PSSRU

Personal Social Services Research Unit

Estimating local relative expenditure needs of changes in social care means-testing arrangements: a microsimulation approach[1].

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2 Lay summary

2.1 Introduction

This report summarises the methodology and results of a formula for estimating relative spending needs across English local authorities associated with proposed changes in the social care means-testing arrangements.

According to the proposed rules modelled in this analysis, the upper capital threshold would be raised from £23,250 to £27,000 for individuals in the community or for individuals in a care home whose property is disregarded. For individuals in care homes without a property or whose property was taken into account when calculating assessable income, the upper capital limit would increase to £118,000. The lower limit (disregarded assets) would increase from £14,250 to £17,000. Tariff income rates of £1 per week per £250 in assets would remain unchanged.

The methods described follow a microsimulation-based approach, and focus exclusively on the impact of changes in means-testing arrangements on older people.

2.2 Methods

To estimate formula shares, a model was developed to estimate for each local authority the number of older people with different social care needs, income and wealth.

Since no single source of evidence contains all relevant indicators at the individual level, population estimates were derived by reweighting pooled data from the English Longitudinal Study of Ageing (ELSA) according to local authority characteristics. This analysis was carried out using a model developed for estimating a needs formula relating to the introduction of a cap on social care expenditure.

ELSA is a nationally-representative survey of older people living in the community that provides detailed indicators of income, wealth, living arrangements and social care needs. Though subjects can (subject to NatCen approval) be matched to local authorities, the sample is not sufficiently large to reliably reflect differences in these combined characteristics at the authority level. Instead, a process called 'reweighting' was used, whereby the entire ELSA sample was adjusted to reflect the known characteristics of each local authority, essentially providing a separate ELSA dataset for each local authority. Weighting variables were derived from local-authority indicators from the 2011 Census, Department of Work and Pensions and House Price Index – including age and gender, housing wealth, benefit receipt, longstanding illness, tenure and cohabitation. Data from the Adult Social Care Survey were used to identify the characteristics of those currently receiving funded care services within each local authority. Using individual income and wealth data from the weighted sample, current and proposed means testing rules were simulated to determine the number and characteristics of individuals financially eligible to receive care under each system.

Since the ELSA dataset does not provide information about individuals in care homes (those most likely to benefit from the changes), income and asset distributions were approximated on the basis

of the characteristics of the community-based population weighted according to the probability of entering residential or nursing care.

2.3 Results

The relationship between local indicators of need and wealth and the model's estimates of supported clients according to existing means-testing regulations was assessed to check that the weighting method was successful in its reflection of key differences between local authority populations. Regression results showed a high level of correlation (92% R-squared) between the two. Additional checks compared correlations between model estimates and levels of provision and expenditure as reported by the Information Centre. Although the overall correlation was high (88%), there were noticeable differences between modelled and observed estimates. This is not surprising since the model assumes a national average care model, in contrast to the wide variation in the way local authorities target their resources.

A regression model was fitted to estimate coefficients for predicting relative needs across areas. This model allowed for estimates of relative needs to be calculated on the basis of an equation in the same way as the existing older people's Personal Social Services RNF. This enables relative needs for additional assessments to be calculated in the future using updated data. The results of this equation are summarised in Table 1 below:

Table 1 Relative need formula for means test extension (2013-based)

	Proportion population 65+ that owns home	x	0.0779
+	Pension credit recipients aged 80+ as proportion of population 65+	x	0.2713
+	Proportion population 65+ that lives alone	x	0.1889
+	Proportion population 65+ that is female	x	-0.3660
+	Proportion of properties that are in council tax bands C-G	x	-0.0523
+	Proportion of properties that are in council tax bands H	x	-0.1499
+	Unit cost of residential care (2013/14 financial year)	x	0.0001
+	0.0781		

Estimated per capita spending shares vary significantly between authorities. Overall, the highest per capita spending shares are associated with areas with low house prices such as the North East. This finding is likely to be related to the fact that in such areas a greater number of individuals with moderate housing wealth going into residential care will be helped by the £118,000 assets threshold.

As with all regression-based formulae, the validity of the formula estimated (summarised in Table 1) is reduced when it is applied to values that differ significantly from the values used in its estimation. In light of changes in the accounting of social care provision and expenditure data from 2014/15 onwards, an alternative model was specified incorporating 2014/15 unit costs (outlined in the main report). Given that local authorities had submitted unit cost estimates for only one financial year

using the new measure at the time of analysis, the formula might need to be re-estimated in subsequent years if significant changes in local authority returns are observed.

2.4 Implications

Because it simulates the needs and means-testing eligibility rules directly at the individual level, the microsimulation-based approach adopted avoids the need to impose assumptions about the relationship between population characteristics and authority expenditure required by utilisation-based methods.

Given the lack of a single data source with all required evidence for estimating the formula, the proposed method is contingent on the accurate simulation of local populations. Encouragingly, validity checks showed a high level of correlation between local authority profiles simulated using the model and observed indicators of need at the local level.

Sensitivity analyses showed substantial temporal variation in local measures of need to be an important factor in terms of the suitability of the regression model in the future. To account for changes in the calculation of unit costs introduced in 2014/15, a separate model has been specified on the basis of revised unit cost data.

3 Introduction

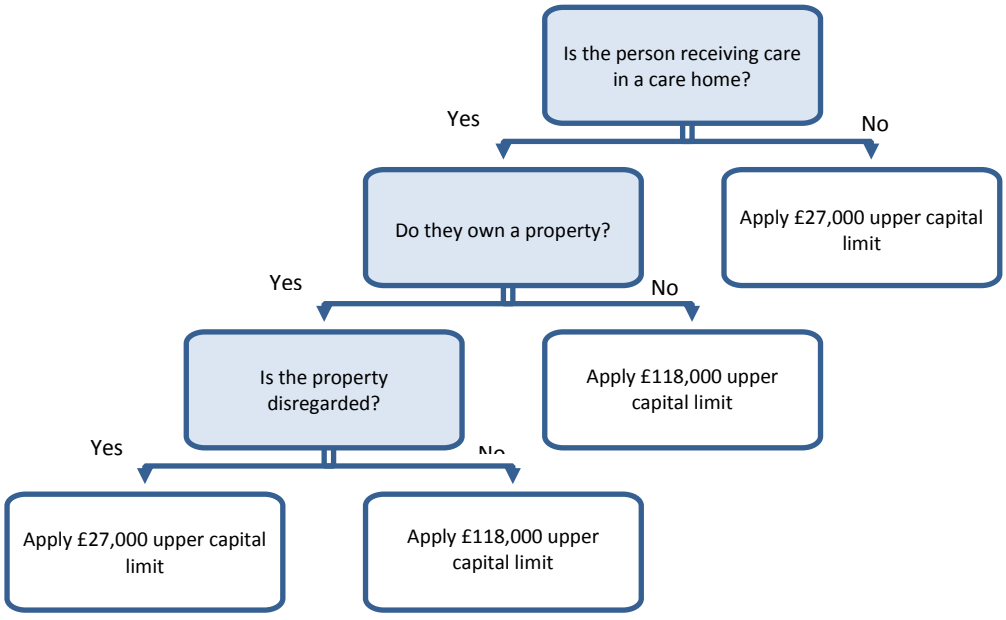
This report summarises the methodology and results of a formula for estimating relative spending needs across English local authorities associated with proposed changes in the social care means-testing arrangements (Department of Health 2015a).

In the English social care system, adults with eligible social care needs undergo a means-test to determine, according to their assessable income and assets, the relative contributions of the individual and their local authority to care costs. Until April 2015, needs-based eligibility was determined according to Fair Access to Care Services (FACS) guidelines. Since, it is determined according to the national minimum eligibility criteria set out in the Care Act 2014.

Under present means-testing rules, service users with assessable assets in excess of £23,250 (including property unoccupied by a dependent relative in the case of residential care) are expected to personally fund their care costs in full. Assets below £14,250 are disregarded, meaning that charges for those with savings and capital below this level are determined solely on the basis of income. Between the two asset thresholds, personal contributions from assets are calculated on a sliding scale according to the tariff income (a contribution of £1 per week for every £250 in assets between the lower and upper limit).

Under the alternative rules modelled in this analysis (summarised in Figure 1), the upper capital threshold would be raised from £23,250 to £27,000 for individuals in the community or for individuals in a care home whose property is disregarded. For individuals in care homes without a property or whose property was taken into account when calculating assessable income, the upper capital limit would increase to £118,000. The lower limit (disregarded assets) would increase from £14,250 to £17,000. Tariff income rates of £1 per week per £250 in assets would remain unchanged (Department of Health 2015a).

Figure 1 Changes in means-testing arrangements



Source: Department of Health (2015b)

As part of the policy process, the Personal Social Services Research Unit (PSSRU) were commissioned by the Department of Health to develop a formula estimating the relative spending needs of local authorities in England according to the proposed changes. Two distinct approaches to developing a formula have been explored: a microsimulation-based approach (described in this paper), and a hybrid utilisation approach (described in Forder and Vadean 2018).

The remainder of this report summarises the methodology used in the analysis (Section 4), discusses key assumptions, caveats and model checking (Section 5), summarises the modelling results (Section 6), and discusses the key policy implications of the analysis (Section 7).

The analysis in this report focuses exclusively on the impact of changes in means-testing arrangements on older people.

4 Methods

Social care needs allocation formulae have traditionally been developed on the basis of local indicators such as age and gender profiles, deprivation, wealth and levels of informal care provision (see Forder and Vadean 2018 for further background). All these indicators are central determinants of social care need and eligibility, and useful dimensions for comparison between local authorities.

Given their aggregate nature, however, area indicators are inherently limited in their capacity to reflect interactions between multiple characteristics of the local populations. In addition, they are limited in their capacity to identify groups with different levels of need, and in particular individuals with very high needs. This limitation is important because state funded care services are increasingly targeted on the basis of multiple criteria; specifically, those with high levels of need, low income and wealth and limited access to informal sources of support. From a modelling perspective, estimating the joint distributions of these characteristics is crucial to simulating accurately the social care system. Equally, assessing the likely impact of alternative financial eligibility regulations necessitates the ability to differentiate between subgroups (i.e. by social care need) when considering income and wealth distributions.

With this in mind, the analysis uses a microsimulation-based approach to estimate the relative social care spending need of local authorities, using individual-level data to model joint distributions of key indicators of social care need, income and wealth at the local level. This is by contrast to a utilisation-based approach (Forder and Vadean 2018), which uses regression techniques to approximate the determinants of observed long-term care expenditure on the basis of local characteristics. In many ways, the microsimulation method shares traits with epidemiological (or normative) modelling, in the sense that the estimates of need at the local level are derived from "counting" the number of cases with certain characteristics. However, the approach described is different from an epidemiological method in a key respect: it does not assume there to be an objective, commonly agreed and definable measure of social care 'need' and of the relationship between need and social care use. Rather, it applies modelling techniques to observed data to estimate the average relationship between needs and social care use across English authorities.

4.1 The microsimulation model

The analysis builds on a microsimulation model of older people with social care needs across local authorities in England developed using data from the English Longitudinal Survey of ageing (ELSA) and used previously for developing a spending shares formula for additional assessments linked to the 2014 Care Act (Fernandez & Snell 2017). The results of the microsimulation are used to derive a formula, using linear regression methods, that links local authority level indicators to relative spending needs associated with the changes in means-testing arrangements outlined in Section 3.

We provide in Section 4.1 a short summary of the structure and assumptions of the microsimulation model; further information can be found in Fernandez & Snell (2017). Sections 4.2 and 3.3 summarise the process used to derive estimates of relative spending shares associated with changes in the means-test.

4.1.1 The core sources of evidence

Unfortunately, no single data source has sufficient evidence - in terms of the number of observations and appropriateness of the indicators required - to quantify in each local authority the numbers of people with combinations of characteristics required for the analysis (including social care-related need, income, wealth, housing tenure and household composition). Moreover, there exists no definitive “normative” set of rules or definitions linking indicators of need and the targeting of social care. Thus, an approximation of such a relationship must be made in simulating likely patterns of utilisation.

To overcome data limitations, the microsimulation combines data from a number of sources to synthetically impute distributions of individuals with social care needs in each English local authority, on the basis of nationally observed targeting behaviours to estimate impact on social care provision and expenditure. Its core evidence is individual-level data from ELSA waves pooled to construct a representative sample of community-based older people across the 150 local authorities in England.

Data from three waves of ELSA (collected in 2006-07, 2008-09 and 2010-11) were pooled together and the 2006-07 and 2008-09 waves reweighted and rescaled to match 2009-10 population distributions and income levels (Figure 2 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 thus obtained 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.

4.1.2 Reweighting process to derive local authority populations

In order to 'reshape' the pooled ELSA sample to approximate individual local authority profiles, weighting variables were calculated to reflect the representativeness of each sample member for each local authority. Council-level indicators were collected from a number of sources, using multiple levels of stratification where possible to maximise precision:

- Age and gender distributions (based on 2011 Census)
- Limiting longstanding illness stratified by age and gender (based on 2011 Census)
- Receipt of pension credit stratified by age and gender (based on DWP data)
- Attendance allowance take-up (based on DWP data)
- Living alone stratified by home ownership (based on 2011 Census).
- Housing wealth (based on gross values rescaled according to House Price Index - HPI)

To derive the local weights, an iterative raking process was applied which applied each weighting dimension until convergence across all measures was achieved. The resulting 150[1] local authority weights allowed the microsimulation model to reflect the combinations of characteristics of each local authority population and of sub-groups of its population. 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.

4.1.3 Simulating the social care system

Once local authority population profiles were achieved, the model applied a simulation of the social care system to the data, by identifying individuals that would meet the current implicit "national" eligibility criteria and the associated care packages, and by modelling the existing means-testing arrangements in order to establish who would receive local authority financial support.

In order to determine which proportion of the population of older people in each local authority would meet existing 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

[1] Results excluded City of London and the Isles of Scilly owing to data constraints due to small sample sizes.

(4) identified the individuals within each area that would meet needs and/or means-testing eligibility criteria for community- and residential-based services.

We provide below further details of the stages involved in the modelling of the social care system. The process is also summarised in Figure 2.

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 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 the 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. According to current means-testing rules, assessable income corresponding to individuals in the ELSA sample was calculated and then compared against the size of the (nominal) care package 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. Crucially, this normative link was approximated at the national rather than authority level to ensure that the same definition of “entitled need” is applied across all areas and prevent indicators of relative need from reflecting differences in local policy preferences.

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.

Figure 2: Overview of the main stages of the weighted ELSA-based dataset

4.2 Estimating additional expenditure corresponding to reforms to the means-test

In order to estimate the relative spending shares, the analysis used the microsimulation model to calculate the proportional changes in local authority expenditure associated with the alternative set of means- testing arrangements.

Applying these changes was straightforward for cases living in the community. However, the ELSA dataset does not provide information about the distribution of income and assets of individuals in care homes. For people in care homes (those individuals most likely to benefit from the changes), the analysis therefore assumed that the income and assets of the population of care home residents could be approximated by the characteristics of the population in the community of individuals at risk of admission into care homes.

The process for simulating a cohort of new admissions into residential care involved:

- Selecting individuals in the community in need of social care support;
- selecting those with the highest levels of need (4+ ADLs);
- reweighting these cases to reflect differences in their propensity to go into residential care according to informal care support (proxied by living alone) and wealth (proxied by home ownership) in line with the relative risks observed in ELSA and reflected in Table 1.

Table 1 Relative probabilities of institutionalisation (as observed in waves 3-5 of ELSA) by living arrangements and home ownership

	Home owner	Non home owner
Living alone	1.8	2.2
Living with others	1	2.6

Once the cohort of new admissions was simulated, the development of the spending shares formula involved the following steps:

- Developing into the existing microsimulation model a new means-test incorporating the changes to the assets thresholds;
- calculating changes in net local authority expenditure in the community and in residential care using the alternative means-test;
- calculating per capita (per older person) changes in state expenditure in the different local authorities in England;
- running a regression model in order to derive the allocation formula.

The analysis used national average community care packages, estimated as indicated above in line with the average care packages reported in the IBSEN study and the ASCS data. For residential care, the analysis allowed care costs to vary in line with the average cost of residential and nursing care reported in the PSS-EX1 (or ASC-FR) returns by local authorities.

Figure 3 illustrates the importance of capturing differences in the cost of care packages, and in particular in care home prices, when estimating the implications for local authorities of the changes in the means-testing arrangements explored. The figure postulates four case types: the first three represent individuals with assets below £118,000 (and therefore not necessarily excluded from state financial support under the new arrangements) and with low, medium and high assessable income. The fourth represents an individual with assets above £118,000 (for instance, an individual being admitted into a care home, and whose house is taken into account in the calculation of the value of the assets). The relative contributions to the cost of the care package of users and local authorities are indicated in blue and orange, respectively. The shaded orange indicates the local authority contribution assuming a low residential care price.

Figure 3 Illustration of the link between local spending needs linked to the changes in means-testing arrangements and user's assessable income and residential care costs

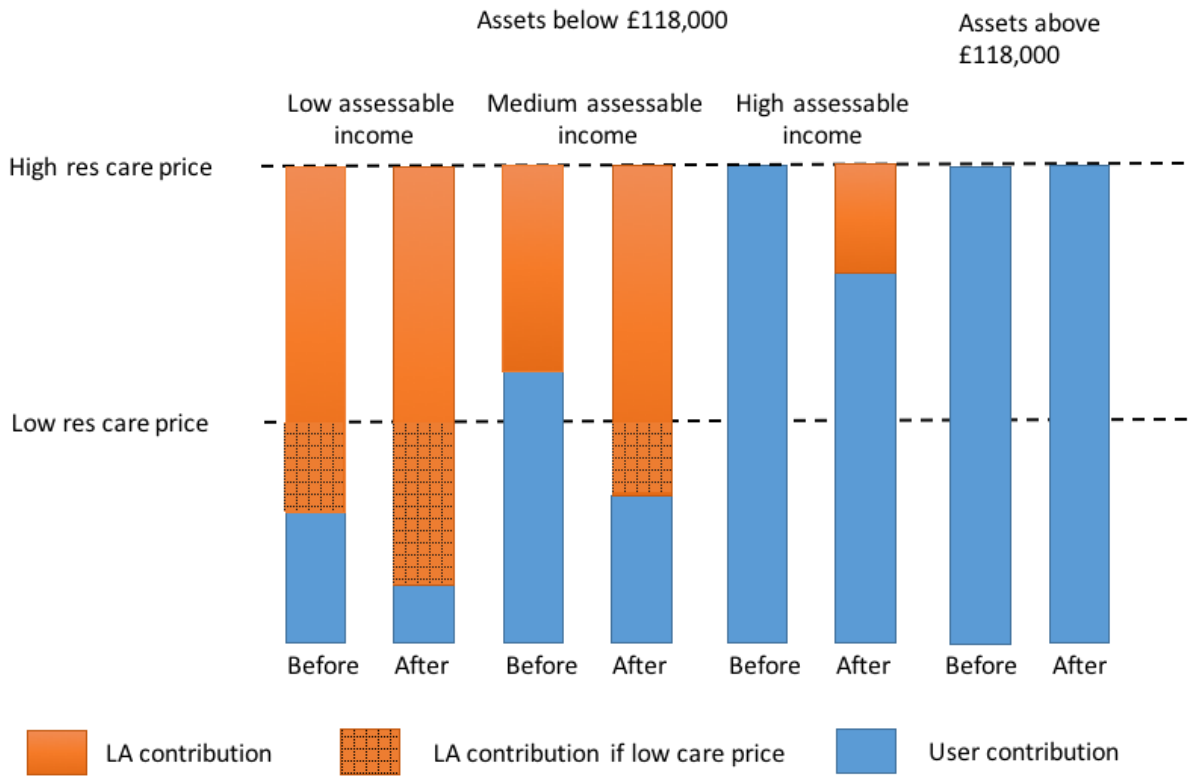


Figure 3 illustrates how the extent to which the changes in assets thresholds lead to increases in local authority expenditure depend on the difference between assessable income and the cost of care packages. Individuals with very high assessable income (but with assets below £118,000) will be more likely to benefit from higher assets thresholds in more expensive areas, in which the cost of the care package (and in particular the cost of a care home place) exceeds their assessable income. In areas where house values typically exceed significantly £118,000 (such as in London) few homeowners whose house is taken into account will benefit from the changes unless they remain in residential care for a number of years.

Text Box 1. Steps involved in calculating the impact on net local authority expenditure of changes in assets thresholds

- Step 1. Impute new means-testing arrangements in the microsimulation model
- Step 2. For community service users
    - Calculate changes in local authority charges under new means-test using microsimulation.
    - Aggregate changes in community expenditure at local authority level.
- Step 3. For care home users
    - Calculate changes in local authority charges under old and new means-test for imputed cohort of new care home admissions.
    - Calculate proportional changes in local authority net expenditure for cohort of new admissions.
    - Apply proportional changes in net expenditure for cohort of admissions to the local authority total residential care net expenditure.
- Step 4. Calculate total impact on local authority net expenditure by adding community and care home expenditure changes.
- Step 5. Divide total local expenditure by local population 65 plus.

5 Key modelling assumptions and caveats

The model makes a number of important assumptions and simplifications of the care system.

Capturing local distributions of home prices: As indicated above, national house prices were shifted in order to reflect differences average house prices across local authorities. It is difficult, however, for the methodology to fully capture fully variations in the distribution of local house prices.

Analysis based on new cohorts of entrants into residential care. The analysis uses individuals with a significant risk of admission into care home as representative of the income and assets of the population of residential care users. This is a simplification, as the income and wealth profile of new entrants into residential care will be different from that of the cross-section of residents, in particular due to the depletion of assets of self-payers.

Behavioural homogeneity: The model takes into account that the probability of admission into a care home varies with need, living arrangements and wealth. However, the analysis does not take into account potential differences in behaviour between individuals in different authorities due to for instance issues of supply-induced demand.

Gaming effects: the means-testing element to eligibility testing presents – other things being equal – a disincentive for individuals to save assets over the financial eligibility threshold, or to otherwise 'game' the system by hiding assets that may prevent access to public support. Understanding the

degree to which such responses occur and how they may vary at different asset thresholds is difficult to estimate reliably, however, and the model does not assume any such behavioural effects.

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 variations 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).

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.

Representativeness of the evidence used in light of recent changes: over recent years, the numbers of individuals receiving social care support, and the intensity of the support they receive have changed significantly. Whereas the analysis has attempted to use the latest available evidence, some of the data sources used to build the model describe the situation of the system a few years ago, and this might lead to some biases in the estimates derived.

5.1 Model validation

The ELSA-based model underwent a number of validation checks to ensure that its underlying estimates reflected accurately observed distributions in terms of demographics, dependency, income and wealth and levels of service utilisation at national and local levels.

5.1.1 Correlation between model estimates and local characteristics

Face validity was assessed using regression models to assess the relationship between local indicators of need and wealth and the model's estimates of supported clients according to existing means-testing regulations.

Table 2 shows the equation predicting per capita relative need for supported community clients 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 and pension credit receipt are significantly correlated with an increased share of supported clients. Higher proportions of older people living alone and lower proportions of older people owning their own

homes 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 92%.

Table 2: Linear model predicting per capita relative need for supported assessment index

R2=0.92; Adj R2=0.92						
	Coef.	Std. Err.	T	P>t	[95%	CI]
Proportion receiving AA	0.056847	0.007736	7.35	0.000	0.041557	0.072137
Proportion own home	-0.00522	0.001984	-2.63	0.009	-0.00914	-0.0013
Proportion receiving PC (80+)	0.138132	0.010953	12.61	0.000	0.116484	0.15978
Proportion live alone	0.012631	0.004852	2.6	0.010	0.003041	0.022221
Constant	0.027166	0.00304	8.94	0.000	0.021158	0.033174

5.1.2 Correlation between simulated and observed client numbers and expenditure

Construct validity was assessed in terms of correlations between model estimates and Information Centre data regarding total numbers of community clients and corresponding expenditure at the local authority level.

Unsurprisingly, overall correlation in terms of numbers of supported clients was high (88%) (Figure 4). The most visible outliers tended to be large authorities, where discrepancies were amplified; the nature of the differences between simulated and observed client levels is more easily observed at per capita levels (43% correlation) (Figure 5). As was expected, levels of client coverage are clearly more wide-ranging in the Information Centre data than in the ELSA simulation, since (crucially) the model discounts the effects of local preferences around targeting policies by universally applying national average behaviours.

Figure 4: Correlation between numbers of supported community care recipients according to RAP (2012/13) and ELSA-based model: local authorities in England

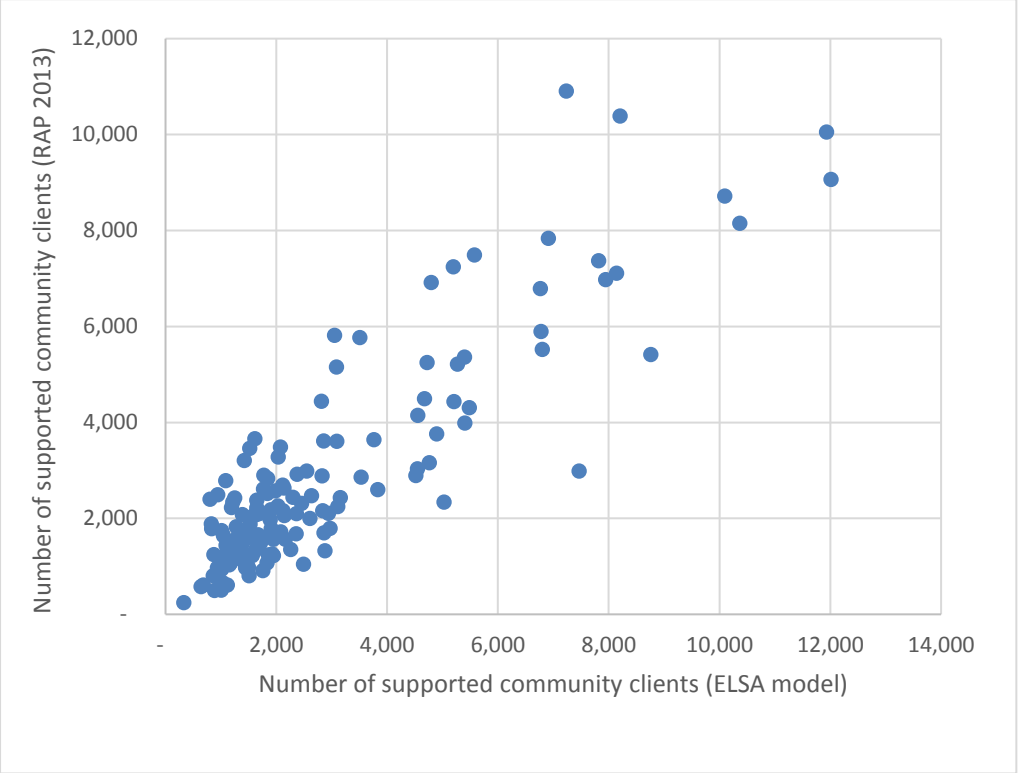
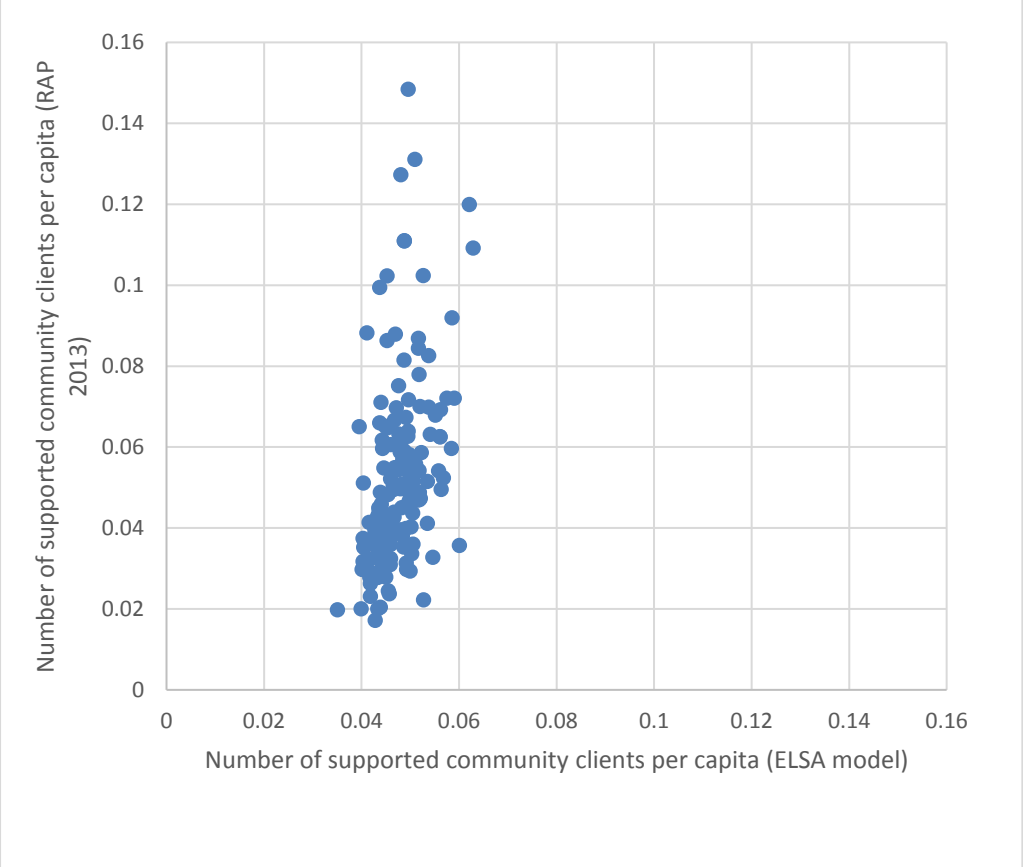


Figure 5: Correlation between numbers of per capita supported community care recipients according to RAP (2012/13) and ELSA-based model: local authorities in England



Correlations between local authority-reported and modelled gross expenditure on supported community clients was somewhat higher (94% overall (Figure 6) and 61% population-standardised (Figure 7)). This is most likely because disparities between local authorities in terms of client coverage are most likely to be accounted for predominantly by lower-need clients, who may account for a modest proportion of total local authority expenditure.

Figure 6: Correlation between community care gross current expenditure according to EX1 and ELSA-based model: local authorities in England

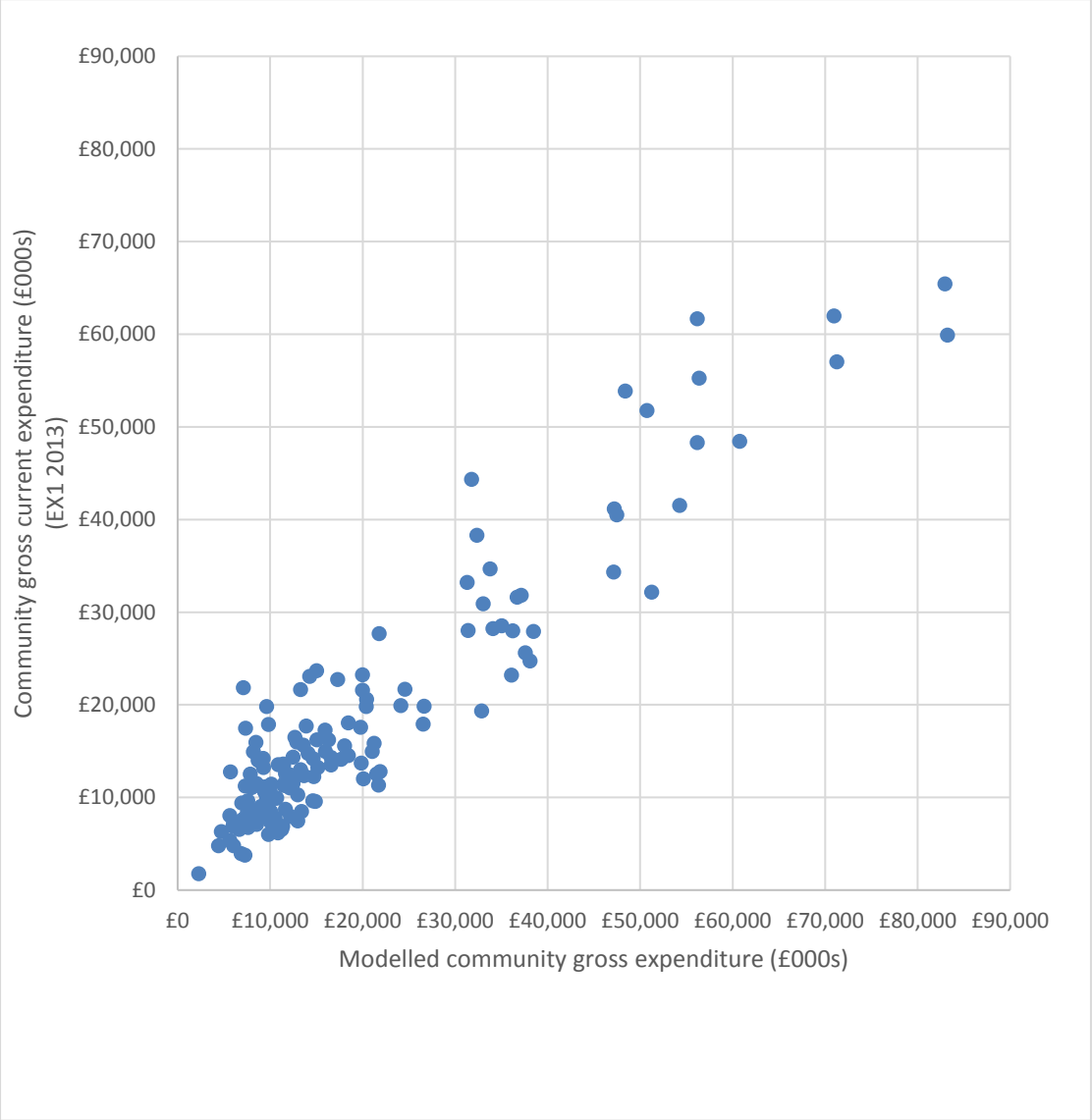
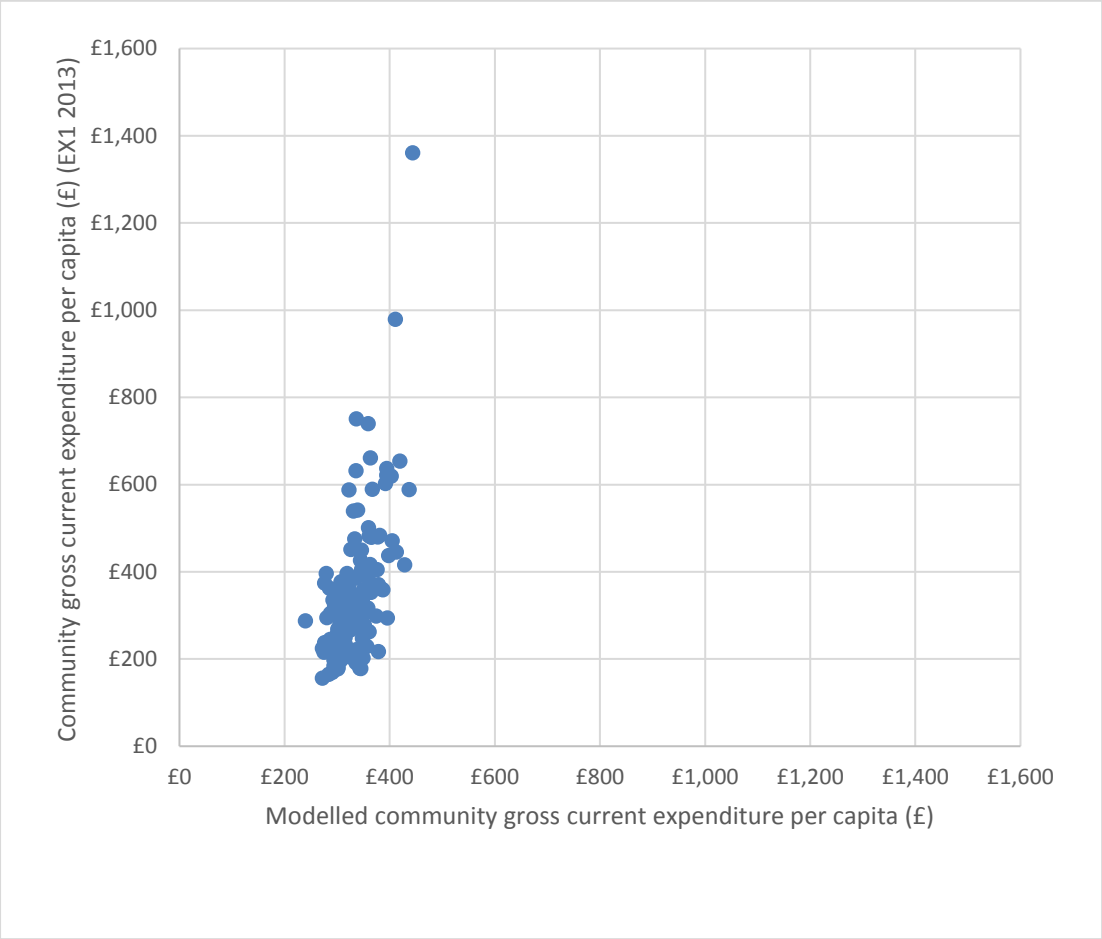


Figure 7: Correlation between community care gross current expenditure per capita according to EX1 and ELSA-based model: local authorities in England



Further checks confirmed that the weighted ELSA sample was consistent at the local authority 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.

6 Estimates of relative needs

Linear regression methods were used to estimate a formula linking local area characteristics to the relative spending shares associated with increases in per-capita expenditure as estimated directly by the microsimulation model. The estimation of shares according to a regression model has a number of advantages. Firstly, the derivation of local authority shares is highly transparent and easily replicable without reference to the microsimulation model. Secondly, regression output (expressing relative needs as a function of authority-level characteristics) allows for updated formulae to be calculated relatively easily on the basis of revised local authority explanatory variables. It should be noted, however, that substantial departure from the values of explanatory variables are likely to necessitate re-specification of the model to minimise bias.

Explanatory variables were selected according to available indicators likely to influence eligibility decisions in the assessment process – primarily, proxy indicators of wealth (home ownership, council tax grading and pension credit receipt), proxy indicators of likely informal care receipt (living alone), gender and unit costs of residential care. The derivation of local authority-level explanatory variables for both EX1-based and ASC-FR-based versions of the model is summarised in Table 3, with a discussion around variable specification and results below.

Table 3: Derivation of local authority-level explanatory variables

Numerator	Denominator	Derived variable
Owned or shared ownership: Total (HRP aged 65+) *Source: Census 2011 (LC4201EW)*	All categories: Tenure (HRP aged 65+) *Source: Census 2011 (LC4201EW)*	Proportion own home (HRP aged 65+)
Pension credit recipients aged 80+ *Source: DWP (May 2013)*	Population aged 65+ *Source: ONS (mid-2013)*	Pension credit (80+ / population 65+)
One person households aged 65+ *Source: Census 2011 (DC4101EW)*	Household residents aged 65+ *Source: Census 2011 (DC1104EW)*	Live alone (proportion 65+)
Female (65+) *Source: ONS (mid-2013)*	Population (65+) *Source: ONS (mid-2013)*	Female (proportion 65+)
Council tax - bands C-G *Source: VOA (24/04/14)*	Council tax - all bands *Source: VOA (24/04/14)*	Council tax - proportion in bands C-G
Council tax - band H *Source: VOA (24/04/14)*	Council tax - all bands *Source: VOA (24/04/14)*	Council tax - proportion in band H
Gross total cost for residential and nursing care for older people during year ended 31 March *Source: PSS EX1 (2013/14)*	The total number of weeks older people were supported in residential and nursing care (including full cost paying and preserved rights residents) during year ended 31 March *Source: PSS EX1 (2013/14)*	Residential/nursing Unit cost (older people - per week) LA-level *Source: PSS EX1 (2013/14)*
Gross total cost (less income from joint arrangements, Income from NHS and other income) for residential and nursing care for older people during year ended 31 March *Source: ASC-FR (2014/15)*	Total number of weeks older people (excluding those wholly supported by the NHS under Section 256 [formerly Section 28a] were supported in residential and nursing care (including full cost paying and preserved rights residents) during year ended 31 March *Source: ASC-FR (2014/15)*	Residential/nursing Unit cost (older people - per week) LA-level *Source: ASC-FR (2014/15)*

The modelling process tested a large number of local authority indicators of need, income and wealth and local costs of provision. Though time constraints necessitated a streamlined approach to variable selection, it would be feasible given additional resources to carry out multiple repetitions of the weighted model using *Monte Carlo* simulation methods to adjust estimates of standard errors and in doing so refine the variable selection process further. It is not anticipated, however, that Monte Carlo simulation would substantially alter the resultant choice of indicators.

The allocation formulae could also adequately be calculated on the basis of the weighted model, without specifying a regression model as a final stage. In this case, confidence intervals around estimates could be estimated, although failure to adequately reflect the stochastic nature of the explanatory variable would likely bias estimates.

None of the indicators of need - prevalence of attendance allowance, standardised mortality ratio, limiting illness and self-reported health status - were found to have a significant effect. This is perhaps not surprising given that the changes in the means-test target individuals principally in terms of their income and wealth rather than in terms of their needs. The proportion of women among the older population reduces the need for additional expenditure, a finding perhaps linked to the availability of informal support (and thus the need for residential care). In addition, the prevalence of single individual households amongst the older population, a factor linked to higher admission into residential care, is linked to higher spending shares.

Controlling for home ownership, housing wealth (through council tax band indicators) and pension credit was important because of the direct relationship between individuals' income and wealth and increases in local authority spending due to the changes in assets thresholds modelled. Overall, the additional spending should be greatest in those areas in which a significant proportion of the population being admitted into a care home has a limited amount of housing wealth (and therefore does not exceed the new £118,000 upper assets threshold) and does not have sufficient income to cover the full cost of care.

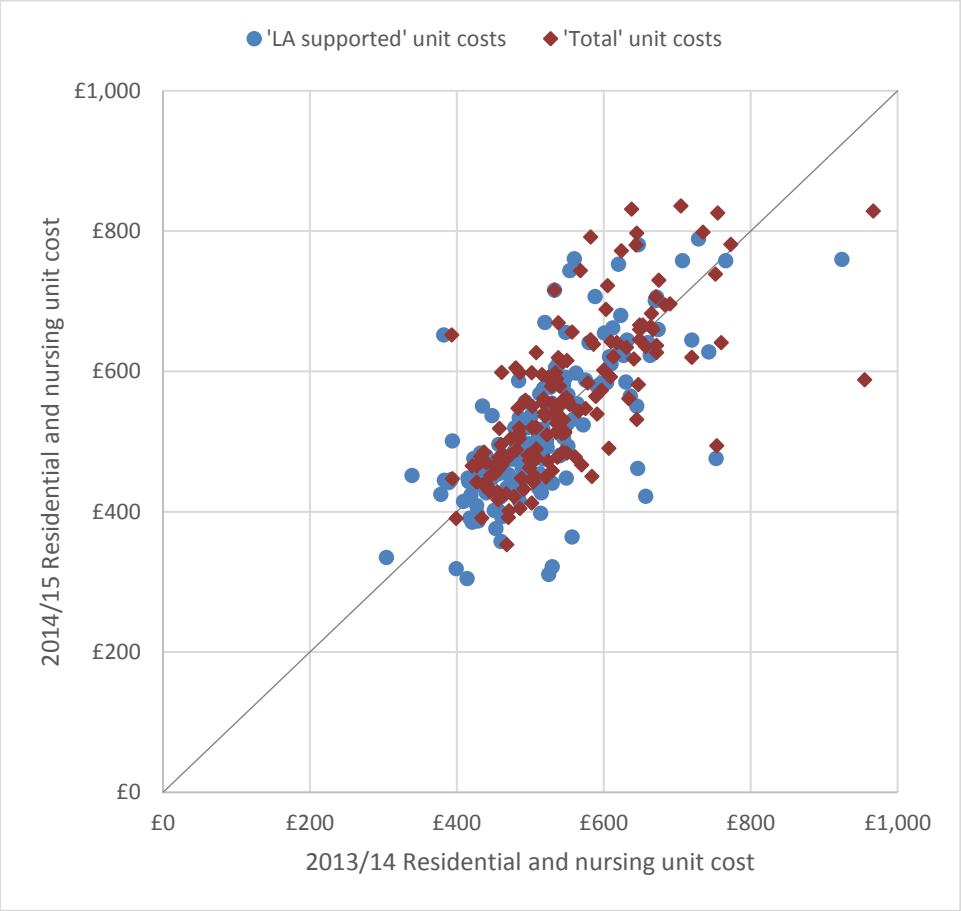
A number of house price indicators were tested in the modelling process. Although greater explanatory power for the model was achieved using house price indices, their variability through time was found to affect the longitudinal stability of the formula. We therefore adopted in the final models as proxies for house prices indicators of the proportion of properties in Band C-G and in Band H (these were the definitions that were found to have the greatest explanatory power).

Residential and nursing care unit costs were originally derived from local authority 2013/14 PSS-EX1 data (the most recent available at the time of construction). Ideally, 'LA supported' unit costs would have been applied – whereby expenditure from the NHS or other local authorities and corresponding activity are disregarded. Analysis of unit cost calculations suggested varying adherence to reporting guidelines among authorities, however: more than two thirds of councils in 2013/14 and all councils in 2014/15 reported identical activity levels for 'la supported' and 'total' residential care in the measures used to derive unit cost data. Furthermore, the exclusion of 'la supported' unit cost measures from ASC-FR 2015/16 precludes the revision of allocations using more recent estimates. For these reasons, unit cost estimates based on total expenditure and activity were applied throughout.

Residential care prices appeared to increase significantly the spending needs. This is not surprising, and responds to the fact that other things being equal, greater care costs increase the chances of a shortfall in people's assessable income relative to the cost of care, and therefore the need for local authority financial support (see Section 4.2 for an additional discussion).

While unit costs at the local authority level are historically relatively stable year-on-year, changes in accounting mechanisms from PSS-EX1 to ASC-FR in 2014/15 saw a sizeable shift in reported unit costs in several authorities. Figure 8 provides a comparison against 2013/14 unit costs on the basis of 'total' and 'LA supported' activity and expenditure.

Figure 8: Scatterplot of local authority level unit costs - 2013/14 (PSS-EX1) and 2014/15 (ASC-FR)



To maximise the long-term validity of the model, a second model was subsequently specified using 2014/15 unit costs throughout the microsimulation and regression stages. Under this revised specification, long-term (rather than long- and short-term) 2014/15 residential unit costs were adopted on the basis that figures were broadly closer to EX1 equivalents and given that the majority of impact is expected to relate to long-term services.

Table 4: Equation predicting spending shares of changes in means-testing arrangements per population 65 plus, using 2013/14 (PSS EX1) local authority residential and nursing care unit costs

Additional net expenditure per cap (£000s)
R2=0.63; Adjusted R2=0.61

	Coef	SE	t	P>t	95% CI lower	95% CI upper
Proportion aged 65+ that own homes	0.0779143	0.018239	4.27	0.000	0.0418592	0.1139693
PC recipients aged 80+ as proportion of population aged 65+	0.2712681	0.0883278	3.07	0.003	0.0966606	0.4458755
Proportion aged 65+ that live alone	0.1888666	0.0497563	3.80	0.000	0.0905079	0.2872254
Proportion aged 65+ female	-0.3659853	0.142273	-2.57	0.011	-0.6472322	-0.0847384
Proportion of CT properties are in bands C-G	-0.052297	0.0064559	-8.10	0.000	-0.065059	-0.039535
Proportion of CT properties are in band H	-0.1498834	0.0698103	-2.15	0.033	-0.2878852	-0.0118815
Residential care UC (2013-based)	0.0000945	0.0000135	6.98	0.000	0.0000677	0.0001213
Constant	0.0781311	0.063609	1.23	0.221	-0.0476118	0.2038741

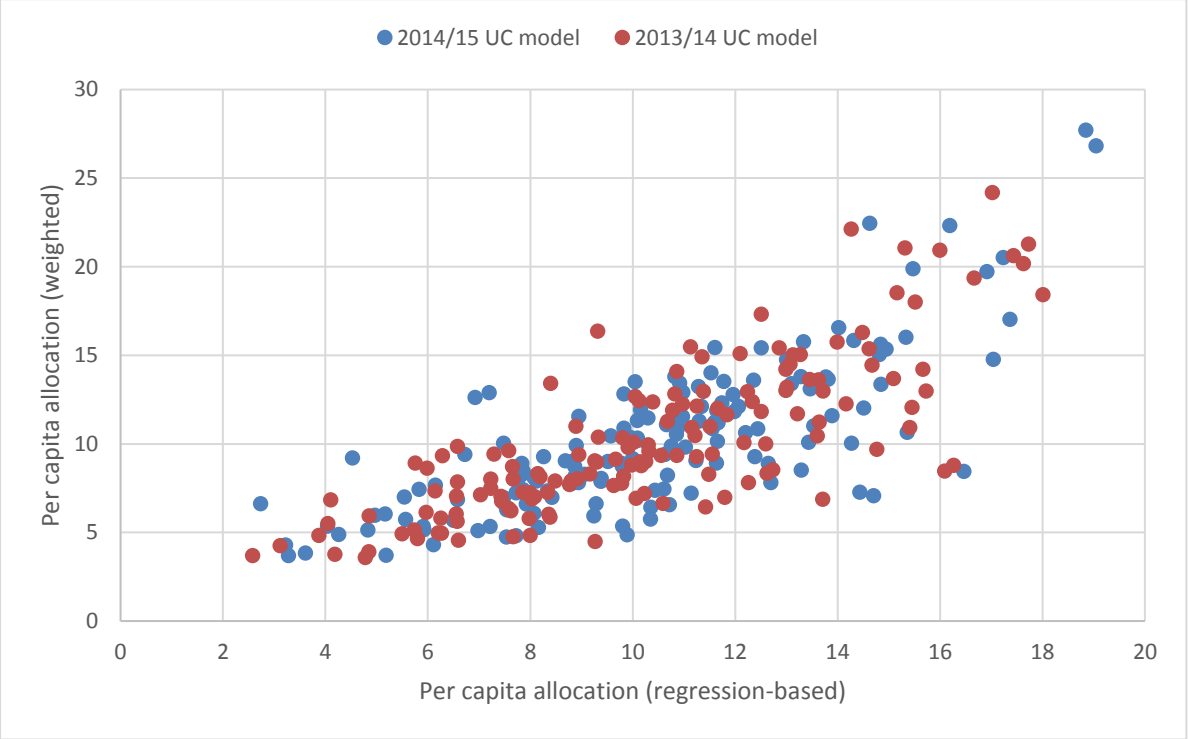
Table 5: Equation predicting spending shares of changes in means-testing arrangements per population 65 plus, using 2014/15 (ASC-FR) local authority long-term residential and nursing care unit costs

Additional net expenditure per cap (£000s)
R2=0.60; Adjusted R2=0.58

	Coef	SE	t	P>t	95% CI lower	95% CI upper
Proportion aged 65+ that own homes	0.089141	0.018999	4.69	0.000	0.0515835	0.1266985
PC recipients aged 80+ as proportion of population aged 65+	0.3182771	0.0921652	3.45	0.001	0.1360838	0.5004704
Proportion aged 65+ that live alone	0.2130284	0.0512641	4.16	0.000	0.1116889	0.314368
Proportion aged 65+ female	-0.5375114	0.1479239	-3.63	0.000	-0.829929	-0.2450938
Proportion of CT properties are in bands C-G	-0.0527161	0.0067293	-7.83	0.000	-0.0660187	-0.0394135
Proportion of CT properties are in band H	-0.112365	0.0698237	-1.61	0.110	-0.2503934	0.0256633
Residential care UC (2014-based)	0.0000907	0.0000119	7.61	0.000	0.0000671	0.0001143
Constant	0.1538244	0.065755	2.34	0.021	0.0238393	0.2838096

The correlation between the microsimulation and regression-based spending shares is high (79% in the 2013/14 unit cost model; 77% in the 2014/15 unit cost model) as shown in Figure 9. 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 9: Correlation between weight-based and regression-based shares per capita (assuming cost of policy is equivalent to £100 million) – 2013/14 and 2014/15 unit cost models



Local authority formulae are calculated by multiplying relative need (RN) (according to the linear model) by the local authority population aged 65+ (*POP*).

The share of the total allocation for each authority (LAA_i) is calculated by dividing the local authority formula by the sum of formulae for all local authorities in England, such that:

$$LAA_i = \frac{RN_i \times POP_i}{\sum_1^{152}(RN_i \times POP_i)}$$

As indicated in Figure 10 and Figure 11, the per capita spending shares estimated vary significantly between authorities.

Figure 10 Distribution of spending shared per person 65 plus predicted – 2013/14 unit cost model

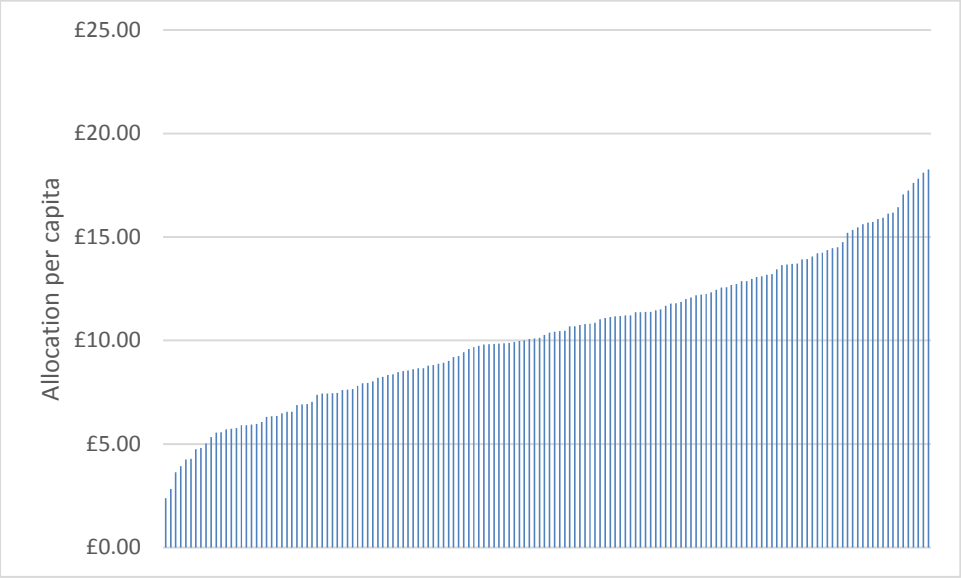
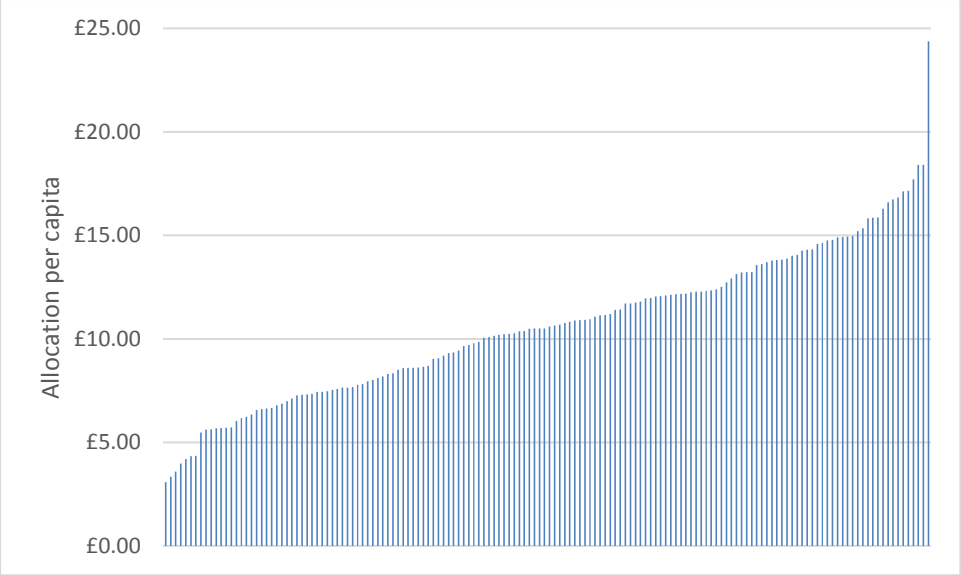


Figure 11 Distribution of spending shared per person 65 plus predicted – 2014/15 unit cost model



7 Policy implications

The results suggest that the model estimates significant variability across authorities in the level of funding needs associated with the changes in means-testing arrangements postulated. Not surprisingly perhaps given the nature of the funding changes investigated, the correlations with overall indicators of deprivation were not strong.

Overall, the highest per capita spending shares are associated with areas with low house prices such as the North East. This finding is likely to be related to the fact that in such areas a greater number of individuals with moderate housing wealth going into residential care will be helped by the £118,000 assets threshold.

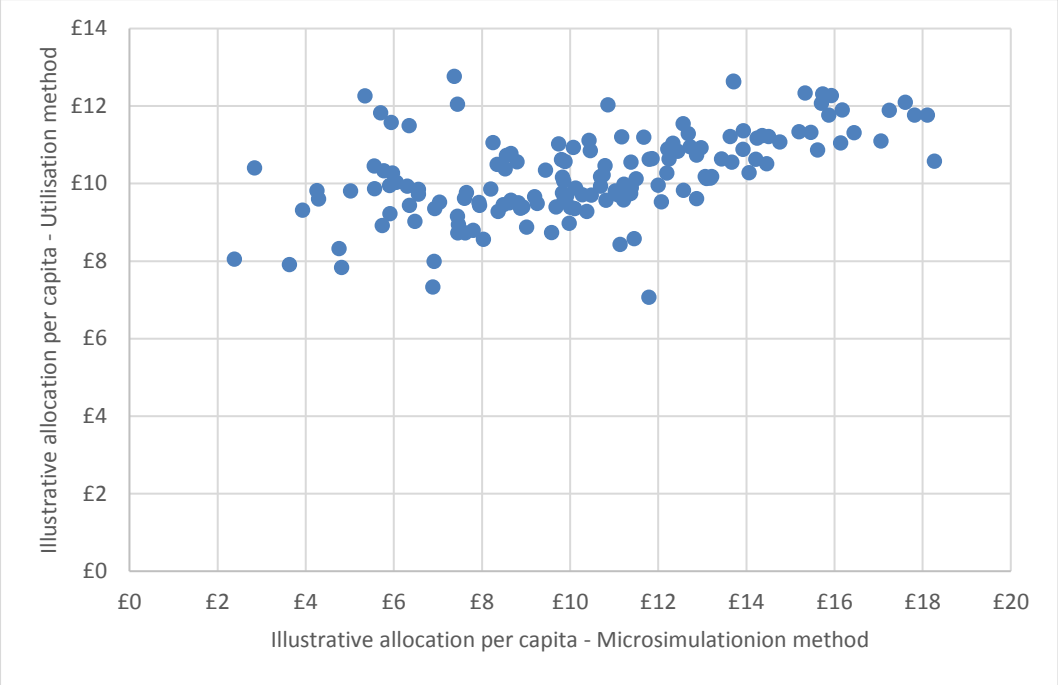
Because it simulates the needs and means-testing eligibility rules at the individual level, the microsimulation-based approach adopted avoids the need to impose assumptions about the functional form of the relationship between local proxies of needs, income and wealth and local authority expenditure. Ideally, the model would incorporate direct estimates of social care need and eligibility for each local authority. Since no such measures exist, the analysis (i) reweighted nationally representative data to simulate the characteristics of local populations of different English councils and (ii) used modelling methods to impute average social care targeting patterns across local areas in England. As a result, the analysis was able to reflect relative need in each area by "summing" the number of people in each area affected by the changes in the means-testing rules, and the extent to which these changes lead to increases in local authority expenditure.

By applying targeting ratios estimated at the national level, the analysis avoids reflecting local targeting preferences in equating underlying need to social care eligibility. However, the method adopted does incorporate some elements of a utilisation-led approach in that average targeting behaviours are applied according to underlying need indicators. The use of targeting ratios was considered to be justifiable for a number of reasons. Importantly, there exists no definitive consensus on what defines a social care need (and the appropriate policy response to such needs). Given this constraint, reflecting the (average) behaviours of assessment staff according to client characteristics was considered to be an appropriate method of weighting needs factors. Indeed, overlooking the role of such judgements by focusing entirely on rigid measures of underlying need would arguably be to misrepresent the tenets that underpin the decision-making process overall.

Because the analysis is based on individual level data, the method is able to model the interaction of combinations of individual characteristics and thus examine specifically the implications for key population groups likely to be particularly affected by the changes explored. It is perhaps not surprising that as a result the formulae generate substantially more variability in the estimates of local need than the hybrid utilisation-based methods described in Forder and Vadean (2018). It is notable, however, that variation in the estimates obtained is nonetheless significantly smaller than the observed variability in observed client coverage and expenditure as reported by local authorities (Figure 4 to Figure 7). This is in line with a priori expectation, and is likely to reflect the fact that observed levels respond to local policy decisions (in terms of targeting strategies) in addition to local needs-related factors, whereas our analysis assumes a single "average" targeting policy across all areas.

The existence of only a moderate (54%; Figure 12) correlation between the two approaches can be further explained by the use of different proxy indicators for wealth, dependency and informal care, and differences in baseline years adopted in the two sets of analyses.

Figure 12: Correlation between microsimulation-based and utilisation-based illustrative allocations (assuming cost of policy is equivalent to £100 million)



A number of quality checks have been carried out to explore the association between the additional burden of funding across local authorities and local care prices and housing prices, two key determinants of the need for additional resources. Final specifications of the models (with regard in particular to the inclusion of council tax bandings in place of average property values) are considered to be adequately robust to the application of year-on-year adjustments on the basis of recent historic trends. Invariably, however, substantial departure from local indicators used to derive the reported coefficients are likely to warrant re-specification of the model. As with all allocation formulae, therefore, validity decreases over time and revised estimates on the basis of updated local authority indicators would be warranted in the medium term.

Sensitivity analyses showed particular volatility to the application of 2014/15 unit costs, given the substantial differences between unit costs as reported in PSS-EX1 (2013/14) and ASC-FR (2014/15) returns. Given the relative infancy of ASC-FR, it was considered prudent to include two alternative models. Whether the adoption of the 2013/14-based model (with static unit cost assumptions) or the 2014/15-based model (with updated unit costs) is the preferred approach for applying updated local indicators to the regression coefficients will most likely be determined according to the stability of the ASC-FR unit cost measure over future reporting periods. Given the relative volatility in ASC-FR unit costs when comparing recently-published 2015/16 figures to the preceding financial year, EX1-based results are arguably more internally consistent and resistant to potential bias. Holding unit costs constant at 2013/14 clearly limits the applicability of the model to future years, however.

8 References

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