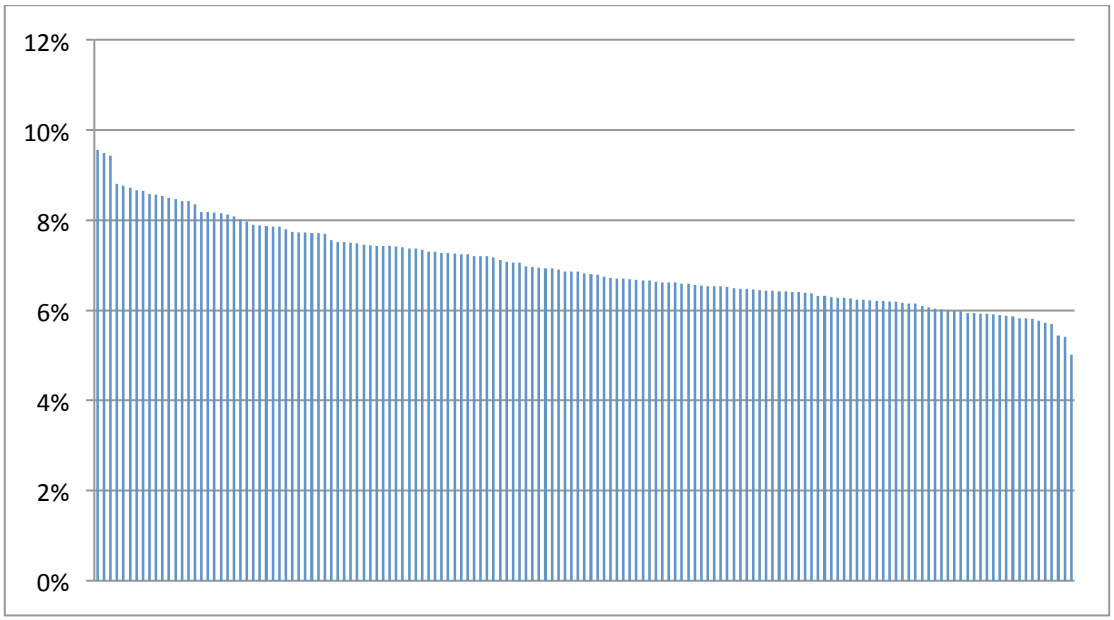
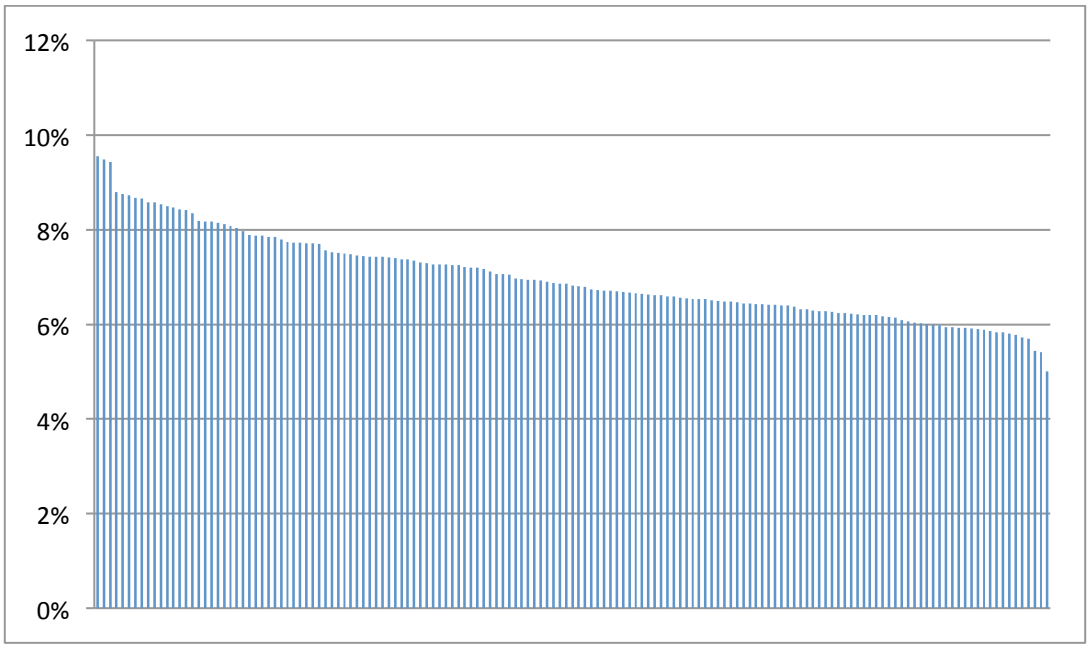
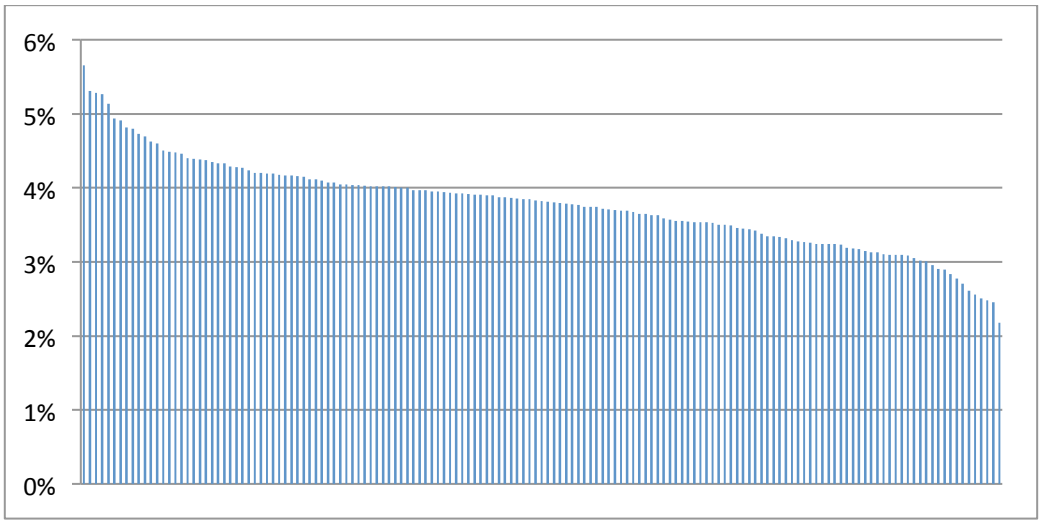


Figure 12: Proportion of older population in receipt of a state-funded care package according to 2012/13 RAP and S1 data



A greater level of variation between local authorities is evident in terms of the proportion of the older population estimated to have eligible needs and are excluded by current means testing rules (corresponding to the need for additional assessment). Estimates of the additional burden of assessments range from 2.2% to 5.7% of older people at the local authority level (Figure 13).

Figure 13: Proportion of older population need for additional assessment according to the ELSA model



6 Estimates of relative needs

Estimates of the per capita need for additional assessments can be derived directly using the reweighted local authority samples by aggregating the numbers of individuals with eligible needs but ineligible for financial support. Using these "direct" estimates has the advantage that it minimises the loss of information associated with further statistical manipulation of the data.

However, traditionally relative needs estimates are calculated on the basis of a linear formula that links local characteristics to estimates of relative needs by applying a set of coefficients. This method has the advantage of greater transparency by providing clarity about the relative effect of different local characteristics on the estimates of needs. We therefore provide two sets of estimates of relative needs, the first based on the ELSA-based reweighting methodology and the second based on the results of a linear regression of the reweighting estimates on key need and wealth characteristics of local authorities (see Table 4).

6.1 Estimates of relative needs for additional assessment based on ELSA-based reweighting methodology

Table 3 shows the indices of relative needs in terms of the additional per capita burden of assessments for local authorities in England (excluding the Isles of Scilly) based on the ELSA-based reweighting methodology.

Table 3: Relative per capita spending shares linked to additional burden of assessments using weighted estimates

LA code	LA name	Formula	LA code	LA name	Formula
102	Cumbria	0.043158	609	Suffolk	0.04219
104	Northumberland	0.040399	611	Luton	0.031822
106	Gateshead	0.032526	612	Buckinghamshire	0.041577
107	Newcastle Upon Tyne	0.038096	613	Milton Keynes	0.041287
108	North Tyneside	0.035145	614	Bracknell Forest	0.037875
109	South Tyneside	0.026075	615	West Berkshire	0.033802
110	Sunderland	0.027091	616	Reading	0.041391
111	Hartlepool	0.03806	617	Slough	0.034975
112	Middlesbrough	0.025325	618	Windsor & Maidenhead	0.048139
113	Redcar & Cleveland	0.032258	619	Wokingham	0.041779
114	Stockton-On-Tees	0.034481	620	Essex	0.038414
116	Durham	0.033749	621	Southend-On-Sea	0.045555
117	Darlington	0.03982	622	Thurrock	0.029584
204	Barnsley	0.031181	623	Cambridgeshire	0.037121
205	Doncaster	0.036413	624	Peterborough	0.036139
206	Rotherham	0.03044	625	Bedford	0.042115
207	Sheffield	0.038639	626	Central Bedfordshire	0.03213
209	Bradford	0.038124	702	Camden	0.030037
210	Calderdale	0.034105	703	Greenwich	0.038094
211	Kirklees	0.03546	704	Hackney	0.028435
212	Leeds	0.032106	705	Hammersmith & Fulham	0.031617
213	Wakefield	0.036096	706	Islington	0.033501
214	East Riding Of Yorkshire	0.039141	707	Kensington & Chelsea	0.046907
215	Kingston Upon Hull	0.035309	708	Lambeth	0.035994
216	North East Lincolnshire	0.039649	709	Lewisham	0.035024
217	North Lincolnshire	0.034082	710	Southwark	0.026477
218	North Yorkshire	0.045599	711	Tower Hamlets	0.025992
219	York	0.044243	712	Wandsworth	0.038915
304	Bolton	0.033347	713	Westminster	0.033308
305	Bury	0.041184	714	City of London	0.02209
306	Manchester	0.036164	716	Barking & Dagenham	0.038811
307	Oldham	0.037371	717	Barnet	0.044263
308	Rochdale	0.033612	718	Bexley	0.03881
309	Salford	0.033287	719	Brent	0.029434
310	Stockport	0.04096	720	Bromley	0.038971
311	Tameside	0.032305	721	Croydon	0.040127
312	Trafford	0.040123	722	Ealing	0.039691
313	Wigan	0.034018	723	Enfield	0.039871
315	Knowsley	0.030737	724	Haringey	0.030785
316	Liverpool	0.032451	725	Harrow	0.037763
317	Sefton	0.044892	726	Havering	0.03646
318	St Helens	0.034412	727	Hillingdon	0.039542
319	Wirral	0.042374	728	Hounslow	0.02933
321	Halton	0.038859	729	Kingston Upon Thames	0.039597
322	Warrington	0.038632	730	Merton	0.035521

323	Lancashire	0.042116	731	Newham	0.028672
324	Blackburn With Darwen	0.033354	732	Redbridge	0.039388
325	Blackpool	0.048786	733	Richmond Upon Thames	0.043899
326	Cheshire East	0.04415	734	Sutton	0.042594
327	Cheshire West & Chester	0.04052	735	Waltham Forest	0.036213
404	Warwickshire	0.040469	803	Isle of Wight	0.05124
406	Birmingham	0.037798	805	Surrey	0.046931
407	Coventry	0.041631	807	West Sussex	0.052696
408	Dudley	0.032508	809	Dorset	0.043151
409	Sandwell	0.033479	810	Bournemouth	0.056939
410	Solihull	0.044044	811	Poole	0.048077
411	Walsall	0.037958	812	Hampshire	0.043508
412	Wolverhampton	0.040605	813	Portsmouth	0.041951
413	Staffordshire	0.039381	814	Southampton	0.031444
414	Stoke-On-Trent	0.033879	815	East Sussex	0.052793
415	Herefordshire	0.042104	816	Brighton & Hove	0.03951
416	Worcestershire	0.041876	817	Wiltshire	0.042025
417	Shropshire	0.043011	819	Swindon	0.035265
418	Telford & Wrekin	0.034517	820	Kent	0.041953
503	Lincolnshire	0.035895	821	Medway	0.033801
504	Northamptonshire	0.037671	902	Cornwall	0.045146
506	Derbyshire	0.040665	904	Gloucestershire	0.039693
507	Derby	0.038572	905	Somerset	0.044585
508	Leicestershire	0.039993	906	Isles of Scilly	.
509	Leicester	0.04046	908	Bath & N. E. Somerset	0.040864
510	Rutland	0.044675	909	Bristol	0.04441
511	Nottinghamshire	0.038186	910	North Somerset	0.050118
512	Nottingham	0.041114	911	South Gloucestershire	0.041158
606	Hertfordshire	0.039159	912	Devon	0.047117
607	Norfolk	0.03891	913	Plymouth	0.042004
608	Oxfordshire	0.04324	914	Torbay	0.054393

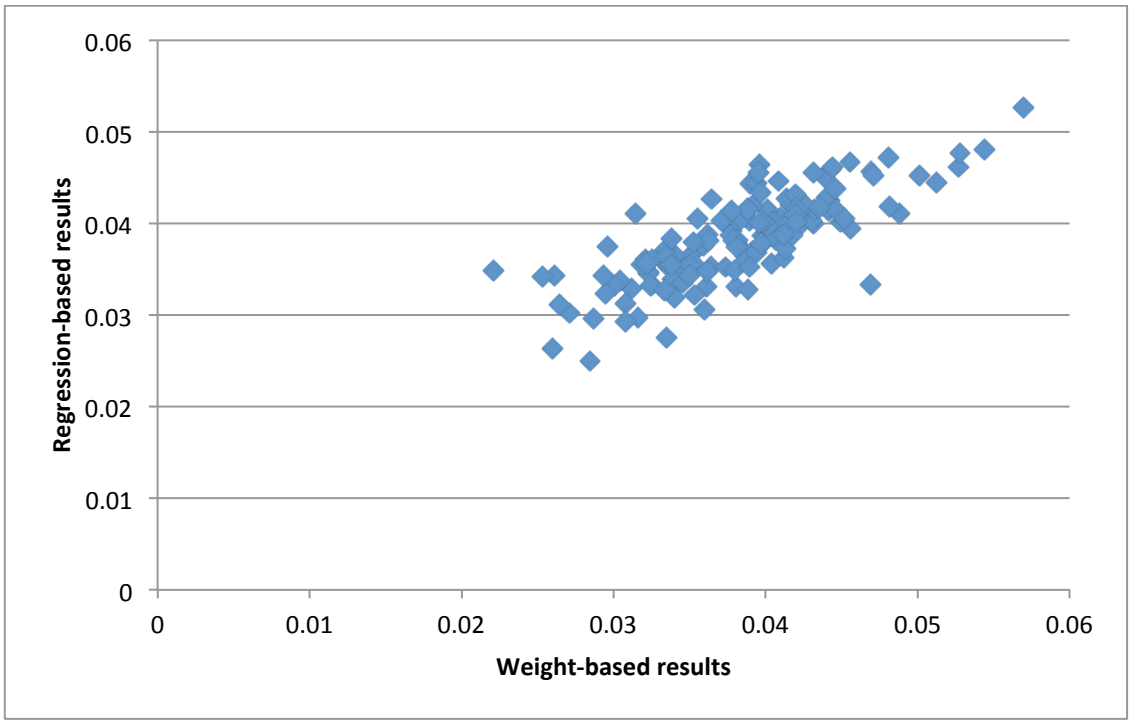
6.2 Estimates of relative needs for additional assessment based on a linear regression model

The reweighting method followed by the ELSA-based model allows for the simulation of local authority characteristics while maintaining the integrity of interactions between effects within the model. In order to update the output as new data became available (updated population distributions, pension credit data, etc.) the recommended approach would be to incorporate revised local authority weights into the model.

This approach may not always be practical since it does not allow for adjustments to be estimated off-model. To address this, a regression model was fitted to estimate coefficients for predicting relative needs across areas. This allows for revised formulae to be calculated on the basis of an equation much in the same way as the existing older people's PSS RNF for 2014/15.

The correlation between the weighted and regression-based formula values is high (79.2%) as shown in Figure 14. By imposing a linear model, however, the regression results do not allow for interactions between explanatory variables or for non-linearities in the relationship between factors in the model, and therefore a degree of loss in the accuracy of the estimates should be expected.

Figure 14: Correlation between weight-based and regression-based formula values (population weighted)



After standardising for population, authorities were found to have an increased formula share for additional assessments (corresponding to clients excluded on the basis of existing means testing rules) if they had higher levels of home ownership and lower levels of pension credit receipt among adults aged 80 and above. A significant positive correlation remained with levels of attendance allowance receipt and proportion of older people that were female (Table 4).

Table 4: Equation predicting share of additional burden of assessments per population 65 plus

Source	SS	df	MS		Number of obs	151
					F(5, 145)	62.29
Model	.003358394	5	.000839598		Prob > F	0.0000
Residual	.001968004	146	.000013479		R-squared	0.6305
					Adj R-squared	0.6204
Total	.005326398	150	.000035509		Root MSE	0.0037
	Coef.	Std. Err.	t	P>t	[95%	C.I]
Proportion receiving AA	0.040886	0.018395	2.22	0.028	0.004531	0.077241
Proportion aged 85+	0.209282	0.025068	8.35	0.000	0.159739	0.258826
Proportion own home (HRP 65+)	0.016428	0.003449	4.76	0.000	0.009612	0.023244
Proportion receiving PC (80+)	-0.01513	0.006881	-2.2	0.030	-0.02872	-0.00153
Constant	-0.0026	0.005096	-0.51	0.611	-0.01267	0.007476

Table 5 reports the derivation of the local authority-level explanatory variables in Table 4.

Table 5: Derivation of local authority-level explanatory variables

Measure	Source	URL
Proportion receiving AA		
Number of AA cases in payment aged 65+ in LA	DWP November 2011 cases in payment	http://tabulation-tool.dwp.gov.uk/100pc/aa/ccla/cnage/a_carate_r_ccla_c_cnage_nov11.html
divided by:		
Number of adults in LA aged 65+	ONS mid-2011 population estimates	http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/rft---mid-2011--census-based--population-estimates-for-england-and-wales.zip
Proportion aged 85+		
Number of adults in LA aged 85+	ONS mid-2011 population estimates	http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/rft---mid-2011--census-based--population-estimates-for-england-and-wales.zip
divided by:		
Number of adults in LA aged 65+	ONS mid-2011 population estimates	http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/rft---mid-2011--census-based--population-estimates-for-england-and-wales.zip
Proportion own home (Household reference person aged 65+)		
Number of persons with ownership or shared ownership (Household Reference Person aged 65+)	Census 2011	http://www.nomisweb.co.uk/census/2011/lc4201ew
divided by		
Number of persons with any category of tenure (Household Reference Person aged 65+)	Census 2011	http://www.nomisweb.co.uk/census/2011/lc4201ew
Proportion receiving PC (80+)		
Number of claimants of pension credit in LA aged 80+	DWP May 2011 claimants	http://www.nomisweb.co.uk/query/114.1/advanced.aspx
divided by:		
Number of adults in LA aged 80+	ONS mid-2011 population estimates	http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-england-and-wales/mid-2011--2011-census-based-/rft---mid-2011--census-based--population-estimates-for-england-and-wales.zip

Table 6 reports the relative need estimates for additional assessments on the basis of the coefficients of the linear model shown in Table 4.

Table 6: Relative per capita spending shares linked to additional burden of assessments using the model coefficients

LA code	LA name	Formula	LA code	LA name	Formula
102	Cumbria	0.039927	609	Suffolk	0.041557
104	Northumberland	0.035583	611	Luton	0.0352
106	Gateshead	0.033265	612	Buckinghamshire	0.040246
107	Newcastle Upon Tyne	0.037938	613	Milton Keynes	0.03733
108	North Tyneside	0.036987	614	Bracknell Forest	0.038245
109	South Tyneside	0.034661	615	West Berkshire	0.038211
110	Sunderland	0.030728	616	Reading	0.04236
111	Hartlepool	0.033173	617	Slough	0.0354
112	Middlesbrough	0.034142	618	Windsor & Maidenhead	0.041879
113	Redcar & Cleveland	0.034745	619	Wokingham	0.038966
114	Stockton-On-Tees	0.033895	620	Essex	0.040695
116	Durham	0.032935	621	Southend-On-Sea	0.04682
117	Darlington	0.038601	622	Thurrock	0.037555
204	Barnsley	0.033043	623	Cambridgeshire	0.040192
205	Doncaster	0.035419	624	Peterborough	0.038825
206	Rotherham	0.033937	625	Bedford	0.040668
207	Sheffield	0.03629	626	Central Bedfordshire	0.035429
209	Bradford	0.037856	702	Camden	0.032994
210	Calderdale	0.036448	703	Greenwich	0.037445
211	Kirklees	0.035462	704	Hackney	0.024944
212	Leeds	0.036116	705	Hammersmith & Fulham	0.029886
213	Wakefield	0.033273	706	Islington	0.027822
214	East Riding Of Yorkshire	0.037192	707	Kensington & Chelsea	0.032998
215	Kingston Upon Hull	0.032118	708	Lambeth	0.03052
216	North East Lincolnshire	0.037541	709	Lewisham	0.034494
217	North Lincolnshire	0.036483	710	Southwark	0.031121
218	North Yorkshire	0.039754	711	Tower Hamlets	0.026162
219	York	0.042908	712	Wandsworth	0.035723
304	Bolton	0.035696	713	Westminster	0.032037
305	Bury	0.036553	714	City of London	0.033507
306	Manchester	0.034777	716	Barking & Dagenham	0.041953
307	Oldham	0.035482	717	Barnet	0.045865
308	Rochdale	0.035303	718	Bexley	0.042186
309	Salford	0.035884	719	Brent	0.031774
310	Stockport	0.040891	720	Bromley	0.044798
311	Tameside	0.03464	721	Croydon	0.03984
312	Trafford	0.041772	722	Ealing	0.037443
313	Wigan	0.031796	723	Enfield	0.040407
315	Knowsley	0.031648	724	Haringey	0.028859

316	Liverpool	0.033129	725	Harrow	0.041313
317	Sefton	0.040817	726	Havering	0.043485
318	St Helens	0.03487	727	Hillingdon	0.039935
319	Wirral	0.042168	728	Hounslow	0.034209
321	Halton	0.032879	729	Kingston Upon Thames	0.046448
322	Warrington	0.036217	730	Merton	0.040977
323	Lancashire	0.039695	731	Newham	0.029375
324	Blackburn With Darwen	0.036887	732	Redbridge	0.04448
325	Blackpool	0.041015	733	Richmond Upon Thames	0.045193
326	Cheshire East	0.041476	734	Sutton	0.042371
327	Cheshire West & Chester	0.040255	735	Waltham Forest	0.037962
404	Warwickshire	0.039312	803	Isle of Wight	0.044379
406	Birmingham	0.038894	805	Surrey	0.045752
407	Coventry	0.041792	807	West Sussex	0.046375
408	Dudley	0.035973	809	Dorset	0.045514
409	Sandwell	0.036384	810	Bournemouth	0.052206
410	Solihull	0.043025	811	Poole	0.047176
411	Walsall	0.034995	812	Hampshire	0.041813
412	Wolverhampton	0.038423	813	Portsmouth	0.043101
413	Staffordshire	0.036911	814	Southampton	0.04104
414	Stoke-On-Trent	0.033785	815	East Sussex	0.047683
415	Herefordshire	0.041226	816	Brighton & Hove	0.045127
416	Worcestershire	0.041035	817	Wiltshire	0.041595
417	Shropshire	0.040227	819	Swindon	0.03781
418	Telford & Wrekin	0.033387	820	Kent	0.040967
503	Lincolnshire	0.037352	821	Medway	0.035666
504	Northamptonshire	0.038437	902	Cornwall	0.040506
506	Derbyshire	0.038277	904	Gloucestershire	0.043391
507	Derby	0.040781	905	Somerset	0.043753
508	Leicestershire	0.039807	906	Isles of Scilly	.
509	Leicester	0.038395	908	Bath & N. E. Somerset	0.044652
510	Rutland	0.041281	909	Bristol	0.045799
511	Nottinghamshire	0.03834	910	North Somerset	0.04521
512	Nottingham	0.039609	911	South Gloucestershire	0.038795
606	Hertfordshire	0.042049	912	Devon	0.045199
607	Norfolk	0.040064	913	Plymouth	0.040045
608	Oxfordshire	0.041516	914	Torbay	0.047822

7 Policy implications

In this report, we have tested the viability of using data sources with individual level information about needs, income and wealth to develop a formula for allocating social care resources across local authorities.

The results suggest that it is indeed possible to use information from individual level surveys in order to estimate the level of social care needs in different authorities.

A number of quality checks have been carried out which showed that the distribution of additional burden of assessments across local authorities exhibit the expected correlations with local need, income and wealth characteristics. For instance, greater need at the local level (per capita and overall) was found to be positively correlated with the numbers of local additional assessments, ceteris paribus. Local levels of deprivation, indicated by the per capita take-up of pension credit, were positively correlated with social care need supported by local authorities, but negatively related to additional assessments, ceteris paribus.

The analysis has some important limitations. ELSA is the individual level survey that provides the best combination of indicators about the needs and income and wealth of older people in England. However, even pooling several waves of ELSA does not provide enough cases to estimate directly levels of social care need for each local authority in England. Instead, the analysis reweighted for each of the 152 local authorities in England the sample data in order to reflect their characteristics. And whereas the reweighting process was able to reflect simultaneously differences in the local combinations of the needs and wealth, the range of indicators available for reweighting the data was limited. It is therefore possible that the reweighting procedure was unable to capture fully differences in local circumstances across authorities.

Another limitation of the approach presented is that it cannot directly be used to compensate local authorities for differences in local supply circumstances. In some cases, differences in the availability of services can affect local demand levels through what is termed supply-induced demand. A greater than average availability of residential care, for instance, could lead more individuals than expected to use the service. Whether a relative needs formula should aim to compensate for these effects is open to debate, but it is worth noting that trying to do so with the approach presented here would require additional, off-model, analysis to be carried out in order to amend the weights given to social care needs in different areas. Overall, the estimates of relative needs for additional assessments using the individual-level data and methods proposed in this study were very strongly correlated (83%) with the estimates derived using extrapolation methods.

The proposed methodology has some distinct advantages, however. It uses directly indicators of social care need, income and wealth and provides therefore a more normative approach to estimating local need compared to the use of regression analyses of historical patterns of expenditure. In addition, the fact that it is based on individual level data makes it particularly useful for testing the implications of policy changes, such as changes in means testing arrangements or eligibility criteria before they are introduced. This point is particularly salient where historical expenditure data relating to the cost of the policies does not exist. Furthermore, one of the advantages of using a re-weighting procedure is that it does not require necessarily the use of regression methods. As a result, it does not impose the loss of precision in the estimates associated with the use of regression models, which in the context of the development of allocation formulae have tended to reduce the complex relationships between factors linked to social care need to linear, additive relationships.

Finally, it is worth noting that although the analysis in this report develops a formula specifically for additional assessments, the same methodology could be applied in order to develop other types of formulae. A formula for overall social care need could be developed, for instance, by attaching intensity weights to different individuals in order to reflect their different needs and therefore in the levels of support they require.

8 References

Fernandez, J.-L., & Snell, T. (2013). *Implications on expenditure and numbers of social care clients of minimum needs eligibility criteria in England*. London: PSSRU Discussion Paper 2856.