NIHR | Policy Research Unit in Adult Social Care

Relative need formula allocation of additional funding to local authorities to meet social care charging reforms:

Considering the extension to the financial means test and need for additional assessments

Julien Forder

Florin Vadean

Hansel Teo

Personal Social Services Research Unit

University of Kent

August 2022

LSE The London School of Economics and Political Science

University of Kent

King's College London

Acknowledgements

This report is based on independent research commissioned and funded by the National Institute for Health and Care Research (NIHR) Policy Research Programme through its core support to the Adult Social Care Research Unit (PR-PRU-1217-21101). The views expressed are those of the authors and are not necessarily those of the NIHR or the Department of Health and Social Care.

We would like to thank Karen Jones for leading on the ethics and research governance applications, as well as for her involvement with the LA-funded social care service users' survey and the care home survey data collection.

Furthermore, we like to thank the local authorities and care homes that took part in the research and provided data, and members of the advisory panel for their invaluable advice on research design and data collection.

Data from the English Longitudinal Study of Ageing (ELSA) were made available through the UK Data Archive (UKDA). ELSA was developed by a team of researchers based at the National Centre for Social Research, University College London and the Institute for Fiscal Studies. The data were collected by the National Centre for Social Research. The funding is provided by the National Institute of Aging in the United States, and a consortium of UK government departments co-ordinated by the Office for National Statistics. The developers and funders of ELSA and the Archive do not bear any responsibility for the analyses or interpretations presented in this report.

Contents

1 Introduction

The Adult social care charging reform first set out in 2021 and developed in 2022 (henceforward the *2021 reforms*) introduced a lifetime cap on the amount anyone in England will need to spend on their personal care and changed the means test for local authority financial support. Both elements are due to be implemented from October 2023.

The reforms place additional funding requirements on the public sector.[1] Local authorities (LAs) are responsible for social care in England. As LAs across England differ according to both the level of care need and financial wherewithal of their local populations, the reforms will have a differential impact on the amount of expenditure per capita that each LA will need to make to meet their obligations. In this study we are concerned with the share of total additional funding that should be allocated to each LA. We seek to develop formulas – called relative need formulas – that are used to predict this different expenditure requirement on a fair and equitable basis, and so help guide the distribution of budgets. This work updates our previous study of these funding allocation requirements that was produced for the reforms that underpin the current new policy (the 2012 Dilnot reforms), which includes an account of the principles of formula allocation (Vadean and Forder, 2018).[2]

[1] These are laid out in the *Social Care Charging Reform Impact Assessment* (IA No: 9583) 5 Jan 2022.

[2] There are broadly two alternative approaches to determining resource allocation formulae. The first is the *utilisation-based* approach (Gravelle, Sutton et al. 2003; Smith 2007; Darton, Forder et al. 2010). The central premise is that the effect of need – and differences in patterns of need between individuals – is reflected in

The remit of the current report is funding allocations for the reform to the means test and the additional need for assessments required to implement the two components of the 2021 reforms (i.e. the new means test and cap on lifetime out-of-pocket costs to care).

1.1 The reforms

1.1.1 Changes to the means test

Under the current rules, only people with assets below £23,250 qualify for means-tested financial support from the public system for their care. The 2021 reforms change the means-testing rules, increasing the respective thresholds for support, and extending the coverage of the public system with respect to population wealth.

The upper capital limit (UCL), the point at which people become eligible to receive some financial support from their local authority, will rise to £100,000 from the current £23,250. The lower capital limit (LCL), the threshold below which people will not have to pay anything for their care from their assets will increase to £20,000 from £14,250.

The reforms will significantly affect people who would be self-funders under the current system. Older people – those aged 65 and over – who pay for their own social care account for about two-fifths of residential and nursing home places in England.[3]

A smaller proportion of older people using community-based care are self-payers. Previous estimates suggest only about 20 per cent of community-based service users 65 and over are self-funders (Forder 2007, Institute of Public Care 2011). Based on our analysis of data from a representative sample of people aged 65 and above, we estimate that this proportion has increased to around 30 per cent (which is consistent with increased wealth and the unchanged – including in money terms – of the capital limits in the current means test). Recent ONS estimates provide a similar figure, suggesting that about 28 per cent of community care services for older people and dementia care are provided to self-funders.[4]

Data about the funding of care for people under 65 with care needs is limited, although available estimates suggest that the proportion of those young adults self-funding their care is much smaller than for those aged over 65. Based on the LaingBuisson Adult Specialist Care UK Market Research Report 2019, the DHSC Impact Assessment (IA No: 9583) assumed that 1 per cent of adults under 65 receiving residential care are self-funders,[1] with a similar figure estimated by ONS.[5] The ONS also estimates that 7 per cent of younger adults are self-funding their care in the community.[4]

To be eligible for publicly-funded support, individuals are assessed to determine whether they have an eligible level of need (Department of Health, 2014). The financial means test is applied alongside this needs test. The introduction of the cap does not affect the needs eligibility assessment as set out in the 2014 Care Act.

---

observed patterns of utilisation. The second method might be called the *epidemiological* or *normative* approach. In this case, need is determined on the basis of specific normative criteria, and the measures of need populating these criteria are used directly to allocate resources (Asthana, Gibson et al. 2004; Vallejo-Torres, Morris et al. 2009; Asthana and Gibson 2011; Galbraith and Stone 2011).

[3] Office for National Statistics (2021) *Care homes and estimating the self-funding population, England: 2019 to 2020* (accessed May 2022). Analysis based on Table 12.

[4] Office for National Statistics (2022) *Estimating the size of the self-funding population in the community, England*, Table 6 (accessed August 2022)

[5] Office for National Statistics (2022) *Care homes and estimating the self-funding population, England: 2021 to 2022*.

1.1.2 Additional assessments

The changes to the means test and the implementation of a cap on lifetime out-of-pocket costs are expected to increase the number of assessments undertaken. This again has differential cost implications for individual LAs. We can expect more people with care needs who would be self-payers under the current system to come forward for assessment. As with the means test, we expect the majority of *additional* assessments to be for people over 65 (since most younger adults with care needs will already be having assessments, regardless of their financial means/eligibility).

1.2 Aims

The aim of this study is to produce allocation formulas that predict the relative size of the additional public expenditure requirements arising from the reforms as this affects each local authority in England. These formulas need to be produced with readily available metrics so they can be used to routinely calculate the shares of the additional funding to be allocated to each LA following the implementation of the reforms.

We focus on the differential impact of the reform to the financial support of newly-eligible people due to extension of the means test and the additional number of assessments required to implement the 2021 reforms (i.e. the extension of the means test and the cap on lifetime out-of-pocket costs to care).

The remit of this study is primarily the allocation formulas for the additional cost of care for older adults (conventionally defined as 65 years or older). We also consider and develop formulas for younger adult's care, although limitations with data means that we use a different approach for estimating formulas for older adults (conventionally defined as 65 years or older) and younger adults.

1.3 Methodological approach

Following the methods developed in our previous study, we combine analysis of person-level survey data – to simulate changes in financial eligibility for people with potential care need – with small area level data,[6] which includes key drivers/variables of both need and financial eligibility. We predict (changes in) financial eligibility at individual level (with the survey data) using the same drivers/variables that are available at small area level. Accordingly, we can predict how changes in eligibility rules will affect local populations with care needs, and so estimate additional expenditure requirements for those populations. We can link the predicted additional expenditure requirement with routinely available drivers/variables of need and financial means. The resultant formulas can be used to allocate financial resources to all local authorities both currently and repeated in the future on a consistent basis.

The above approach is used for developing the older adult's formula. A key data source is the English Longitudinal Study of Ageing (ELSA), which has detailed financial information for individuals. ELSA surveys people aged 50 years or more so cannot be used to fully simulate financial eligibility for younger adults. There is also less information on self-payer numbers for that population group. We offer a more pragmatic method for developing a formula for younger adults. We propose metrics for financial eligibility and potential care need for younger adults that are available at the area level. However, we use the financial eligibility simulation results for the older adults' formula to calculate effect sizes – i.e. the parameters – of these metrics in the allocation formula. A number of assumptions are embodied in this approach, and these are considered in discussion section.

[6] Mainly at the ONS defined lower-layer supper output area (LSOA) level.

2 Analytical framework

2.1 Additional expenditure requirements from change in the means test

To receive LA-funded support, an individual will have to satisfy both a needs (denoted by R) and a financial eligibility test (denoted by E). We can consider the probability that each person satisfies both tests – this joint probability is denoted $p(R \cap E)$ for shorthand. Conditional on providing support to an individual, there will be a net cost of care incurred by the LA, and this is expressed as $u(R \cap E)$. This net cost is equal to the total cost of providing the required care less the individual's personal contribution (charge). The latter is determined by charging regulations and in general depends on the individual's assets, income and housing situation. The expenditure requirement per individual, i.e. the per capita expected cost of care to the LA, is given by the probability of satisfying both the needs and financial eligibility test, $p(R \cap E)$, multiplied by per person net cost, $u(R \cap E)$.

The extension to the means test involves a rise in the upper capital limit (UCL) from £23,250 to £100,000 and a rise in the lower capital limit (LCL) from £14,250 to £20,000. The additional expenditure requirement (AER) resulting from this means test extension is the difference between the expenditure requirement under the new and the old (i.e. current) means tests:

$$AER^{ext} = ER^{NEW} - ER^{OLD} = p(R \cap E^{NEW}) \times u(R \cap E^{NEW}) - p(R \cap E^{OLD}) \times u(R \cap E^{OLD}) \quad (1)$$

The extension of the means test affects expenditure requirements in two ways. First, the change in the UCL increases the probability of an individual being eligible for support. Second, the combined shifts in LCL and UCL changes the *net* cost of care of supporting an eligible individual, the costs of care less the person's contribution (charge). For a person with assets between the LCL and UCL, for the purposes of calculating their charge, in addition to their actual (eligible) income, a person is assumed to have an additional 'tariff income' based on their assets – for every £250 of capital between the lower and upper capital limit, a tariff income of £1 a week is assumed – and this increases their charge accordingly – see section 2.1.1 below for details. With the extension of the means test, the asset base for deriving an individual's 'tariff income' contribution shifts from assets above £14,250 and below £23,250 to assets above £20,000 and below £100,000 and this can affect the amount the person is charged for their care.

Our overall objective is to estimate a (linear) equation that predicts the additional expenditure requirement at the small-area level as a function of need proxies, income and wealth proxies and supply, all of which are available in routinely collected data. This will allow the derivation of an allocation formula for the extension to the means test.

Since the extended means test is yet to be implemented, there is no utilisation data for people who become newly eligible under the reform. Moreover, individual (or household) income and wealth data are not collected routinely at national level. Therefore, we cannot directly estimate the joint probability of a person satisfying the needs test and the new means test, i.e. $p(R \cap E^{NEW})$, nor the new net cost, accounting for differences in charges i.e. $u(R + E^{NEW})$. Nonetheless, $p(R \cap E^{OLD})$ can be decomposed into the probability of having eligible needs, $p(R)$, multiplied by the conditional probability of satisfying the current financial means test given eligible needs, $p(E^{OLD}|R)$:

$$p(R \cap E^{OLD}) = p(R) \times p(E^{OLD}|R) \quad (2)$$

Applying the same decomposition to $p(R \cap E^{NEW})$ and substituting out $p(R)$ using (2) yields:

$$p(R \cap E^{NEW}) = p(R) \times p(E^{NEW}|R) = \frac{p(R \cap E^{OLD})}{p(E^{OLD}|R)} \times p(E^{NEW}|R) \quad (3)$$

The additional expenditure requirement can therefore be re-written as:

$$AER^{ext} = \frac{p(R \cap E^{OLD})}{p(E^{OLD}|R)}[p(E^{NEW}|R) \times u(R \cap E^{NEW}) - p(E^{OLD}|R) \times u(R \cap E^{OLD})] \quad (4)$$

While the share of LA-supported people is a suitable measure of the joint probability of having both eligible needs and satisfying the current means test, $p(R \cap E^{OLD})$, the information required to estimate the remaining terms in equation (24) is not available at the small-area level. To obtain these measures of financial eligibility given eligible needs (i.e. $p(E^{OLD}|R), p(E^{NEW}|R)$) and the associated expenditure requirements (i.e. $u(R \cap E^{OLD}), u(R \cap E^{NEW})$) we proceed in three steps.

First, we use individual-level survey data to simulate the financial means tests and per capita expenditure requirements under the old and new means tests. Next, using these simulated measures we estimate an individual-level model that predicts financial eligibility given eligible needs and the corresponding expenditure requirements as functions of information available at the small-area level. Third, we apply the coefficients from the resulting (individual-level) model at small-area level to predict the additional expenditure requirements. This procedure is performed separately for residential and community care. Further details for how these estimates are brought together are available in Annex A.1.

2.1.1 Individual-level analysis

As the assessment and charging rules are formulaic and explicit, the eligibility and LA financial support for a person with given characteristics can be calculated, as least to a reasonable degree of approximation.

2.1.1.1 Residential care

When assessing financial eligibility for LA-supported residential care, housing wealth is considered only if there are no eligible dependents living in the property. When it is considered, a 10 per cent deduction is applied to account for selling expenses. Furthermore, we assume a discount factor of 0.75 which is applied to reflect that housing wealth is not considered for the first 12 weeks (ca. 3 months) of residence in a care home. Financial eligibility under current UCL is thus given by the threshold condition:

$$E^{OLD} = \begin{cases} 1 \; if \; NHW + 0.9 \times 0.75 \times HW \times alone < £23{,}250 \\ 0 \; if \; NHW + 0.9 \times 0.75 \times HW \times alone \geq £23{,}250 \end{cases} \quad (5)$$

while the financial eligibility under the new UCL is:

$$E^{NEW} = \begin{cases} 1 \; if \; NHW + 0.9 \times 0.75 \times HW \times alone < £100{,}000 \\ 0 \; if \; NHW + 0.9 \times 0.75 \times HW \times alone \geq £100{,}000 \end{cases} \quad (6)$$

where NHW denotes non-housing wealth, HW denotes housing wealth and $alone$ equals to 1 if the person lives alone and 0 if the person lives with a spouse, partner or a relative (i.e. son, daughter, etc.).

The weekly LA net expenditure requirement for an individual (u) is approximated by the gross unit cost for residential care (UC^{res})[7] net of the individual's personal contribution:

$$u(R \cap E) = UC^{res} - (I + TI^{res} - PA) \quad (7)$$

[7] The 'usual cost' (or 'standard rate') is the maximum amount the local authority is usually prepared to pay to for care services to meet a certain level of eligible needs. This maximum amount varies from authority to authority, and for different levels and types of care.

An individual's personal contribution consists of their weekly income (I) and a means-tested tariff income (TI) less a personal expenses allowance (PA). The maximum personal contribution cannot exceed the cost of the care package, meaning that u cannot be less than zero.

The tariff income specifies the amount of personal contribution out of an individual's assets. Chargeable assets consist of non-housing wealth, considered at market value, and housing wealth if there is no (eligible) dependent living in the property. Where housing wealth is charged, a 10 per cent discount from its market value is applied for selling expenses. A contribution of £1 is charged for every £250 of chargeable assets above the LCL:

$$TI^{res} = \begin{cases} (NHW + 0.9 \times HW \times alone - LCL)/250 & if\ NHW + 0.9 \times 0.75 \times HW \times alone > LCL \\ 0 & if\ NHW + 0.9 \times 0.75 \times HW \times alone \leq LCL \end{cases} \quad (8)$$

The expenditure requirement according to the current means test is thus given by[8]:

$$u(R \cap E^{OLD}) = UC^{res} - \left(I + \frac{NHW + 0.9 \times 0.75 \times HW \times alone - £14{,}250}{250} - £24.90\right) \quad (9)$$

while the expenditure requirement according to the new means test is:

$$u(R \cap E^{NEW}) = UC^{res} - \left(I + \frac{NHW + 0.9 \times 0.75 \times HW \times alone - £20{,}000}{250} - £24.90\right) \quad (10)$$

The shift in UCL affects the expenditure requirement by changing the maximum amount of wealth that is chargeable through tariff income from £23,250 to £100,000.

2.1.1.2 Community care

Housing wealth is disregarded in the means test for community care. Therefore, financial eligibility for public support with community care services according to current upper capital limit is:

$$E^{OLD} = \begin{cases} 1\ if\ NHW < £23{,}250 \\ 0\ if\ NHW \geq £23{,}250 \end{cases} \quad (11)$$

while financial eligibility according to new upper capital limit is:

$$E^{NEW} = \begin{cases} 1\ if\ NHW < £100{,}000 \\ 0\ if\ NHW \geq £100{,}000 \end{cases} \quad (12)$$

The weekly LA net expenditure requirement for an individual (u) is approximated by the gross unit cost for non-residential care (UC^{com}) from which we subtract the individual's personal contribution. The personal contribution consists of: a) the individual's weekly income (I) net of income from earnings (I_{earn}) and self-employment (I_{self}), and b) a means-tested tariff income (TI^{com}) less the Minimum Income Guarantee (MIG) and disability related expenses (DRE). The amount is constrained to be greater than or equal to zero, as supported persons are not expected to contribute from their income and savings in addition to the cost of their care package.

$$u(R \cap E\ ) = UC^{com} - \left[\left(I - I_{earn} - I_{self}\right) + \left(TI^{com} - MIG - DRE\right)\right] \quad (13)$$

Chargeable assets for non-residential care consist of only non-housing wealth. A contribution of £1 is charged for every £250 of chargeable assets above the LCL:

$$TI^{com} = \begin{cases} (NHW - LCL)/250 & if\ NHW > LCL \\ 0 & if\ NHW \leq LCL \end{cases} \quad (14)$$

[8] Personal Expense Allowance rates are for 2019-2020, in line with the reference period of our data. https://www.gov.uk/government/publications/social-care-charging-for-local-authorities-2019-to-2020

The Minimum Income Guarantee depends on an individual's living arrangements and receipt of disability benefits[9]:

- £189 for individuals living alone and *not* receiving a disability premium;
- £144.30 for individuals living as a couple and *not* receiving a disability premium;
- £189 + £40.35 for individuals living alone and receiving a disability premium;
- £189 + £19.70 for individuals living alone and receiving an *enhanced* disability premium;
- £144.30 + £28.75 for individuals living as a couple if either is receiving a disability premium;
- £144.30 + £14.15 for individuals living as a couple if either is receiving an *enhanced* disability premium.

In addition, £43.25 is added to MIG if the individual is in receipt of carer premiums and £83.65 is added to MIG for every dependent child living in the household. Finally, a Savings Credit disregard of £5.75 for individuals living alone and £8.60 for couples is added to MIG in case they are in receipt of Savings Credit.

Disability Related Expenditure is assumed to be $20 \times \sqrt{\#ADL}$, which assumes a baseline weekly cost of £20 that is increasing in number of activities of daily living (ADLs) people have difficulties with. We also disregard gross rental payments for renters and mortgage payments for homeowners, included all in the DRE term below.

The expenditure requirement according to the current means test thus given by:

$$u(R \cap E^{OLD}) = UC^{com} - \left(I - I_{earn} - I_{self} + \frac{NHW - £14{,}250}{250} - MIG - DRE\right) \quad (15)$$

while the expenditure requirement according to the new means test is:

$$u(R \cap E^{NEW}) = UC^{com} - \left(I - I_{earn} - I_{self} + \frac{NHW - £20{,}000}{250} - MIG - DRE\right) \quad (16)$$

A dataset with relevant variables (i.e. level of disability, living arrangements, income, housing and non-housing wealth) that enabled us to simulate the means tests and expenditure requirements is the English Longitudinal Study of Ageing (ELSA). Eligibility conditions and expenditure requirements are approximated by applying the above criteria (i.e. equations (5), (6), (9), (10), (11), (12), (15) and (16)) according to the characteristics of people in the ELSA dataset.

2.1.2 LSOA-level analysis

We used the coefficients from the ELSA estimates to predict the share of people in each LSOA (i) that are financially eligible given eligible need according to either the current ($\hat{p}_i(E^{OLD}|R)$) or the extended means test ($\hat{p}_i(E^{NEW}|R)$),[10] as well as the net individual expenditure requirement for each LSOA according to either the current (u_i^{OLD}) or the new capital limits (u_i^{NEW}). These estimated values were then plugged into equation (4) and multiplied by the LSOA population level (m_i) to obtain the predicted total additional expenditure requirement for each LSOA:

$$AER_i^{ext} = \frac{p_i(R \cap E^{OLD}) \times m_i}{\hat{p}_i(E^{OLD}|R)} \times \left[\hat{p}_i(E^{NEW}|R) \times u_i^{NEW} - \hat{p}_i(E^{OLD}|R) \times u_i^{OLD}\right] \quad (17)$$

With this measure, we can statistically model LSOA-level additional expenditure requirements in terms of factors that are available in routine data sets:

[9] Minimum Income Guarantee rates are for 2019-2020, in line with the reference period of our data. https://www.gov.uk/government/publications/social-care-charging-for-local-authorities-2019-to-2020

[10] For more details on the prediction of financial eligibility, see (Forder and Vadean 2018), Annex 1.

$$AER_i^{ext} \cong \beta_0^{ext} + \beta_1^{ext} x_i + \beta_2^{ext} y_i + \beta_3^{ext} w_i + \beta_4^{ext} m_i + \beta_5^{ext} s_i \quad (18)$$

where the terms in the equation are need proxies (x_i), income (y_i) and wealth (w_i) proxies, all expressed as rates per capita in the LSOA, and the LSOA population (m_i) and supply (s_i). The coefficients are the βs (see Annex A.1 for details).

Relative need (RN) formulas are traditionally provided in linear form and are applied at the LA level as rates per capita for the LA, with the relative needs formula for the extended means test being: $RN_k^{ext} = \sum_{i \in k} \widehat{AER}_i^{ext} / m_k = \pi_0^{ext} + \pi_1^{ext} x_k + \pi_2^{ext} y_k + \pi_3^{ext} w_k$, where k denotes each LA and $\widehat{AER}_i^{ext}$ is the predicted additional expenditure requirement for each LSOA. The proxy variables are expressed in rates per capita at the LA level. The π's are the coefficients of the relative need formula and are derived, and rescaled, from the βs in (18) (see Annex A.1 for details). Conventionally, supply effects are removed (by using their national average values), as are population effects (so that per capita allocations to LAs are independent of their population size) – see also section 4.3 below and, for a discussion of these principles, Forder and Vadean (2018).

The relative need adjustment, RN_k^{ext}, gives the relative amount per capita that should go to each LA to adjust for differences in need. For example, this would mean that the ratio of resources per capita going to local authority k' compared to local authority k'' would be $RN_{k'}^{ext} / RN_{k''}^{ext}$ to account for differences in need (other things equal).

2.2 Additional need for assessments from the reforms

The difference in the need for additional assessments between local authorities following the implementation of the reforms will likely vary according to: (a) the number of people with potential care needs in a locality and (b) the number who come forward in the new system, who would otherwise have not sought an assessment under the current system. There is some uncertainty about both numbers. The former will be proportional to the number of people with *eligible-level* care needs (i.e. eligible for public support on the basis of need) but go beyond that number. The latter will be positively related to the number of self-funders in a locality who might not request an assessment under the current system, expecting not to be (means test) eligible.

We propose two approaches for estimating (the variation between) the number of additional assessments by local authority to reflect this uncertainty:

- First, to estimate the total number of people with eligible need less the number of LA-supported people (who will have had an assessment). This number is equivalent to the number of self-payers with eligible level need.
- Second, estimate the total number of people in local populations with *potential* need and subtract the number of LA-supported people (who will have had an assessment).

These approaches differ according to their judgement of the number of people in the population with a need for an assessment. The first approach defines the need for assessment according to those that currently pass a LA needs test. This approach uses, therefore, a concrete estimator of need, i.e. people that are recorded as having used services. However, an issue is we know that more people come forward currently for an assessment (NHS Digital, 2020), and still more might come forward in the new system. These assessments data are available at LA level, but not at small area (LSOA level) as required for our analysis.

The second approach uses predictions of the number of people with ADL difficulties in local populations to define need for assessment. ADLs are a very good indicator of potential need for services and likely to be a better predictor of total assessments. The issue with this approach is that whilst a good predictor, we do not know the exact relationship between numbers of people with

ADL difficulties and (resultant) numbers of actual assessments. We implicitly assume in this case that this will be a 1:1 relationship. This assumption is satisfactory for estimating *relative* need (for assessment), as long as we can confidently assume that this relationship does not change from one local area to another.

Details of these two approaches are given in Annex A.1.2. For the utilisation-based approach this is:

$$AA_i = \frac{X_i^{res}}{\hat{p}_i(E^{OLD}|R^{res})} + \frac{X_i^{com}}{\hat{p}_i(E^{OLD}|R^{com})} - X_i^{res} - X_i^{com} \quad (19)$$

where $X_i^{res} = p_i(R^{res} \cap E^{OLD}) \times m_i$ and $X_i^{com} = p_i(R^{com} \cap E^{OLD}) \times m_i$ are LSOA residential and community service users in each locality i.

For the normative approach we have:

$$AA_i = \hat{p}_i(ADL)m_i - X_i^{res} - X_i^{com} \quad (20)$$

where $\hat{p}_i(ADL)$ is the predicted probability of a person having ADL need.

Relative need formulas are calculated on this basis using the same method as above for the extended means-test.

3 Data

Two datasets were used for the analysis.

3.1 LA-funded social care service users survey

We used data on social care service use at Lower Layer Super Output Area (LSOA) level for the period 1 April 2012 to 31 March 2013, collected by LG Futures from 60 local authorities (Ranasinghe, Tideswell 2014). Anonymous, aggregated data were collected on the number of:

- LA-supported permanent admissions to residential and nursing care of older people aged 65 and over; and
- LA-supported community-based service users aged 65 and over.

To update these data to reflect the position in 2019-20, we weighted service utilisation totals at LA level in our data to be equivalent to the 2019-20 totals at LA level – as available from Adult Social Care Activity and Finance: England 2019-20; see Annex A.3.2. for more details.

The data on LA-supported care home clients were based on new admissions, so that needs factors could be applied to the pre-care address, thereby avoiding problems of out-of-area placements. A number of LAs reported some problems in identifying pre-care addresses and so were not included in the final sample. Another issue was that some LAs appeared to select clients for the downloaded data in a way that was inconsistent with their RAP/ASC-CAR returns. In other words, the LA-level total clients differed from the number reported in RAP/ASC-CAR. The inclusion of LA-level effects helped to deal with this latter problem, although we also ran models with some excluded LAs where differences were substantial. In the main, this made relatively little difference to the results.

After excluding LAs with incomplete and/or inconsistent data, the final sample of permanent admissions to residential and nursing care included 13,430 LSOAs in 53 LAs, while the sample of community-based service users included 12,462 LSOAs in 49 LAs.

Regarding needs, wealth and supply control variables, we put together LSOA-level data on: benefits uptake (e.g. Attendance Allowance and Pension Credit) downloaded from the Department for Work and Pensions website; various Census 2011 variables capturing information on people's activities of

daily life limitations, home ownership, living arrangements and ethnicity; Office of National Statistics population estimates; Valuation Office Agency (VOA) council tax data; house prices data from HM Land Registry; and the number of care home beds from the Care Directory statistics provided by the Care Quality Commission (CQC). For more details see Annex A.3.3. to A.3.8.

3.2 English Longitudinal Study of Ageing (ELSA)

The second dataset used was the English Longitudinal Study of Ageing (ELSA). ELSA is longitudinal panel survey covering a representative sample of people aged 50 and above living in private households in England. There are currently nine waves of data covering 2002-2018. A rich set of information is collected in each wave, including about information on respondents' income, wealth, benefit uptake and needs-related characteristics.

All nine available waves of ELSA data were pooled for our analysis and financial variables were inflated to 2020 prices. Our baseline sample is restricted to respondents aged 65 and above at the time of interview and for whom key information on age, care need and home ownership status were available. These baseline exclusions yield a sample of 45,923 respondent-year observations.

To ensure this pooled sample is representative of the target population, we generated analysis weights for each observation by calibration (details in Annex A.3.9.). Specifically, the weights were calibrated such that aggregate numbers of homeowners, individuals living alone and recipients of pension credit in the baseline ELSA data (i.e. all individuals aged 65 and above) match control totals for the whole population of England aged 65 and above.

4 Empirical analysis and results – extension to the means test

The empirical analysis to derive an allocation formula for the extension to the means test follows the steps outlined in Section 2.1. First, we simulate financial means tests and per capita expenditure requirements under the old and new means tests at the individual-level using ELSA data. Second, we model financial eligibility and per capita expenditure requirements conditional on needs as functions of predictors available in LSOA-level data. Third, we use the resulting models to predict additional expenditure requirements at the LSOA level. Fourth, we model additional expenditure requirements at the LSOA level and derive an allocation formula.

4.1 Individual-level analysis

For individuals in each wave of our baseline ELSA sample, we first simulate their financial eligibility status under the current (old) and extended (new) means test and resulting net expenditure requirements. This amounts to computing, for each individual, equations (5), (6), (9) and (10) for residential care, and equations (11), (12), (15) and (16) for community care. In computing the expenditure requirements, we used regional average unit costs to balance the ability to account for geographical heterogeneity in unit costs against the ability to interpret these differences as exogenous. As regions contain a number of local authorities, it is reasonable to assume that a particular local authority has no control over prices in a whole region. Differences in unit costs between regions are thus likely to reflect differences in economic activity and can be regarded as exogenous.[11] Unit costs for residential and nursing care were from the 2019 Adult Social Care Financial Returns (ASC-FR) published by NHS Digital. Unit costs for community care are based on regional 2019 ASC-FR unit costs calibrated to match the national average unit cost used in the DHSC charging reform impact assessment and based on CPEC analysis.

[11] We tried also alternative models in which we used national unit cost for the simulation of the individual expenditure requirements. The results, however, were not significantly different.

While financial eligibility for LA-supported care is defined by the means test, the definition of eligible care needs is less clear. For our analysis, we take having two or more Activity of Daily Living (ADL) limitations as the definition of having eligible needs. This definition yields aggregate needs and financially eligibility proportions (under the current means test) that are well-aligned with actual rates of LA-supported care. Nonetheless, to explore if our findings are sensitive to our operationalisation of need, we conduct sensitivity analyses under different ADL thresholds for need.

After restricting the baseline sample to individuals with two or more ADLs and excluding observations with missing values for required variables, the analysis sample contains 5,355 observations. The top panel of Table 1 reports the financial eligibility and corresponding expenditure requirements under the old and new means tests for this sample. As noted above, the summary statistics use our calibrated sample weights. Amongst needs-eligible individuals, the means test reform increases the proportion of eligible people for LA-supported residential care from 55 per cent to about 73 per cent. The corresponding average per capita expenditure requirement increases from £282 to £346 per week. For community care, the means test reform increases the proportion of financial eligible people for LA-support from around 70 per cent to around 90 per cent. The average per capita expenditure requirement, in turn, increases from £112 to £132 per week.

Table 1. Descriptive statistics ELSA sample (age >= 65, 2 or more ADLs)

	Obs.	Mean	Std Dev.	Min	Max
Residential and nursing care					
Financially eligible for LA support: new means test	5,355	0.733	0.442	0.000	1.000
Financially eligible for LA support: old means test	5,355	0.553	0.497	0.000	1.000
Expenditure requirement: new means test (£)	5,355	345.83	253.42	0.00	856.48
Expenditure requirement: old means test (£)	5,355	281.42	274.22	0.00	856.48
Community care					
Financially eligible for LA support: new means test	5,355	0.895	0.306	0.000	1.000
Financially eligible for LA support: old means test	5,355	0.696	0.460	0.000	1.000
Expenditure requirement: new means test (£)	5,285	131.83	78.27	0.00	210.05
Expenditure requirement: old means test (£)	5,270	112.17	87.37	0.00	210.05
Female	5,355	0.608	0.488	0.000	1.000
Age 85 and over	5,355	0.218	0.413	0.000	1.000
Home owner	5,355	0.595	0.491	0.000	1.000
House value (£; 2020 prices)	5,355	152,718	189,511	0	3,033,981
Log house value	5,355	7.123	6.092	0.0000	14.925
In receipt of pension credit	5,355	0.198	0.399	0.000	1.000
Lives alone	5,355	0.516	0.500	0.000	1.000
Wave 1	5,355	0.142	0.349	0.000	1.000
Wave 2	5,355	0.114	0.317	0.000	1.000
Wave 3	5,355	0.103	0.304	0.000	1.000
Wave 4	5,355	0.111	0.314	0.000	1.000
Wave 5	5,355	0.112	0.315	0.000	1.000
Wave 6	5,355	0.112	0.316	0.000	1.000
Wave 7	5,355	0.109	0.312	0.000	1.000
Wave 8	5,355	0.101	0.301	0.000	1.000
Wave 9	5,355	0.096	0.295	0.000	1.000

The bottom panel of Table 1 reports summary statistics of the variables in our statistical model. We adopt the same specification in modelling both financial eligibility and net expenditure requirement and for both residential and community care. Our preferred model uses gender, being

aged 85 and above, living alone, being in receipt of pension credit and the log of home value as explanatory variables.

4.1.1 Residential care

Table 2 presents OLS estimation results for our models of net expenditure requirement and the probability of financial eligibility for residential care support. The value of one's home is strongly negatively related to both the probability of being financially eligible and the net expenditure requirement. This is natural since the value of an individual's home is used to calculate both their financial eligibility for LA support and their personal contribution to care costs. Moreover, because support is only provided to the financially eligible, the home value also affects net expenditure requirements indirectly, via its effect on financial eligibility. That is, given that they have eligible needs, an individual with more housing wealth is less likely to be financially eligible for support and hence will have a lower expected expenditure requirement from the LA's perspective.

Table 2. Estimation results ELSA sample (age >= 65, ADL count >= 2) – Residential & Nursing Care

	(1)	(2)	(3)
	Net expenditure requirement: New means test	Net expenditure requirement: Old means test	Probability of financial eligibility given needs: Old means test
Gender: female	46.578***	37.957***	0.006
	(7.930)	(8.590)	(0.015)
Aged 85 and over	-25.311***	-33.235***	-0.074***
	(8.254)	(8.536)	(0.015)
Log home value	-20.654***	-22.809***	-0.046***
	(0.631)	(0.683)	(0.001)
In receipt of pension credit	52.776***	76.559***	0.155***
	(7.715)	(8.518)	(0.014)
Lives alone	-241.594***	-208.255***	-0.360***
	(8.035)	(8.312)	(0.014)
Constant	630.021***	558.417***	1.077***
	(9.987)	(10.946)	(0.019)
Wave dummies	Yes	Yes	Yes
Observations	5,355	5,355	5,355
R-squared	0.409	0.372	0.418

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Low income status, as captured by being in receipt of pension credit, is associated with a significantly increased chance of being financially eligible and a greater expenditure requirement. Because personal contributions to care costs account for individuals' income, low income status has a direct impact on net expenditure requirements. On the other hand, the positive association with meeting the financial eligibility criteria likely stems from the implicit relationship between income and wealth.

Finally, living alone reduces the probability of being financially eligible under the means test and the corresponding net expenditure requirement because the value of one's home is included in financial eligibility and tariff income calculations when there are no other individuals residing in that home.

4.1.2 Community care

Table 3 presents OLS estimation results for the net expenditure requirement and the probability of financial eligibility for community care support. Low income status, as captured by being in receipt of

pension credit, is associated with a significantly increased chance of being financially eligible and a greater expenditure requirement. Similar to the case with residential care, low-income status has a direct impact on net expenditure requirements via an individual's personal contributions. The positive association financial eligibility and low-income status, on the other hand, likely reflects the fact that individuals with low-income typically also have low levels of non-housing wealth.

Table 3. Estimation results ELSA sample (age >= 65, ADL count >= 2) – Community Care

	(1) Net expenditure requirement: New means test	(2) Net expenditure requirement: Old means test	(3) Probability of financial eligibility given needs: Old means test
Gender: female	25.495***	17.745***	0.043**
	(2.827)	(3.081)	(0.017)
Aged 85 and over	-3.601	-9.767***	-0.070***
	(3.024)	(3.406)	(0.018)
Log home value	-3.207***	-3.840***	-0.020***
	(0.214)	(0.244)	(0.001)
In receipt of pension credit	23.331***	36.755***	0.216***
	(2.487)	(2.923)	(0.014)
Lives alone	-10.336***	-8.483***	-0.037**
	(2.820)	(3.082)	(0.017)
Constant	151.149***	140.296***	0.830***
	(3.439)	(3.929)	(0.020)
Wave dummies	Yes	Yes	Yes
Observations	5,355	5,355	5,355
R-squared	0.139	0.154	0.143

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses

Home value is negatively related to both the probability of being financially eligible and the net expenditure requirement. While an individual's home value does not directly influence the means test criteria, the negative relation likely reflects the positive correlation between individuals' housing and non-housing wealth. The latter, in turn, is used to assess financial eligibility and compute personal contributions to care. Living alone reduces the probability of being financially eligible under the means test and the corresponding net expenditure requirement. Since half of the value of shared non-housing wealth is considered for couples versus the entire value for singles, living alone could reduce financial eligibility to the extent that it increases an individual's chargeable assets.

4.2 LSOA-level analysis

The coefficients from the three regression models above for each care setting were applied at small-area level to predict their counterpart value at the LSOA level, i.e. to give predicted values for $\hat{p}_i(E^{NEW}|R) \times u_i^{NEW}$, $\hat{p}_i(E^{OLD}|R) \times \hat{u}_i^{OLD}$, and $\hat{p}_i(E^{OLD}|R)$. These values would be used in equation (17). The predicted probability of financial eligibility for residential care services was rescaled to equal share of publicly supported residents in care homes (0.59) estimated in ONS (2021), while the predicted probability of financial eligibility for community-based support was rescaled to equal the mean value in the ELSA sample for community care (0.696).

Further regression models were estimated at LSOA level to provide a value for $p_i(R + E^{OLD})$ in equation (17) for each residential and community care. We estimated the determinants of each: a) the count of LA-supported permanent admissions by older people to residential and nursing care, and b) the count of LA-supported people in community care in each LSOA (i.e. people that satisfy

both a needs and the old financial means test) in terms of need, wealth and supply. The distribution of supported people in LSOAs in residential and nursing care was based on new admissions, so that recent needs data could be applied to the pre-care address and, therefore, avoid problems of out-of-area placements.

Together these results were used to calculate, for each care setting, the additional expenditure requirement at LSOA level from the extension of the means test: AER_i^{ext}. These values were then used as a dependent variables in linear regressions suitable for calculating allocation formulae – i.e. the regression of equation (18) using need, wealth, supply and (population) scaling variables. As the dependent variables were stochastic, the statistical errors for the whole LSOA level process (the LSOA regressions) were estimated using bootstrapping.

Table 4. Descriptive statistics LSOA sample

	Obs	Mean	Std. Dev.	Min	Max
Residential and nursing care					
Predicted value of additional LA expend. requirement per LSOA (£)	13,430	145.82	56.79	7.24	443.44
Attendance Allowance claimants 65+ per capita 65+	13,430	0.112	0.049	0.000	0.385
Limiting (significantly) condition 85+ per capita 65+	13,430	0.060	0.026	0.000	0.400
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	13,430	0.574	0.200	0.000	0.989
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	13,430	0.085	0.134	0.000	0.906
Pension Credit Claimants 65+ per capita 65+	13,430	0.138	0.116	0.000	0.993
Living arrangements: couple households 65+ per households 65+	13,430	0.448	0.121	0.000	0.865
Ethnic White population 65+ per capita 65+	13,430	0.934	0.132	0.000	1.000
Population 65+ (log)	13,430	5.684	0.452	2.944	7.009
Total MSOA care home beds for old age/dementia per MSOA pop 65+	13,430	0.038	0.040	0.000	0.280
Community care					
Predicted value of additional LA expend. requirement per LSOA (£)	12,462	170.13	56.57	11.14	448.32
Attendance Allowance claimants 65+ per capita 65+	12,462	0.114	0.051	0.000	0.526
Limiting (significantly) condition 85+ per capita 65+	12,462	0.059	0.026	0.000	0.400
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	12,462	0.572	0.198	0.000	0.989
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	12,462	0.087	0.138	0.000	0.906
Pension Credit Claimants 65+ per capita 65+	12,462	0.144	0.122	0.000	0.993
Living arrangements: couple households 65+ per households 65+	12,462	0.446	0.121	0.000	0.865
Ethnic White population 65+ per capita 65+	12,462	0.927	0.144	0.000	1.000
Population 65+ (log)	12,462	5.667	0.460	2.944	7.024
Total MSOA care home beds for old age/dementia per MSOA pop 65+	12,462	0.039	0.042	0.000	0.280

Descriptive statistics of the LSOA samples for each care setting are presented in Table 4. The final sample for the small area analysis on residential and nursing care covered 13,430 LSOAs in 53 LAs, while for community care 12,462 LSOAs in 49 LAs. The figures confirm the quite substantial geographic variation in need and wealth between LSOAs. For example, the predicted additional expenditure requirement per LSOA for residential and nursing care varies between £7.24 and

£443.44 (with an average of £145.82); for community care the additional expenditure requirement per LSOA varies between £11.14 and £448.32 (with an average of £170.13). The share of Attendance Allowance claimants varies from 0 to 53 per cent with an average of about 11 per cent, while the share of Pension Credit claimants varies between 0 and 99 per cent, with an average of about 14 per cent. Households owning their home in the household population aged 65 and over varies from 0 to 99 per cent, with an average of about 66 per cent. Supply of residential care is also far from evenly distributed. At MSOA level, the number of care home beds varies from 0 to 280 per 1,000 people aged 65 and over, with an average of about 38 beds per 1,000 people aged 65 and over.

Table 5 shows the results of the GLM small-area estimation of the additional expenditure requirements for both residential and community care and corresponding marginal effects (i.e. the linear approximation). As expected, higher levels of need (i.e. the share of Attendance Allowance claimants and the share of people with significant limiting conditions) significantly increase the additional expenditure requirement for either care setting, as the reform is targeted at people with eligible social care needs.

Table 5. Estimation results of the additional expenditure requirement at LSOA level

	Residential/nursing care		Community care	
	GLM	Marg Eff	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	1.396***	186.4***	1.244***	199.4***
	(0.196)	(26.16)	(0.135)	(19.89)
Limiting (significantly) condition 85+ per capita 65+	2.725***	363.7***	3.321***	532.4***
	(0.220)	(27.30)	(0.234)	(39.87)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.002***	133.7***	0.500***	80.13***
	(0.085)	(13.04)	(0.044)	(11.54)
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.645***	86.03***	-0.011	-1.741
	(0.119)	(17.78)	(0.108)	(17.28)
Pension Credit Claimants 65+ per capita 65+	-0.487***	-65.06***	-0.711***	-113.9***
	(0.174)	(23.48)	(0.106)	(21.40)
Living arrangements: couple households 65+ per households 65+	-0.540***	-72.01***	-0.463***	-74.15***
	(0.106)	(14.93)	(0.061)	(10.47)
Ethnic White population 65+ per capita 65+	0.720***	96.03***	-0.001	-0.186
	(0.203)	(27.45)	(0.057)	(9.202)
Population 65+ (log)	0.611***	81.51***	0.614***	98.35***
	(0.037)	(4.669)	(0.037)	(5.213)
Total MSOA care home beds for old age/dementia per MSOA pop 65+	0.090***	12.06***	0.133***	21.25***
	(0.035)	(4.368)	(0.017)	(3.308)
Constant	0.106		-0.222	
	(0.363)		(0.482)	
Observations	13,430		12,462	
Log Likelihood	-48,660		-45,060	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The value of owned homes is most likely the main asset determining both the financial eligibility for public support in a care home setting, and the eligible persons' own contribution to their care. As people with eligible care needs and low housing assets are likely to be already eligible under the current system, it is not surprising that those owning homes in lower to middle council tax bands

(i.e. middling levels of wealth) will be the most likely to newly qualify for public support in care homes. The effect on the additional expenditure requirement in residential care is still positive for ownership of homes in the upper council tax bands. However, the effect size is substantially lower.

Home ownership is disregarded when assessing financial eligibility and own contributions to community care. Nonetheless, ownership of a home in a lower to middle council tax band in the community care estimation is still positive, reflecting the fact that home ownership is likely correlated with other forms of wealth. Ownership of a home in a higher council tax band is, however, small negative and insignificant, as people with high levels of wealth are not likely to be eligible.

Low income levels, as captured by the share of Pension Credit claimants in an LSOA, has a negative effect on the additional expenditure requirements for both residential and community care, as eligible people with low income levels are likely already supported under the current system.

Living as a couple had a negative effect on additional expenditure requirements for both forms of care, as the presence of a partner who can provide informal care significantly decreases the likelihood of receiving formal care.

4.3 The allocation formula for the extension to the financial means test

Table 6 gives the relative need allocation formula for the extension to the means test. The coefficients for residential and community care are based on the marginal effects in Table 5, rescaled to per capita values – they are the π coefficients in the RN formula, as outlined in section 2. The coefficients are in £s per week per capita aged 65 and over. As the coefficients for both formulae are in £ per capita per week, they can be added to obtain a combined formula.

Table 6. Allocation formula for the extension to the financial means test

	Residential/ nursing care	Community care	All care
Attendance Allowance claimants 65+ per capita 65+	2.854	0.911	3.764
Limiting (significantly) condition 85+ per capita 65+	5.322	2.432	7.754
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.542	0.366	1.908
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.820	-0.008	0.812
Pension Credit Claimants 65+ per capita 65+	-1.876	-0.520	-2.395
Living arrangements: couple households 65+ per households 65+	-0.782	-0.339	-1.121
Constant	0.757	0.525	1.282

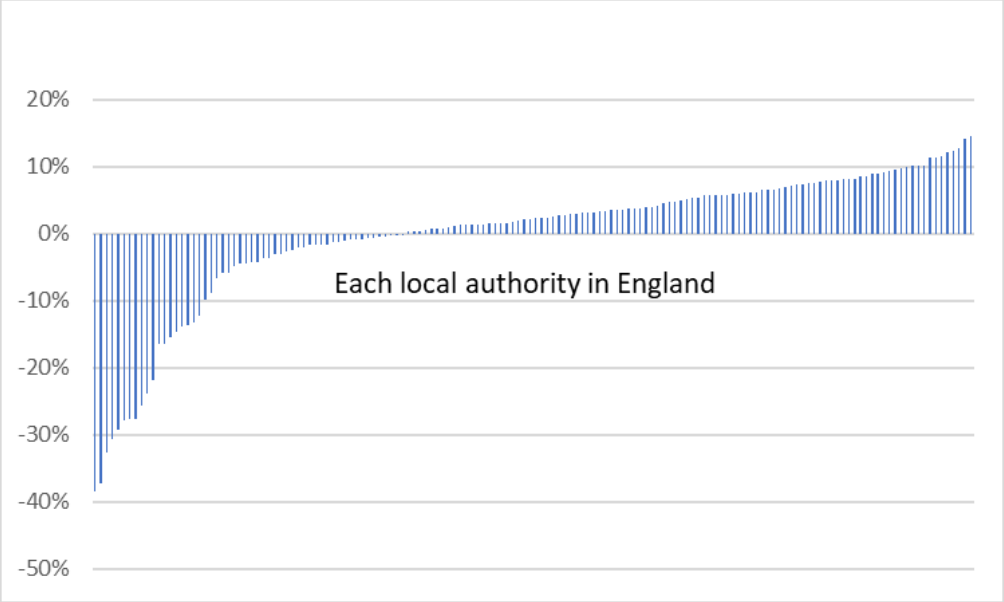
Supply effects were removed by using their national average values and adjusting the constant term.

Although ethnicity is used in the estimations (to minimise estimation bias), it is not used as a factor in allocation formulas. Rather than treating this effect only as a shift factor in the constant of the allocation formula, we first account for the correlations we observe between ethnicity and the other need and financial proxy variables in the estimation (i.e. the first five variables in Table 5). Using the results of a regression of these other variables on ethnicity, we re-apportion the effects of ethnicity that correspond to those need and wealth effects otherwise captured by these other variables to the respective coefficients of those other variables. Any remaining ethnicity effect is treated as a constant effect only (i.e. not different between LAs).

Population size (of the LSOA) is included in the estimation as a scaling factor to account for differences in the size of LSOAs – since we use totals/counts of people with need to underpin the calculation of AER, rather than rates per capita. As noted above, this effect is also removed from allocation formulas, so that per capita allocations to LAs are independent of their population size.[12]

Applying this formula would produce a quite different allocation of resources to each LA compared with a simple per capita rule – see Figure 1.

Figure 1. Difference (%) in predicted AER per person per week (all care) compared to a simple per capita allocation – by local authority



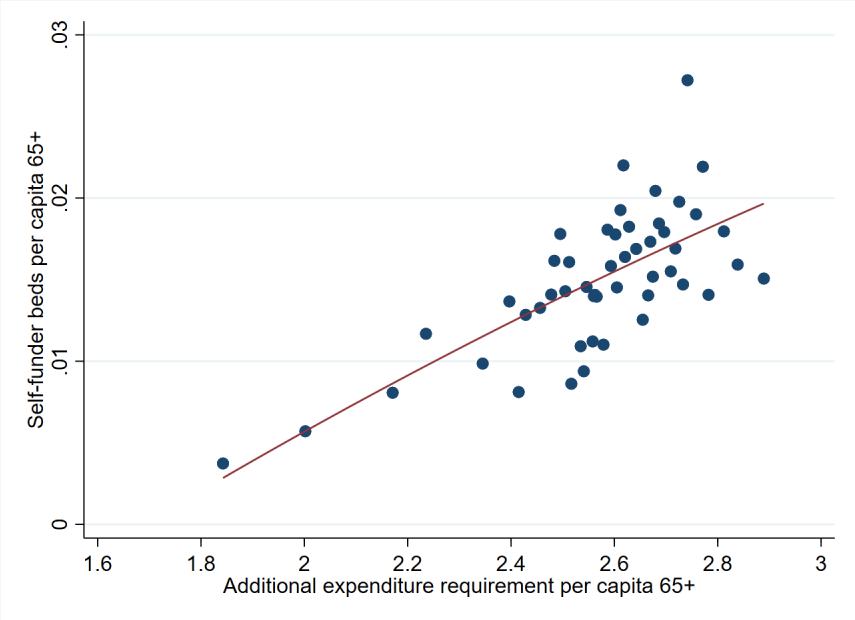
As the extension of the means test will help current self-funders (particularly those people just above the current thresholds), we expect the AER (per capita) predicted by the formula to be (positively) correlated with the number of self-funders (per capita) in an area. Figure 2 shows the positive correlation, as expected, between the predicted AER and share of self-funder care home beds at the local authority level.[13] The results also show that formula AERs are not fully in-line with the (care homes) self-funder rate – which might be due to differences in self-funders need levels (relative to the public needs test), differences in need versus supply, and because self-funder rates for residential care may not directly correspond to (un-recorded) self-funder rates in community care.

We also find that the formula predicted AERs per capita are negatively correlated with deprivation as measured by the index of multiple deprivation (for 2021). This is consistent with the expected effects of the reforms to help people that are not currently eligible on the basis of financial position (i.e. those generally in less deprived populations).

[12] For further details, see Forder and Vadean (2018), Annex A1.5.

[13] We apply ONS/CQC survey data on rates of self-funders in care homes for older people and/or dementia, and apply those to numbers of care home beds per capita 65+. Numbers of self-funder for community care is not routinely recorded.

Figure 2. Correlations between predicted AER per person per week (all care) and number of 'self-funder beds' per capita 65+



5 Empirical analysis – Additional Assessments

The empirical analysis to derive an allocation formula for additional assessments follows the steps outlined in Section 2.2.

5.1 Utilisation-based approach

The utilisation-based approach predicts the number of additional assessments in each LSOA, as outlined in equation (19) (see also Annex A.1.2.1) using:

- the number of LA supported people in each LSOA in residential and nursing care (X_i^{res}) (from LA collected data; see Annex A.3.1.1);
- the number of LA supported people in each LSOA in community-based care (X_i^{com}) (from LA collected data; see Annex A.3.1.2);
- the probability of being financially eligible for public social care support (given eligible needs) in residential or nursing care (predicted in Section 4.2 based on coefficients of the individual-level models of financial eligibility estimated using the ELSA dataset; see Table 2, Model 3); and
- the probability of being financially eligible for public social care support (given eligible needs) in community care (predicted in Section 4.2 based on coefficients of the individual-level models of financial eligibility estimated using the ELSA dataset; see Table 3, Model 3).

The resulting count of additional assessments is a predicted number of self-payers with eligible care needs according to each LA assessment criteria. This value is then used as a dependent variable in linear regressions suitable for calculating allocation formulae using need, wealth, supply and (population) scaling variables. As the dependent variable is stochastic, the standard errors for the LSOA regressions were estimated using bootstrapping.

The LSOA sample characteristics are very similar to those presented in Table 4, Section 4.2. The main difference being that the sample size is restricted to 45 LAs (including 11,130 LSOAs) that provided complete data for utilisation of both residential and community care services.

The results of a GLM small-area estimation of additional assessments are presented in Table 7. As expected, higher levels of need (i.e. the Attendance Allowance rate and the share of people with significant limiting conditions), wealth (i.e. home ownership of either a lower/middle or higher tax band dwelling) as well as income (i.e. not being a Pension Credit claimant) significantly increase the share of additional assessments in a LSOA, as the reforms concern people with higher income and wealth (and eligible social care needs) that are currently not eligible for publicly funded social care support. Moreover, people living as a couple will be less likely to step forward for an assessment (and seek formal social care support), as they are more likely to benefit from informal care.

Table 7. Estimation results of additional assessments analysis at LSOA level – utilisation-based approach

	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	1.408***	8.336***
	(0.158)	(0.669)
Limiting (significantly) condition 65+ per capita 65+	0.496***	2.936***
	(0.136)	(0.848)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.416***	8.381***
	(0.058)	(0.806)
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	1.127***	6.674***
	(0.101)	(1.011)
Pension Credit Claimants 65+ per capita 65+	-0.934***	-5.528***
	(0.115)	(0.779)
Living arrangements: couple households 65+ per households 65+	-1.546***	-9.154***
	(0.107)	(0.649)
Ethnic White population 65+ per capita 65+	0.268**	1.588**
	(0.111)	(0.626)
Population 65+ (log)	0.627***	3.711***
	(0.040)	(0.158)
Total MSOA care home beds for old age/dementia per MSOA pop 65+	0.102***	0.605***
	(0.033)	(0.181)
Constant	-2.405***	
	(0.309)	
Observations	11,130	
Log Likelihood	-20,484	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2 Needs proxy approach

For the needs proxy approach, we first use ELSA data to model the probability of having a *normatively defined* level of eligible care needs (i.e. having difficulties with three or more ADLs) as a function of predictors available in our LSOA-level dataset.

The analysis uses the baseline sample of individuals aged 65 and above. Our preferred model specification includes gender, five-year age groups, living alone, being in receipt of attendance allowance, being in receipt of pension credit, and an indicator for self-reported poor health as covariates.

Table 8 reports the results from estimating our model by OLS. The coefficients on our covariates are positive and statistically significant. Specifically, the probability of having care needs is increasing in age, especially beyond age 80. Receipt of attendance allowance (which proxies for disability) and

self-reported poor health are strongly related with needing care. Attendance allowance and self-reported health are both statistically and quantitatively significant within the same model because while attendance allowance captures realised/verified disability, self-reported health also reflects latent health, which may nevertheless contribute to impairment.

Table 21 in the Annex reports results from replicating this analysis when we use difficulty with two or more ADLs as our definition of eligible care needs as well. Overall, the resulting coefficients follow largely the same pattern as our preferred model.

Table 8. Estimation results for needs proxy using ELSA baseline sample

	ADLs 3+
Gender: female	0.006*
	(0.003)
In receipt of attendance allowance	0.130***
	(0.009)
Lives alone	0.001
	(0.003)
Self-reported general health: poor	0.145***
	(0.006)
In receipt of pension credit	0.010**
	(0.005)
Age group: 70 to 75	0.002
	(0.003)
Age group: 75 to 80	0.002
	(0.003)
Age group: 80 to 85	-0.001
	(0.004)
Age group: 85 and over	0.036***
	(0.007)
Constant	0.027***
	(0.004)
Wave dummies	Yes
Observations	44,191
R-squared	0.094

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The coefficients from Table 8 are used to predict the number of people aged 65 and over with this *normatively defined* eligible care needs in each LSOA. The difference between the predicted number of people with eligible care needs and the number currently supported people gives the predicted number of additional assessments under this approach (equation (20), see also Annex A.1.2.2.). This predicted count of additional assessments is then used as a dependent variable in linear regressions for calculating allocation formulae using need, wealth, supply and (population) scaling variables. The statistical errors for the LSOA level model are estimated using bootstrapping, as the dependent variable is stochastic.

Similar to the estimation results of additional assessments based on the *utilisation-based approach*, the estimation results of additional assessments predicted based on a *normative definition* of eligible care needs are positively related to higher level of need (i.e. the share of Attendance Allowance claimants and the share of people with significant limiting conditions), wealth (i.e. home ownership) as well as income (i.e. *not* being a Pension Credit claimant) (see Table 9).

Table 9. Estimation results of additional assessment analysis at LSOA level – needs proxy approach

	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	5.340***	23.11***
	(0.750)	(3.107)
Limiting (significantly) condition 65+ per capita 65+	1.757***	7.605***
	(0.441)	(1.737)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	0.221	0.957
	(0.159)	(0.807)
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.643***	2.781**
	(0.173)	(1.104)
Pension Credit Claimants 65+ per capita 65+	-0.686**	-2.969**
	(0.309)	(1.170)
Living arrangements: couple households 65+ per households 65+	0.936***	4.052***
	(0.268)	(0.711)
Ethnic White population 65+ per capita 65+	-1.217***	-5.270***
	(0.216)	(1.203)
Population 65+ (log)	1.811***	7.839***
	(0.244)	(0.990)
Total MSOA care home beds for old age/dementia per MSOA pop 65+	1.655***	7.166***
	(0.332)	(0.883)
Constant	-9.284***	
	(1.737)	
Observations	11,131	
Log Likelihood	-21,253	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3 The allocation formulae for additional assessments

Table 10 gives the allocation formula for additional assessments. The coefficients are based on the marginal effects in Table 7 and Table 9, rescaled to per capita values.

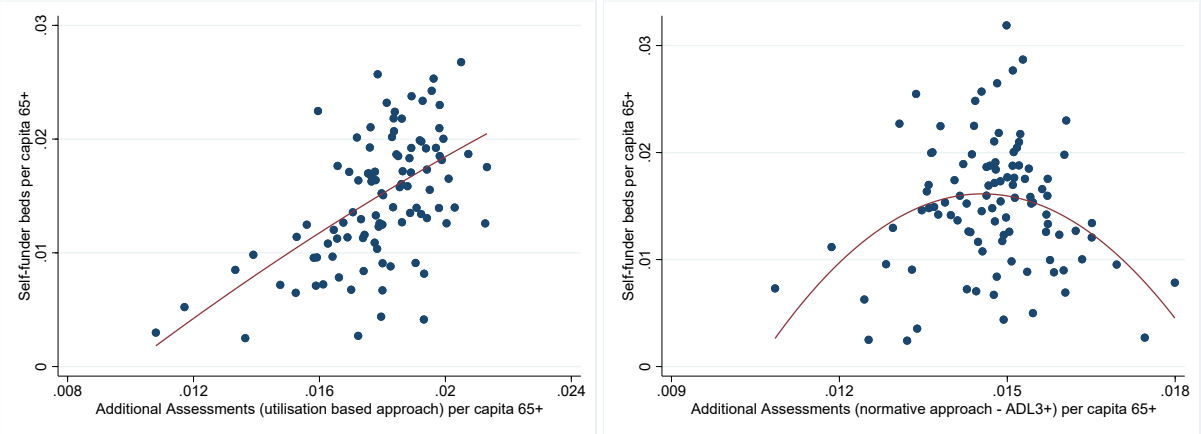
Table 10. Allocation formula for additional assessments

	Utilisation-based approach	Normative approach
Attendance Allowance claimants 65+ per capita 65+	0.028	0.064
Limiting (significantly) condition 65+ per capita 65+	0.009	0.022
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	0.025	0.004
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.020	0.011
Pension Credit Claimants 80+ per capita 65+	-0.022	0.006
Living arrangements: couple households 65+ per households 65+	-0.028	0.013
Constant	0.013	-0.004

As illustrated in Figure 3, the utilisation-based approach would give larger allocations to more affluent LAs (i.e. with a larger share of self-funders). On the other hand, allocations based on the

normative approach formula will be less favourable to affluent LAs, giving larger allocations to LAs with relatively more (baseline) care needs.

Figure 3. Correlations between predicted additional assessments and number of 'self-funder beds' per capita 65+



6 Additional expenditure requirements from the extended means test for care recipients under 65

Modelling of financial eligibility for people with care needs over 65 is done using the ELSA dataset as described above. ELSA being a survey of ageing does not sample people aged under 50 and therefore is not representative of working age adults with care needs. Given the relatively low prevalence of social care need among working age adults, general population surveys have limited data on such people (see also next steps below). Whilst it might be possible to use other datasets – for example the Family Resources Survey – we anticipate issues in identifying a sufficiently robust sample of working age adults with social care eligible levels of need. An alternative approach outlined here is to assume that the needs-test and means tests (and its extension) that apply to older people apply in the same way to younger adults.

In using the assumption of the same (underlying) effects, we can potentially use the need and wealth effects we observe on the additional expenditure requirement for older people in an application for younger adults. In this case, we substitute indicators of wealth and need that are appropriate for older adult populations with those more suitable for younger adults. Again, in making some assumptions about the size and range of need and wealth effects, we can use these indicators for younger adult populations to derive a (simplified) allocation formula that can predict AERs from the extended means test as they apply to the support of younger adults with care needs. We detail the approach and the assumptions used in Annex A.2.

Discussion of these assumptions, and the limitations and implications of this approach are considered in the Discussion section 7.6.

6.1 General approach

The AER per capita for over 65s predicted at LA level, as set out in Table 6 of section 4.3, is used as basis of this approach. AER per capita is denoted $\hat{B}_k^{OA}$ for shorthand, where OA is older adult and the subscript k is the local authority. We 'mean-standardised' this value by dividing each observation by the national average value $\bar{B}^{OA}$ and then estimated a simplified allocation formula – with just one need and one wealth effect indicator – for the mean-standardised AER per capita by OLS regression. The results are in Table 11, and give the coefficients for the need and wealth effects: b_N^{OA} and b_W^{OA}.

Table 11. OLS regression - mean-standardised AER per capita 65+

	OLS
Attendance Allowance claimants 65+ per capita 65+ (b_N^{OA})	1.329***
	(0.151)
Home-owner households 65+ per HHs 65+ (b_W^{OA})	0.911***
	(0.024)
Constant	0.266***
	(0.027)
Observations	150
R-squared	0.922

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The high R-squared value indicates that these two variables capture a high proportion of the variation in predicted AER.

The next step is to replace these two variables with indicators that are more suitable for support for people under 65. Specifically, we substituted *personal independence payment (PIP) claimants per capita 16-64* for Attendance Allowance (need) and the *homeowner households per total households 25 to 64* for Homeowner households 65+ per HHs 65+ (wealth). To ensure that the need and wealth effects are on the same scale using these variables, we multiply the above coefficients by the sample mean value of the older adult's variable and divide this by the sample mean of the younger adult's variable (i.e. $b_N^{YA} = b_N^{OA}\frac{\bar{n}^{OA}}{\bar{n}^{YA}}$and $b_W^{YA} = b_W^{OA}\frac{\bar{w}^{OA}}{\bar{w}^{YA}}$). These sample means are given in Table 12.

Table 12. Descriptive statistics need and wealth metrics, older and younger adults – LA level

	Obs	Mean	Std. Dev.	Min	Max
Attendance Allowance claimants 65+ per capita 65+ ($\bar{n}^{OA}$)	150	0.118	0.020	0.041	0.176
Homeowner households 65+ per HHs 65+ ($\bar{w}^{OA}$)	150	0.634	0.112	0.201	0.786
PIP claimants 16-64 per capita 16-64 ($\bar{n}^{YA}$)	150	0.044	0.018	0.009	0.094
Homeowner households 25-64 per HHs 25-64 ($\bar{w}^{YA}$)	150	0.179	0.040	0.069	0.257

The constant for a YA formula is calculated by subtracting the mean predicted value of the need and wealth effects from 1 (i.e. $b_0^{YA} = 1 - b_N^{YA}\bar{n}^{YA} - b_W^{YA}\bar{w}^{YA}$).

6.2 Results

Using the above approach, the younger adults MT formula is:

$$AER^{YA} = 0.2655 + 3.5299 \times PIP\ claimants\ 16\ to\ 64\ per\ capita\ 16\ to\ 64 + 3.2234 \times Homeowner\ households\ 25\ to\ 64\ per\ HHs\ 25\ to\ 64 \quad (21)$$

where AER^{YA} is the relative need and wealth adjustor expressed as a rate per capita 18-64. It can be used in the same way as the AER per capita for the extension to the financial means test formula for older adults.

7 Discussion points

7.1 Purpose

To access means-tested financial support towards care costs, local authorities (a) carry out an assessment to determine whether the person has an eligible level of need, and (b) apply a financial means-test to determine whether the person is eligible for public support as a result of having modest income and assets. Because the number of people who satisfy both these conditions varies substantially from place to place, so too does the public sector expenditure requirement that each local authority must meet.

Under the reforms the financial means-test is being extended although the needs condition remains the same. The relative share of the additional funding required by each local authority to meet the higher public cost will differ for the same reasons between areas, as will the number of people that will require an assessment as the means-test is extended (over and above the number of people who are assessed under the current system).

Furthermore, under the reforms, everyone who wishes to start metering towards the cap on care will require an assessment. Local authorities with relatively high proportions of current self-funders in their needs-eligible populations compared to those with low proportions, can expect to see a relatively greater number of additional assessments.

Without allowance for these differences, local authorities would differ in their financial capacity to meet their care responsibilities, potentially creating either unmet need or overfunding (i.e. where budgets could be better used elsewhere). Prospective systems that use formula-based allocations to account for differences between areas are advocated. This arrangement, rather than retrospective reimbursement, is preferred as it limits creation of unwanted reporting incentives. The principle of formula allocations is that local authorities are compensated for externally driven expenditure variation, due to differences in need and financial position. Typically, these systems use (metrics of) factors that are good predictors of LA care expenditure requirements, but are not under the control of LAs (or at least not directly) – for example, age structure of the local population, uptake of national benefits, household composition, housing tenure, etc. Because these factors are better predictors when taken together, resource allocation formulas are used to combine these metrics in estimating expenditure requirements for each LA.

To make use of this approach, the coefficients of resource allocation formulas need to be determined. Historical data on expenditure requirements is linked with the set of prediction metrics for this purpose. Two main alternative methodologies are used, differing essentially by how they represent this (historical) expenditure requirement. The first uses data on the *actual* use of (publicly-funded) care in the care system and the associated level of expenditure on this care e.g. past number of people in care homes and using community-based care. The second method uses an indicator that *should* be a good determinant of local expenditure requirements, such as the level of social care-related impairment in the population (e.g. ADL rates). Each has strengths and weaknesses, and these are discussed elsewhere (e.g. see Vadean and Forder, 2018). To date most development work on relative needs formulas has used the former approach, and this is the method used here (in large part).

7.2 Methods

The relative size of the additional expenditure requirement faced by each LA will depend on how far its population (with care needs) are affected by the change in the financial means-test, and the number of people with care needs. As the financial means test is a rules-based condition, we can

simulate the effects of the extension of the means-test as a change in the rules using a representative sample of people in the population – in this case, available from the English Longitudinal Survey of Ageing.

This leaves us to estimate how many people would also be needs-eligible (for which the rules are far less precise and cannot be done by simulation). We have data on the total number of people who are both needs and financially eligible under the current system. By calculating their current financial eligibility as outlined, we can divide this out of the total to leave the number who would be needs-eligible – and because this is not changing, the result can be used to estimate the number of people that would be both needs and financially eligible under the new system; see the Box 1 for an example.

These calculations are made for each of the 32,844 'small areas' in England (i.e. using the ONS's finest geographical classification). A formula is then estimated using the range of predictor metrics – as outlined above – which best predicts the AER for each area. The resulting formula is then used to allocate future expenditure to local authorities.

Box 1. Calculating AERs – an example

Suppose 100 people in an LA population are currently supported and we know that 50 per cent of people with potential care needs would meet the current financial eligibility test, then this implies that there are 200 people who would meet the needs-test. If under the (new) extended means test 75 per cent of people are financially eligible, then under the new system 150 people would meet both tests (100/0.5 x 0.75 = 200 x 0.75).

In this example, suppose also that the expenditure requirement for each (jointly) eligible person averages £100 per person in the current system and £90 per person in the new system. Then the total additional expenditure requirement (AER) in the population is calculated as the difference between the products of the number of eligible people and the respective average expenditure requirement per person: (150 x £90) – (100 x £100) = £3,500.

We used the English Longitudinal Survey of Ageing (ELSA) to simulate financial eligibility. For the current total expenditure on care, we used our previous collection of data from around 50 local authorities in England. This latter amount was inflated and adjusted to more closely correspond to the 2019 (pre-covid) situation.

We use both direct need predictors (in this case, the proportion of people claiming Attendance Allowance, which is not means-tested, and share of people with significantly limiting conditions) and financial prosperity indicators (such as, home ownership rate, average house prices, and proportion on income benefits) in the formula to predict AER for each LA.

We expect direct need indicators to be positive predictors of AER – because the more people with need, the greater is the AER for that area (and so the higher average AER per total population of that area). As such, areas with a high base number of the population with care needs will have a greater AER than an area with a low in-need population.

For financial means indicators, our expectation is somewhat less clear cut, mainly owing to the (well-established) relationship between low income/wealth and greater health issues and care needs in a population. Therefore, people with relatively low income and wealth compared to others, are more likely to satisfy both tests, other things equal. The reforms make the means test more generous, so areas with a high number of relatively more wealthy people (those that are just *in*eligible in the current system) can expect a relatively high AER compared to more deprived areas which already have high eligibility. However, wealthier areas have fewer people with care needs, so the in-need population base is smaller, which implies the total AER may not increase as much as expected (see Box 2 for an example).

Box 2. Need and wealth relationships – an example

In 'poor' area A, 100 people have care needs and under the new reforms 10 per cent more of those become eligible under the new reforms i.e. 10 more people. In 'wealthy' area B, 60 people have care need and 20 per cent more become eligible, i.e. 12 more people. So B will have a greater AER than A, but only by a proportionately small amount.

Living arrangements (couple households) can affect the outcome of both the needs and the means tests. In theory the (negative) need effects will be most significant: people in couples are more likely to have spousal carers, and so have less need for (formal) care under current assessment practices. Living arrangements also affect the means test with housing assets generally disregarded for couple households, and non-housing assets split between the couple for this purpose.

The other important distinction is between residential (care homes) and community care needs. Both needs and financial tests differ between these types of care. For this reason, we estimated separate formulas for each.

According to NHS Digital data, around 1.37m new request for social care support were made to LAs by people over 65 in 2019/20 (NHS Digital, 2020). This is significantly greater than the number in receipt of long-term services, which suggests that many of these requests were made by people who are either not eligible on the basis of need or due to the financial means test. Although it is clear that *additional* assessments expected from the reforms will mostly be from people who are not currently financially eligible, it is less clear how many additional assessments will come from people that may not end up being eligible on the basis of the needs-test.

Therefore, for the purposes of estimating resource allocation formula to cover the costs of additional assessments we have taken two approaches, which essentially differ according to how we define the size of the population who might need as assessment in each area. In the first, the *utilisation-based* approach, we focus only on people with eligible care need, and who are not currently eligible on the basis of the (current) means test, by subtracting current public system recipients from total numbers with need.

In the second, the *normative* approach, we use a definition of assessment need based on impairment (and not care service eligibility) which is to include anyone with three or more ADLs, and again subtract current public system recipients.

The former approach has the advantage of focusing only on people estimated to pass a needs eligibility assessment, but may underestimate additional assessments from people that contact their LA with potentially eligible need, or who need some preliminary assessment to make that determination. The latter approach uses only a proxy of eligible need (3+ ADLs) which is an indicator of people with potentially eligible need.

7.3 Results

7.3.1 Means test reform

As hypothesised, we find that areas with higher population rates of Attendance Allowance claimants and more people with limiting conditions can expect to need more additional funding – due to the higher baseline number of people with need in these areas. Moreover, areas with higher proportions of wealthier people (more assets/income) will have a greater AER than other areas - due to the more generous means test. The results suggest that any offsetting need effect was small.

For residential care the financial effect works through asset holding (i.e. areas with greater home ownership will have a greater AER than others) and income (i.e. areas with higher pension credit recipient rates will have a lower AER). Unsurprisingly, given the extended means test threshold of £100,000, this effect was strongest for areas with high proportions of people owning more modest housing assets (CT bands A-E).

For community care, the financial effect is strongly captured by pension credit recipient rates. For areas with high proportions of people owning more modest housing assets (CT bands A-E) the formula also predicts a higher AER compared with elsewhere. But areas with a high proportion of high-value homes (CT bands G-H) would be less affected, reflecting that the change in the means test makes less difference for wealthier people.

Areas with a higher proportion of couple households will have a smaller AER than others – mainly due to the need effect (more spousal informal care), but also because for in couple households the value of property is disregarded and so a change in the means test threshold has little effect.

The combined (residential and community care) relative need formula is positively associated with the numbers of self-payers in the LA, and negatively correlated with levels of deprivation in LA populations.

7.3.2 Additional assessments

Regarding the relative need allocation formulas produced, in both cases need factors are strong positive predictors of additional assessments (AAs). In the utilisation-based approach, areas with high proportion of homeowners (mainly with modest housing assets and to some extent those with greater housing assets) are more likely to have (more) AAs than contrasting areas. Similarly, areas with higher rates of pension credit claimants are less likely. For the proxy approach, these wealth effects are less strong.

The utilisation-based formula produces (relative need adjusted) allocations that are positively associated with the numbers of self-payers in the LA, while this relationship is less clear cut for allocations based on the normative formula.

7.4 Robustness testing and validity

Since we are developing allocation formulas for the new entitlements under the reforms, which have not yet been implemented, we cannot directly assess the 'fit' of our models by comparing them with (historical) real data.

Nonetheless, to explore the overall validity we have two approaches. First, we assessed theoretical validity, that is contrasted the results with the effects we expect to see knowing how the reforms will make changes. As outlined above, the estimation results were in line with hypothesised effects (e.g. considering need and financial means indicators on AERs and AAs).

Second, we conducted extensive robustness analysis, estimating a range of variant specifications, embodying different underlying assumptions, as outlined below. Whilst there were naturally some

differences these were not marked, and correlations between predicted effects were generally high. Overall, the statistical models performed well in terms of statistical results.

The ELSA simulation of financial eligibility (for modelling the extension to the means-test differences between LAs) should be made for people with care needs. We did this by restricting the sample ELSA sample to people with 2+ ADLs, which on the one hand gives a good number of observations in modelling changes in the means-test, and on the other sufficiently focuses on people with relatively high level of need. To see if our results are sensitive to this assumption, we re-estimated our model for the means test analysis on the sample of individuals aged 65 and above with either 1+ or 3+ ADL difficulties. The variants estimated with 1+ ADLs or 3+ ADLs made little difference to the results. The results from this sensitivity analysis are summarised in Figure 6 and Figure 7 (Annex A.4.1.1). As can be seen from their overlapping 95 percent confidence bands, the estimates for the care homes models are very close across all three eligible needs definitions. Estimates for the community care models are also broadly similar, although they show relatively more variation across the needs definitions.

Although the means test system is rules-based, some of the (very) fine detail is not fully replicable with ELSA data. Variables for the main components are, however, available. In the means test, income from assets is generally disregarded (as asset holding is tested directly and tariff income also approximates income from main assets), although in special cases some income from assets is not disregarded – we only modelled the general case in this regard. Nonetheless, when using a more inclusive definition of income from assets and treating this as further income, we found again that the formula results only changed by a small amount.

We estimated the small area/LSOA models with these two eligibility simulations variants and also two specifications of housing wealth: a) using council tax bands, and b) using sample mean house prices in the LSOA; see Annex A.4.2 for the regression results. Our preferred specification is to use council tax band models. Although banding is somewhat out of date, it is comprehensive. House price data is for the sample of homes for which there were transactions. Nonetheless, the models again produced very similar results.

For modelling additional assessments (in the normative approach), we also explored using a 2+ and 3+ ADL definition. In this case, since we are estimating the proportion of the whole population with this ADL condition or not (rather than complex combinations of financial situation as with the means-test modelling), the choice to opt for a 3+ ADL definition (which is arguably closer to the needs criteria in use) was taken.

7.5 Potential limitations

Estimation of allocation formulae relies on access to good quality data. As noted, it also requires that we make certain assumptions during the analysis. There are a number of specific potential limitations to consider.

First, as outlined, the analysis of the needs test is underpinned by social care use data that were collected previously for the 2012 study and reweighted to better reflect the situation in 2019, i.e. the last pre-pandemic year (see Annex A.3.2). We do not believe that the distribution of care use *within* each local authority (i.e. between different districts of the LA) will have changed systematically in the period. Changes in patterns of service use between LAs will be accounted for in the reweighting.

Second, we use data on current holding of assets of people sampled in ELSA but have not made any specific account of whether such holdings might be affected by previous and future spending on

care. Given the data (and follow-up) of people's care use is generally limited, including in ELSA, this was deemed a reasonable option. Again, it seems unlikely that after accounting for different levels of asset holdings between areas that we would expect to see systematic differences in any spend-down patterns.

Third, current national data collections on social care are at the aggregate (LA) level which limits their use for small area analysis. Furthermore, current data collections do not provide breakdowns by type of care used (other than support setting) and lack granularity on income and expenditure. These limitations restrict how far we can calibrate simulation models, especially for home care.

Fourth, data on self-funding and on charges paid (for eligible people) is generally limited. The new ONS collections drawing on CQC data provide a better picture of the proportion of self-funders, but we lack information about specific breakdowns (e.g. age group in community care) and amounts paid by individuals (including self-funders and publicly-supported people). Some insight for model calibration was possible using 2014 PSSEX1 data (now discontinued and superseded by ASC-FR return).

Fifth, on a related point, local authorities have more flexibility to implement the means test for community care. We have had to make assumptions about some allowances when simulating that means test, in particular, regarding the amount of disability related expenditure LAs allow. In any case since these assumptions affect all LAs in the same way, they are unlike to affect our estimation of relative need formulas.

Finally, number of care home beds were used in the estimation to remove supply effects, however, in principle supply can itself be affected by (previous) demand/need. In previous analyses we did not find this potential 'circularity' to be an issue, but have not explicitly tested this in the current analysis.

Although important to anticipate potential limitations, we believe they will have minimal impact on the derivation of the allocation formulae for the reasons laid out above.

7.6 Developing an allocation formula for people under 65 with care needs

This study mainly considers relative need allocation formulas for public funding of care for people aged 65 and over. Without being able to use ELSA data for simulating financial eligibility for younger adults with disability, we have instead, a number of more pragmatic options to consider for allocation of additional funding for younger adults' services following implementation of the reforms. The first is to use the older people's allocation formula. A second is for allocations to be made in proportion to a single relevant need or wealth indicator (e.g. PIP claimant rates), or indeed to use flat allocations per capita between LAs. A lack of data on numbers of working age self-funders precludes the use of that metric, however.

A third option combines elements of the first and second: we assume that underlying need and wealth effects on AERs are the same for younger and older adult group, and that relevant metrics for both age groups (e.g. AA rates for older adults and PIP rates for younger adults) are proportionately related to this underlying need and wealth. On this basis we can calculate a simple allocation formula for younger adult populations.

We use the variables *personal independence payment (PIP) claimants per capita 16-64* and the *homeowner households per total households 25 to 64* to capture the need and the wealth effects respectively of the AER for the extended means test reform. These are brought (weighted) together using the parameters that link these two effects in the older adult's formula. We are implicitly assuming, in doing so, that the needs test and the financial means test are the same for both groups.

For the former, the needs assessment processes and care planning (offered support) might differ between the two groups in practice. Indeed, unit costs of care appear higher for younger adults services. Regarding the latter, the rules are fundamentally the same. Although we note that previous studies – and our own analysis of people aged 50 to 64 in ELSA – suggest that financial eligibility rates for younger adults are high in the current system. This could mean that using parameters from the older adult formula puts too much weight on the wealth component, but this is difficult to judge *a priori*. In any case, we might not expect any such differences to also differ between LAs, limiting any consequences for an allocation formula. We suggest that this third option is better than the first two options.

To explore these issues further, consideration is merited for either bespoke data collections or exploration of alternative datasets (recognising their limitations) for direct estimation of a younger adults formula.

7.7 Implications and extensions

This study clearly supports the principles of need adjustment. Need and financial means vary between areas and this impacts on the expenditure required by each local authority to meet its social care obligations. Without allowance for variation in these factors that are (largely) beyond their direct control, local authorities would have differing financial capacity to meet their care responsibilities. This study has produced relative needs formulas for this purpose and has shown that the resultant allocation of funding will be different from un-adjusted allocations, such as those made on a simple per capita basis only.

8 Annexes

A.1. Analytical framework

A.1.1. Means test reform

The probability that person j in the population satisfies both the needs test (R_j) and the (financial) eligibility test (E_j) is $p_j(R_j \cap E_j)$. In modelling the impact of the change in the means test, we need isolate the effect of the (unchanging) needs test (R) and, in particular, to estimate the probability $p(R)$ for the average person in each LA as a function of the available need and wealth proxies.

In theory we can use some estimate of the probability of $p_j(E_j = 1)$ to infer the probability of being in need from the joint probability $p_j(R_j \cap E_j)$, but we need to recognise that these probabilities are not independent. Accordingly, the probability of people with care needs is given by:

$$p_j(R_j) = \frac{p_j(R_j \cap E_j)}{p_j(E_j|R_j)} \tag{22}$$

Where $p_j(E_j|R_j)$ is the conditional probability of meeting the final eligibility test given eligible needs; being itself different according to the person's level of need.

We therefore need an estimate of $p_j(R_j \cap E_j)$ and $p_j(E_j|R_j)$, as a function of relevant risk factors: need proxies, x_j, wealth proxies, w_j, income proxies, y_j, and supply, s_i.

The former, $p(R + E)$ corresponds to the actual activity of LAs in providing services for eligible people. We can therefore use data on this activity directly to model:

$$p_j(R_j \cap E_j) = f^{R \cap E}(x_j, w_j, y_j, s_{j \in i}) \tag{23}$$

We also need an estimate of $p(E|R)$. As outlined in the main text, we cannot directly observe the number of people that satisfied this test because actual utilisation is the result of both tests. Instead, we can simulate the eligibility test by approximating the eligibility rules in a sample dataset. For this purpose, we need a dataset with relevant variables enabling us to most closely simulate the eligibility test. Furthermore, the dataset should have need variables. As noted, in general, $p(E|R) \neq p(E)$ because people in need generally have a different wealth situation compared to those with no need. The ELSA data are suitable. We use this dataset to capture the conditional nature of the probability of being eligible on the probability of being in need.

In general, we have:

$$p_j(E_j) = f_j^E(y_j, w_j; R_j) \tag{24}$$

and so, restricting to just those people with care needs:

$$p_j(E_j|R_j = 1) = f_j^{E|R}(y_j, w_j) \tag{25}$$

We cannot directly observe R but we can use need proxies x to identify populations that could yield appropriate relationships:

$$p_j(E_j|R_j = 1) = f_j^{E|R}(y_j, w_j) \cong f_j^E(y_j, w_j; x_j > \underline{x}, \bar{s} = 1) \tag{26}$$

Here $\underline{x}$ is some minimum threshold of needs-related characteristics that should correspond to the person having the equivalent of a care level need. We assume that supply does not effect this relationship and treat this as a constant (since we estimate it using need proxies, not actual service use, where only the latter depends on supply).

Having made these two estimations, the two functions (23) and (26) can then be combined:

$$p_j(R_j) = \frac{p_j(R_j \cap E_j)}{f_j^E(y_j, w_j; x_j > \underline{x}, \bar{s} = 1)} \tag{27}$$

This function still embodies supply effects because the numerator is a function of supply. For needs-based resource allocation we seek to remove the effects of supply to give a probability $p_j^{\bar{s}}(R_j)$.

This step can be achieved when we apply (27) at small area (LSOA) level (with small areas denoted by i), where we have data on the count of service users which is $p_{j\in i}(R_j)m_i$. We use predicted values $\hat{f}_i^{R\cap E}(\bar{s})$ from an estimation of $p_{j\in i}(R_j \cap E_j)m_i = f_i^{R\cap E}(s_i, m_i) + \eta_i$ and subtract out supply effects (where η_i is the estimation error, and $\overline{\eta_i} = 0$).

Applying the function f_j^E as estimated at individual level to small area using (small-area level) indicators, we have the denominator in the following need function:

$$p_j^{\bar{s}}(R_j)m_i = \frac{\hat{f}_i^{R\cap E}(y_i, w_i, x_i, m_i; \bar{s})}{\omega^T \hat{f}_j^E(y_i, w_i; x_i > \underline{x}, \bar{s}) + \epsilon^T} \tag{28}$$

where $f_j^E = \omega^T \hat{f}_j^E(y_i, w_i; x_i > \underline{x}, \bar{s}) + \epsilon^T$ with ω^T being a scaling factor that may be needed to scale to LSOA level when applying individual level estimates to small area populations, and ϵ^T being a corresponding additive component needed to ensure that $\omega^T \bar{\hat{f}}_j^E = \bar{p}_i^E$ where $\bar{p}_i^E$ is the average value of eligibility observed in across the sample LSOA's i (i.e. in England). In making the assumption that populations within LSOAs are relatively homogenous and equally sized, we can in turn assume that $\omega^T = 1$ and $\epsilon^T = 0$.

As outlined in the main text, for financial and needs eligible people, we can calculate the net public cost per individual by subtracting charges from the unit cost of care, which is denoted $u_j(R_j \cap E_j)$. Again, this can be estimated at individual level and applied at small area level: $u_j(R_j \cap E_j) = \hat{g}_j^E(y_i, w_i; x_i > \underline{x}, \bar{s})$.

Taking these estimations together, we can calculate the additional expenditure requirement AER_i^{ext} as:

$$\begin{aligned} AER_i^{ext} &= \frac{p_i(R \cap E^{OLD}) \times m_i}{\hat{p}_i(E^{OLD}|R)} \times \left[\hat{p}_i(E^{NEW}|R) \times \hat{u}_i^{NEW} - \hat{p}_i(E^{OLD}|R) \times \hat{u}_i^{OLD}\right] \\ &= \frac{\hat{f}_i^{R\cap E^{OLD}}(y_i, w_i, x_i, m_i; \bar{s})}{\omega \hat{f}_j^{E^{OLD}}(y_i, w_i; x_i > \underline{x}, \bar{s}) + \epsilon} \Big[\hat{f}_j^{E^{NEW}}(y_i, w_i; x_i > \underline{x}, \bar{s}) \hat{g}_j^{E^{NEW}}(y_i, w_i; x_i > \underline{x}, \bar{s}) \\ &\quad - \hat{f}_j^{E^{OLD}}(y_i, w_i; x_i > \underline{x}, \bar{s}) \hat{g}_j^{E^{OLD}}(y_i, w_i; x_i > \underline{x}, \bar{s})\Big] \end{aligned} \tag{29}$$

The final relative needs formula is estimated using AER_i^{ext} as the dependent variable:

$$AER_i^{ext} = f_i^{AER}(y_i, w_i, x_i, m_i, s_i) \tag{30}$$

The coefficients on f_i^{AER} are the terms of the formula.

This function is estimated at the LSOA level. As outlined in Forder and Vadean (2018), we use count estimations in the main. Relative need (RN) formulas are calculated at LA level as linear functions. They are expressed as rates per capita at the LA level: $RN_k^{ext} = \sum_{i\in k} \widehat{AER}_i^{ext}/m_k = \pi_0^{ext} + \pi_1^{ext} x_k + \pi_2^{ext} y_k + \pi_3^{ext} w_k$, where k denotes each LA and $\widehat{AER}_i^{ext}$ is the predicted additional expenditure requirement for each LSOA. The π coefficients are derived using the marginal effects

$f_i^{AER'}$ in (30), and rescaled to the LA per capita by dividing through the mean LSOA population size – see Annex A1.5 of Forder and Vadean (2018) for the derivation.

A.1.2. Additional assessments

A.1.2.1. Option 1. Utilisation-based approach

Additional assessments (AAs) are the number of people with eligible needs less the number of people with eligible need who have had an assessment. The latter is the number of LA-supported people, i.e. those that are financially eligible. The result is the number of people with eligible needs who are self-payers. At individual level this:

$$AA = p\left(R^A\right) - p\left(R \cap E^{OLD}\right) = \frac{p(R \cap E^{OLD})}{p(E^{OLD}|R)} - p(R \cap E^{OLD}) \quad (31)$$

where $p(R^A)$ is the probability that a person has an 'assessment need' (denoted R^A). In this option we take this to be to equal the probability that they are need eligible i.e. $\frac{p(R \cap E^{OLD})}{p(E^{OLD}|R)}$.

Applying this at LSOA level we have:

$$AA_i = \frac{X_i^{res}}{\hat{E}_i^{res}} + \frac{X_i^{com}}{\hat{E}_i^{com}} - X_i^{res} - X_i^{com} = \frac{X_i^{res}}{\hat{E}_i^{res}}\left(1 - \hat{E}_i^{res}\right) + \frac{X_i^{com}}{\hat{E}_i^{con}}\left(1 - \hat{E}_i^{com}\right) \quad (32)$$

where $X_i^{res} = p_i(R^{res} \cap E^{OLD}) \times m_i$ and $X_i^{com} = p_i(R^{com} \cap E^{OLD}) \times m_i$ are LSOA residential and community service users in each locality i, which can be directly observed. Also $\hat{E}_i^{res} = \hat{p}_i(E^{OLD}|R^{res})$ and $\hat{E}_i^{com} = \hat{p}_i(E^{OLD}|R^{com})$ are predicted eligibility for residential and community care at local level, estimated using ELSA-based simulations.

A.1.2.2. Option 2. Normative (need proxy) approach

Under this option, additional assessments (AAs) are modelled as the number of people having difficulty with 3+ ADLs less the number of people that are both needs and financially eligible. For an individual this is:

$$AA = p(R^A) - p(R \cap E^{OLD}) = p(ADL^{3+}) - p(R \cap E^{OLD}) \quad (33)$$

where $p(R^A) = p(ADL^{3+})$ is the probability that a person has an 'assessment need', which we assume to equal the probability that they have 3 or more ADL difficulties.

Applying this at LSOA level we have:

$$AA_i = \hat{p}_i(ADL^{3+})m_i - X_i^{res} - X_i^{com} \quad (34)$$

where $\hat{p}_i(ADL^{3+})$ is the predicted probability of a person to have 3+ ADLs from an ELSA simulation, and m_i is the LSOA population.

With both options, we can statistically model LSOA-level additional assessment requirements in terms of factors that are available in routine data sets:

$$AA_i \cong \beta_0^{AA} + \beta_1^{AA}x + \beta_2^{AA}y_i + \beta_2^{AA}w_i + \beta_3^{AA}m_i \quad (35)$$

where the terms in the equation are: need proxies (x), income (y) and wealth (w) proxies, and population (m), and the coefficients are the βs.

A.2. An approach to producing a formula for allocating resources to meet the additional costs of the means test reform for younger adults

The predicted additional expenditure requirement (AER) per capita for older adults (aged 65 and over), which we denote as $\hat{B}_k^{OA}$ for short, can be 'mean-standardised' by dividing it by its national average value $\bar{B}^{OA}$.[14] This can be used as a dependent variable for a simplified RA formula using only two factors, one to measure need effects and the other to measure wealth effects. This simplified AER formula is:

$$\frac{\hat{B}_k^{OA}}{\bar{B}^{OA}} = b_0^{OA} + b_N^{OA} n_k^{OA} + b_W^{OA} w_k^{OA} + \epsilon_k \tag{36}$$

Here we use *attendance allowance per capita 65+* and *homeowner rate for households 65+* as the need and wealth proxies n_k^{OA} and w_k^{OA} respectively. The k subscript denotes each local authority. This formula is estimated using OLS regression at the local authority level.

We can use this simplified formula as the basis for estimating a younger adults (aged 18 to 64) formula *if we assume that the relative need and wealth effects are the same for younger adults as they are for older adults*. However, rather than using proxies for need and wealth related to older adults, we can substitute those for variables that better reflect the position for younger adults with care needs, specifically *personal independence payment (PIP) claimants per capita 16-64* for need and the *homeowner households per total households 25 to 64* for wealth.

These proxy variables are assumed to link with underlying need N_k and wealth W_k on a proportional basis: $n_k^{OA} = \nu^{OA} N_k$ and $w_k^{OA} = \phi^{OA} W_k$, for older adults. Similarly for younger adults: $n_k^{YA} = \nu^{YA} N_k$ and $w_k^{YA} = \phi^{YA} W_k$. With underlying need N_k and wealth W_k assumed to be the same for both older and younger adults, we have $\frac{n_k^{OA}}{\nu^{OA}} = N_k = \frac{n_k^{YA}}{\nu^{YA}}$. At the sample mean value of N_k, this gives $\frac{\nu^{OA}}{\nu^{YA}} = \frac{\bar{n}^{OA}}{\bar{n}^{YA}}$. Likewise for the wealth effect, we have: $\frac{\phi^{OA}}{\phi^{YA}} = \frac{\bar{w}^{OA}}{\bar{w}^{YA}}$.

The mean-standardised effect of need and wealth on the older adults AER is:

$$\frac{\partial\left(\frac{\hat{B}_k^{OA}}{\bar{B}^{OA}}\right)}{\partial N_k} = b_N^{OA} \nu^{OA} \tag{37}$$

and similarly for wealth:

$$\frac{\partial\left(\frac{\hat{B}_k^{OA}}{\bar{B}^{OA}}\right)}{\partial W_k} = b_W^{OA} \phi^{OA} \tag{38}$$

On the assumption that need and wealth effects are the same for both older and younger adults, i.e. $\frac{\partial\left(\frac{\hat{B}_k^{YA}}{\bar{B}^{YA}}\right)}{\partial N_k} = \frac{\partial\left(\frac{\hat{B}_k^{OA}}{\bar{B}^{OA}}\right)}{\partial N_k}$ and $\frac{\partial\left(\frac{\hat{B}_k^{YA}}{\bar{B}^{YA}}\right)}{\partial W_k} = \frac{\partial\left(\frac{\hat{B}_k^{OA}}{\bar{B}^{OA}}\right)}{\partial W_k}$, then $b_N^{YA} = b_N^{OA} \frac{\nu^{OA}}{\nu^{YA}}$, and similarly: $b_W^{YA} = b_W^{OA} \frac{\phi^{OA}}{\phi^{YA}}$. Using the above sample mean values for PIP and homeowner variables, the coefficients for the younger adult formula are calculated as: $b_N^{YA} = b_N^{OA} \frac{\bar{n}^{OA}}{\bar{n}^{YA}}$and $b_W^{YA} = b_W^{OA} \frac{\bar{w}^{OA}}{\bar{w}^{YA}}$.

Finally, substituting the sample mean values of $\hat{B}_k^{YA}$, $n_k^{YA}$and w_k^{YA}, for a mean-standardised formula for younger adults (i.e. $\frac{\hat{B}_k^{YA}}{\bar{B}^{YA}} = 1$ and the sample mean), we have a constant term:

$$b_0^{YA} = 1 - b_N^{YA} \bar{n}^{YA} - b_W^{YA} \bar{w}^{YA} \tag{39}$$

[14] There would not be any difference between final allocations after doing so.

This gives a mean-standardised formula for younger adults of:

$$\frac{\hat{B}_k^{YA}}{\overline{B}^{YA}} = b_0^{YA} + b_N^{YA} n_k^{YA} + b_W^{YA} w_k^{YA} \quad (40)$$

A.3. Data sources and manipulation

A.3.1. LA-funded social care service user data

A.3.1.1. Care home service users

Source: Aggregated data at LSOA level on the Number of Local Authority (LA) Supported Permanent Admissions to Residential and Nursing Care during 1 April 2012 and 31 March 2013 were collected by LG Futures from 60 local authorities that agreed to participate in the study (for more details see (Ranasinghe, Tideswell 2014) and Table 13). The data were collected for two population groups: a) young adults aged 18 to 64 and b) older people aged 65 and over. Data were supplied on the number of service users living in each LSOA before admission to the care home.

This collection was of anonymous data. Only data on numbers of service users per LSOA were collected. Where there were any services users in an LSOA, numbers below 5 were masked, i.e. data were supplied with an '*' for values between 1 and 4.

From the 60 sampled LAs, three submitted incomplete data, while four were excluded as aggregated totals could not be validated when compared to national returns from the Community Care Statistics, Social Services Activity, England - 2012-13, Final release [NS], reported by the Health and Social Care Information Centre.[15] The sample characteristics were representative of all England's LSOAs; see (Forder, Vadean 2018), Table 6 and 7, p. 24.

Missing values: For each type of residence, we replaced missing values for Total Primary Clients with the sum of values for the respective primary client types and zero values of Total Primary Clients with the sum of values for the respective primary client types if at least one of the latter values was different from zero.

A synthetic value for the number of service users was used for LSOAs with masked values. Those "*" LSOAs were attached values based on the average number of service users across all the LSOAs in the local authority that had five service users or more. For Total Primary Clients in Residential Care (i.e. LA Staffed Residential Care + Independent Residential Care) and Total Primary Clients in Nursing Care, we replaced masked values with '*' LA-level mean values, computed as:

$$\bar{*}_{RCi} = \frac{NRResCare_i - \sum_j ResCare_{ij}}{N^*_{RCi}}, \forall\, ResCare_{ij} \geq 5$$

where $NRResCare_i$ stands for National Return of Total Primary Client Types in Residential Care in the LA *i*, $ResCare_{ij}$ stands for Total Primary Client Types in Residential Care in LA *i* and LSOA *j*, and N^*_{RCi} represents the total number of '*' values for residential care clients in the LA *i*.

The '*' mean value for nursing care for LA *i* ($\bar{*}_{NCi}$) is computed as:

$$\bar{*}_{NCi} = \frac{NRNurCare_i - \sum_j NurCare_{ij}}{N^*_{NCi}}, \forall\, NurCare_{ij} \geq 5$$

[15] http://www.hscic.gov.uk/catalogue/PUB13148/comm-care-stat-act-eng-2012-13-fin-data.zip

where $NRNurCare_i$ stands for National Return of Total Primary Client Types in Nursing Care in the LA *i*, $NurCare_{ij}$ stands for Total Primary Client Types in Nursing Care in LA *i* and LSOA *j*, and N^*_{NCi} represents the total number of '*' values for nursing care clients in the LA *i*.

In order to remove outliers from both $\bar{*}_{RCi}$ and $\bar{*}_{NCi}$, values smaller than the 5th percentile weighted by the number of stars at LA level (i.e. N^*_{RCi} and N^*_{NCi} respectively) were replaced with the 5th weighted percentile value. Similarly, values higher than the 95th weighted percentile were replaced with the 95th weighted percentile value.

A.3.1.2. Community-based service users

Source: Data on the on the Number of Clients Registered to Receive Community Based Services Provided or Commissioned by the CASSR on 31 March 2013 by primary client type and components of service were provided at LSOA level by local authorities that agreed to participate in the study. The data were collected by LG Futures from 60 local authorities that agreed to participate in the study (for more details see (Ranasinghe, Tideswell 2014) and Table 14). The data were collected for two population groups: a) young adults aged 18 to 64, and b) older people aged 65 and over. One LA could not submit all the data required and was not used in the analysis, while data from nine further LAs were excluded from the analysis of the 18 to 64 group and ten from the analysis of the 65+ group due to apparent inconsistencies between counts of clients at LA level and RAP returns.

As above, LAs provided masked data to the project with a "*" in place of actual count for LSOAs that had counts between 1 and 4.

Missing data: Five components of service were used for the estimation of the Relative Needs Formulae: Home Care, Day Care, Direct Payments, Professional Support, Equipment and Adaptations. For each of these components, we first replaced missing values of total primary client types with the sum of values for the respective primary client types and zero values of total primary client types were replaced with the sum of values for the respective primary client types if at least one of the latter values was different from zero.

LSOAs with a masked value were given a synthetic count value based on the average number of service users across all the LSOAs in the local authority that had five service users or more, computed by component as:

$$\bar{*}_{Ki} = \frac{RAPK_i - \sum_j K_{ij}}{N^*_{Ki}} \text{ , } \forall\, K_{ij} \geq 5$$

where $RAPK_i$ stands for RAP Return for service component K in the LA *i*, K_{ij} stands for count of clients for service component K in LA *i* and LSOA *j*, and N^*_{Ki} represents the total number of '*' values for the service component K in the LA *i*.

For each service component, star mean values ($\bar{*}_{Ki}$) that were out of the (0,5) range were replaced with the average value of the in-range values. In order to remove outliers, values smaller than the 5th percentile weighted by the number of stars at LA level (N^*_{Ki}) were replaced with the 5th weighted percentile value. Similarly, values higher than the 95th weighted percentile were replaced with the 95th weighted percentile value.

After replacing the masked values, the counts of community-based care service users were used to estimate gross weekly cost-weighted community-based care utilisation at LSOA level. As local unit cost can be influenced by differences in the commissioning practices of councils, national average unit costs were applied. The unit cost figures were taken from the Personal Social Services Expenditure and Unit Costs - England, 2013-14, Final release [NS] reported by the Health and Social

Care Information Centre.[16] The cost-weighted utilisation for older people for each LSOA j ($GWCommCareExp65plus_j$) was calculated as:

$$GWCommCareExp65plus_j = 193 \times HomeCare_j + 138 \times DayCare_j + 188 \times DirPay_j + 117 \times ProfSupport_j + 22 \times Equipment_j$$

A.3.2. Weighting to 2019/20 service utilisation levels

As the collected data on utilisation of LA-funded social care at LSOA-level described above is rather dated and the collection of new data was not feasible for the short period of this project, we weighted the data to more recent service utilisation levels using data from Adult Social Care Activity and Finance: England 2019-20. Data from the fiscal year 2019-20 was preferred as it reflects service utilisation that has not been affected by the Covid-19 pandemic.

A.3.2.1. Residential and nursing care service use

As the Adult Social Care Activity and Finance: England 2019-20 does not include information on PERMENENT admissions to residential and nursing care, the weight used for each LSOA j in LA i in the sample is the relative change in the number of residents aged 65 and over supported by LAs in residential and nursing care placements between 31 March 2013 and 31 March 2020. Therefore, the weighted number of LA supported PERMANENT admissions to residential and nursing care during 1 April 2012 to 31 March 2013 in the LSOA j in LA i ($\mathrm{paResNurCare\_1213LA\_W}_{ij}$) is calculated as:

$$\mathrm{paResNurCare\_1213LA\_W}_{ij} = \mathrm{paResNurCare\_1213LA}_{ij} \times \frac{\mathrm{ResNurCare\_Mar20SALT}_i}{\mathrm{ResNurCare\_Mar13CAR}_i}$$

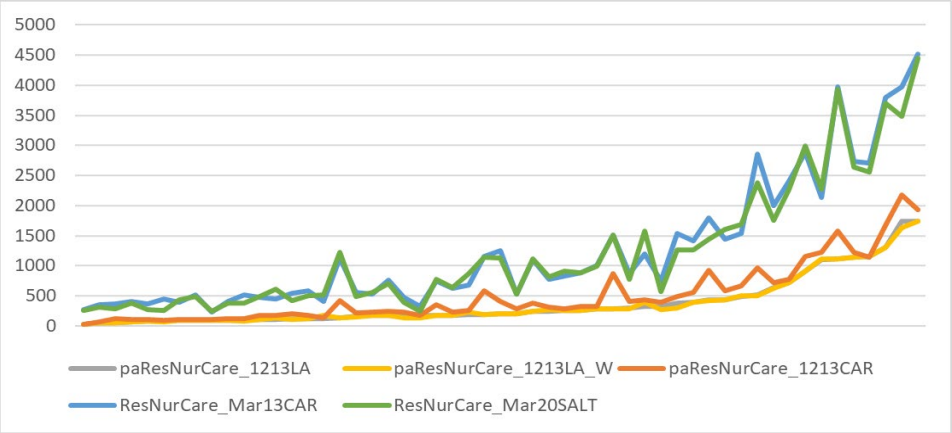
where:

- $\mathrm{paResNurCare\_1213LA}$ denotes the number of LA supported PERMANENT admissions to residential and nursing care during 1 April 2012 to 31 March 2013 from the LA data collection above (Annex A.2.1.1.),
- $\mathrm{ResNurCare\_Mar13CAR}$ stands for the number of residents aged 65 and over supported by your local authority in residential and nursing care placements on 31 March 2013 from ASC-CAR SocialCareActivityReport_2013_Final_Release_ROUNDED – sum of residential and nursing care (i.e. CAR_S2_pg1_row4_col1 + CAR_S2_pg1_row4_col2), and
- $\mathrm{ResNurCare\_Mar20SALT}$ stands for the number of clients aged 65 and over accessing long term support in residential and nursing care on 31 Mar 2020 from Adult Social Care Activity and Finance: England 2019-20, Table 38 – sum of residential and nursing care.

The geographical distribution of the weighted vs. unweighted PERMENENT admissions to residential and nursing care is highly correlated (0.998), as shown in Figure 4.

[16] http://www.hscic.gov.uk/catalogue/PUB16111

Figure 4. Geographical distribution of the weighted and unweighted permanent admissions to residential and nursing care are



A.3.2.2. Community-based service use

As the Adult Social Care Activity and Finance: England 2019-20 does not include information on Gross Current Expenditures by the client types reported in PSS-EX1 2013-14 (i.e. the denominator in the calculation below), we use as numerator the Gross Weekly Current Expenditure on long-term care for clients aged 65 and over by support setting (i.e. the sum of 'Community: Direct Payments', 'Community: Home Care', 'Community: Supported Living', 'Community: Other Long Term Care' [from ASC-FR 2019-20, Table 44] divided by 52). Despite the differences, the two measures of Gross Current Expenditures on long-term community care are highly correlated (0.97). The weighted gross weekly cost-weighted utilisation of community services by older people in the LSOA j in LA i ($\mathrm{gwCE\_Comm\_Mar2013LA\ \_W19}_{ij}$) is calculated as:

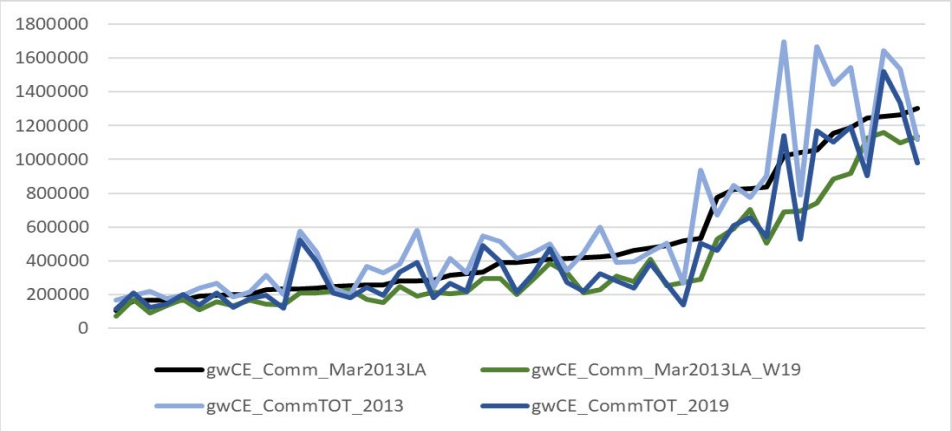
$$\mathrm{gwCE\_Comm\_Mar2013LA\ \_W19}_{ij} = \mathrm{gwCE\_Comm\_Mar2013LA}_{ij} \times \frac{\mathrm{gwCE\_CommTOT\_2019}_i}{\mathrm{gwCE\_CommTOT\_2013}_i}$$

where:

- $\mathrm{gwCE\_Comm\_Mar2013LA}$ is the gross weekly (cost-weighted) community-based care utilisation on 31 March 2013 from the LA data collection discussed in Annex A.2.1.2.;
- $\mathrm{gwCE\_CommTOT\_2013}$ stands for GROSS CURRENT EXPENDITURE; OLDER PEOPLE (AGED 65 OR OVER) INCLUDING OLDER MENTALLY ILL from PSS-EX1 2013/14 – sum of Home Care, Day Care, Direct Payments, Assessment and care management (i.e. Professional Support), and Equipment and Adaptations; divided by 52 (to obtain gross weekly current expenditure);
- $\mathrm{gwCE\_CommTOT\_2019}$ stands for Gross Current Expenditure on long term care for clients aged 65 and over, by support setting, during 2019/20 from Adult Social Care Activity and Finance: England 2019-20, Table 44 – sum of Community: Direct Payments, Community: Home Care, Community: Supported Living, Community: Other Long-Term Care; divided by 52 (to obtain gross weekly current expenditure).

The geographical distribution of the weighted vs. unweighted gross weekly community-based care utilisation is highly correlated (0.971), as illustrated in Figure 5.

Figure 5. Geographical distribution of the weighted and unweighted gross weekly community-based care utilisation



A.3.3. Population Estimates at July 2019

Source: We used mid-2019 population estimates at LSOA level by single year of age, as they are the closest population estimates available to the data collection on care home and community-based service users. The statistics are provided by the Office of National Statistics, Population Statistics Division.[17] Using these statistics, we computed through aggregation of single years of age the population aged 65 and over as well as working age population (i.e. aged 16 to 64) at LSOA level.

A.3.4. Benefits Claimants Data

Source: We used data on counts of benefits claimants for August 2019 (i.e. Attendance Allowance, Pension Credit, and Personal Independence Payment claimants) at LSOA level provided by the Department for Work and Pensions.[18]

Calculation: For share of Attendance Allowance and Pension Credit claimants aged 65+ in the LSOA population 65 and over we used as denominator the ONS estimates of the population aged 65 and over, while for share of Personal Independence Payment claimants aged 16 to 64 in the LSOA population 16 to 64 we used as denominator the ONS estimates of the working age population (i.e. aged 16 to 64) (see Annex A.3.3 above).

A.3.5. Number of Care Home Beds

Source: Data on the number of care home beds on 1 September 2019 were extracted from the Care Directory statistics provided by the Care Quality Commission.[19] The statistics are at care home level.

Calculation: Before estimating the number of care home beds at LSOA 2011 level, we cleaned the data by dropping duplicated care homes,[20] corrected typos in the care home postal codes, corrected the entry for Local Authority Area and replaced missing values for Service User Band (i.e. type of client) using information from carehome.co.uk.

The number of care home beds for 'Old Age/Dementia' clients at LSOA level was estimated in two steps. In the first step, the number of care home beds of the care homes registered to serve 'Old Age/Dementia' clients was aggregated at postal code level. Then, in the second step, using the

[17] http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-320861
[18] http://tabulation-tool.dwp.gov.uk/NESS/BEN/iben.htm
[19] http://www.cqc.org.uk/cqcdata
[20] Double entries in the Care Home register are sometimes due to a change in management.

February 2022 ONS Postcode Directory,[21] postcodes were matched to LSOAs and the care home bed numbers aggregated at LSOA level.

The number of care home beds was used in the analysis as a measure of supply of care services.

A.3.6. Census 2011 data

We used Census 2011 data at LSOA level for specific indicators of needs and wealth:

- The share of people aged 85 and over with substantial activities of daily life limitations (i.e. day-to-day activities limited a lot) in the Census 2011 population aged 65 and over – Table ID LC3302EW;[22]
- The share of households with members living as a couple (i.e. married or cohabiting) aged 65 and over in the Census 2011 households 65 and over – Table ID LC1102EW;[23]
- The share of homeowner households aged 65 and over in the Census 2011 households 65 and over – Table ID LC4201EW.[24]

The share of people with substantial activities of daily life limitations were used as an indicator of social care needs. For older people, we used the share of couples aged 65 and over in the total number of households 65 and over as an additional need indicator, as people living as a couple may help each other in times of need and access less LA care support. The share of homeowner households aged 65 and over in the total number households 65 and over is used as a measure of housing wealth.

A.3.7. VOA Council Tax data

Source: Data on the dwelling stock by council tax bands were extracted from the Valuation Office Agency (VOA). The data give the overall number of domestic properties allocated to each of the eight standard Council Tax bands at Lower Layer Super Output Area (LSOA).

Calculation: The dwelling stock by council tax bands on 31 March 2020 are used to calculate the share of dwellings in each council tax band in the total number of dwellings in a LSOA.

A.3.8. Land Registry Price Paid data

Source: Data on the house prices were extracted from the Land Registry Price Paid Data provided by data.gov.uk.[25] The data track the residential property sales in England and Wales that are lodged with the Land Registry for registration.

Calculation: Land Registry Price Paid data for 2018, 2019 and 2020 were used to calculate mean values at LSOA level. Prices were inflated/deflated to 2019 £ using the CPIH index. In order to reduce the influence of extremes, we compute a geometric mean instead of an arithmetic mean. As in log form the low and high values are not as extreme relative to the rest of the data, the data are first transformed into log values, then averaged at LSOA level and, finally, converted back to a linear value.

A.3.9. English Longitudinal Study of Ageing (ELSA)

The English Longitudinal Study of Ageing (ELSA) is a longitudinal survey conducted once every two years since 2002. There are currently nine waves of data available, covering 2002 to 2018. The

[21] https://geoportal.statistics.gov.uk/datasets/ons-postcode-directory-february-2022/about
[22] https://www.nomisweb.co.uk/census/2011/lc3302ew
[23] https://www.nomisweb.co.uk/census/2011/lc1102ew
[24] https://www.nomisweb.co.uk/census/2011/lc4201ew
[25] http://data.gov.uk/dataset/land-registry-monthly-price-paid-data

original wave 1 sample draws from individuals aged 50 and above who previously participated in the Health Survey of England between 1998 and 2001. New refreshment samples from the HSE have also been added in waves 3,4,6,7 and 9 in order for the panel to remain representative of the English population aged 50 and above.

ELSA contains a rich set of variables on demographics, income, wealth, health and disability status, care utilisation and benefit receipt. For the purpose of our analysis, we used data on age and household structure, home ownership, individual receipt of pension credit and attendance allowance, reported difficulties with Activities of Daily Living (ADL), reported subjective health as well as home value, household non-housing and housing wealth.

Wealth is reported at the benefit unit (BU) level. Net housing wealth is defined as the gross value of primary housing less housing debt. Net non-housing wealth is the sum of the value of savings (e.g. current and savings accounts, ISAs) and investments (e.g. shares, bonds, trusts, life insurance ISAs) less financial debt, plus the net value of second homes, business, farm or business property and other physical assets. Total individual income is defined as an individual's income from employment income, self- employment, private pensions, state pensions, state benefits and income from other sources. We do not include capital income (e.g. dividends from shares, interest on savings) as charging rules treat these as capital which is subject to tariff income charging.[26]

The average values of variables used in the analysis are presented in Table 15 for each of waves 1 to 9.

The objective of our analysis using the ELSA data is to quantify the cross-sectional relationship between financial eligibility and per capita net expenditure requirements and a set of selected individuals' characteristics (age, home value, pension credit receipt, living alone). These quantities, i.e. the coefficients from our regression model, are then used to project from the same set of individuals' characteristics in our LSOA dataset to obtain predicted financial eligibility prevalence and expenditure requirements at the LSOA-level. Therefore, we require our ELSA analysis sample to be representative of our LSOA sample along a set of key characteristics. To achieve this, we generated weights for each ELSA observation using calibration. These weights were chosen such that the weighted aggregates of our set of calibration variables matched the target aggregates. Calibration variables and their targets were total number of homeowners aged 65 and over (7,720,724), total number of individuals aged 65 and over living alone (4,377,151), total number of pension credit recipients aged 65 and over (1,325,215), and the total population 65 and over (10,353,716). As noted in the main text, the resulting weights were used in our main regression analysis and to produce the summary statistics in Table 1.

[26] See Charging for Residential Accommodation Guide.

Table 13. Sampled local authorities – residential and nursing care

LA code	LA name	LA code	LA name
E06000055	Bedford	E08000034	Kirklees
E09000004	Bexley[b]	E10000017	Lancashire
E08000025	Birmingham[a]	E06000016	Leicester
E06000009	Blackpool	E10000019	Lincolnshire
E06000036	Bracknell Forest	E08000003	Manchester
E09000006	Bromley	E09000024	Merton
E10000002	Buckinghamshire	E06000042	Milton Keynes
E10000003	Cambridgeshire	E06000024	North Somerset
E09000007	Camden	E06000048	Northumberland
E06000049	Cheshire East	E10000024	Nottinghamshire
E06000052	Cornwall	E10000025	Oxfordshire
E06000047	County Durham	E06000031	Peterborough[a]
E08000026	Coventry	E06000038	Reading
E09000008	Croydon[b]	E08000005	Rochdale
E10000007	Derbyshire	E08000028	Sandwell
E09000009	Ealing	E08000014	Sefton
E10000011	East Sussex	E08000029	Solihull
E09000010	Enfield[b]	E08000013	St Helens
E10000012	Essex	E08000007	Stockport
E10000013	Gloucestershire	E10000029	Suffolk
E09000012	Hackney	E10000030	Surrey
E09000013	Hammersmith and Fulham	E09000029	Sutton[a]
E10000014	Hampshire	E06000030	Swindon
E09000014	Haringey	E06000027	Torbay
E06000001	Hartlepool	E09000030	Tower Hamlets
E09000017	Hillingdon	E09000031	Waltham Forest
E09000018	Hounslow[b]	E09000033	Westminster
E06000046	Isle of Wight	E06000054	Wiltshire
E09000020	Kensington and Chelsea	E08000031	Wolverhampton
E10000016	Kent	E06000014	York

Notes: [a] Excluded due to incomplete data submitted. [b] Excluded due to inconsistencies between aggregated totals and national returns.

Table 14. Sampled local authorities – community-based care

LA code	LA name	LA code	LA name
E06000055	Bedford	E08000034	Kirklees
E09000004	Bexley[b,c]	E10000017	Lancashire
E08000025	Birmingham	E06000016	Leicester
E06000009	Blackpool	E10000019	Lincolnshire
E06000036	Bracknell Forest	E08000003	Manchester
E09000006	Bromley	E09000024	Merton[b,c]
E10000002	Buckinghamshire	E06000042	Milton Keynes
E10000003	Cambridgeshire[c]	E06000024	North Somerset
E09000007	Camden	E06000048	Northumberland
E06000049	Cheshire East	E10000024	Nottinghamshire[b,c]
E06000052	Cornwall[b]	E10000025	Oxfordshire
E06000047	County Durham	E06000031	Peterborough
E08000026	Coventry[b,c]	E06000038	Reading
E09000008	Croydon[b,c]	E08000005	Rochdale
E10000007	Derbyshire	E08000028	Sandwell
E09000009	Ealing	E08000014	Sefton
E10000011	East Sussex	E08000029	Solihull
E09000010	Enfield[b]	E08000013	St Helens[c]
E10000012	Essex	E08000007	Stockport
E10000013	Gloucestershire[c]	E10000029	Suffolk
E09000012	Hackney	E10000030	Surrey
E09000013	Hammersmith and Fulham[a]	E09000029	Sutton
E10000014	Hampshire	E06000030	Swindon
E09000014	Haringey	E06000027	Torbay
E06000001	Hartlepool	E09000030	Tower Hamlets
E09000017	Hillingdon	E09000031	Waltham Forest[b,c]
E09000018	Hounslow[b,c]	E09000033	Westminster
E06000046	Isle of Wight	E06000054	Wiltshire
E09000020	Kensington and Chelsea	E08000031	Wolverhampton
E10000016	Kent	E06000014	York

Notes: [a] Excluded due to incomplete data submitted. [b] Excluded form analysis of community-based care for young adults due to inconsistencies between aggregated totals and national returns for clients aged 18 to 64. [c] Excluded form analysis of community-based care for older people due to inconsistencies between aggregated totals and national returns for clients aged 65 and over.

Table 15. Summary statistics (mean values) ELSA data

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	Wave 8	Wave 9
Female	0.554	0.556	0.558	0.544	0.545	0.539	0.546	0.539	0.553
Age group: 65 to 74	0.580	0.558	0.541	0.595	0.576	0.568	0.565	0.572	0.567
Age group: 75 to 84	0.342	0.354	0.351	0.311	0.328	0.338	0.341	0.337	0.334
Age group: 85 and above	0.079	0.088	0.108	0.094	0.096	0.095	0.095	0.090	0.099
Owns home (outright)	0.682	0.720	0.723	0.749	0.763	0.772	0.786	0.799	0.808
Home value (£; 2020 prices)	171,999	232,997	251,096	248,932	266,405	263,495	287,389	309,300	326,783
Attendance Allowance claimant	0.079	0.089	0.091	0.083	0.080	0.070	0.061	0.058	0.058
Pension Credit claimant	0.156	0.166	0.158	0.153	0.139	0.117	0.103	0.075	0.072
Lives alone	0.366	0.361	0.365	0.339	0.325	0.315	0.306	0.293	0.285
No. of ADLs limited: 0	0.725	0.726	0.736	0.747	0.762	0.780	0.789	0.797	0.801
No. of ADLs limited: 1	0.139	0.145	0.136	0.134	0.123	0.111	0.101	0.102	0.099
No. of ADLs limited: 2	0.066	0.063	0.056	0.061	0.058	0.050	0.051	0.045	0.041
No. of ADLs limited: 3	0.034	0.030	0.035	0.029	0.027	0.028	0.026	0.021	0.024
No. of ADLs limited: 4+	0.036	0.036	0.036	0.030	0.031	0.031	0.032	0.036	0.035
Region: North East	0.069	0.066	0.068	0.065	0.065	0.060	0.058	0.061	0.057
Region: North West	0.130	0.132	0.119	0.121	0.114	0.112	0.116	0.113	0.113
Region: Yorkshire and the Humber	0.108	0.109	0.113	0.108	0.104	0.102	0.101	0.103	0.106
Region: East Midlands	0.089	0.096	0.095	0.098	0.101	0.106	0.107	0.109	0.112
Region: West Midlands	0.110	0.108	0.109	0.112	0.114	0.113	0.107	0.105	0.102
Region: East of England	0.116	0.118	0.121	0.122	0.130	0.130	0.132	0.136	0.135
Region: London	0.093	0.087	0.090	0.083	0.084	0.083	0.082	0.080	0.080
Region: South East	0.161	0.162	0.161	0.170	0.165	0.169	0.173	0.172	0.171
Region: South West	0.124	0.123	0.124	0.121	0.124	0.125	0.125	0.122	0.124
Observations	5,349	4,683	4,286	5,008	5,197	5,468	5,371	5,282	5,177

A.4. Empirical analysis and robustness – extension to the financial means test

A.4.1. Individual level (ELSA) estimations

Table 16. Estimation results ELSA sample (**regional** unit cost; age >= 65, ADLcount >= 2) – Residential & Nursing Care

	(1)	(2)	(3)
	Exp Req new	Exp Req old	FinElig old
Gender: female	46.578***	37.957***	0.006
	(7.930)	(8.590)	(0.015)
Aged 85 and over	-25.311***	-33.235***	-0.074***
	(8.254)	(8.536)	(0.015)
Log house value	-20.654***	-22.809***	-0.046***
	(0.631)	(0.683)	(0.001)
In receipt of pension credit	52.776***	76.559***	0.155***
	(7.715)	(8.518)	(0.014)
Lives alone	-241.594***	-208.255***	-0.360***
	(8.035)	(8.312)	(0.014)
Constant	630.021***	558.417***	1.077***
	(9.987)	(10.946)	(0.019)
Wave dummies	Yes	Yes	Yes
Observations	5,355	5,355	5,355
R-squared	0.409	0.372	0.418

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 17. Estimation results ELSA sample (**regional** unit cost; age >= 65, ADLcount >= 2) – Community Care

	(1)	(2)	(3)
	Exp Req new	Exp Req old	FinElig old
Gender: female	25.495***	17.745***	0.043**
	(2.827)	(3.081)	(0.017)
Aged 85 and over	-3.601	-9.767***	-0.070***
	(3.024)	(3.406)	(0.018)
Log house value	-3.207***	-3.840***	-0.020***
	(0.214)	(0.244)	(0.001)
In receipt of pension credit	23.331***	36.755***	0.216***
	(2.487)	(2.923)	(0.014)
Lives alone	-10.336***	-8.483***	-0.037**
	(2.820)	(3.082)	(0.017)
Constant	151.149***	140.296***	0.830***
	(3.439)	(3.929)	(0.020)
Wave dummies	Yes	Yes	Yes
Observations	5,355	5,355	5,355
R-squared	0.139	0.154	0.143

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

A.4.1.1. Sensitivity analysis – needs definitions variants

Figure 6. Coefficient estimates under different definitions of eligible need – Residential & Nursing Care

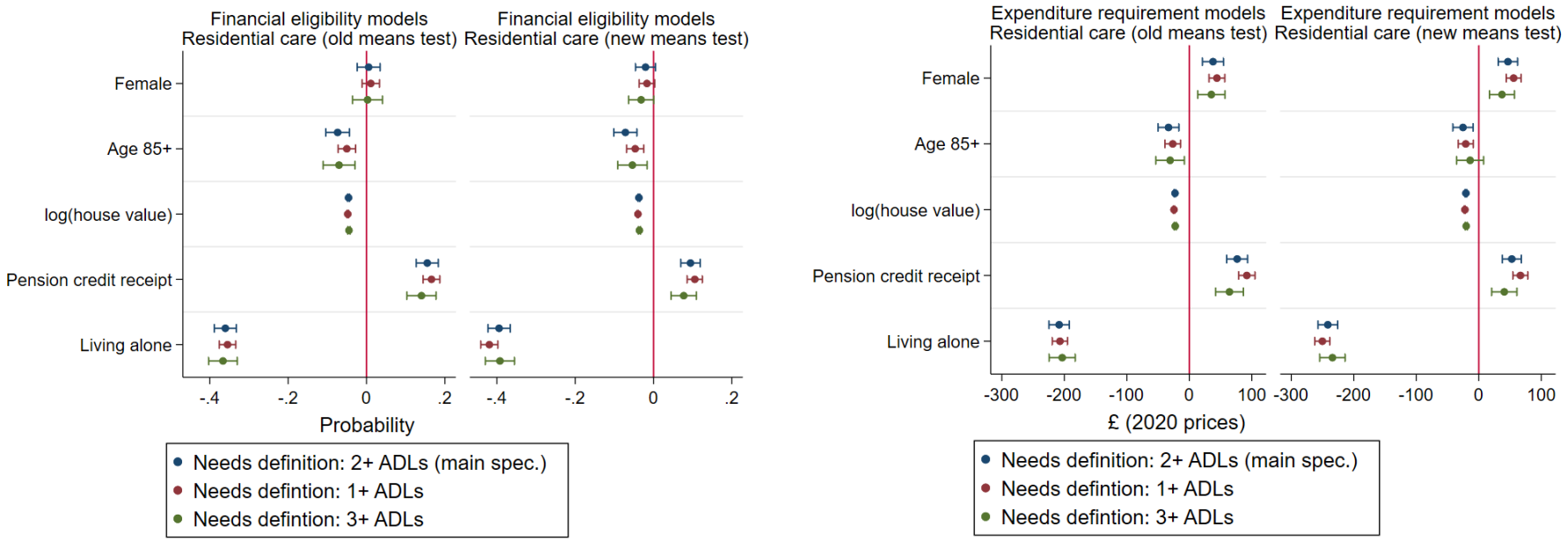
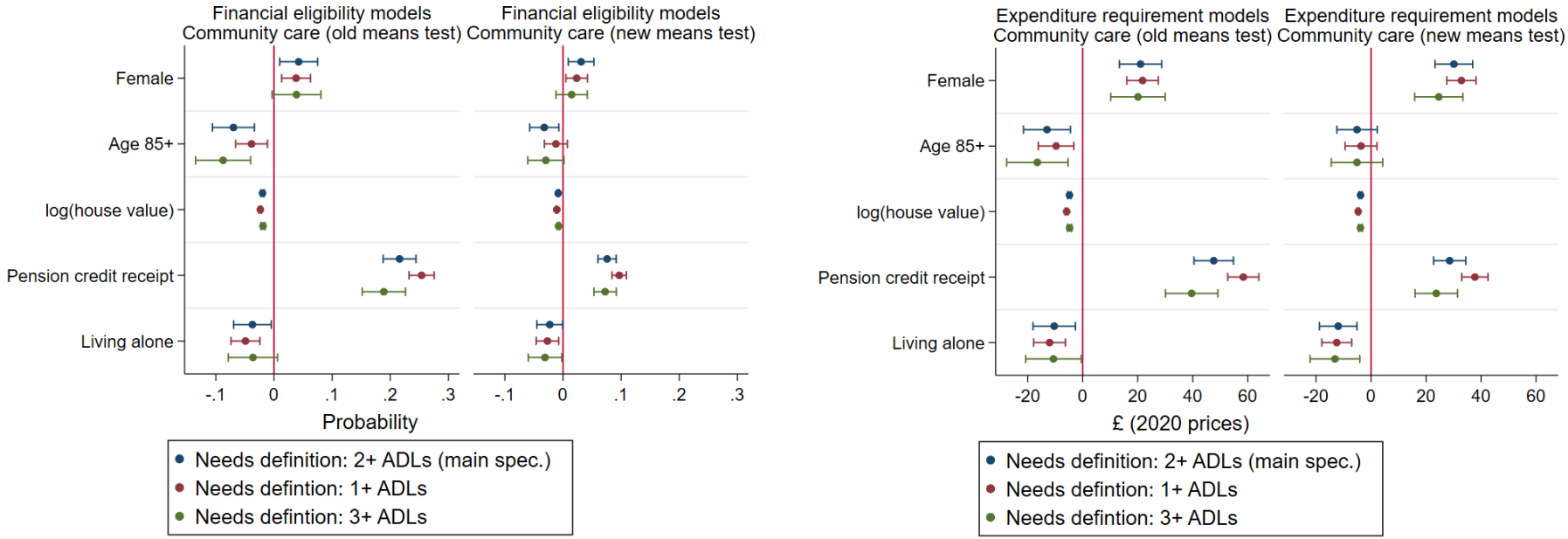


Figure 7. Coefficient estimates under different definitions of eligible need – Community care



A.4.2. Small area (LSOA) estimations

Table 18. Estimation results of the additional expenditure requirement at LSOA level (**regional** unit cost) – Residential & Nursing Care

	(1)		(2)	
	GLM	Marg Eff	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	1.396***	186.4***	1.511***	202.2***
	(0.196)	(26.16)	(0.190)	(26.00)
Limiting (significantly) condition 85+ per capita 65+	2.725***	363.7***	2.649***	354.6***
	(0.220)	(27.30)	(0.221)	(26.91)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.002***	133.7***		
	(0.085)	(13.04)		
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.645***	86.03***		
	(0.119)	(17.78)		
Home-owner households 65+ per households 65+			1.761***	235.7***
			(0.443)	(55.54)
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020			-0.060*	-8.047*
			(0.035)	(4.492)
Pension Credit Claimants 65+ per capita 65+	-0.487***	-65.06***	-0.363**	-48.61**
	(0.174)	(23.48)	(0.165)	(22.10)
Living arrangements: couple households 65+ per households 65+	-0.540***	-72.01***	-0.563***	-75.41***
	(0.106)	(14.93)	(0.098)	(13.62)
Ethnic White population 65+ per capita 65+	0.720***	96.03***	0.798***	106.9***
	(0.203)	(27.45)	(0.206)	(28.01)
Population 65+ (log)	0.611***	81.51***	0.603***	80.66***
	(0.037)	(4.669)	(0.036)	(4.770)
Total MSOA care home beds for old age/dem per MSOA pop 65+	0.090***	12.06***	0.156***	20.93***
	(0.035)	(4.368)	(0.028)	(3.486)
Constant	0.106		0.030	
	(0.363)		(0.356)	
Observations	13,430		13,430	
Log Likelihood	-48,660		-47,797	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 19. Estimation results of the additional expenditure requirement at LSOA level (**regional** unit cost) – Community Care

	(1)		(2)	
	GLM	Marg Eff	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	1.244***	199.4***	1.300***	214.9***
	(0.135)	(19.89)	(0.143)	(20.39)
Limiting (significantly) condition 85+ per capita 65+	3.321***	532.4***	3.224***	532.8***
	(0.234)	(39.87)	(0.249)	(41.42)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	0.500***	80.13***		
	(0.044)	(11.54)		
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	-0.011	-1.741		
	(0.108)	(17.28)		
Home-owner households 65+ per households 65+			1.753***	289.7***
			(0.353)	(51.79)
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020			-0.101***	-16.76***
			(0.029)	(4.252)
Pension Credit Claimants 65+ per capita 65+	-0.711***	-113.9***	-0.670***	-110.8***
	(0.106)	(21.40)	(0.106)	(23.47)
Living arrangements: couple households 65+ per households 65+	-0.463***	-74.15***	-0.506***	-83.64***
	(0.061)	(10.47)	(0.064)	(11.70)
Ethnic White population 65+ per capita 65+	-0.001	-0.186	0.040	6.553
	(0.057)	(9.202)	(0.055)	(9.108)
Population 65+ (log)	0.614***	98.35***	0.591***	97.61***
	(0.037)	(5.213)	(0.045)	(5.417)
Total MSOA care home beds for old age/dem per MSOA pop 65+	0.133***	21.25***	0.170***	28.13***
	(0.017)	(3.308)	(0.015)	(4.089)
Constant	1.281***		1.382***	
	(0.284)		(0.350)	
Observations	12,462		12,462	
Log Likelihood	-45,112		-45,060	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A.4.3. Allocation formulae – extension to the financial means test

Table 20. Allocation formulae for the extension to the financial means test

	Residential & Nursing Care		Community Care		Combined (Residential and Community Care)	
	(1)	(2)	(1)	(2)	(1)	(2)
Attendance Allowance claimants 65+ per capita 65+	2.8536	2.9529	0.9108	0.9896	3.7644	3.9425
Limiting (significantly) condition 85+ per capita 65+	5.3218	5.3144	2.4320	2.4558	7.7538	7.7702
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.5419		0.3662		1.9082	
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.8201		-0.0077		0.8123	
Home-owner households 65+ per households 65+		4.3776		1.3537		5.7313
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020		-0.2311		-0.0794		-0.3105
Pension Credit Claimants 65+ per capita 65+	-1.8756	-1.9237	-0.5197	-0.5390	-2.3953	-2.4626
Living arrangements: couple households 65+ per households 65+	-0.7818	-0.8322	-0.3388	-0.3810	-1.1207	-1.2132
Constant	0.7575	0.7628	0.5247	0.5319	1.2822	1.2947

A.5. Empirical analysis and robustness – additional assessments

A.5.1. Individual level analysis

Table 21. Estimation results ELSA sample (age >= 65)

	ADLs 2+	ADLs 3+
Gender: female	0.008*	0.006*
	(0.004)	(0.003)
In receipt of attendance allowance	0.212***	0.130***
	(0.011)	(0.009)
Lives alone	0.006	0.001
	(0.005)	(0.003)
Self-reported health: Poor	0.226***	0.145***
	(0.007)	(0.006)
In receipt of pension credit	0.037***	0.010**
	(0.007)	(0.005)
Age group: 70 to 75	0.008**	0.002
	(0.004)	(0.003)
Age group: 75 to 80	0.011**	0.002
	(0.005)	(0.003)
Age group: 80 to 85	0.024***	-0.001
	(0.006)	(0.004)
Age group: 85 and over	0.077***	0.036***
	(0.009)	(0.007)
Constant	0.056***	0.027***
	(0.005)	(0.004)
Wave dummies	Yes	Yes
Observations	44,191	44,191
R-squared	0.138	0.094

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

A.5.2. Small area analysis

Table 22. Estimation results for additional assessments at LSOA level – Utilisation-based approach

	(1)		(2)	
	GLM	Marg Eff	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	1.408***	8.336***	1.411***	8.554***
	(0.158)	(0.669)	(0.158)	(0.684)
Limiting (significantly) condition 65+ per capita 65+	0.496***	2.936***	0.742***	4.497***
	(0.136)	(0.848)	(0.134)	(0.838)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	1.416***	8.381***		
	-0.058	(0.806)		
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	1.127***	6.674***		
	(0.101)	(1.011)		
Home-owner households 65+ per households 65+			1.351***	8.190***
			(0.387)	(2.255)
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020			0.008	0.05
			-0.031	(0.190)
Pension Credit Claimants 65+ per capita 65+	-0.934***	-5.528***	-0.875***	-5.303***
	(0.115)	(0.779)	(0.119)	(0.735)
Living arrangements: couple households 65+ per households 65+	-1.546***	-9.154***	-1.540***	-9.336***
	(0.107)	(0.649)	(0.107)	(0.598)
Ethnic White population 65+ per capita 65+	0.268**	1.588**	0.335***	2.033***
	(0.111)	(0.626)	(0.108)	(0.625)
Population 65+ (log)	0.627***	3.711***	0.603***	3.655***
	-0.04	(0.158)	-0.042	(0.153)
Total MSOA care home beds for old age/dem per MSOA pop 65+	0.102***	0.605***	0.175***	1.059***
	-0.033	(0.181)	-0.027	(0.163)
Constant	-2.405***		-2.434***	
	(0.309)		(0.307)	
Observations	11,130		11,130	
Log Likelihood	-20,484		-20,591	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 23. Estimation results for additional assessments at LSOA level – Normative approach (ADL 3+)

	(1)		(2)	
	GLM	Marg Eff	GLM	Marg Eff
Attendance Allowance claimants 65+ per capita 65+	5.340***	23.11***	5.626***	22.69***
	(0.750)	(3.107)	(0.824)	(3.267)
Limiting (significantly) condition 65+ per capita 65+	1.757***	7.605***	1.651***	6.657***
	(0.441)	(1.737)	(0.422)	(1.699)
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	0.221	0.957		
	(0.159)	(0.807)		
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.643***	2.781**		
	(0.173)	(1.104)		
Home-owner households 65+ per households 65+			-1.129	-4.552
			(0.921)	(3.669)
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020			0.108	0.437
			-0.069	(0.289)
Pension Credit Claimants 65+ per capita 65+	-0.686**	-2.969**	-0.675**	-2.722***
	(0.309)	(1.170)	(0.293)	(0.975)
Living arrangements: couple households 65+ per households 65+	0.936***	4.052***	1.064***	4.290***
	(0.268)	(0.711)	(0.272)	(0.745)
Ethnic White population 65+ per capita 65+	-1.217***	-5.270***	-1.259***	-5.076***
	(0.216)	(1.203)	(0.219)	(1.178)
Population 65+ (log)	1.811***	7.839***	1.888***	7.615***
	(0.244)	(0.990)	(0.266)	(1.035)
Total MSOA care home beds for old age/dem per MSOA pop 65+	1.655***	7.166***	1.665***	6.714***
	(0.332)	(0.883)	(0.337)	(0.965)
Constant	-9.284***		-9.791***	
	(1.737)		(1.861)	
Observations	11,131		11,130	
Log Likelihood	-21,253		-21,027	

Bootstrapped (100 replications) standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

A.5.3. Allocation formulas

Table 24. Allocation formulae for additional assessments

	Utilisation-based approach		Needs proxy approach	
	(1)	(2)	(1)	(2)
Attendance Allowance claimants 65+ per capita 65+	0.0279	0.0289	0.0641	0.0636
Limiting (significantly) condition 65+ per capita 65+	0.0095	0.0131	0.0220	0.0224
Home-owner households 65+ per households 65+ × properties in council tax band ABCDE per all properties	0.0255		0.0041	
Home-owner households 65+ per households 65+ × properties in council tax band FGH per all properties	0.0198		0.0113	
Home-owner households 65+ per households 65+		0.0320		-0.0310
Home-owner households 65+ per households 65+ × log of average LSOA house price in 2020		-0.0004		0.0029
Pension Credit Claimants 65+ per capita 65+	-0.0215	-0.0223	0.0058	0.0063
Living arrangements: couple households 65+ per households 65+	-0.0282	-0.0289	0.0125	0.0135
Constant	0.0130	0.0118	-0.0036	-0.0049

References

ASTHANA, S. and GIBSON, A., 2011. Setting health care capitations through diagnosis-based risk adjustment: A suitable model for the English NHS? *Health Policy,* **101**(2), pp. 133-139.

ASTHANA, S., GIBSON, A., MOON, G., DICKER, J. and BRIGHAM, P., 2004. The pursuit of equity in NHS resource allocation: should morbidity replace utilisation as the basis for setting health care capitations? *Social science & medicine,* **58**(3), pp. 539-551.

DARTON, R., FORDER, J., NETTEN, A., BEBBINGTON, A., HOLDER, J. and TOWERS, A., 2010. Slicing Up the Pie: Allocation of Central Government Funding of Care of Older People. *Social Policy & Administration,* **44**(5), pp. 529-553.

DEPARTMENT OF HEALTH, 2014. *Care and Support Statutory Guidance: Issued under the Care Act 2014.* London: Department of Health.

FORDER, J., 2007. *Self-funded social care for older people: an analysis of eligibility, variations and future projections.* Discussion Paper 2505. Canterbury: PSSRU, University of Kent.

FORDER, J. and FERNANDEZ, J., 2009. *Analysing the costs and benefits of social care funding arrangements in England: technical report (1st Edition).* Discussion Paper 2644. London: PSSRU, University of Kent and London School of Economics and Political Science.

FORDER, J. and VADEAN, F., 2018. *Estimating relative needs formulae for new forms of social care support.* Discussion Paper 2877/2. London: PSSRU, University of Kent and London School of Economics and Political Science.

GALBRAITH, J. and STONE, M., 2011. The abuse of regression in the National Health Service allocation formulae: response to the Department of Health's 2007 'resource allocation research paper'. *Journal of the Royal Statistical Society: Series A (Statistics in Society),* **174**(3), pp. 517-528.

GRAVELLE, H., SUTTON, M., MORRIS, S., WINDMEIJER, F., LEYLAND, A., DIBBEN, C. and MUIRHEAD, M., 2003. Modelling supply and demand influences on the use of health care: implications for deriving a needs-based capitation formula. *Health Economics,* **12**(12), pp. 985-1004.

INSTITUTE OF PUBLIC CARE, 2011. *People who pay for care: An analysis of self-funders in the social care market.* Oxford: Oxford Brookes University.

NHS Digital (2020) *Adult Social Care Activity and Finance: England 2019-20*, Table 11: Number of requests for support received from new clients aged 65 and over, by what happened next, 2019-20.

RANASINGHE, J. and TIDESWELL, E., 2014. *Study to Review and Update RNF Allocation Formulae for Adult Social Care: Engagement and Data Collection Activities.* Milton Keynes: LG Futures.

SMITH, P.C., 2007. *Formula Funding of Public Services.* London and New York: Routledge.

VADEAN, F and FORDER, J (2018) *The revision of the Relative Needs Formulae for adult social care funding and new allocation formulae for funding Care Act reforms*, PSSRU Discussion Paper 2906/2 (https://www.pssru.ac.uk/pub/5143.pdf).

VALLEJO-TORRES, L., MORRIS, S., CARR-HILL, R., DIXON, P., LAW, M., RICE, N. and SUTTON, M., 2009. Can regional resource shares be based only on prevalence data? An empirical investigation of the proportionality assumption. *Social science & medicine,* **69**(11), pp. 1634-1642.